London School of Economics and Political Science

Department of Management

Performance Evaluation of London Court

Stochastic Modelling Project 2015/2016

Candidate Number. 13709

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1 Executive Summary

The aim of this report is to investigate the effects of cutting the number of essential staff involved in London's judicial system, and to find out the estimated total cost of running the system for a period of one year as the government plans to change the way criminal cases are processed.

The model in this paper analyses the Court system which will operate five days a week, 48 weeks in the year, running for eight hours from 9.00am to 5pm. To understand how criminal cases are processed in the UK, please refer to "Structure of the courts system" in Appendix.

For the first part of the analysis, I will be performing certain analysis before concluding if the manpower proposed can cope with the expected workload, and they are as follows:

1. Produce a flow diagram to provide an overall picture of how the judicial system works
2. Build a discrete event simulation model that reflects the behaviour of the judicial system
3. Analyse the behaviour of the Magistrates' Court and identify any possible bottlenecks
4. Inspect certain parameters of interest that will explain if the system can cope with the workload
5. Suggest the minimum number of new staff required to eliminate the bottleneck if there are any bottleneck present

Due to the nature of the system, all criminal cases (standard, serious and very serious) are initially seen in a Magistrates' court and very serious cases will be proceeded to the Crown Court. This paper only investigate the total cost incurred in the Magistrates' court as required. Similarly, I will be performing certain analysis which will aid me in estimating the total cost in running the Magistrates' court and they are as follows:

1. Produce a flow diagram showing the relationship between the inputs and outputs, namely the costs for each type of different criminal case heard the Magistrates' court.
2. Develop an Excel Model incorporating the variability of the inputs
3. Calculate the total cost of the system
4. Discuss the implications of increasing the fees for district judge and clerical staff
5. Estimate the savings (if any) should serious cases be processed online

The software used in this report are Simul8[1] and @Risk[2]. The technique of simulation is used because it makes it simple and easy to look into possible different scenarios.

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[1] http://www.simul8.com/
[2] http://www.palisade.com/risk/

2   Assumptions

Even though sufficient information are provided, certain assumptions are to be made before running the simulation. This is to clarify and clear any doubts before running the model. The assumptions for this report are as follows:

1. The number Magistrates' and Crown court in London are 16 and 9 respectively. This report assumes that there are more than enough court rooms compared to the number of judicial staff so as to remove the constraint that there are lesser court available compared to the number of judicial staff. I will be analysing the number of staff require for a period of one year and the court proceedings should not be impeded by the number of court rooms available.

2. This report assumes that very serious, serious and standard cases enter into their own queue before proceeding to their respective courtrooms. This allows me to identify a single queuing time for cases going into their respective court.

3. A Magistrate judge would be require to sort the cases into the different classes (effective, ineffective and cracked cases) because they have they knowledge and experience to do so. In reality, a Magistrate takes minimal time to differentiate these cases but for simplicity sake, I assume that it does not take any time.

4. As reported by the Ministry of Justice, the number of criminal cases that take place in London do not occur at a specific interval, and different period in the year can have different crime rates[3]. However, for the sake of this simulation, this report assumes that the number of cases arriving each day of the week follows the same distribution.

5. When a trial is postponed or dropped, this report assumes that the next case will be ready to start immediately. This situation however is not possible/practical in reality because everyone involved in the case (e.g. defendant, witness, and lawyer) will have to be free and ready to enter the court room.

6. This report assumes that when a court case ends, another case scheduled will be able to start immediately. In reality, this does not happen because they court room will have to be tidied and cleaned before another court case starts. However, for simplicity, this report assumes that when a case end, another case can start immediately.

7. In extremely complex (very serious cases), the cases can go up to a maximum of 350 days and these court cases will be fought over few hours across many different days. Such cases can go on for months. However, for simplicity sake, this report assumes that an extremely complex case will be trialled consecutively over consecutive working days until it ends.

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[3] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/321352/court-statistics-jan-mar-2014.pdf

8. In reality, the efficiency of the different judge will drop as he/she sits though a few cases in a day. However for simplicity sake, the trial time are independent from one another and follow the time set. Delay time in this case are also independent.

