[Cover sheet]

2

ASSIGNMENT 2

**DEFECT ANALYSIS REPORT**

CSE 6329 -- SOFTWARE MEASUREMENT AND QUALITY ENGINEERING

Professor Dennis J. Frailey

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| Grading template Student do not write inside this box | | | | | | | | | | | |
| \_\_\_\_\_\_\_  (/16) | 1.0 Description of Analysis Tool (spreadsheet) | | | | | | | | (16 points) | | |
|  | 2.0 Details for each of the Six Measures/Graphs | | | | | | | | | | |
|  | (1 pt.)  Overview  (2.n.1) | | (3 pts)  Sample Graph(s)  (2.n.2) | | | (3 pts)  Generic  Description  (2.n.3) | | (3 pts)  Analysis Discussion  (2.n.4) | | (4 pts)  How to Generate  (2.n.5) | |
| \_\_\_\_\_\_\_\_  n=1 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_  n=2 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_-1\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_  n=3 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_  n=4 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_  n=5 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_\_  n=6 (/14) | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_\_\_\_\_\_\_ | |
| \_\_\_\_\_\_\_  (/100) | Total Assignment Grade | | | | | | | | | | |
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This is the template. To generate your report, **delete all red text** and replace as appropriate with suitable words, formulas, figures, etc.

**Defect Analysis Report**

1. **Introduction**
   1. **Purpose of This Report**

This report shows the results of analyzing three years of defect data on our released products. The purpose is to gain a greater understanding of the quality levels of our released products and to determine whether changes in our quality engineering procedures have resulted in changes in product quality.

* 1. **Structure of Analysis Tool**

In order to analyze defect data, we have created a workbook which consists of 10 worksheets including the data sheet that has been given.

The a4data is the sheet which contains all the data information given by the professor. The post release measure consists of three worksheets. Post release quality for a year is the measure which describes the total defects and the uncorrected defects. Post release quality for 3 year is the measure which describes the total defects and the uncorrected defects for a 12 month period For 3 releases. Post release quality one on another is the measure which describes the total defects and the uncorrected defects which super impose on one another. The post quality history consists of the calculation for the best, average, worst case. The post quality history consists of the graph for the cases by monthly, quarterly, yearly. The current quality consists calculation of the total uncorrected defects, normalized by the size and the active releases. The current quality graphs consists of the graphs calculated for the current quality. The 6th measure worksheet consists of the method devised. The 6th graphs consists of the graphs of the 6th measure

* 1. **Analyses and Graphs**

We have analyzed the data in six different ways, resulting in six different measures and their corresponding graphs:

1. Post Release Quality (shown three ways, for a single product),
2. Post Release Quality History (for all products),
3. Current Total Quality (for all products currently in use),
4. Current Total Quality Normalized by Product Size,
5. Current Total Quality Normalized by Number of Active Product Releases, and
6. Immediate release quality measure

The data necessary to perform these measurements have been collected monthly for each active software product, over the past three years. The data are stored in the **data spreadsheet**, named A2data.xlsx. The post release measure consists of three worksheets. Post release quality for a year is the measure which describes the total defects and the uncorrected defects. Post release quality for 3 year is the measure which describes the total defects and the uncorrected defects for a 12 month period For 3 releases. Post release quality one on another is the measure which describes the total defects and the uncorrected defects which super impose on one another.

The post quality history consists of two work sheets.

The post quality history consist of the calculation for the best, average, worst case. The post quality history graph consists of the graph for the cases by monthly, quarterly, yearly. The current quality consists calculation of the total uncorrected defects, normalized by the size and the active releases. The current quality graphs consists of the graphs calculated for the current quality. The 6th measure worksheet consists of the method devised. The 6th graphs consists of the graphs of the 6th measure





The exact steps for each analysis are listed in sections 2.x.1 through 2.x.6 and make reference to these worksheets.

1. **Measures, Graphs and Analysis**
   1. **Post Release Quality**
      1. **Overview**

Post release quality is measured for an individual product and is defined as the number of defects in the product after release. It answers the question “how many defects are in this product and how does the total grow after release?”

