DATA ANALYTICS USING VENA AND QLIKVIEW FOR QUARTER PROCESSES

A
PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE & ENGINEERING

by

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under the supervision of

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DECLARATION

I declare hereby that the work presented in this report entitled **"Data Analytics using Vena and QlikView for Quarter Processes"** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science & Engineering** submitted in the Department of Computer Science & Engineering, Jaypee University of Information Technology Waknaghat, Solan is an authentic record of my own work carried out over a period from February 2020 to the present day at AXA XL.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Harshit Chrangoo
161317

CERTIFICATE

This is to certify that the work reported in this report entitled **"Data Analytics using Vena and QlikView for Quarter Processes"** submitted by Harshit Chrangoo at Jaypee University of Information Technology, Waknaghat is a bonafide record of his original work carried out under my supervision.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Geet thukral

Geet Thukral
Sr. Specialist, Corporate Actuarial
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ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible, whose constant guidance and encouragement crown all efforts with success. The internship opportunity I had with AXA XL was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having a chance to meet so many wonderful people and professionals who led me though this internship period.

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I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives. Hope to continue cooperation with all of you in the future.

Harshit Chrangoo, 161317

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LIST OF SYMBOLS AND ACRONYMS

S. No.	Acronyms	Meaning
1.	IBNR	Incurred But Not Reported
2.	AY	Accident Year
3.	UY	Underwriting Year
4.	SSMS	SQL Server Management Studio
5.	AvE	Actual vs Expected
6.	UWD	Underwriting Division
7.	UWU	Underwriting Unit
8.	FY	Full Year
9.	YTD	Year To Date
10.	QTD	Quarter To Date
11.	CyAccoMonth	Current Year Accounting Month
12.	CY	Current Year
13.	Res Qtr	Reserving Quarter
14.	LDF	Loss Development Factor

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ABSTRACT

The main aim of the actuarial reserving process is to calculate and predict the resources that must be reserved in order for the company to pay its liabilities and to hence calculate what part of the income it can use to grow.

For this purpose of reservation of resources, the **Vena/Sparta 2.0** reserving tool has been used. It has paved a way for smooth and data inconsistency free process of reserving the resources for a clean and inambiguous reporting process. The tool is based on data cubes, a concept in Data Science where data is present at the intersection of the dimensions.

QlikView, is a platform that provides assistance in business discoveries through its service as BI tool. It is used for business users all through the organizations. With Qlikview we are able to analyze data and use it as a source of truth in order to make business decision. Qlikview lets you ask and answer your own questions and follow your own paths to insight. Qlikview enables for the team to reach decisions collaboratively.

Qlikview at its core, is patented software engine, which lets the user generate the required views for the data on the fly. Qlikview holds the data memory by compressing it and there the data is made available to be explored by whosoever might want to use it. For the sets of data which are large, i.e. the cannot be held in memory, Qlikview connects directly to the source of the data. Qlikview delivers an associative experience across all the data used for analysis, regardless of where it is stored. You can start anywhere and go anywhere; and are not limited to pre- defined drill paths or pre-configured dashboards.

With the help of Qlikview I have shown the Actual Vs. Expected graphs which made it pretty simple to show that which are the profiles that we need to work on. I have successfully implemented the data analysis for the Losses data from different source systems on Qlikview.

Quarter Process:

The data from various source systems need to be allocated on various levels before sending the numbers to finance for further processing. This IBNR allocation process takes place once every quarter and output of this is known as **File to Finance.**

Chapter 1

INTRODUCTION

1.1 INSURANCE

Insurance is a device or a method of economy whereby an individual or a firm contributes a small certain cost which is also called premium for a large uncertain financial loss or contingency which would exist if it were not for insurance arrangement.

Insurance is a written contract or agreement between 2 parties' i.e. insurer and insured, where the former, in consideration of having received a premium agrees to make good any financial loss arising out of peril covered under the insurance policy, subject to agreed terms, condition and sum insured under the policy.

For Example, in a Policy on Property, by paying as they paid the premium to the Insurer, the insured receives an amount of money if any damage occurs to the insured property.

Insured

A person who buys an insurance policy and whose interests are protected by any kind of loss. The entity is also called policy holder.

Example: Loss of health or property or life.

Insurer

A company or a person who underwrites an insurance policy and Pay compensation if any loss occurs on insured.

Factors of insurance:

- Loss must be definite.
- Loss must be incidental.
- Loss must cost financial burden.
- Loss must be calculable.
- Insurance must be affordable.

Main elements of contract:

- Offer and acceptance.
- Legality of contract.
- Mutual consent of both parties.
- Capacity of parties to contract.
- Consideration

Insurance is mainly a risk management technique.

1.1.1 Claim Time Line

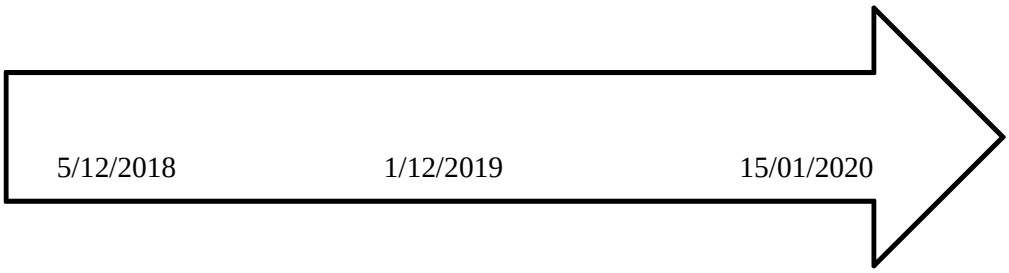


Figure 1.1 Claim time line

- Date of policy written – 5/12/2018
- Date of loss – 1/12/2019
- Date of loss Reported – 15/01/2020

Claim is reported on 15th January 2020 with the date of loss 1st December 2019, for a one-year policy which is underwritten on 5th December 2020.
The claim was initially estimated as 1,00,000 rupees on reporting date but the estimate is revised on later date to 80,000 rupees and then paid to the policy holder.

This estimation and revaluation of loss is made by the actuaries with the help of Loss Development Factors and the Loss Triangle.

1.1.2 Premium-Loss

- **Paid Claim Amount (Paid Loss)**

  These are the actual amount that are paid. This measure may be gross or net of recoveries.

- **Case Reserves**

  These are the amounts that have not yet been paid to the insured. These are kept as a buffer against claims already generated.

- **Incurred Claim Amount (Incurred Loss)**

  These are the latest estimate of the cost of each claim which the insurer is aware of and these are a sum total of Paid Loss and Case Reserves. These can be called as Case Estimates.

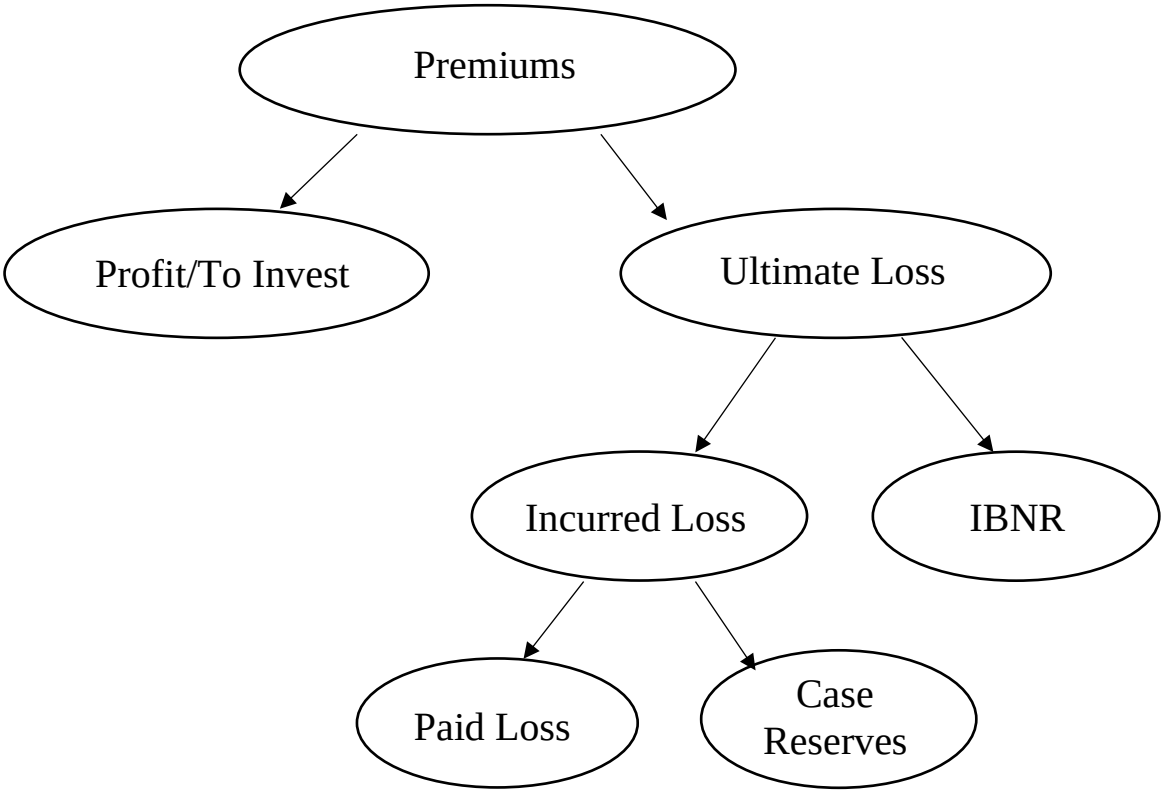
  History of the previous case estimates is also required. Judgment of experienced claim handler is mostly used to handle these.

