# Inference - Assignment

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# Effort Data:

**Overall Summary Measures:**

Mean Effort is 81.3, while Median Effort is 52. Range varies from 1 to 646, while the 25th %tile and the 75th %tile values are 30 and 103. So, the Inter Quartile Range is 73. This shows that mean is affected by extreme values. Hence, Median would be a better summary measure here. Standard Deviation of Effort is 84.6.

**Stratified Summary Measures:**

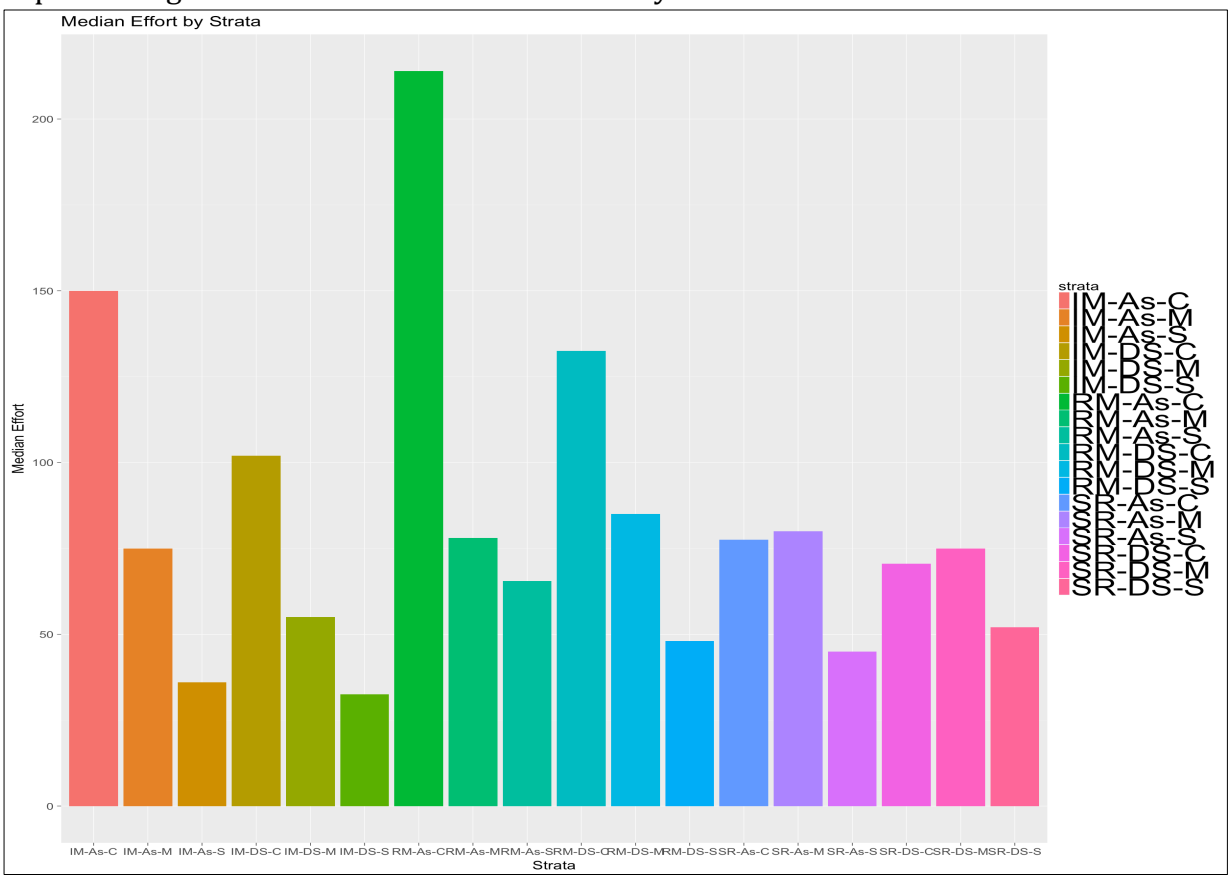
There are a total of 18 stratas. Below is a cross tabulation of Median effort in each strata:

| ITIL Process Type | Service Domain Type | Median Complexity | | |
|---|---|---|---|---|
| | | Simple | Medium | Complex |
| Service Request | Database Support | 52 | 75 | 70.5 |
| | App suport | 45 | 80 | 77.5 |
| Incident Management | Database Support | 32.5 | 55 | 102 |
| | App suport | 36 | 75 | 150 |
| Release Management | Database Support | 48 | 85 | 132.5 |
| | App suport | 65.5 | 78 | 214 |