The post release quality graph consists of two defects: total defects and the uncorrected defects. After the product A is released and the data is collected during the duration of the twelve months. The two mention defects are calculated and are drawn into line chart. The line chart drawn represents the post Release Quality of product A

* + 1. **Sample Graph(s)**

The graph below shows Post Release Quality for one year of Product A, Release 1.

The next graph shows Post Release Quality for the first three releases of product A, one year each.

The next graph shows Post Release Quality for the first three releases of product A, superimposed so their defect trends can be more closely compared.

* + 1. **General Discussion**

The Post Release quality is measured for an individual product and is defined as the number of defects in the product after release.

Usually the Post release quality is shown in three different ways 12months, 36 months and the super imposed graphs. Total number of defects and the total number of uncorrected defects are calculated for the releases. The data which is collected is used for the graph

The graph-1 shows history of 12 months for release 1 with number of defects on the vertical axis and months on the horizontal axis

The graph-2 shows history for all three releases for the product A from 0 to 36 months with number of defects on the vertical axis and months on the horizontal axis. In this graph we show the data of the product after it has been released for twelve months

The graph-3 shows history of 36 months which is similar to graph-2 with number of defects on the vertical axis and months on the horizontal axis. In this graph they super impose on each other.

* + 1. **Analysis of Specific Graph(s)**

The generated graphs are plotted such that the number of defects are on the vertical axis and the number of months on the horizontal.

The graph-1 shows two lines which represents the uncorrected defects and the total defects for the first 12 months of the product a release. From the graph we can deduce that the uncorrected defects decreased gradually towards the 12th month and the total defects increase over the span of the 0 to 12 months. The above observation explains how the quality of the product has been increased.

The graph-2 shows two lines in each graph which represents the uncorrected defects and the total defects for the 36 months of the product a release. From the graph we can deduce that the uncorrected defects increased gradually towards the 3rd release. As the quality program has been reduced the quality of the product has been reduced.

The graph-3 shows six lines which represents the uncorrected defects and the total defects for the 12 months of the product a release. From the graph we can deduce that the uncorrected defects increased gradually towards the 3rd release and the total defects of the product A release 2 and 3 are almost similar. This has allowed to decrease the quality of the product.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.1.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DRPT, I – The number of defects reported in the *ith* customer failure report.
* N – The total number of customer failure reports (total number of months).
* DC,i – The number of defects corrected in month *i*, reported monthly by engineering staff

The above data are collected separately for each release of each product.

**2.1.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

* **Uncorrected Defects** (at time T is defined as **Total Defects** minus the cumulative sum of all defects that have been corrected:

Equation - Uncorrected Defects

**2.1.5.3 Data refinement, extraction and graphing**

First we filter the data for Product A which displays for the releases 1, 2, and 3.

The total defects are calculated.

The total corrected defects are calculated

The total uncorrected defects are calculated from the above for each of the releases.

* For the first graph, two lines are shown: both DT and DUNC, T are plotted monthly on a line chart for the first release of product A. The horizontal axis is actual month and the vertical axis shows defect count. The chart shows one year of data.
* For the second graph, the data from the first three releases of product A are shown (two lines for each release). The horizontal axis is the actual month, spanning three years, and the DT and DUNC, T values are shown separately for each product, one year each, on the same graph (each in its corresponding time period).
* For the third graph, the same six lines are shown, but superimposed on top of each other. The horizontal axis shows months since release, spanning twelve months, and the data from all three releases are shown on the same scale.
  1. **Post Release Quality History**
     1. **Overview**

Post Release Quality History is measured for several products that were released during a particular time period. As it is a lagging indicator it can be calculated only after 12 months of the product release.

The total number of defects found for all the product releases during the first 12 months use is measured. It answers the question “overall, how good were the products we shipped in terms of defect rates?”

The best, worst and the average case defects are computed

* + 1. **Sample Graph**

The figure below shows a Post Release Quality History Chart for 3 full years by month.