- **IBNR**

  These are losses to the company that have been reserved against the claims that have been incurred but have not yet been reported.

- **Ultimate Loss**

  This is the total loss that is expected for the book. This is a sum total of Incurred Loss and IBNR.



1.2 REINSURANCE

It is a method whereby an original insurer distributes its risks by giving off the whole or some portion thereof to another insurer (reinsurer), with the object of reducing the amount of possible loss. It is a contract between 2 experts' insurer and reinsurer.

Ceding Company: The primary company or direct company who seeds the premium to reinsurer.

Reinsurer: The company to whom the risk has been transferred.

Retrocession: It is reinsurance of reinsurance. In this the reinsurance company limits its liability or in a simple way transfers the risk.

Coinsurance: In this the original insured is the party to the Contract. On large, there are more than one insurer. In reinsurance the leader decides the terms which are followed by others insurance.

1.2.1 Types of Reinsurance

(1) **Proportional**

- Ceding company decides % of risk which it wishes to retain. The balance is ceded to reinsurer.
- The reinsurers take the premium accordingly and pay losses in same proportion.
- It is of two types Treaty and facultative.

(2) **Non-proportional**

- Ceding company sets up a money limit up to which it bears losses and any loss after that is beared by reinsurer.
- It is of two types Excess of loss and stop loss.

1.2.2 Types of Proportional Reinsurance

(1) Treaty Reinsurance

- In this reinsurer have to accept each and every risk which fall within agreement up to agreed percentage.
- In this reinsurer is not involved in risk acceptance decision.
- It has 2 categories i.e. Surplus and Quota share.
- Low administrative cost.

(2) Facultative Reinsurance

- Reinsurer have right to accept or Decline.
- Reinsurers access the risk and terms of insurance and then decides acceptance.

1.3 IBNR

- IBNR are incurred but not reported losses. It is mainly an estimate of amount of claims which has already been occurred but not yet reported. IBNR are mainly occurred because of the reporting delays. This is the part of claim reserves that the company holds. We have to estimate the IBNR to determine the profit for the company. The IBNR is estimated by the help of actuaries and in the line of business where average reporting delays are higher than IBNR held will be higher as well.
- This term mostly occurs in countries where the catastrophe events are common. In those countries the actuaries estimate the loss or the damage to infrastructure and the amount of claim that may arise. Based on above estimates by actuaries the amount of money set aside that is reserve by the insurance company or the insurer to pay claims.
- The amount of the **I**ncurred **B**ut **N**ot **R**eported (IBNR) losses plus incurred or reported losses gives the estimate of total insurer liability which is also known as Ultimate losses.

Chapter 2

LITERATURE REVIEW
(INCLUDING PRODUCTS AND TECHNOLOGIES)

2.1 SOFTWARE USED

- SQL Server Management Studio
- QlikView
- Vena

2.1.1 SQL Server Management Studio

SSMS is an application that is used to manage and configure all the components of Microsoft SQL server. As company has to manage large amount of data so, SQL is a good database to store and retrieve large amount of data.

Advantages of SQL Server Management Studio:

- ***Smooth and continuous Navigation***

  We have to pay a large amount of cost to learn new technology. SQL Server management studio manages database in a company or on premises. We just have to provide database name and user id and password to connect to a database.
- ***Easy to migrate database***
- ***Basic dialog support***

  We can make dialog box for each and every action. Let's we want to give a dialog box before deleting the data.
- ***Object explorer***

  It also consists of the object explorer which shows detail of tables made by which user and when it is made.
- ***Export data in excel***

  We can run a query and all of its results can be exported in a csv file from the lower corner at top of results.

2.1.2 **QlikView**

Qlikview is a flagged product of QlikTech Company and can be classified as the “Business Intelligence tools of the future”. In 2007 QlikTech was named the “coolest” vendor and has since appreciated quicker and shown growth much better than any other vendor. Recognized as a “Visionary” in Gartner Group's annual Magic Quadrant (2007). According to Gartner's predictions "By 2012, 70% of Global 1000 organizations will load detailed data into memory as the primary method to optimize BI application performance (0.7 probability)" and the Qlikview has been a leader in this market. On its official website, the product is described as one where there exists “endless possibilities of making ad hoc queries in a non-hierarchical data structure. It is possible thanks to (AQL - Associative Query Logic) - for automatically associating values in the internal Qlikview database. Qlikview simplifies analysis for everyone. It makes it possible for anybody to create very useful, accurate KPI, measurement reports and performance dashboards and make accurate, strategic decisions.”

Qlikview has over thousands of customers in about 5 dozen countries and adds approximately a dozen new customers by the day. QlikTech customers belong to various small and mid-sized organizations but is not limited to that. Large corporations such as Pfizer, AstraZeneca, The Campbell Soup Company, Top Flite, and 3M are also the customers of the company. QlikTech is a privately held organization.

QlikView has turned out to be a simple, effective and flexible tool for Business Intelligence since its inception in 1993. It supports interactive analysis and is easy to create and use thereof.

Other products of the organisation include Qlikview Server which provides data analysis of Qlikview data over the web and Qlikview Publisher which helps control the distribution of Qlikview applications.

QlikView, as a suite is powerful and can be deployed rapidly as a software for business intelligence that enables the organization to manage effectively and monitor proactively. This leads to business optimization. QlikView helps in efficient and reliable analysis of data. It also is able to eliminate the need for the use of data warehouses, data marts, and OLAP cubes; instead it gives users rapid access to data from multiple sources in an intuitive, dashboard-style interface.

With the help of QlikView, organisations are able to use the data and process them into information leading to better decisions being undertaken.

QlikView is quick to implement, flexible and powerful to use, and easy to learn. It provides a rapid return on investment and a low total cost of ownership compared to traditional OLAP and reporting tools.

QlikView is a tool to build business intelligence report and finds its purpose in Reporting.

Below is the architecture of QlikView:

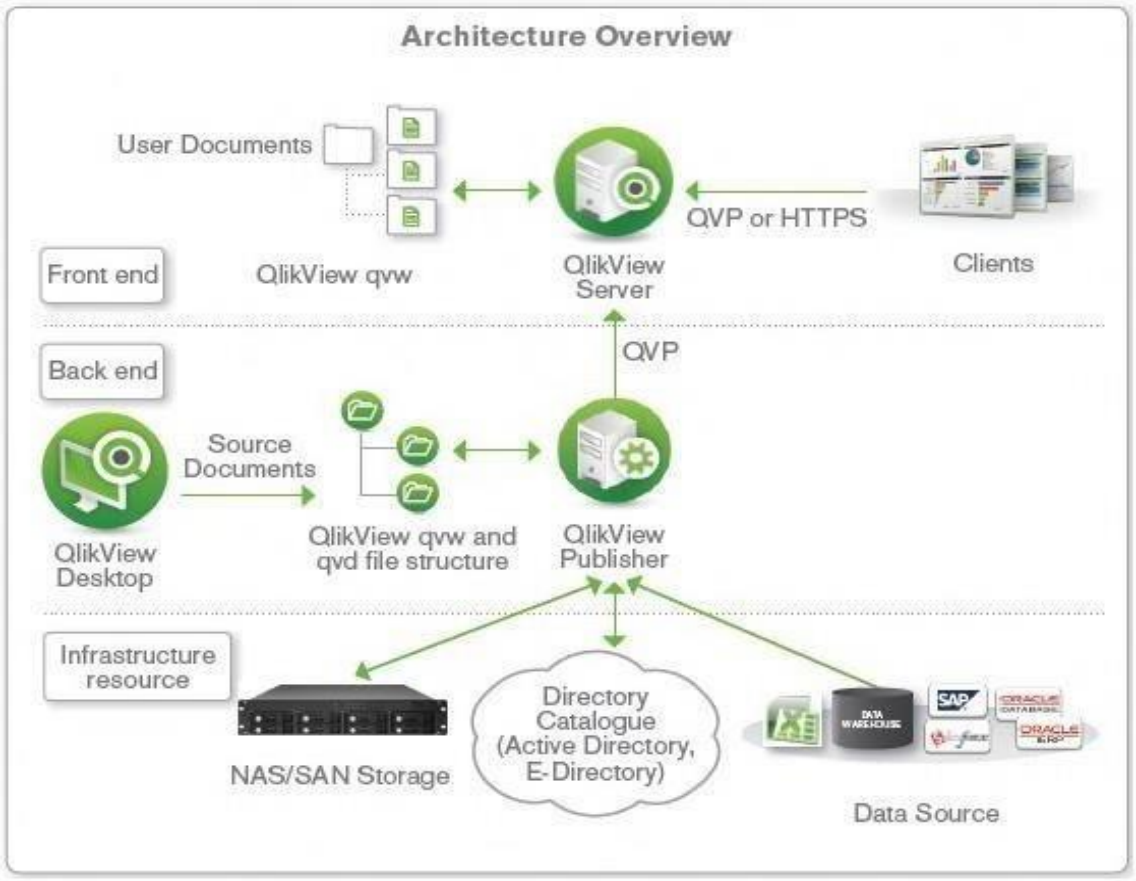


Figure 2.1 Architecture of QlikView

Frontend

In the frontend it consists of a QlikView Server which is used by a Business user to access previously made BI reports through the internet.