3 Discrete Event Simulation

3.1 Flow diagram

To begin with, I have constructed a flow diagram to provide a clear view of how the criminal cases are treated. Figure 1 below shows the flow of cases. The arrow into the green box gives the percentage sorted for the respective cases. All cases would have to enter a queue before being trialled at the court. Remember that one of the assumption made is that it takes zero amount of time for the cases to be sorted into the different classes (effective, ineffective and cracked cases). This effectively translate to 4 queues in total, 2 for very serious cases and 1 each for serious and standard cases. Do take note that for ineffective cases, they will be delayed as a new trial date will have to be scheduled. For information pertaining to the trial and delay time, please refer to Table 1 in Appendix
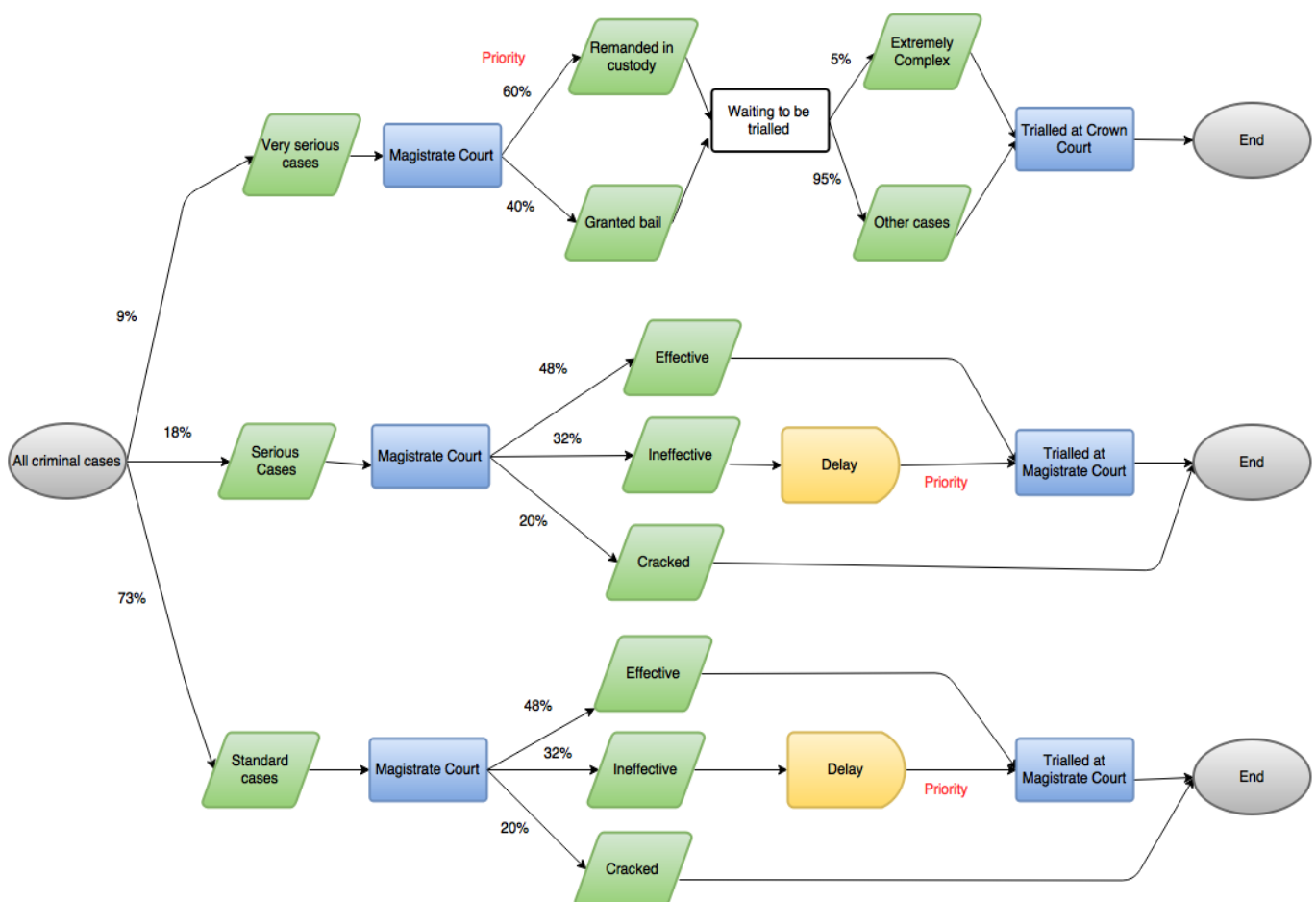

Figure 1: Flow diagram of all criminal cases
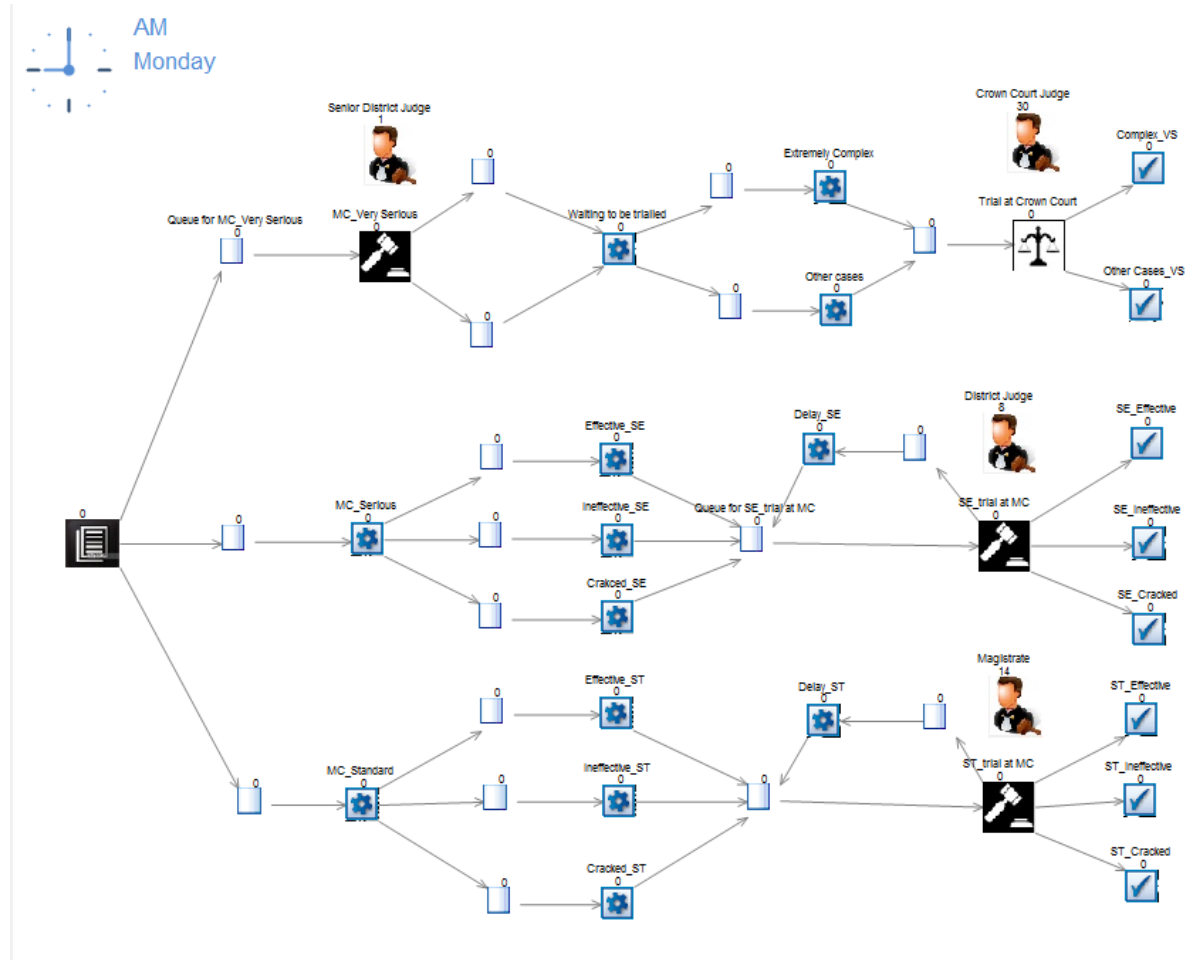
3.2 Discrete event simulation (DES) model

Figure 2 below gives the discrete event simulation model that reflects the behaviour of the judicial system. As seen in the diagram, there are 4 queues, as mentioned earlier, with their respective resources above the court icon. The DES model has been constructed with respect to the flow diagram developed above. For future references, please take note of the abbreviations used. MC – Magistrates' court, VS – Very serious, SE – Serious and ST – Standard.