The figure below shows the Post Release Quality History for 3 full years by quarter.

The third figure shows the Post Release Quality History for 3 full years by year.

* + 1. **General Discussion**

This measure can be computed only after a release has been out for 12 months.

We use three different line charts to demonstrate the average, best, worst cases

The generated graphs are plotted such that the cases are on the vertical axis and the number of months on the horizontal.

The graphs are generated for monthly, quarterly and yearly.

In graph-1 we show the average, best, and worst of the data on a length of a month as the horizontal axis.

In graph-2 the horizontal axis consists of three months per cell and we calculate the average, best, and worst on a quarterly basis

In graph-3 we plot the average, best and the worst on a yearly basis and we would plot the 3 years on the horizontal axis.

The above 3 graphs helps us to determine about the frequency of the data should be monitored as there has been a considerable debate on this issue

* + 1. **Analysis of Graph**

The generated graphs are plotted such that the number of defects are on the vertical axis and the number of months on the horizontal.

The graphs are displayed for a three year data in three ways: monthly, quarterly, and yearly. The vertical axis number of defects consists of average, worst and the best.

From the **graph-1** we see that the average, best, worst case of the product release in a given month is same. If the product doesn’t have any releases, it is 0.

The main **advantage** of this graph is we can calculate it monthly so that the results can be visible and any immediate action can be taken on the product so that the quality of the product can be improved.

The **disadvantage** of this graph type is the cost of monitoring the data is very high.

From the graph-2 we can see that the average, best, worst case of the product release is in quarterly and the three of them almost meet at two certain points.

The main **advantage** of this graph is that the cost of monitoring the data is decreased than the monthly while still able to see the results in a quarterly manner which helps us to give insight about the data

From the graph-3 we can see that the average, best, worst case of the product release is in yearly.

The main advantage of this graph is to have a view of the entire year data analysis results and cost of the process is very low.

The disadvantage of this graph is that the monitoring is too delayed so it might fail to give insight in what was happening and might be too late to take action.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.2.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DRPT, I – The number of defects reported in the *ith* customer failure report.

The above data are collected separately for each release of each product.

**2.1.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

DIT is the total defect for I (0, 1, 2, 3…) month

* Worst case is calculated by

Max ()

* Best case is calculated by

Min ()

* Average case is calculated by

Average () value.

**2.1.5.3 Data refinement, extraction and graphing**

First we filter the data for Products which displays uncorrected data

The total defects are calculated for each product

For Max, Min, and Average the value depends upon the number of months which is ith months.

For Quarterly graph, a 3 month period is sent in as argument for calculating best, worst and average cases. The graph is plotted for this.

For the yearly graph, 12 month period is sent as an argument for calculating best, worst and average cases and a graph is plotted with these values.

* For the first graph, one line is shown and then we plot the average, best, worst cases on a monthly data for 36 months. The horizontal axis is actual month and the vertical axis shows defect count. The chart shows three year of data.
* For the second graph, the data from the three cases of products are shown. It is shown in a quarterly basis. The horizontal axis is the actual 3rd month, spanning three years
* For the third graph, the data from the three cases of products are shown. It is shown in a yearly basis. The horizontal axis is the actual year, spanning three years
  1. **Current Quality Total**
     1. **Overview**

The current quality is measured for all active products and is defined as the total uncorrected defects for all active products. The active products are the products that are released but are still within their first 12 months. This is depicted as a line chart, as illustrated in the lectures and below. This answers the question "how many known defects are out there this month in all currently-supported products?"

We calculate the total uncorrected defects for each month of the release on that month. The graph is generated with the number of defects on the vertical axis and the months spanning from 1-36 on the horizontal axis.

* + 1. **Sample Graph**

The current quality tool graph is shown below.

* + 1. **General Discussion**

The current quality control measure is a measure that is computed after the product release and we calculated for the 36 months based upon the data given. The span of 0 to 36 months the kilo lines of code is calculated and we also calculate the total uncorrected defects per monthly release for all the active products.