Backend

It has 2 parts QlikView Desktop and QlikView Publisher.

- **QlikView Desktop** is used on windows environment. It has drag and drop feature to create report visible to frontend.
- **QlikView Publisher** is a service which used to share document on different user and servers by using access privilege.

Why QlikView?

Data and Data Loading:

The data loaded in the application of QlikView is direct from text or data files (as in delimited text files, Excel, CSV, XML, etc) along with data from sources such as OLEDB and ODBS data sources. The data could also be directly uploaded from data warehouses and data marts. The application presents a mode for custom data sources too, from the web. Adding to these, there is unlimited number of cells, fields and rows to use.

– "QlikView can handle billions of unique values in a given field."

The only other factor that limits the size of the application is the RAM since there is a direct relation between the maximum size that the application can have and the Ram which is present on the system where the application has to run. The application also compresses the data and hence uses just a small percentage of space as compared to the data, as stored originally.

Load Script:

QlikView can load data that is stored in a variety of formats, as mentioned above. Data can be loaded from generic tables, cross tables, mapping tables (data cleansing), and interval matching tables. Tables can be joined, concatenated, sampled and linked to external information such as other programs, bitmaps, URLs, etc.

As per its manual: "In order to pull data from a data source, QlikView executes a load script. The load script defines the source databases and tables and fields that should be loaded into QlikView."

In addition, you can calculate new variables and records using hundreds of functions available in the script. In order to help you create a load script, QlikView includes a wizard that will generate the script.

Visual Basic Script and JavaScript Support:

Programmers can develop VBScript or JavaScript macros to add specific functionality to an application.

The user manual explains the use of Macros by having it "attached to button objects that a user must click to activate, or the macros can be attached to various QlikView events. For example, a macro can be automatically invoked whenever an application is opened, when the load script is executed, or when a selection is made in a list box."

Analysis Engine:

As described earlier, QlikView's In Memory Data Model forms the basis for every QlikView application. It holds all data loaded down on a transaction level and is part of the QVW file (QlikView file format), which is loaded into RAM.

The Platform is optimized to run on every available Windows platform (32 & 64-bit) and makes use of all available processing power and RAM for each specific platform.

The Selection Engine processes the user "point-and-click" and returns the associated values to that query. It provides sub-second response times on queries made to the In-Memory Data Model.

The Chart & Table Engine handles the calculations and graphic display of the charts in the user interface. It calculates multiple “cubes” in real time (one cube for each graph in application) and promotes user selections directly in graphs.

Clients:

Supported clients include an installed Windows EXE client that connects to QlikView Server; an ActiveX component integrates other software. The Platform also allows for an ActiveX plug-in for Microsoft Internet Explorer An open interface enables automated integration with QlikView.

Security:

The data in a QlikView application is often confidential and then you need to control the access to the data.

Authentication:

The process which leads to verification of personnel, that is they are who they claim to be is called Authentication. The system uses the Windows Authentication using the log-on and user logs which is password protected and specific to the user. The application also has its own authentication method using serial number and can be used, if required in the organisation but usually it is not required.

Authorization:

It is the process wherein for a user who is identified as being valid is checked to see if he is permitted to use the resource. Windows can be allowed by the application to authorize a user and act hence with this judgement to authorize or disallow a user the access to the application. If a finer granularity is required, the publisher of the application may make custom application based on the user groups.

QlikView Application and User Interface

The interface of the application of QlikView is designed in a manner so as to provide a complete and comprehensive overview of data in multidimensions, thus making it simpler to analyse the data and create reports. The data presented is intuitive in the sense that it allows the users to post their queries regarding all types of data and objects. These queries can be asked regardless of the location of data in the hierarchy.

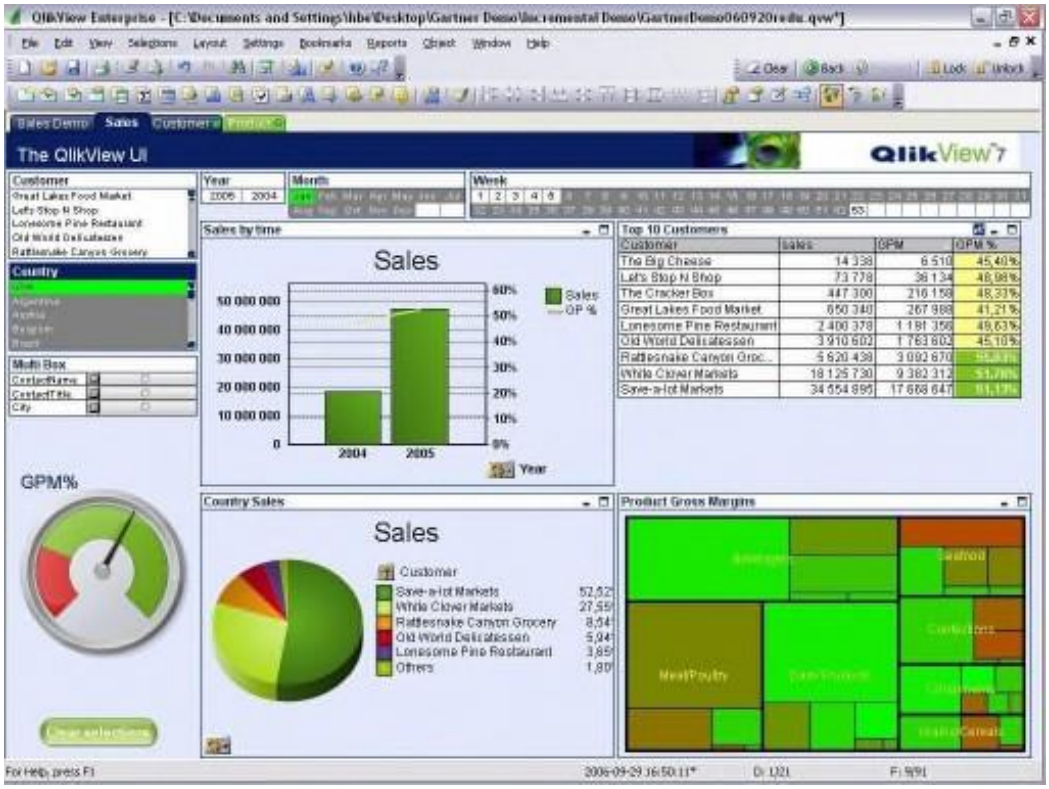


Figure 2.2 Qlikview Interface

Key Elements of the User Interface

Sheets & Tabs:

As in excel, QlikView provides different sheets for analysis of data. These can be navigated through tabs. Each sheet is able to possess multiple objects to make it convenient for the user to analyse the underlying data that has been extracted from the data model. All these sheets have an effect on each other based on selections made in any one of them.

List Box:

The basic building block of a QlikView application is the list box. A list box is a movable, resizable object that presents the data taken from a single column of a table. Rather than listing the duplicate values, only unique values are presented. If desired, the number of occurrences of each distinct value can also be listed.

Multi Box:

Multi box is able to store a large number of data fields in one object. Selections are made by clicking and entering the in the dropdown list. The values displayed in this are only in one mode that has been selected.

Charts & Gauges:

In QlikView, the results of a selection or query can be displayed in graph. Typically, a graph holds one or more expressions which are recalculated each time a selection is made. The result can be displayed as a bar chart, line chart, heat chart, grid chart, scatter chart, or as speedometer or gauge. All graphs are fully interactive, which means that you can make selections or queries directly by point-and-click or by “painting” the area of interest.

Tables:

As is possible with the graphical representation of the data using graph objects, the results achieved by analysis can also be shown as a table. The application can be used to show data in Pivot Tables and/or regular tables. It is also highly interactive, meaning selections can directly be made in the tables itself.

By using a table, the application can display n-combination of fields in one object, regardless of what is the data source. This is a very regularly used and impressive feature while providing listings. Sorting can be done on table too.

Reports & Send to Excel:

Queries correspond to report creation. The report can be generated on the go in QlikView by dynamically selecting and updating the records. This helps for the users to adjust their values and check for mismatch if any. Once checked, the final reports are generated and as per user, could be exported to Excel or other application from the displayed GUI. Thus, making it easier to generate, check and export records in multiple forms.

Navigation and Analysis by User

Point-and-Click Queries:

It is as easy to ask questions in QlikView as it is to point and click. The user can ask the application queries by simply clicking on the field that holds their interest. The user is also able to select a bunch of options from the list to include/exclude data from the query. The application rapidly responds to the query and updates its records in accordance and displays it on the frontend.