Figure 2: DES model constructed in Simul8

After building the model, I ran the model at a slow speed to verify that the work item took the route according the specifications that I have set. I then made a sense check by calculating the proportion of cases ending in each end point to validate the model.

3.3 Behaviour of Magistrates' court

To collect the results for the model that I have built, I will need to set the warm up period in order to remove any initialisation bias. Initialisation bias take place because this simulation model starts with an empty queue but in reality this does not happen because the start of the simulation should begin at the end of previous year. Therefore, removing the initialisation bias will allow me to collect more accurate results. To do this, I will need to remove all bottle neck, which then makes it possible for me to identify the warm up period.

Removing the bottle neck ensures that the system will have a steady, which is critical in calculating warm up period. To remove all bottleneck, I will have to run the model over different time period and analyse if certain performance measure suggest that bottleneck exist. Table 2 below gives the different values of performance measure collected at the 1 year, 2 year and 3 year mark respectively.

Simulation Object	Performance Measure	1920hrs	3840hrs	5740hrs
Queue for MC_Very Serious	Average Queue Size	1157.02	1797.01	2436.79
	Average Queue Time	692.79	1075.54	1456.57
Queue for trial at crown court	Average Queue Size	90.73	92.91	92.57
	Average Queue Time	89.54	91.93	91.63
Queue for SE_trial at magistrates' court	Average Queue Size	2265.32	3484.26	4708.7
	Average Queue Time	557.21	854.75	1155.05
Queue for ST_trial at magistrates' court	Average Queue Size	0.16	0.16	0.16
	Average Queue Time	0.91	0.93	0.95

Table 2: Average queue size and queue time into different courts

Looking at the table, I can clearly identify 3 bottle neck, where average queue size and average queue time increase over the years. They occur at the queue for Magistrates' court (very serious cases), queue for Crown court and queue for Magistrates' court (serious cases) highlighted in red. This suggest that there are insufficient judicial staff at the respective courts to deal with the cases and therefore, average queue time and average queue size does not stabilise over the different periods. Over a 3 year period, the queue time for standard cases increased by a slight fraction and this can be considered to be negligible. At this point, I notice that the average queue time for Crown court and average queue time for serious cases to Magistrates' court are very high. This suggest that much more resources are required in these 2 queues to remove these bottle neck.

After trying different iterations, I came up with a set of judicial staff required in order to remove the bottle neck. Please refer to Table 3 in Appendix which shows the change in average queue size and time over different time periods. I have increase the number of resources required until the average queue size and queue time stabilises.

This DES requires 2 Senior district Judge, 16 District judge, 14 Magistrate and 60 Crown court judge to remove all bottleneck. A Senior District judge works from 9am to 1pm but all other judges work from 9am to 5pm. Instead of changing the resource of Senior District Judge from one to two, I placed an additional resource who works from 1pm to 5pm from Monday to Friday. This makes more sense since the system will then need only one court room instead of 2 different court rooms, and it provides more flexibility for very serious cases brought to the Magistrates' court since it runs from morning until late noon.

After setting the number of require staff, it is possible to identify the warm-up period. Running the model accounting for different time period, the value that I attained is 700 hours. Please refer to table 4 in Appendix. The warm up period is the period when the average queue size and average queue time stabilizes. According to simul8 support[4], it suggest adding 20% to warm up period calculated as a safety of margin. This gives a warm up period of 840 hours. Doing this ensures that I remove all the initialisation bias which can affect the values of the results collected.

3.4 Results (Parameters of interest)

The results collected utilises 1 Senior Distract Judge, 8 District Judge, 14 Magistrates and 30 Crown Court Judge, as proposed by the government. I have also set the travel time from activity to queue and the travel time from queue to activity to be zero. Table 5 below gives the results collected after the warm-up period has been set. The values give a 95% confidence interval for the average results. For example, the average time in the system for complex case falls in between 840.2 hours and 860.13 hours with 95% confidence interval. 76 iterations were used to collect the most accurate results and the number of iterations was calculated using the trial calculator tool.

Simulation Object	Performance Measure	Low 95% range (hrs)	Average (hrs)	High 95% range (hrs)
complex_VS	Average time in system	843.28	850.04	856.79
other cases_VS	Average time in system	762.17	767.28	772.4
SE_effective	Average time in system	557.14	560.38	563.62
SE_Ineffective	Average time in system	963.97	968.8	973.63
SE_cracked	Average time in system	553.89	557.56	561.24
ST_cracked	Average time in system	0.89	0.9	0.9
ST_Ineffective	Average time in system	16.89	16.9	16.9
ST_cracked	Average time in system	0.01	0.01	0.01
Queue for MC_Very Serious	Average Queue Size	1146.23	1157.2	1167.81
	Average Queue Time	687.77	692.79	697.82
Queue for trial at crown court	Average Queue Size	89.13	90.73	92.33
	Average Queue Time	87.92	89.54	91.15
Queue for SE_trial at magistrates' court	Average Queue Size	2250.2	2265.32	2280.04
	Average Queue Time	554.04	557.21	560.38
Queue for ST_trial at magistrates' court	Average Queue Size	0.15	0.16	0.17
	Average Queue Time	0.8	0.83	0.87
Senior District Judge	Utilization %	100	100	10
District Judge	Utilization %	100	100	100
Magistrate	Utilization %	68.47	68.5	68.59
Crown Court Judge	Utilization %	92.26	92.79	93.32

Table 5: Results collected after warm up period set

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[4] https://simul8.com/support/help/doku.php?id=gettingstarted:techguide:warmup

From the results above, I can see that for very serious complex and very serious other cases, the average time in the system takes around 850.04 hours (21.3 weeks) and 767.28 hours (19.2 weeks) respectively. The long hours make sense since there are bottle necks in both the Magistrates' and Crown court. For such cases, most of the time are spent on queuing, where 692.79 hours are spend on queuing to enter the Magistrates' court and 89.54 hours are spent on queuing to be trialled at the Crown court.

For serious cases, the average time in the system takes around 560.38 hours, 968.8 hours and 557.56 hours for efficient, inefficient and cracked cases respectively. The high values are a result of high average queue time – 557.21 hours. This means that for efficient and cracked cases, most of the time spend in the system is spent on queuing.