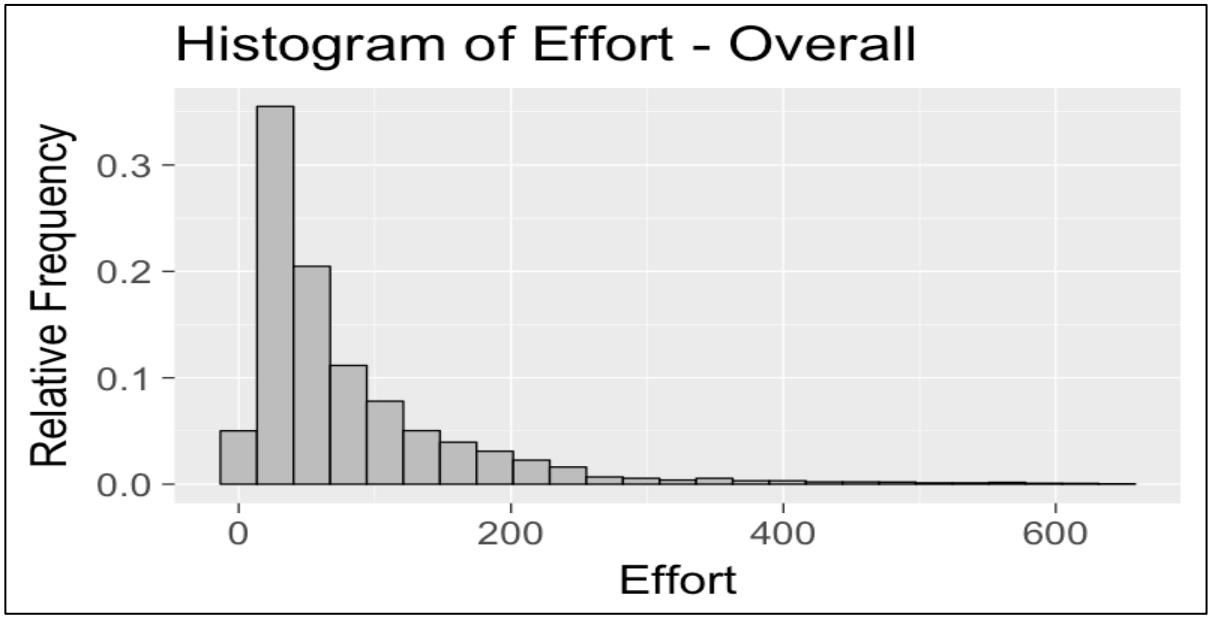
We can infer from this table:

1) Release Management **(RM)** has a higher effort than Incident Management **(IM)** and Service Request **(SR)**.
2) Complex **(C)** tasks have a higher effort than Medium **(M)** and Simple **(S)**, except for Service Request where Medium tasks have the highest effort.
3) Database Support **(DS)** generally has a lower effort than App Support **(As)** tasks.

Representing the stratified median effort visually:

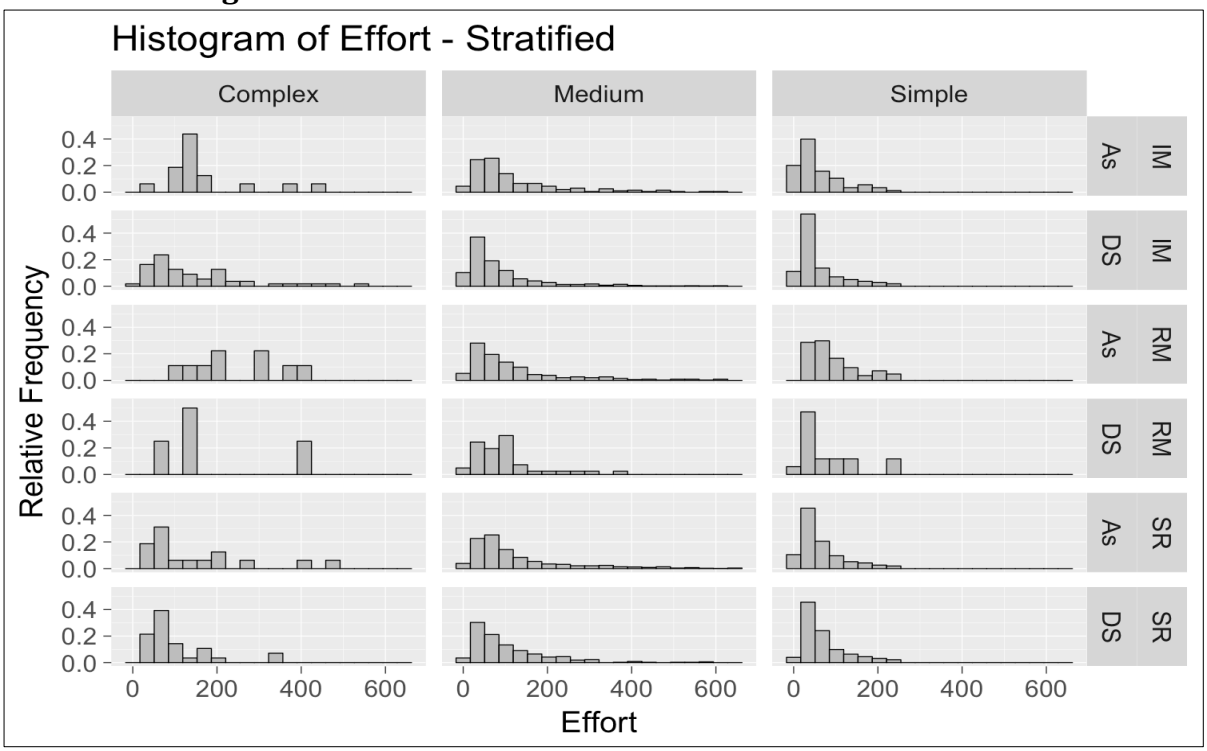


**Overall Histogram:**




Histogram of Overall Effort shows that the distribution is right skewed, i.e. Median < Mean. Most of the data seems to be concentrated in the range 0-200, with extreme values affecting the mean.