Multiple Sorting Options:

Since each data has its own field in the form of a list box, it makes it imperative for the user to be able to sort each list on its own, i.e. independent from other set of fields/lists. Thus, while scrolling through the list, if the user prefers to sort the values basis his judgement, the application allows complete control in doing so.

A single or multiple algorithm can be applied to each list in either ascending or descending order:

- ***State***: Selected and optional values can be sorted from the top or bottom of the list box.

- ***Expression***: Values sorted by the result of evaluation of the expression entered.
- ***Frequency***: Values are sorted by how frequently they occur.
- ***Numeric Value***: The values are sorted from highest to lowest or vica versa.
- ***Text***: The Value is sorted according to the order of the alphabets.
- ***Load Order***: Values are sorted in accordance with their occurrence in the database from where the values are imported.

Powerful Searching:

The software has a search supported frontend where it is as easy and simple to search through the list as typing on the keyboard. We can choose any drop down and start typing to search through the items. The software starts to search immediately for results corresponding to the criteria entered. Date and Numeric ranges are also supported and can be accessed by using the less than or greater than signs.

Quick Design of Application and it's Deployment:

Trivial applications can be made within just a few minutes using QlikView's wizards.
Trivial applications can be made in matter of minutes using the software's wizards. A more complex application which use integration of data from different sources may take some more time. Pivot tables and Charts can be easily and readily incorporated.

The following are the steps involved in creating an Application using QlikView. It is hence easier to comprehend the ease with which the application could be created. The steps involved are:

Step 1: Locating the Data Source

The preliminary step involved in the creation of the application is to ascertain the data which is to be loaded. Although it is possible to include the data which is present in the application's script (known as In-Line Data), still it is almost always that the data will come from other sources like a database or an existing file or a spreadsheet. It is also possible to include and merge data from different sources.

The application is able to work practically with any data format, including but not limited to generic and hierarchical databases. We can have the first row contain the field labels or make the changes directly in the script itself. We can choose or overwrite using script too. When the data is gathered from a text file, usually every file is taken to be as a separate table with the exception of spreadsheets where each tab is considered to be a table in itself.

Step 2: Creating the Load Script

Upon the determination of the source of data, the creation of script called Load Script is to be done. This script helps copy the data from the source to the software's database. This process is simplified by using wizards which help in construction of script statements for the file types that are supported.

Step 3: Running the Load Script

Once the script is loaded in the Load Script section, it is important to run the script. This can be done either by selecting "Reload" which is available on the toolbar, or by using the "Execute" button which is present in the Edit Script option. The data is hence loaded in QlikView and the software examines every statement present in sequential order while processing it. Once the script is loaded, all of the data is referenced and made available in the application.

Step 4: Placing Objects on the Sheet

To be able to access and use the QlikView application, list boxes and/or other objects must be incorporated on the sheet/s. As to which objects should be used, the choice depends on the developer and user requirements.

Step 5: Initializing and using the Application

With the creation of the first object on the sheet, the software is available to be used. All the various objects are linked together and with a simple click of the object, the query is initiated.

Step 6: Adding Tabs and Objects (as per requirement)

At last, the application can be loaded with the objects as per required functionality. One may opt to add macros so as to automate some parts of the application. Customization might also be added to the Load Script.

Main features and benefits of QlikView:

- Data model is present in the memory of the software itself.
- The manipulation of large datasets is instant.
- User friendly due to its automated integration of data and inclusion of analytics based on graphics.
- Massive data can be visualized quickly.
- Low cost - shorter implementations result in cost saving and fast return on investment
- Ease of Use – The user virtually requires no pre-training.
- Highly flexible – data can be visualized and modified with respect to multiple dimensions in matter of seconds.
- Highly scalable – almost instantaneous time of response on data of large volumes.
- Integrated - all in one solution: dashboards, power analysis and simply reporting on a single architecture
- High end hardware is not required.

2.1.3 **Vena**

Vena is a cloud-based technology platform which uses native Excel as front-end and integrate it with robust multi-dimensional data model at back-end.

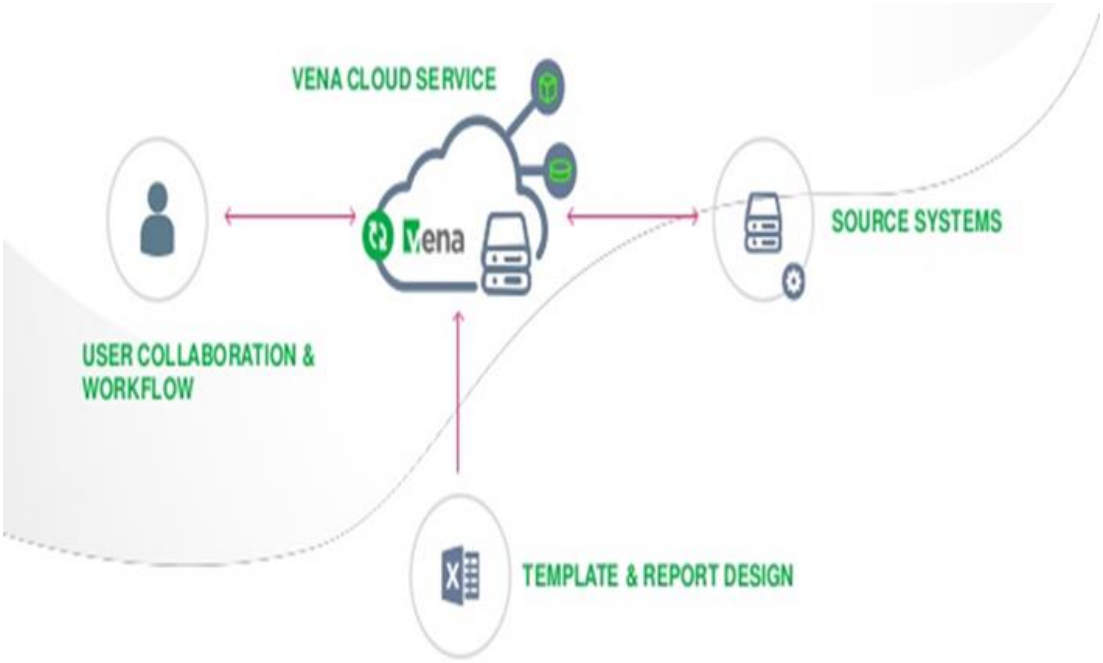


Figure 2.3 How Vena works

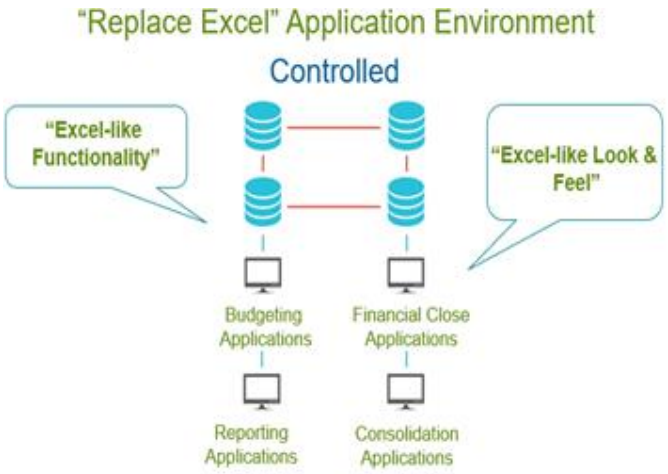


Figure 2.4 Vena as Excel Add-in

Why Vena?

Figure 2.5 Vena Benefits

The Vena platform was chosen as the platform for reserving assets after a careful study of the previous Reserving Platform which was built in-house. Vena provides a better control and consistency between the data objects.

Some of its improvements over the previous platform are:

1. Single Platform & Easy Consolidation
    - Single template for Ultimate Reserves as well as Earning process.
    - Flexibility to perform Booking and Valuation anytime
2. Customized View by Line of Business
    - Auto-hide/show column based on line of business
3. Connected Modules
    - Consistency of data across modules
4. Enhanced Auditing & Governance
    - Robust cell-by-cell audit trail
    - Version control for each data save
5. Reporting
    - Real time Reporting
    - Pre-Defined version and Admin control

Chapter 3

PROPOSED METHODOLOGY

3.1 INTRODUCTION TO DATA ANALYTICS

Data analytics is the method of processing raw data with purpose of extracting or draw conclusions about information. Data Analytics is used in many organization and company to make better decision in business. Data analytics is different from data mining by scope. In data mining the undiscovered patterns and relationship which is not known are found by using different software. Data analytics is to find conclusion on the basis of what it is known to the person.

The word analytics is used everywhere from BI software vendors to describe different function. It is also used from OLAP to customer relationship management in many call centres. Banks also used to see the pattern of spending money by credit cards or ATM withdrawal to prevent fraud. E- commerce Company uses to find which kind of product the individual is interested and what should be shown in his/her dashboard. Dynamic analytics is one in which the system uses real time information or information entered in last 2-3 minutes and show results accordingly.