For standard cases, the average time in the system takes around 0.9 hours, 16.9 hours and 0.01 hours for efficient, inefficient and cracked cases respectively. The queue time for the standard cases is very low (0.83 hours) because there are enough Magistrates to handle standard cases.

The average utilisation of Senior District Judge, District judge, Magistrates and Crown court judges are 100%, 100%, 68.5% and 92.79% respectively. A sound check would make sense since I have found that bottle neck exist at 3 of the queue as mentioned earlier. The utilisation of crown court is not 100% because very serious cases have to be cleared at the Magistrates' court before entering the Crown court, and the resources are not fully utilised in the beginning when the system runs.

3.5 Minimum number of staff required to remove bottle neck

Under section 3.4 of this report, I have identified the number of judicial staff require to remove the bottle neck. This system requires an *additional* Senior district judge, 8 District judge and 20 Crown court judge. An important point to take note here is that the number of Magistrates can be reduced since the utilisation is not 100% as seen in Table 5 above. Looking at the average queue time and average queue size, I found out that the number of Magistrates can be reduced to 12, without reducing the bottle neck.

Running the model with 2 Senior district judge (one working from 9am to 1pm and the other working from 1pm to 5pm), 16 District judge, 12 Magistrate and 60 Crown court judge gives the results collected in Table 6 below.

After changing the number of resources, we can see that the average queue time and average queue size for all queues to the different courts have fallen significantly, with the exception of queue for standard cases (because its values are very low to begin with).

Simulation Object	Performance Measure	Low 95% range (hrs)	Average (hrs)	High 95% range (hrs)
complex_vs	Average time in system	169.74	169.89	170.04
other cases_vs	Average time in system	21.99	22	22
SE_effective	Average time in system	5.37	5.37	5.37
SE_Ineffective	Average time in system	44.43	44.44	44.45
SE_cracked	Average time in system	0.4	0.41	0.41
ST_cracked	Average time in system	0.95	0.95	0.95
ST_Ineffective	Average time in system	16.94	16.94	16.94
ST_cracked	Average time in system	0.03	0.03	0.03
Queue for MC_Very Serious	Average Queue Size	1.84	1.85	1.86
	Average Queue Time	1.1	1.11	1.11
Queue for trial at crown court	Average Queue Size	0.04	0.04	0.05
	Average Queue Time	0.02	0.03	0.03
Queue for SE_trial at magistrats'e court	Average Queue Size	1.78	1.79	1.8
	Average Queue Time	0.4	0.4	0.4
Queue for ST_trial at magistrate's court	Average Queue Size	0.8	0.8	0.8
	Average Queue Time	0.04	0.04	0.04
Senior District Judge	Utilization %	83.01	83.05	83.09
District Judge	Utilization %	83.02	83.05	83.08
Magistrate	Utilization %	79.86	79.87	79.88
Crown Court Judge	Utilization %	77.39	77.45	77.5

Table 6: Results collected after changing number of resources

The average time in the system for each cases has also decreased significantly. For example, the average time taken for very serious complex cases now takes an average 169 hours. Looking at the judge utilisation figures, they lie around 100% initially (except for Magistrates), but all resource utilisation figure has dropped to around 80% after additional resources have been introduced, with the exception of Magistrates where 2 were reduced.

Table 7 below gives the average number of cases trialled for the year, we can see that the number of cases trial has increase, before and after additional resources have been added.

	Very serious	Serious	Standard	Total cases trialled
Before increase	1911.25	3976.26	26046.35	31933.86
After increase	3211.25	6399.58	26052.33	35663.16

Table 7: Number of cases trialled for the year

3.6 Recommendations

Should the government run the judicial system with the number of judicial staff proposed, about 90% of cases will be clear in the year. This figure is calculated using the total number of cases at the end point over most likely number of cases for the year. However, if the government runs the judicial system with additional staff, the cases cleared will rise to around 100%. Of course, this comes at a price, which amounts to the additional remuneration for 1 Senior district judge, 8 District judge and 20 Crown court judge.

For the 10% of the criminal cases not cleared in the year, they will have to be trialled in the following year. Therefore, assuming that the time value of money is constant, it makes more sense to hire more judicial staff to clear these criminal cases. This is because cases have to be trialled sooner or later and hiring less judge will only push back the whole trial process and make the judicial system look inefficient. By cutting the number of essential staff for the year, the government might have to hire even more staff to cope with the large number of criminal cases waiting to be trialled.

In reality, judicial staff utilisation will not reach 100% because some staff will take sick leave or will have urgent matters to attend to and will not be able to report for work. When such incidents happen, this will lead to a further increase in average queue size and average queue time in the system. Having staff utilisation of 80% therefore provides more flexibility.

Given the considerations above, it is recommended that the government hire 2 Senior district judge, 16 District Judge, 14 Magistrates and 60 Crown court judge to manage the judicial system for the following year.

4 Additional Assumptions

The assumptions under cost analysis is similar to those as explained under the discrete event simulation. However, additional assumptions were made in this part of the analysis.

In splitting all the criminal cases to their respective case type, some figures are not in integer values. I have made them into integer values as this make more sense because cases brought to the court are complete cases.

The pre-trial time spent in preparation and judicial staff cost involved might not follow an exponential and normal distribution in reality. However, for simplicity sake, this report will assume that the distributions does follow an exponential and normal distribution for the 2 variables mentioned above.