The horizontal axis is defined as the months and the vertical axis is defined as the normalization of the data with respect to the number of active releases. Only the graph for the current quality normalized with the number of active releases is shown.

* + 1. **Analysis**

The graph is plotted with the horizontal axis as the months and the vertical axis as the normalized data by number uncorrected defects on a release month.

The graph is over the span of 36 months.

The graph shows the line chart which ranges from the value 40 and it gradually decreases towards the final value of 0. From the graph we observe a gradual fall in the size over the span of the months after initial increase towards the first year.

The increase in the graph is because of the increase in the defects or to maintain the same or less resources to handle the defects while the defects have increased.

The graph after the steady increase takes a fall towards the final 0 as they might have assigned the new resources to handle the defects.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.3.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DC,i – The number of defects corrected in month *i*, reported monthly by engineering staff

The above data are collected separately for each release of each product.

**2.3.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

* **Uncorrected Defects** (at time T is defined as **Total Defects** minus the cumulative sum of all defects that have been corrected:

Equation 2 - Uncorrected Defects

* **Total Uncorrected Defects** (at time T is defined as **Total of the**  uncorrected defects:

Equation 3 – Total Uncorrected Defects

**2.3.5.3 Data refinement, extraction and graphing**

First we assign the data by performing the calculation for the uncorrected defects.

We sum the total uncorrected defects for a given month.

For the graph, one line is shown: DTUNC, T is plotted monthly on a line chart for the span of 36 months. The horizontal axis is actual month and the vertical axis shows Total uncorrected defects on a release month.

The chart shows three years of data.

* 1. **Current Quality Total Normalized by Product Size**
     1. **Overview**

The current quality is measured for all active products and is defined as the total uncorrected defects for all active products. The active products are the products that are released but are still within their first 12 months. This is depicted as a line chart, as illustrated in the lectures and below. This answers the question "how many known defects are out there this month in all currently-supported products?"

The quality is then measured and normalized by active product size.

We calculate the total uncorrected defects for each month of the release on that month.

From the size we obtain the kloc

We obtain the normalized answer by calculating using the kloc and the uncorrected defects.

* + 1. **Sample Graph**

The graph for current quality total normalized by active product size is shown below.

* + 1. **General Discussion**

The current quality control measure is a measure that is computed after the product release and also calculated for the 36 months based upon the data given. The span of 0 to 36 months the kilo lines of code is calculated and also the total uncorrected defects per monthly release.

The horizontal axis is defined as the months and the vertical axis is defined as the normalization of the data with respect to the size. Only the graph for the current quality normalized with the size is shown.

* + 1. **Analysis**

The size of the data is used to normalize the data. The graph is plotted with the horizontal axis as the months and the vertical axis as the normalized data by size.

The graph is over the span of 36 months.

The graph shows the line chart which starts from the value 16.6 and it gradually decreases towards the final value. From the graph we observe a gradual fall in the size over the span of the months.

The quality of a product depends upon the size and the total number of defects. The possible conditions are:

If the defects are decreasing, and if the size is increasing the graph will be decreasing.

If the defects are increasing and the size is decreasing the graph will be increasing.

The initial decrease in the graph is because the size of the active release products is increasing and also the total uncorrected defects of the active releases is also increasing. The decrease in the graph after half of the span is because of the decrease in the size as there are less active releases and also the reason may also be less uncorrected defects.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.4.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DC,i – The number of defects corrected in month *i*, reported monthly by engineering staff

The above data are collected separately for each release of each product.

**2.4.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

* **Uncorrected Defects** (at time T is defined as **Total Defects** minus the cumulative sum of all defects that have been corrected:

Equation 2 - Uncorrected Defects

* **Total Uncorrected Defects** (at time T is defined as **Total of the**  uncorrected defects:
* Equation 3 – Total Uncorrected Defects
* **Kloc** is defined as total lines of the code that is active for the particular month.
* **Total normalized**  (at time T is defined as **Total of the**  uncorrected defects normalized by the size of the data:

Equation 4 – Total Uncorrected Defects/kloc

**2.1.5.3 Data refinement, extraction and graphing**

First we assign the data by performing the calculation for the uncorrected defects.