3.2 ROLE OF DATA ANALYTICS IN AXA XL

- In the business of Insurance where companies buy and sell risk, we quantify the financial consequences of risk. With unbeatable analytical skills, our team help organizations plan for the future and protect themselves from loss.
- Analyse risk and quantify risk and ascribe a financial value to risk.
- Closely work with the Actuaries to report the analysed data to the management.
- Handle large database and extract information
- Develop models/tools for analytical purpose
- Automate reoccurring manual processes
- Handling quarterly/monthly/yearly financial reporting

3.2.1 **Quarter Process**

3.2.1.1 **Data Processing by Actuaries & IBNR Calculation**

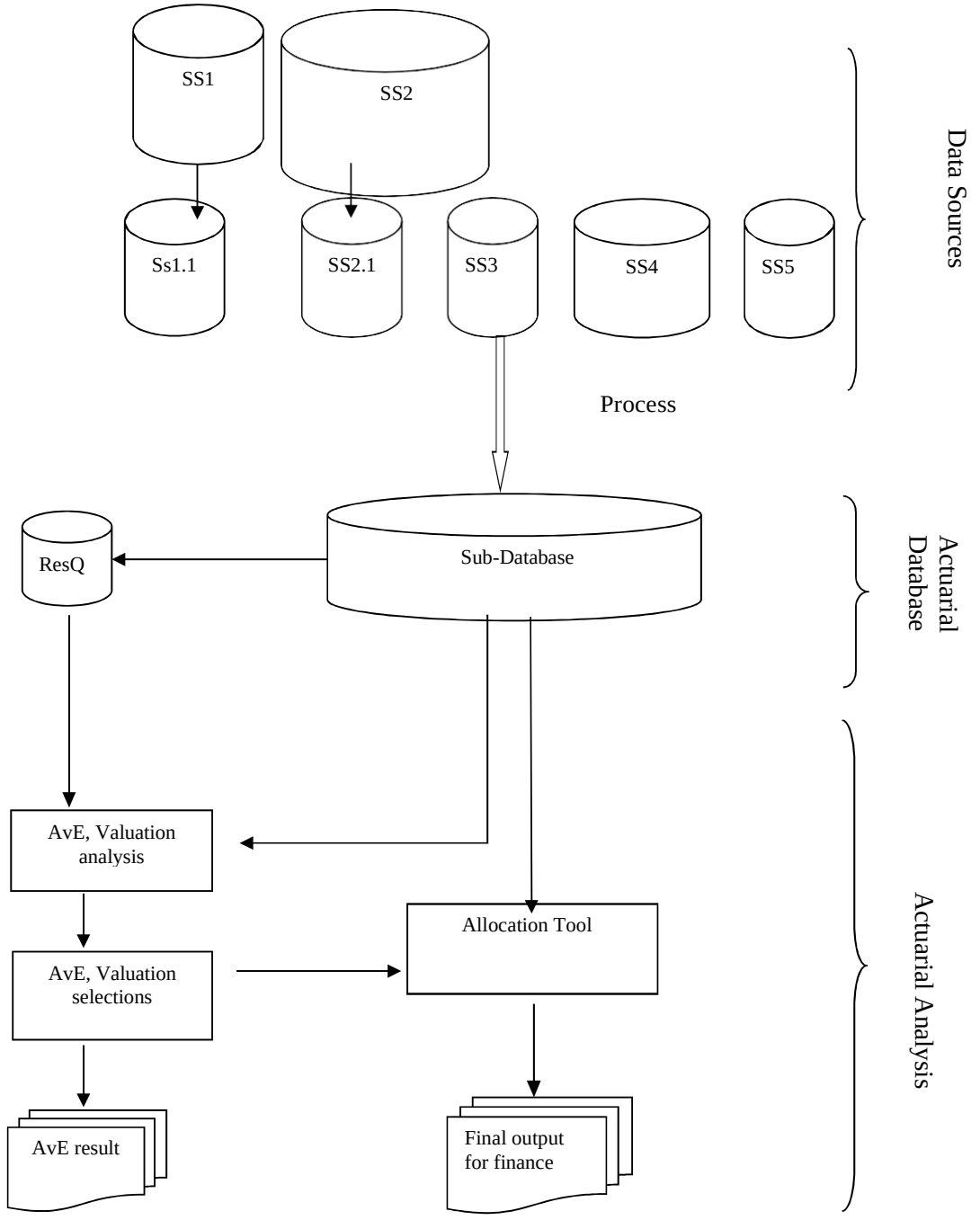


Figure 3.1 Flow diagram for quarter process

Data is sent by data sources to Database (subset of data created through a monthly ETL (Extract, Transform & Load) Process. In this database profiling happens based on profiles that are credible and homogenous. Data at the homogenous profile level is then aggregated and sent to RESQ monthly and to the allocation tool.

Profiling: According to nature of transaction, data is categorized into different actuarial reserving lines called Profile-ID.
Ultimate Loss Valuation = Projections made by actuaries

3.2.1.2 **IBNR Roll Forward**

This is meant for Prior Year Numbers. Based on the current quarters Ultimate Loss and Incurred, IBNR is calculated. The calculated IBNR is at a profile ID and Accident Year level. Based on the IBNR factors (EP ratio or Case Reserve ratio or Incurred ratio) IBNR is then allocated at chart field level.

IBNR factors currently being used are:

- Exposure Year Premium Ratio
- Incurred Loss Ratio
- Case Reserve Ratio

The factor is chosen based on the method of projection used for Ultimate Loss Calculation by the actuaries. Ultimate Loss Valuation is done post booking of IBNR for a quarter.
Hence,

Ultimate Loss Valuation = Projections made by actuaries
IBNR = Ultimate Loss – Incurred Loss
Ultimate Loss Ratio = Ultimate Loss/ Ultimate EP

Ultimate earned premium:

It is exactly same as earned premium except current year. If we talk in terms of ultimate-EP the formula can be applied across all years (even current year). In certain cases, due to data issues, actuarial ultimate earned premium can be different from system generated earned premium even for prior years. As these ultimate-earned-premiums are estimate based on unreliable data, they may also change from time to time. These estimates of ultimate-EP are made at profile-AY level.

	Q1	**Q2**	**Q3**	**Q4**
Ultimate Loss	Projections based on Q4 Data Analysis	Projections based on Q2 Data Analysis	Projections based on Q2 Data Analysis	Projections based on Q4 Data Analysis
IBNR	Ultimate Loss Projected based on Q4 Data Analysis – ITD Incurred	Ultimate Loss Projected based on Q2 Data Analysis – ITD Incurred	Ultimate Loss Projected based on Q2 Data Analysis - ITD Incurred	Ultimate Loss Projected based on Q4 Data Analysis – ITD Incurred

Table 3.1 Quarters and IBNR processing

3.2.1.3 **IBNR on new Earned Premium (EP)**

This is meant for current period.

Ultimate Loss = New EP * Loss Ratio

Loss Ratio = Ultimate Loss/ Ultimate EP

IBNR = Ultimate Loss – ITD Incurred Loss

Allocation and Booking Process remains same as for Prior Year.

3.2.2 **Actuarial Analysis – Valuation & AvE Analysis**

3.2.2.1 **Valuation**

- Valuation means estimation of IBNR.
- Complete Valuation for all lines is performed bi-annually after Q2 and Q4 AvE analysis.

3.2.2.2 **Actual vs. Expected Analysis**

- At each valuation, the expected for the subsequent quarters are projected for each line
- In each quarter, the expected incurred projected from the previous valuation is compared to the actual incurred in the current quarter.

The reserving software ResQ is used for actuarial analyses.

3.2.3 **Allocation**

IBNR is estimated at the profile ID and Accident Year level however it has to be reported at the chart field level, So the IBNR allocation tool allocates the IBNR from RESQ to the required level of detail and generates File to Finance (F2F).

The required details as available from source system will be as follows:

- Earned Premium [Gross, Ceded and Net]
- Paid Loss [Gross, Ceded and Net]
- Case Reserves [Gross, Ceded and Net]
- Incurred Loss [Gross, Ceded and Net]

Reporting at chart field level:

1. All gross accounts will be split into Direct and Assumed (e.g. Direct Earned Premium vs. Assumed Earned Premium).

2. In addition to Direct and Assumed, the Loss accounts will be further split into loss indemnity versus expense (ALAE). This applies to paid loss, case reserves and incurred loss.

3. The calculated IBNR is allocated at AY and Profile ID level using any of the below factors:

    - Exposure Year Premium Ratio = (Ultimate Earned premium at AY and Chartfield Level/ Total Ultimate EP at AY) * IBNR at AY
    - Incurred Loss Ratio = (Incurred Loss at AY and Chartfield Level/ Total Incurred Loss at AY) * IBNR at AY
    - Case Reserve Ratio = If Case loss is Zero then Zero else (Case Reserve AY and Chartfield Level/ Total Case Reserve at AY) * IBNR at AY

4. The allocated IBNR is allocated at chartfield level by splitting into direct or assumed (for Gross accounts) and into indemnity and expenses using
    - Direct/ Total Ratio
    - Indemnity/ Total Loss Ratio as provided by actuaries

5. The ceded accounts are split between ceded internal versus ceded external for both premiums and losses. The ceded accounts calculated in the F2F are all labelled as “Ceded External” i.e. the ceded accounts are all assigned to the ceded external chartfield. Similarly, for the Assumed accounts, all accounts will be assumed to be assumed external.