5 Cost Analysis

5.1 Flow diagram

Figure 3 below shows the flow diagram of the relationship between the inputs and outputs, namely the costs for each type of different criminal case. Very serious cases only consist of pre-trial cost and trial cost but serious and standard cases includes pre-trial cost, delay cost as well as trial cost. Cost are coloured in red and resources required are coloured in purple. Please refer to Table 8 in Appendix for details pertaining to the breakdown of different cost and trial time.
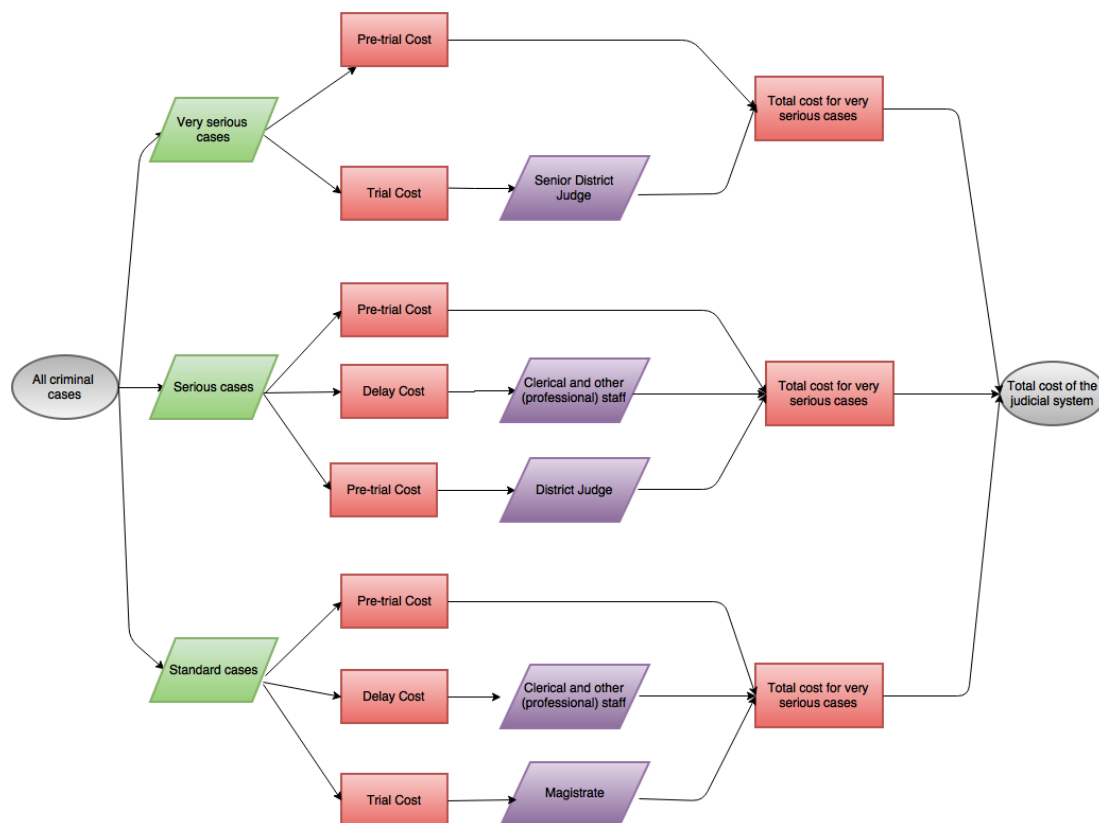

Figure 3: Relationship between inputs and outputs

5.2 Excel model

Please refer to the @Risk file attached for the excel model. The total cost of the judicial system calculated uses a structure similar to the flow diagram produced above.

In this model, I have chosen to use Latin Hypercube sampling instead of Monte Carlo sampling. Latin Hypercube gives a tighter variance because confidence interval are calculated several times using this method. This will return a narrower confidence interval value for total cost of running the judicial system, which I am interested to calculate.

5.3   Total cost of the system

Table 9 below shows the total cost of the system after running 1000 iterations for 10 different simulation using @Risk. Running the model for 1000 iterations for 10 simulation increases the accuracy of results collected. The total cost of running the judicial system lies between £31,964,247.95 and £31,998,632.65 with 95% confidence interval.

Overall mean	£31,981,440.30	
Std Error of overall mean	£7,599.98	
Desired confidence level	95%	
Critical t	2.262157163	
Margin of error	£17,192.35	
Confidence interval	£31,964,247.95	£31,998,632.65

Table 9: Total cost after running with Latin Hypercube

Looking at the distrituion of the first simulation model in Figure 4 below, I can see that the total cost of the system follows a lognormal distribution. The first simulation results indicate that there is a 5% probability that total cost of the system will be lesser than £17.1 million and a 5% probability that the total cost of the system will be greater than £50.4 million.
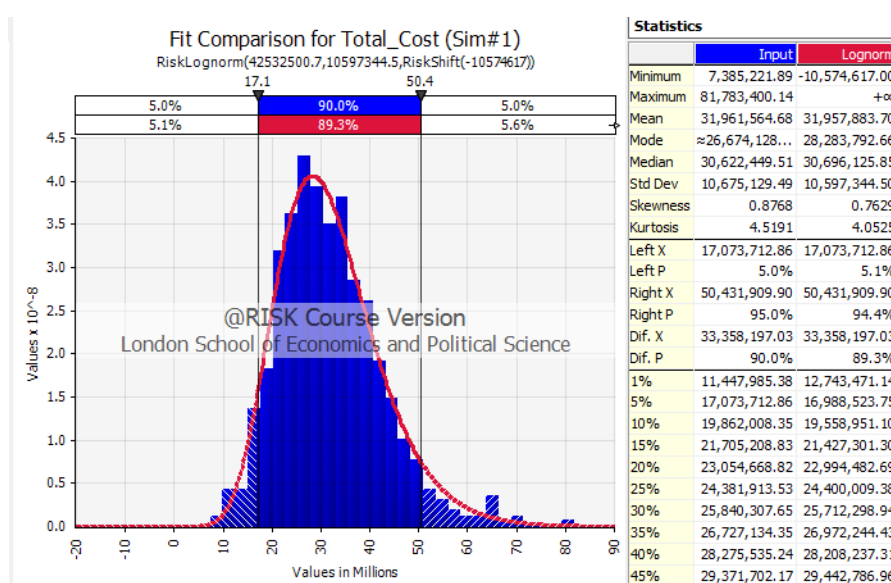