We sum the total uncorrected defects for a given month

We calculate the size of the data for a given month and then we find the kloc by dividing it with the kilo lines of the code.

Then we calculate the DTN by using the total uncorrected defects and the kloc.

For the graph, one line is shown: DTN is plotted monthly on a line chart for the span of 36 months. The horizontal axis is actual month and the vertical axis shows Total normalized by the size of the data. The chart shows three year of data.

* 1. **Current Quality Total Normalized by Number of Active Products**

* + 1. **Overview**

The current quality is measured for all active products and is defined as the total uncorrected defects for all active products. The active products are the products that are released but are still within their first 12 months. This is depicted as a line chart, as illustrated in the lectures and below. This answers the question "how many known defects are out there this month in all currently-supported products?"

The quality is then measured and normalized by Number of Active products

We calculate the total uncorrected defects for each month of the release on that month.

We obtain the normalized answer by calculating using the no of active releases and the uncorrected defects.

* + 1. **Sample Graph**

The graph for current quality total normalized by number of active releases is shown below.

* + 1. **General Discussion**

The current quality control measure is a measure that is computed after the product release and we calculated for the 36 months based upon the data given. The span of 0 to 36 months the kilo lines of code is calculated and we also calculate the total uncorrected defects per monthly release.

The horizontal axis is defined as the months and the vertical axis is defined as the normalization of the data with respect to the number of active releases. Only the graph for the current quality normalized with the number of active releases is shown.

* + 1. **Analysis**

The active number of releases is used to normalize the data. The graph is plotted with the horizontal axis as the months and the vertical axis as the normalized data by number of active releases.

The graph is over the span of 36 months.

The graph shows the line chart which starts from the value 40 and it gradually decreases towards the final value. From the graph we observe a gradual fall in the size over the span of the months after initial increase towards the first year.

The initial decrease in the graph is because the number of the active release products is less and also the total uncorrected defects of the active releases is increasing.

The increase in the graph is because the number of active releases is maintained at 10 but the uncorrected errors is increasing as they have not been correcting much defects to ensure the quality of the product.

The decrease towards the final is because the almost all the defects have been corrected and the active product releases is also decreasing. This has caused for the increase in product quality.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.5.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DC,i – The number of defects corrected in month *i*, reported monthly by engineering staff

The above data are collected separately for each release of each product.

**2.5.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

* **Uncorrected Defects** (at time T is defined as **Total Defects** minus the cumulative sum of all defects that have been corrected:

Equation 2 - Uncorrected Defects

* **Total Uncorrected Defects** (at time T is defined as **Total of the**  uncorrected defects:
* Equation 3 – Total Uncorrected Defects
* **Number of active releases** is defined as total releases active for the particular month.
* **Total normalized**  (at time T is defined as **Total of the**  uncorrected defects normalized by the active releases of the data:

Equation 4 – Total Uncorrected Defects normalized by active releases.

**2.5.5.3 Data refinement, extraction and graphing**

First we assign the data by performing the calculation for the uncorrected defects.

We sum the total uncorrected defects for a given month

We calculate active release of the data for a given month.

Then we calculate the DTN by using the total uncorrected defects and the active releases.

For the graph, one line is shown: DTN is plotted monthly on a line chart for the span of 36 months. The horizontal axis is actual month and the vertical axis shows Total normalized by the active releases of the data. The chart shows three year of data.

* 1. **Immediate Release Quality Measure**

* + 1. **Overview**

The measure Immediate Release Quality is measured for a single product release and compared with different versions of the product. The measure is defined as the number of corrected defects within the first 12 months of the product release. The graphs consists of the uncorrected defects and the corrected defects. The graph is generated for an individual product with 3 different releases. The measure provides the answer for the question “how does the quality grow after the defects have been corrected”

We calculate the corrected defects for the each month

We calculated the uncorrected defects for the each month by using the total defects and corrected defects.