The IBNR that is used for allocation excludes the claim specific earmarked. This claim specific earmarked IBNR is later appended to the result as this is not required to be allocated.

3.2.3.1 **Capped and Excess Split**

At LOB level threshold limit is set. Once that is reached, all expenses and losses are split between capped and excess irrespective of any period. So once cumulative balance exceeds threshold limit, it is split. Amount beyond limit goes to excess and remaining stays in Capped.

3.2.3.2 **ULAE Allocation**

There are two methods to allocate Gross ULAE to the detailed level:

Method 1:
This method uses the "Selected ULAE Ratio" input and applies that to the sum of 50% Case Reserves and 100% IBNR by accident year and profile at the detailed level to which the data is to be allocated. For example, when calculating the Direct ULAE for a particular accident year, this method will take the Selected ULAE Ratio for the profile and multiply it by the sum of 50% of Direct Case Reserves and 100% of Direct IBNR for that particular accident year.

Method 2: This method allocates the total ULAE by accident year from ResQ to the detailed level in the ratio of the sum of Case and IBNR at the detailed level.

Selected ULAE Ratio: If the ULAE ratio is zero, then Method 2 will be selected, or else Method 1 is selected.

Note: that this method is to be applied to the Gross layer only.

3.2.4 **Bookings**

On quarter close, File to Finance as generated by the actuaries contains the USD amount, original/ transactional currency which is at the previous year end rate. It contains both the ITD numbers (As At) as well as the quarter change. The IBNR booking team in finance takes the quarter change number to calculate the transactional amount from USD amount by applying the previous year end rate (between USD and transactional currency) to the USD amount which is then used to update the Bulk Upload template for booking. The conversion to functional currency happens automatically by FAH using the accounting period rate.

IBNR team uses the Console Ledger numbers (USD) and the File to Finance ITD numbers (USD) revalued at the accounting period rate to prepare the Recs at the ITD numbers.

On the same lines Paid Loss, Incurred, Ultimate Loss, Ultimate EP, ALAE and ULAE numbers are provided by actuaries to finance.

Finance team books 9 types of transactions:

1. Direct IBNR
2. Assumed IBNR
3. Ceded IBNR External
4. Direct ALAE IBNR
5. Assumed ALAE IBNR
6. Ceded ALAE IBNR External
7. Direct ULAE IBNR
8. Assumed ULAE IBNR
9. Ceded ULAE IBNR External

Chapter 4

IMPLEMENTATION DETAILS

4.1 QLICKVIEW IMPLEMENTATION

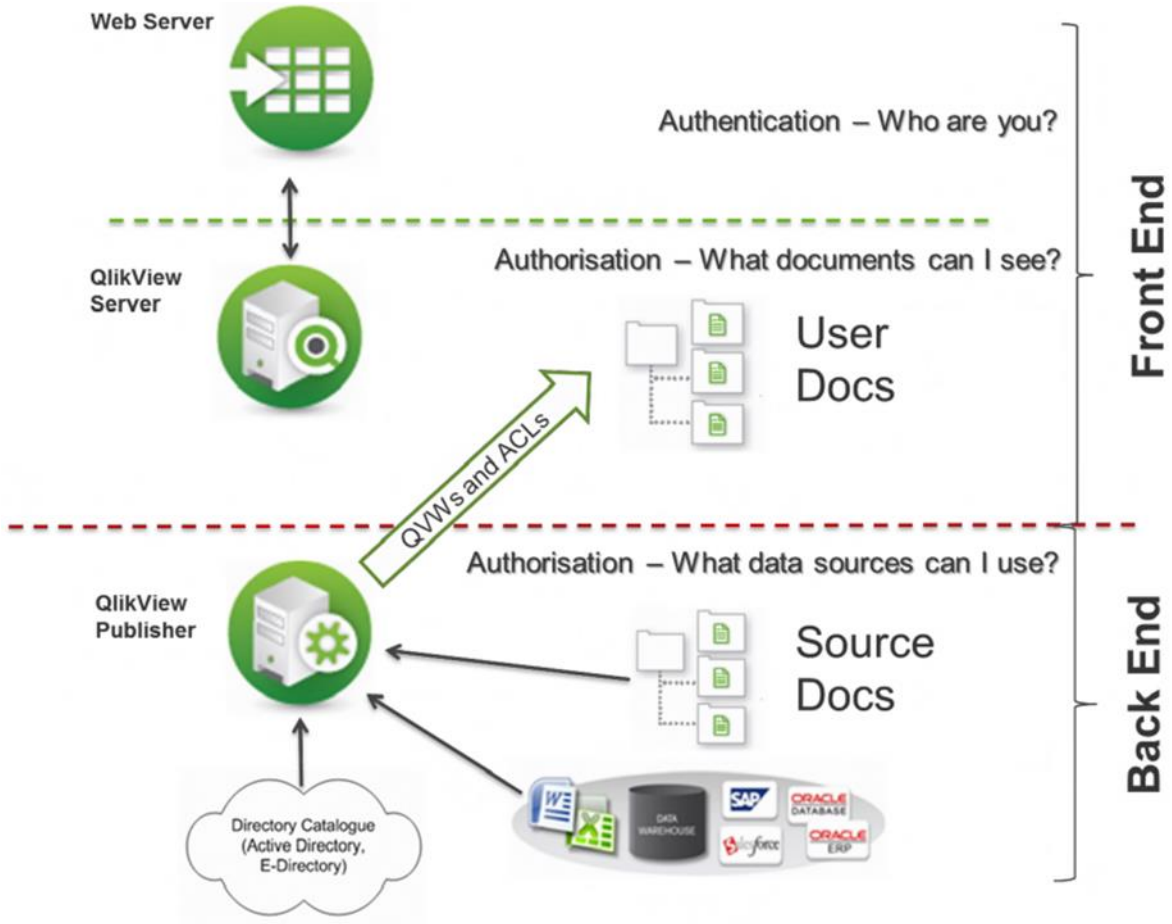


Figure 4.1 Qlikview Front and Back End

4.1.1 **Back End**

For the resultant Qlikview file, I have imported data from 2 different sources. They are:

1. Actuarial dB- Server in SQL where the underlying tables that contain the claim level losses data are present. Since the tables have huge amount of data we group them, club them and apply some more data cleaning processes to display full

information in least number of rows.

Like we club the data for claim before 1996. As we know that hardly anyone is interested in knowing the details of 25-year-old claim.

2. Excel Sheet- It contains the Gross Reserves for each reserving Class.

4.1.2 Front End

The Qlikview file has the following tabs:

1. **Gross Reserves Heat Map**: This tab displays 3 heat maps. One for UWD, one of UWU and last for Reserving Class. The size of each block represents the gross reserves for that particular UWD/UWU/Reserving Class. While its colour (From Bright Green to Bright Red) signifies the % Losses. Green signifies that the Expected were more but the actual losses are comparatively less, vice versa for Red.

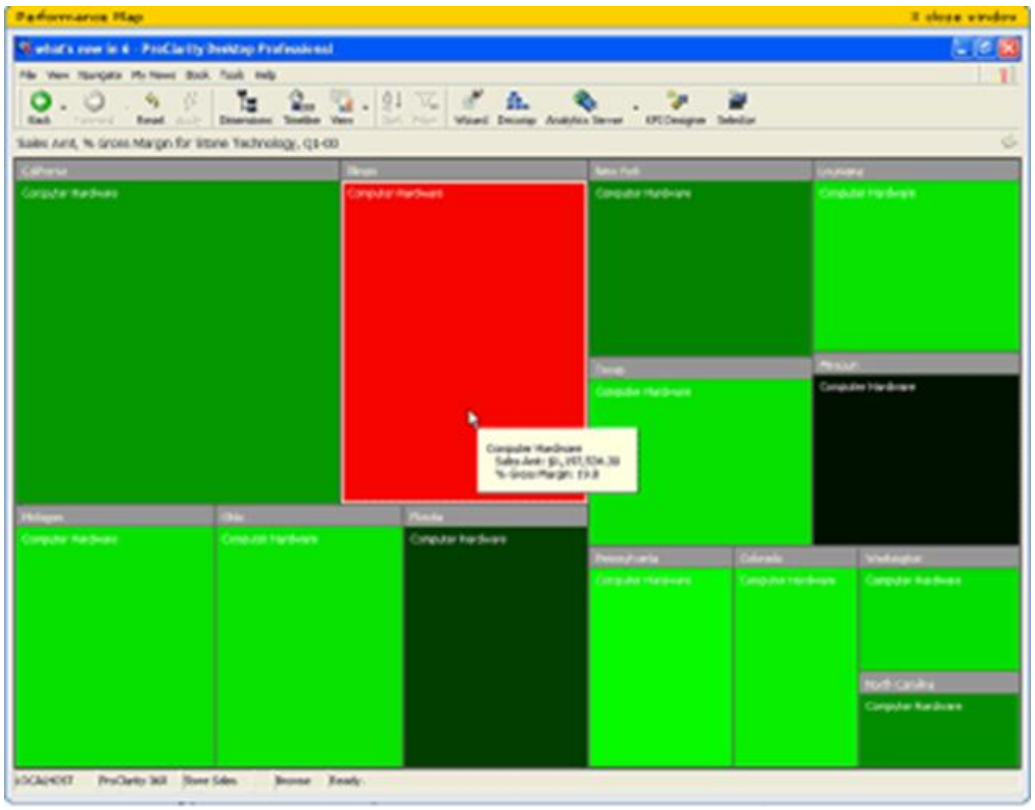


Figure 4.2 Sample Heat Map

2. **Control Checks**: This tab of Qlikview file contains the reconciliations for all the source systems from source system level to profile_id level. These checks ensure that the data that is processed in QlikView reconciles completely with the sub database that was provided in SQL. We can use different filters to select a particular AY or Reserving Class or CyAccoMonth.