Figure 4: Results of first simulation model

5.4   Implications of increased fees

As a result of unions demanding an increase in salary, I have conducted a sensitivity analysis to look at the impact of increasing the salary for district judge and for clerical staff. Figure 5 below shows that sensitivity tornado for cost of District judge and clerical staff.
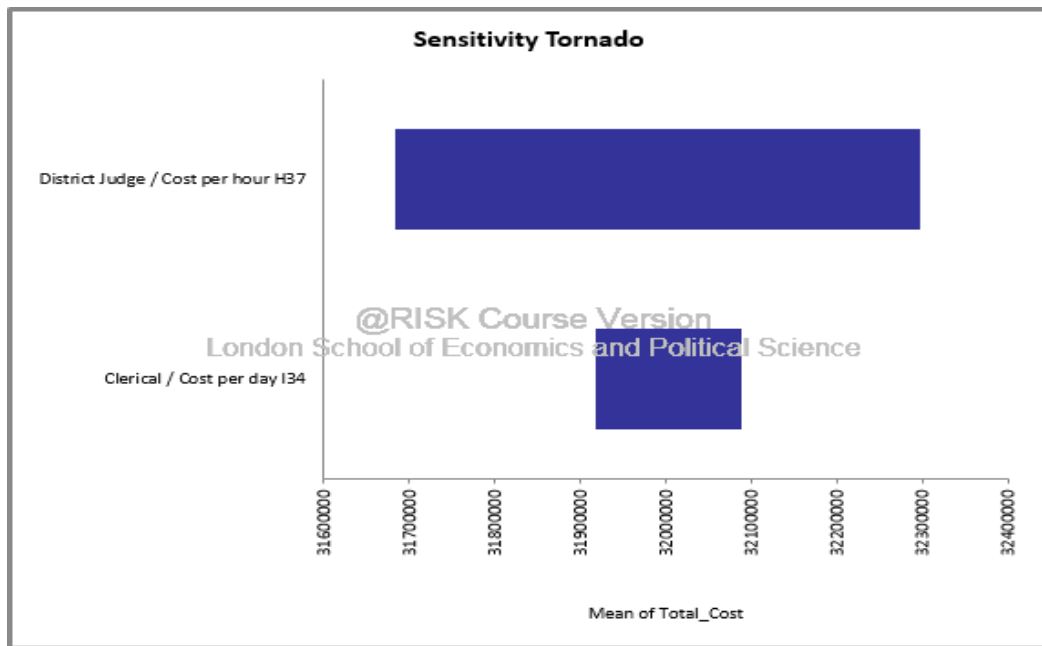
Figure 5: Sensitivity analysis for identified factors
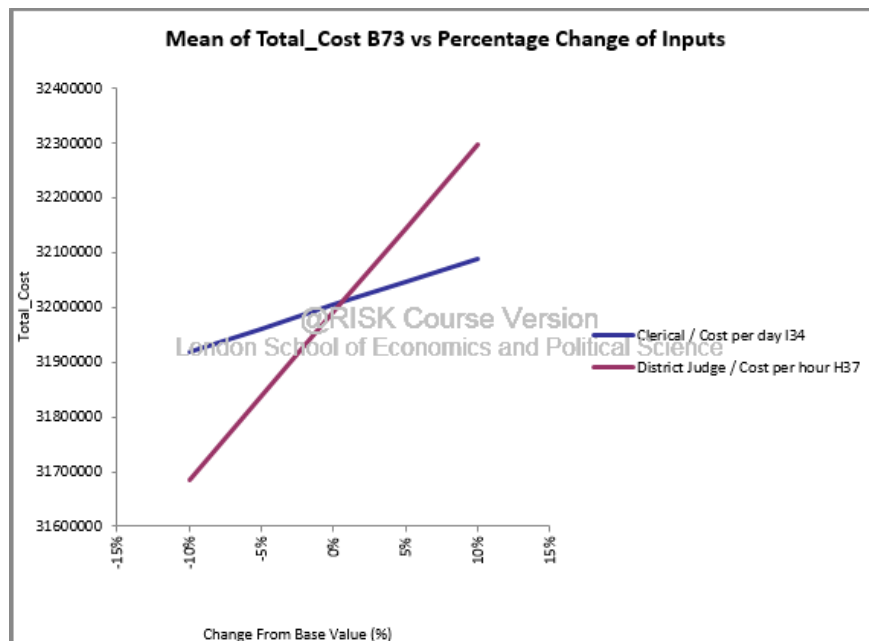
Figure 6: Spider plot graph for identified factors

The spider plot graph above shows how the total mean cost will change with respect to the percentage change in the cost of district judge and clerical staff. I can see that the gradient for the district judge cost is steeper compared to clerical staff cost. This means that a unit increase in percentage cost of district judge per hour will results in a greater increase in the total cost, as compared to a unit increase in percentage cost of clerical staff per day.

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This resonates with figure 5 above which shows that assuming other variables are kept constant, uncertainty and variability in District judge cost has a larger impact on the mean total cost of the system. In this case, I am concerned about the mean total cost which can go up to £32.3 million because of uncertainty in the District judge cost.

5.5   Estimated savings (if any) should serious cases be processed online

It has been suggested that serious cases could be process online, both pre-trial, and trial. This will reduce the pre-trial duration from a mean value of 10 days to a mean value of 7 days, and the length of the trial would decrease by 20%. This will also result in no "inefficient" and "cracked" trials. I have created a new excel model to simulate this scenario and ran the model using Latin Hypercube sampling, using the same parameters for the analysis. Please refer to @Risk file for the excel model.

Overall mean	£25,946,979.93	
Std Error of overall mean	£7,336.46	
Desired confidence level	95%	
Critical t	2.262157163	
Margin of error	£16,596.23	
Confidence interval	£25,930,383.70	£25,963,576.16

Table 10: Total cost after processing serious cases online

Looking at the confidence interval of the cost, before and after serious cases are processed online, the total cost of the judicial system has changed from an interval of (£31,964,247.95, £31,998,632.65) to (£25,930,383.70, £25,963,576.16). Therefore, I can conclude with 95% confidence level that there is a cost savings as the 2 confidence interval does not fall within the same range. Taking the difference between the average total costs of the 2 model, the total cost savings would be around £6,034,460.37.

5.6   Recommendations

From the cost analysis conducted, I recommend the government to process serious cases online. This will results in a cost savings of around 18.9%.

Processing the serious cases online will reduce the length of trail by 20% but this effect will be negated as all cracked cases now will have to be trialled. Therefore, the number of District Judge required in the judicial system will remain the same. Looking at the first part of this report, it is recommended that the government increase the number of District judge, from 8 to 16. The increase in demand of District judge will put the Union in a better position to ask for higher salaries (law of supply and demand[5]), since the government should be looking at hiring more judicial staff. With that in mind, the government can increase the salaries of the District judge and clerical staff using the cost saving if serious cases are processed online. However, the government should try to limit the increase in salary of District judge since it has a larger impact on the mean total cost of the system.

Another point that the government should take note is to monitor the variables that can cause a large deviation in the total cost of the system. Looking at the tornado diagram below, it gives the relative importance of each variable. The diagram gives the highest and lowest total cost the system will take based on the uncertainty of a variable, given that other variables remain constant. For example, the lowest and highest total cost of the judicial system will fall in between £26,207,722 and £57,657,445, after accounting for the uncertainty of the serious time spent in preparation during the pre-trial period, assuming other variables are kept at baseline.