The graph is plotted with the number of corrected defects and the uncorrected defects with months as the reference to the x-axis.

* + 1. **Sample Graph**

The figure below shows Immediate release quality for the first year of Project A’s Release 1.

The figure below shows Immediate release quality for the first year of Project A’s Release 2.

The figure below shows Immediate release quality for the first year of Project A’s Release 3.

* + 1. **General Discussion**

The measure Immediate Release Quality is measured for a single product release and compared with different versions of the product. The measure is defined as the number of corrected defects within the first 12 months of the product release.

The total corrected defects and the total uncorrected defects are calculated for each month for the first twelve months of the product release. The same is calculated for the 3 versions of a single product.

The graph-1 shows the corrected and the uncorrected defects for the first twelve months of product release 1 with months on the horizontal axis and the defects on the vertical axis.

The graph-2 and the graph-3 are similar to graph-1 which shows the corrected defects and uncorrected defects for the product release 2 and product release 3 respectively.

* + 1. **Analysis**

The generated graphs are plotted such that the number of defects are on the vertical axis and the number of months on the horizontal.

The graph-1 shows two lines which represents the uncorrected defects and the corrected defects for the first 12 months of the product a release. From the graph we can deduce that the corrected defects increase gradually towards the 12th month and the uncorrected defects decrease over the span of the 0 to 12 months. There is a point where the two lines of defect intersect and the point is the referral point. This indicates that the product quality is increasingly positive as we move towards the 12th month from the referral point for an individual release. The graph for the release 2 and the release 3 is generated and can be deduced in similar way.

The graph for the releases 1, 2, 3 is compared and we can deduce that the uncorrected defects have increased towards the end gradually from release 1-3 and the corrected defects has fluctuated up and down from the 60th defect number which implies that quality is decreased through the releases.

* + 1. **Procedure Used to Analyze Data and Produce Graph**

**2.6.5.1 Base Metrics** (raw data)

The data required for this measure are:

* DPRE – The number of known defects at the time of product release.
* DRPT, I – The number of defects reported in the *ith* customer failure report.
* DCPREV – The number of known corrected defects at the time.
* DCPT,I – The number of defects corrected in the ith month
* N – The total number of customer failure reports (total number of months).
* DC,i – The number of defects corrected in month *i*, reported monthly by engineering staff

The above data are collected separately for each release of each product.

**2.6.5.2 Compound Metrics** (calculated values)

* **Total Defects** at time T (is defined as the cumulative sum of all defects known at time T. This measure is computed every month, for each product. This includes both defects reported by the customer (post-release defects) and defects known to be in the product at release time (pre-release defects):

Equation - Total Defects

* **Uncorrected Defects** (at time T is defined as **Total Defects** minus the cumulative sum of all defects that have been corrected:

Equation - Uncorrected Defects

* Corrected defects (Dc) at time T is defined as the cumulative sum of all the corrected defects known for a time T. This is computed for every month and the each product.

Equation 3 - corrected Defects

**2.6.5.3 Data refinement, extraction and graphing**

First we filter the data for Product A which displays for the releases 1, 2, and 3.

The total defects are calculated.

The total corrected defects are calculated

The total uncorrected defects are calculated from the above for each of the releases.

* For the first graph, two lines are shown: both Dc, T and DUNC, T are plotted monthly on a line chart for the first release of product A. The horizontal axis is actual month and the vertical axis shows defect count. The chart shows one year of data.
* For the second graph, two lines are shown: both Dc, T and DUNC, T are plotted monthly on a line chart for the first release of product A. The horizontal axis is actual month and the vertical axis shows defect count. The chart shows one year of data.
* For the third graph, two lines are shown: both Dc, T and DUNC, T are plotted monthly on a line chart for the first release of product A. The horizontal axis is actual month and the vertical axis shows defect count. The chart shows one year of data.