3. **Monthly AvE**: This is the main tab. Monthly AvE means Monthly Actual Vs. Expected. For every month we have some expected losses for each profile. As we get the Actual losses data for those profiles, in this tab we show a graph containing bars and lines where Bars show the actual Losses while the lines show the expected values. In this way we came to know whether the amount we have predicted for the corresponding month was more or less than the Actual, and accordingly we change it for next month.

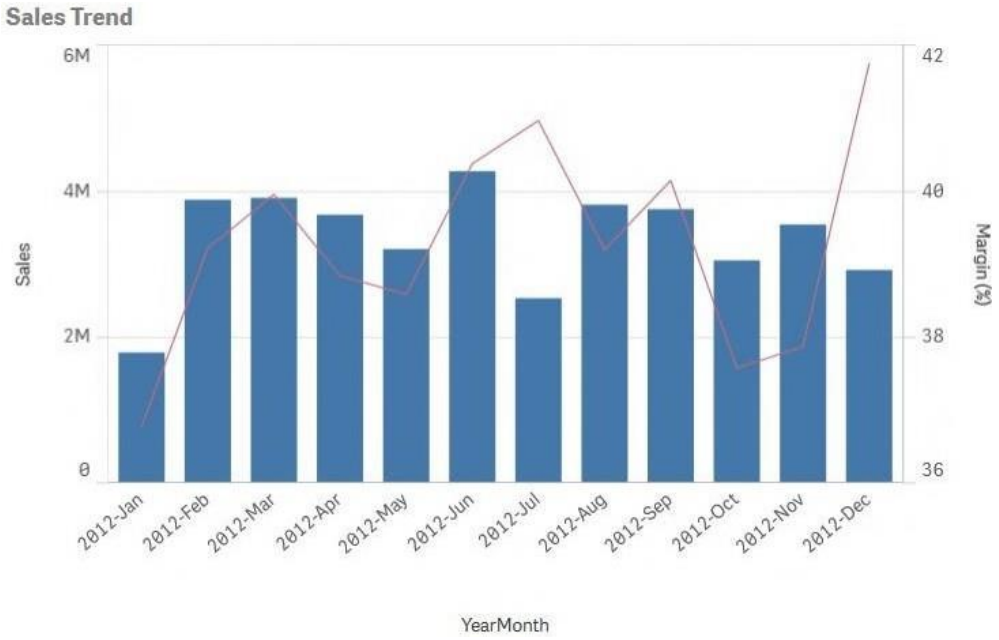


Figure 4.3 Sample Bar Line chart

4. **Summary**: This tab contains Gauge Chart (Speedometer) kind of thing. There are 3 Gauge charts, with actuals on one side and expected on other for current month, QTD and YTD.

Figure 4.4 Sample Gauge Chart

4.2 VENA IMPLEMENTATION

4.2.1 **Browser Requirements**

Vena is web-based and therefore allows users access via a web browser, such as:

- Chrome (Recommended Browser)
- Internet Explorer 9+

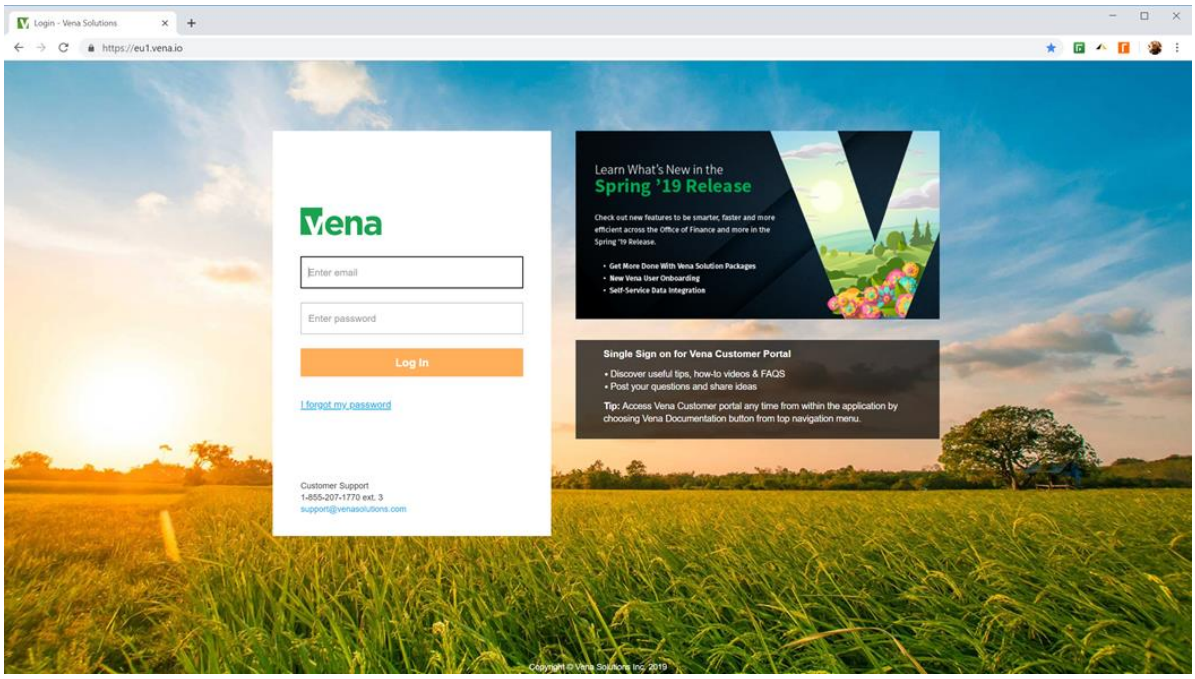


Figure 4.5 Vena in Browser

4.2.2 **The Vena Add-In**

The Vena Add-in is an Excel® Add-in that can be installed from the Vena application on the browser itself.

Steps:

1. Log-in to Vena homepage.
2. On the top-right you will see your name. Click on your name which would open the Profile page

3. Click the Get Add-In button on the left pane of the window.
4. Click on the “Download for Windows”.
5. Close all your Microsoft application before installing add-in.
6. Once installation completes, open excel and Vena plug-in should appear at the top right of excel ribbon.