Therefore, extra efforts should be spent on monitoring line items at the higher end of the tornado graph so that the total cost of the judicial system will not exceed the budget set for the year. For example, the government should identify if less time can be spent on preparation during the pre-trial stage by providing training to the staff involved. This will increase pre-trial's overall efficiency and reduce the mean total cost.
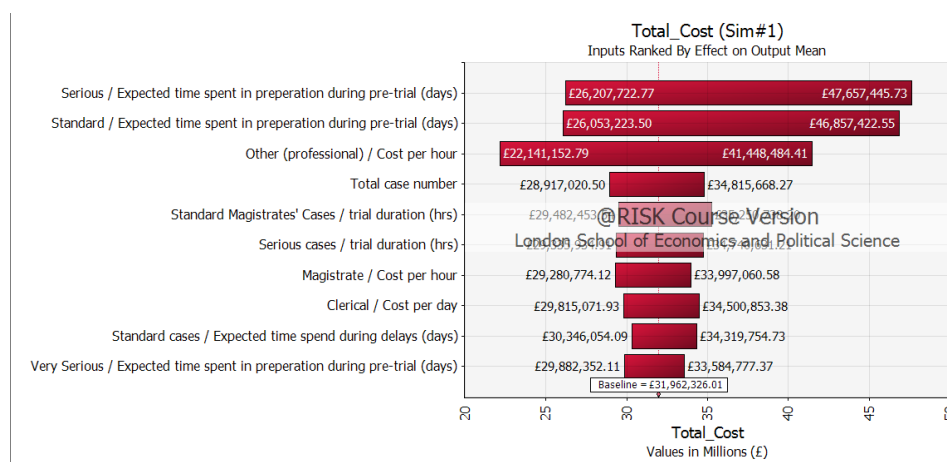

Figure 7: Tornado diagram of the Total cost

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[5] http://www.investopedia.com/terms/l/law-of-supply-demand.asp

6   Conclusion

After simulating the discrete event simulation and cost analysis model, my conclusion is that cutting the number of essential staff involved in London's judicial system will lead to high average queue size and average queue time for very serious and serious cases, and the average cost of running the proposed system for a year will cost around £32 million.

Is it therefore proposed that the government hires additional judicial staff to cope with the system and opt for serious cases to be processed online in order to cut down on the overall expenditure.

The average cost savings of £6 million from processing serious cases online can then be channelled into hiring more judicial staff and increase salary for District judge and clerical staff as demanded by the union. This ensures that the judicial system remains efficient and prevent a strike from taking place; maintaining the stability of the country.

The results collected in the report are based on the simulations that I ran. Running the model again in the respective software might generate different results due to the randomness of the system. However, it should not deviate much from the analysis that I have produced.

Looking into the issue as a whole, it would be ideal for the government to look into the root of the problem, which is to reduce criminal rates in London. London is a cosmopolitan city with around 17 million international visitors coming in annually[6]. Efforts spent in targeting this issue will not only reduce the number of essential staff require in the judicial system which in turn reduce the total cost running the system, but also boost London's position as a safe place for tourist to visit.

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[6] http://www.londonandpartners.com/media-centre/press-releases/2015/150520-london-welcomes-174-million-international-visitors-in-another-recordbreaking-year-for-tourism

7 Appendix

"Structure of the courts system"

The UK courts system is complicated and – in places – confusing, because it has developed over 1,000 years rather than being designed from scratch.

Different types of case are dealt with in specific courts: for example, all criminal cases will start in the magistrates' court, but the more serious criminal matters are committed (or sent) to the Crown Court. Appeals from the Crown Court will go to the High Court, and potentially to the Court of Appeal or even the Supreme Court.

Civil cases will sometimes be dealt with by magistrates, but may well go to a county court. Again, appeals will go to the High Court and then to the Court of Appeal – although to different divisions of those courts.

The tribunals system has its own structure for dealing with cases and appeals, but decisions from different chambers of the Upper Tribunal, and the Employment Appeals Tribunal, may also go to the Court of Appeal.

The courts structure covers England and Wales; the tribunals system covers England, Wales, and in some cases Northern Ireland and Scotland." (Judiciary, 2015)

You can find a detailed diagram showing the routes taken by different cases as they move through the system in the following link:

http://www.judiciary.gov.uk/wp-content/uploads/2012/08/courts-structure-0715.pdf

Criminal Justice

Most people feel very strongly about crime. It is for this reason that they are dealt with in a special way. Some examples of *criminal offences* are:

- Motoring offences
- Minor Criminal Damage
- Being drunk and disorderly

Or slightly more serious offences such as

- Burglary
- Drug related offences

And the more serious offences such as:

- Rape
- Murder
- Robbery

Criminal cases come to court once the Crown Prosecution Service decides to prosecute somebody for an alleged crime.

Magistrates Courts (GOV.UK, 2015)

All criminal cases start in a Magistrates' Court. Cases are heard either by:

- 2 or 3 magistrates or
- A district judge – for very serious case (heard by senior district judge) who will refer the case to Crown court for trial before the judge and jury

Non serious offences or slightly more serious offences can be dealt with at this level, but all the more serious offences will be "remitted" (passed) to the *Crown Court* where they are judged by a Judge and will involve a Jury.

Being Kept in Custody or granted bail

In some cases, the magistrates court decides if the accused should be:

- Kept in custody – eg a police or court cell
- Or granted "bail" and let out on strict conditions – eg to keep away from named places or people

This may happen if:

- Another court hearing is needed
- The court needs more information before passing sentence
- The case is passed on to the Crown Court for trial (or sentencing)

Crown Courts

Deals with more serious cases such as rape, murder or robbery. The jury will decide on whether the "defendant" is guilty or not. The judge will pass on the sentence.

But there is a second important role for the crown courts:

- in some cases a defendant is found guilty at the magistrates' court, but magistrates do not have the power to dictate the sentence and these cases are sent to the crown court for the judge to sentence them. Of course, the duration, when there is no trial but just sentencing is shorter than when a trial takes place.
- In other cases, cases tried at a magistrate's court will appeal. These appeals will then be heard at a Crown Court. In these cases, we can assume that the duration of the case will be similar to the duration of other cases heard and tried at the Crown Court.