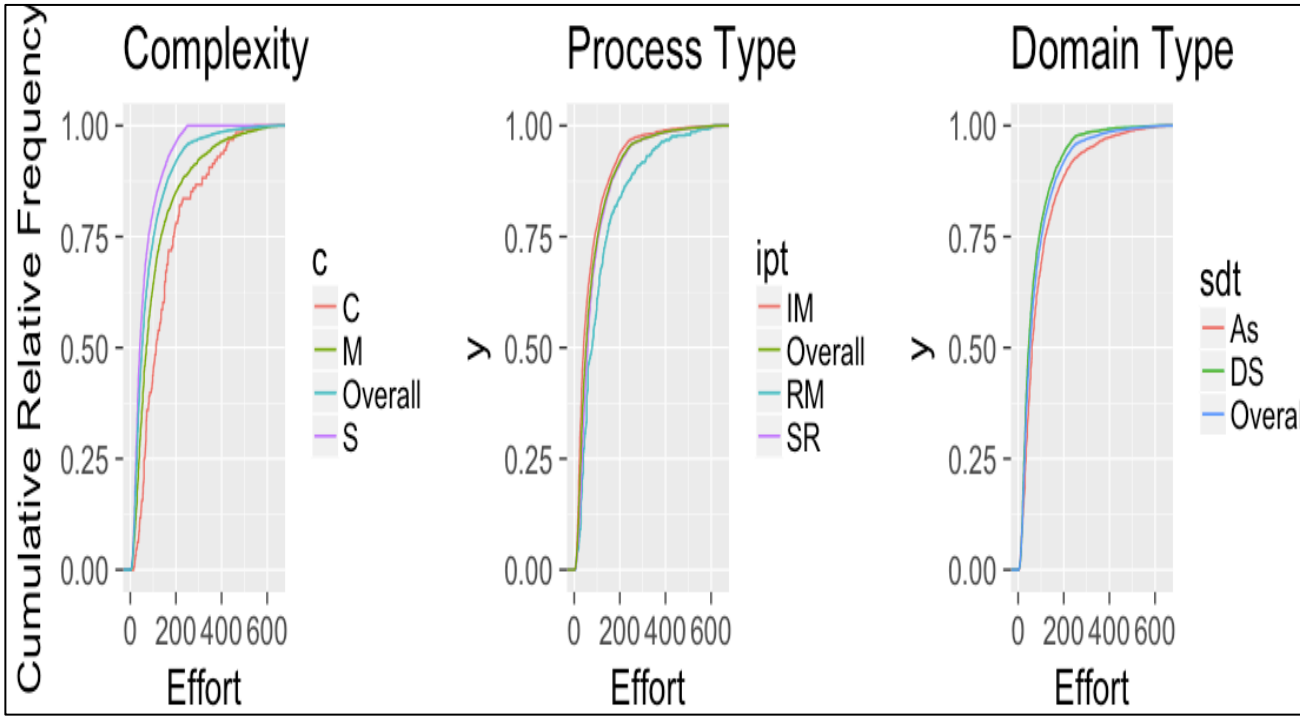
**Stratified Histogram:**




Observations:

1) Simple tasks have histograms behaving similar to the overall histogram, except those for Release Management (RM).
2) Medium tasks have more evenly distributed histograms with smaller peaks than Overall histogram.
3) Complex tasks have infrequent peaks in their histograms, due to very less number of tasks in that category (Only 128).

**Ogive (Stratified + Overall):**




We can see from the Ogive graphs, that Release Management Process Type, Complex tasks and App Support tasks show Stochastic Dominance over the Overall Effort Ogive.

# Death Penalty Data:

The data can be cross-tabulated in the following manner:

| Defendant | Victim | Death Penalty | | Total | Conditional Death Penalty Rate | Conditional Death Penalty Ra |
|---|---|---|---|---|---|---|
| | | Yes | No | | | |
| Black | Black | 6 | 97 | 103 | 5.8% | 10.2% |
| | White | 11 | 52 | 63 | 17.5% | |
| White | Black | 0 | 9 | 9 | 0.0% | 11.9% |
| | White | 19 | 132 | 151 | 12.6% | |
| Total | | 36 | 290 | 326 | 11.0% | |

1. The Variable of Interest here is the **Death Penalty Rate (Total Death Penalties/Total Cases)**
   Out of the 326 cases in total, 36 were awarded death penalties. Hence, overall death penalty rate = 11.0%

   We can compare the conditional probability of death penalty, given the race types of victims and defendants to come to a conclusion.

   a. P(Death Penalty| Defendant = Black) = 10.2%
      P(Death Penalty | Defendant = White) = 11.9%
      It seems like probabilty of death penalty is higher for white defendants, but this is a typical case of Simpson's Paradox as the number of cases for White Defendant and Black Victims are extremely low (Only 9 cases). It could be that such cases are not reported.

   b. P(Death Penalty| Victim = Black) = 5.4%
      P(Death Penalty | Victim = White) = 14.0%
      The death penalty rate varies based on the victim's race. Death penalty rate for white victims is much higher than Death penalty rate in cases where the victims are black.

   c. P(Death Penalty|Defendant = Black,Victim = White) = 17.5%
      P(Death Penalty|Defendant = Black,Victim = Black) = 5.8%
      The death penalty rate for black defendants is also higher, when victim is white. All of this point to racial impact on death penalty.

2. Visualisation can be done through a 2-way cross-tabulation:

| Death Penalty Rate | | Victim | |
|---|---|---|---|
| | | Black | White |
| Defendant | Black | 5.8 | 17.5 |
| | White | 0 | 12.6 |