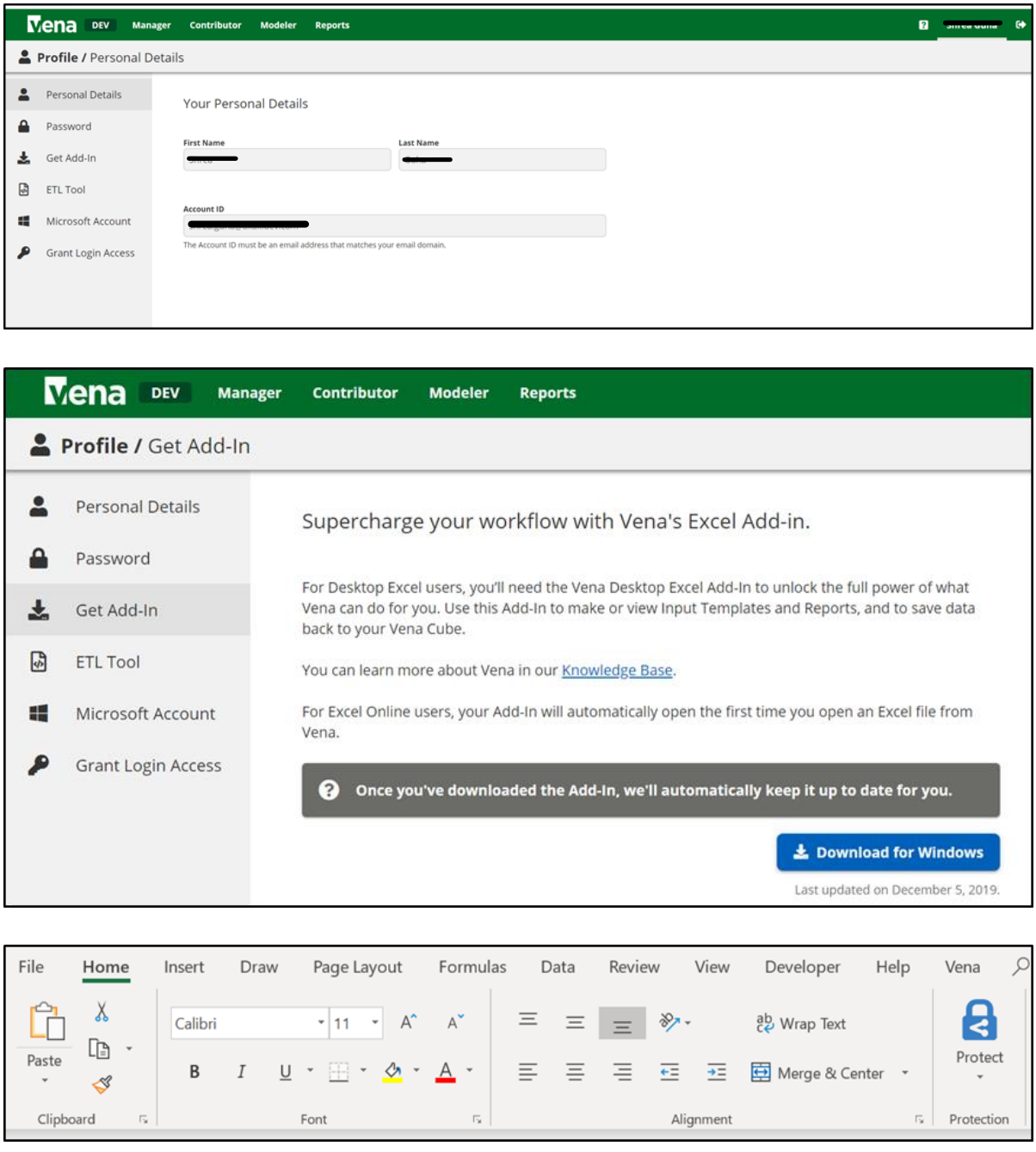


Figure 4.6 Vena Add-In Installation

4.2.3 **Vena Process**

The Vena is available in 3 formats:

1. Development
2. Test
3. Production

The template is created in the Development environment and moves to other environments depending on the stage of completion. When the template is developed, the template/module moves into the Production environment where the User (Actuaries) are able to view and insert records.

The User has only Contributor Access while the DA team has Managerial Access. The access can be granted and revoked by the having access to as a Manager.

Vena has been equipped with all the necessary templates required for Reserving purposes. This also includes User Input, Reports and Checks amongst others.
For a User to open a Template, they have to navigate through to the Contributor tab and select the template and check-out. Upon opening on Excel, the prompt is generated for user to select which Profile is the User going to work on. To make the records consistent, if a file is checked out by a user for a specific profile or unit or division, the file cannot be accessed by any other member from the Contributor tab, i.e. the file will open only in Read Only Mode. Upon completion of the task, the user closes the file and Check-In the file. Now other users can access this record and make edits if required.

On the ribbon of Excel, a Vena tab is generated as an Add-In. Under the ribbon are tools for manipulation of Data and Data Models, viz-a-vis Save Data, Refresh Data Models amongst others. It is also to be noted that the Vena comes with a Drill Save and Audit option where any data change is recorded with the identity of the person who made the change, hence making it easier to follow the trail and debug when required.

Other Features of Vena Add-In:

- Save Data – Use this feature to save the changes you have made in this template which can be then Checked back in to the Vena online data cube.
- Refresh – Use this to refresh the data from Vena backend.
- Choose - You can use the Choose button, to go back to the Selection dropdowns. This would allow you to run the template again with a different set of parameters.
- Insert – Use this to insert a new row for a particular profile.
- Multi Insert – Same as Insert, only used to insert multiple rows in one go.
- Audit Trail – This feature allows you to see the log or history of all the template saves along with the timestamp and the author for every particular save. You can also compare every save through its trail.

Figure 4.7 Vena Process

4.2.4 Vena Templates

1. LDF Selection Template

This template is used for inputting the LDFs into Vena via access to ResQ through the Vena Template.

The LDF Template opens with a Selection panel where the user will provide inputs for the Profile and the Reserving Quarter.

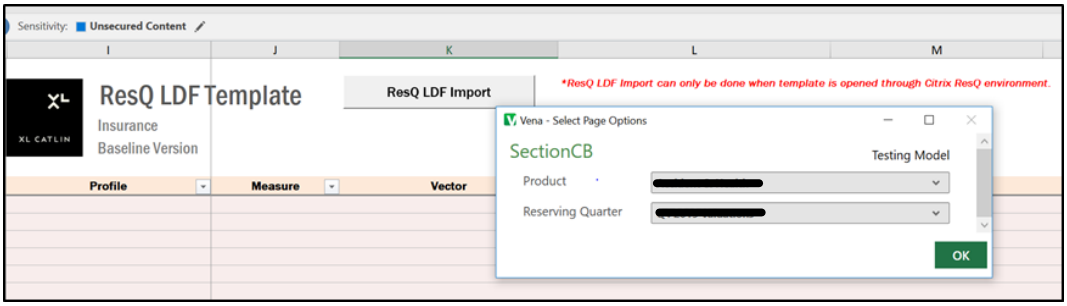


Figure 4.8 LDF Selection Template

This Template can be run either at a Profile level or at an Underwriting Unit level.

Functionality:

The user will open the template that is downloaded from Vena and log into ResQ to load the most recent LDF data from the database. The end user will then save the data in the Vena ribbon to save it to the data model. This will be done in the beginning of the reserving analysis process where data saved here will feed into the Analysis Template/Calc Engine. Data will be updated accordingly when needed.

Hence it can be said that importing ResQ vectors into a specific version of analysis is a 2-step process entailing:

a) Importing ResQ vectors into VENA

b) Updating a specific version of analysis with most recently imported ResQ vectors

The ResQ-LDF interface enables the step a (mentioned above) where the analyst imports development factors set up in ResQ and uploads them to the VENA. This step is a pre-requisite that needs to be carried out for the LDFs to be made available in VENA Analysis template (which does not interact with ResQ) post which step b (mentioned above) is carried out.

2. CY Input/Base LR Template

This template will be used for inputting the base loss ratios and the current year ultimate premiums and losses.

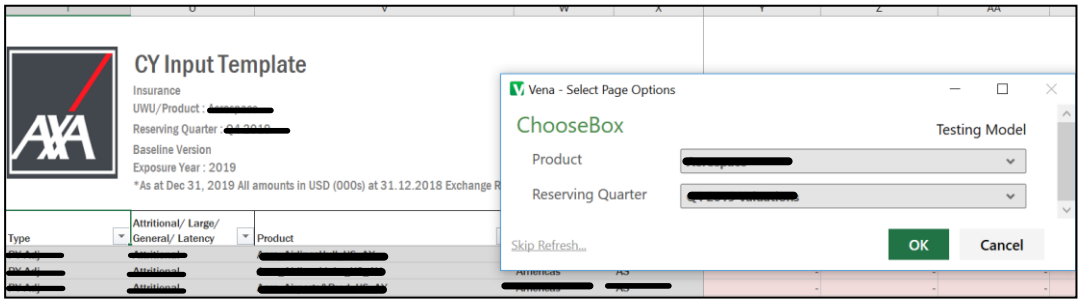


Figure 4.9 CY Input/Base LR Template

This Input Template is only for AY profiles and not for UY profiles. Data from the CY Input and Base LR template flows into the Analysis template.

Functionality:

The user will be prompted to select a Profile or Underwriting Unit, and the template will populate the relevant pre-loaded entries. The user will also be able to enter in the values against profile, region, branch, exposure year and type if the combination was not already pre-populated. Users will enter these amounts in the appropriate fields for both input sheets.

Chapter 5

UNDERSTANDING AND CONCLUSION

Conclusion

This project helped to have a better understanding of Qlikview tool. We can represent any kind of data with Qlikview.

With the help of this report we can simply visualize the data which is pretty much difficult to understand for a layman. But using this Qlikview report anyone can get the basic idea about what all is happening. Qlikview is a great tool for data visualization and data analysis. Qlikview is constructed on in-memory technology which maintains the relationships between the various data.

Along with attaining knowledge of the tools listed above, the project has also helped me with a better understanding of the tool used by the company for Reserving its resources viz-a-vis Vena (Sparta 2.0). This tool has helped me gain a deeper knowledge of data cubes and how data is stored and retrieved from it. This tool has helped me break down the reserving process broadly and helped me gain a fundamental knowledge of the actuarial world.

Vena, which has its own query language based on SQL, known as Vena Query Language or VQL has also been used extensively to run calculation scripts for specific profiles and/or to rapidly retrieve data from the tool.

With creation of different templates, their testing and enhancement on a regular basis, I would conclude that the tool has given an insight to how the things work in a cyclic way, one after the other, subject to reoccurrence.

The project has also given me hands-on, invaluable experience on SQL and Excel which are must in the Analytics field.

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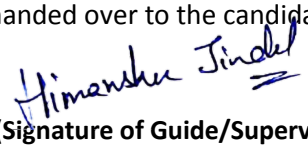

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