Listings for Trial

Once the Crown Prosecution Service has taken the decision on whether to prosecute somebody, the case is allocated a date for the trial (although trials can take more than one day, and very complex cases might take even months to be heard).

The *effectiveness* of a court is measured on the proportion of cases that are heard the date they are scheduled. In practice there are three things that can happen:

- *Effective Trials*: when the trial starts on the scheduled date
- *Ineffective Trials*: when the trial cannot start on the scheduled date for reasons such as a witness prosecution cannot attend, or the defendant barrister needs more time. They then have to be rescheduled.
- *Cracked Trials* when the trial does not go ahead on the scheduled day due to an acceptable plea being offered by the defendant or the prosecution offers no evidence against the defendant. These trials do not required further listing but the time spent on preparing for the trial has been wasted time and witnesses have been unnecessarily inconvenienced thus impacting confidence in the system.

Table 1: Delay time and Trial time for proportion of different cases

Working Time				Type of case and trial duration				
Number of Weeks	Days per Week	Hours per Day		Type of case	Percentage	Min(hrs)	Most Likely (hrs)	Maximum (hrs)
48	5	8		Very serios cases	9.00%	0.33	0.5	0.66
				Serious cases	18.00%	0.5	3.4	11
Number of Cases				Standard Magistrates' Cases	73.00%	0.31	0.8	1.54
Minimum	Most Likely	Maximum						
33,693	35,715	37,858						
				Expected delay for Ineffective trials				
Case efficiency				Cases	Minimum (days)	Most Likely (Days)	Maximum (days)	
Effective	Ineffective	Cracked		Serious cases	2	5.5	7	
48.00%	32.00%	20.00%		Standard cases	1.5	2	2.5	
Expected delay for very serious cases								
Type of case	Percentage	Min(hrs)	Most Likely (hrs)	Maximum (hrs)				
Exteremely complex	5%	5	150	350				
Other Cases	95%	2	14.1	45				

Table 3: Average queue size and average queue time over different time period

SENIOR DISTRICT JUDGE

Number of resources

1 (WHOLE DAY)	Average Queue Size	1.86	1.87	1.88	
	Average Queue Time	1.11	1.12	1.12	

DISTRICT JUDGE

Number of resources

9	Average Queue Size	952.41	1949.02	2930.36	
	Average Queue Time	230.61	471.14	708.04	
14	Average Queue Size	11.7	11.44	11.76	
	Average Queue Time	2.67	2.6	2.67	
15	Average Queue Size	3.97	4.05	3.89	
	Average Queue Time	0.9	0.92	0.89	
16	Average Queue Size	1.76	1.77	1.77	
	Average Queue Time	0.4	0.4	0.4	
17	Average Queue Size	0.46	0.47	0.46	
	Average Queue Time	0.1	0.11	0.1	

CROWN COURT JUDGE

Number of resources

35	Average Queue Size	361.04	750.27	1090.25	
	Average Queue Time	213.72	445.18	674.59	
40	Average Queue Size	194.39	422.91	641.25	
	Average Queue Time	115.93	252.67	382.72	
50	Average Queue Size	5.49	6.33	6.65	
	Average Queue Time	3.27	3.77	3.3.97	
58	Average Queue Size	0.11	0.14	0.13	
	Average Queue Time	0.07	0.08	0.08	
59	Average Queue Size	0.07	0.08	0.08	
	Average Queue Time	0.04	0.05	0.05	
60	Average Queue Size	0.04	0.05	0.05	
	Average Queue Time	0.02	0.03	0.03	
61	Average Queue Size	0.02	0.03	0.03	
	Average Queue Time	0.01	0.02	0.02	

Table 4: Calculating warm up period

WARM UP PERIOD		100hrs	200hrs	300hrs	400hrs	500hrs	550hrs	600hrs	700hrs	800hrs
Queue for MC_Very Serious	Average Queue Size	1.55	1.73	1.78	1.79	1.8	1.81	1.82	1.82	1.81
	Average Queue Time	0.95	1.04	1.06	1.07	1.08	1.08	1.09	1.09	1.08
Queue for Trialled at crown court	Average Queue Size	0	0	0.01	0.02	0.03	0.03	0.03	0.03	0.03
	Average Queue Time	0	0	0.01	0.01	0.02	0.02	0.02	0.02	0.02
Queue for SE_Trialled at magistrate court	Average Queue Size	0.65	1.25	1.44	1.54	1.59	1.6	1.63	1.64	1.64
	Average Queue Time	0.17	0.3	0.34	0.36	0.37	0.37	0.38	0.38	0.38
Queue for ST_Trialled at magistrate court	Average Queue Size	0.13	0.13	0.14	0.15	0.15	0.15	0.15	0.15	0.15
	Average Queue Time	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Table 8: Details pertaining to the breakdown of different cost and trial time for cost analysis

Information Provided				
Working Time				
Number of Weeks	Days per Week	Hours per Day		
48	5	8		
Number of Cases				
Minimum	Most Likely	Maximum		
33,693	35,715	37,858		
Case efficiency				
Effective	Ineffective	Cracked		
48.00%	32.00%	20.00%		
Type of case and trial duration				
Type of case	Percentage	Min(hrs)	Most Likely (hrs)	Maximum (hrs)
Very serios cases	9.00%	0.33	0.5	0.66
Serious cases	18.00%	0.5	3.4	11
Standard Magistrates' Cases	73.00%	0.31	0.8	1.54
Pre-trial: Time spent in				
Type of case	Distribution	Mean(Days)	Cost per Day	
Very Serious	Exponential	2	£120.00	
Serious	Exponential	7	£100.00	
Standard	Exponential	5	£50.00	
Expected delay for Ineffective				
Cases	Minimum (days)	Most Likely (Days)	Maximum (days)	
Serious cases	2	5.5	7	
Standard cases	1.5	2	2.5	
Costs				
Staff	Distribution	Mean	Standard Deviation	Unit of time
Clerical	Normal	£80.00	£40.00	Per Day
Other (professional)	Normal	£100.00	£40.00	Per Hour
Senior District Judge	Normal	£150.00	£30.00	Per Hour
District Judge	Normal	£120.00	£40.00	Per Hour
Magistrate	Normal	£70.00	£10.00	Per Hour
Apportion of work during delay				
Staff	Percentage		Decrease in length of trail	Additiional expense
Clerical	40%		20%	£1,000,000.00
Other (professional)	60%			