

# **Financial Executive Dashboard Using Open Source BI Tools For Small Scale Businesses**

**By**

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## **CERTIFICATE**

**It is certified that the contents and form of thesis entitled “Financial Executive Dashboard Using Opensource BI Tools For Small Scale Businesses” submitted by Hassan Mustafa (2010-NUST-SEECS-BIT-399) Omer Abdul Maroof (2010-NUST-SEECS-BIT-399) have been found satisfactory for the requirement of the degree.**

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**Co-Advisor: Mr. Mujtaba Haider**

## **DEDICATION**

To Allah the Almighty

and

To my Parents and Faculty

## **ACKNOWLEDGEMENTS**

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## **PROJECT ABSTRACT**

The project involved constructing an analytical and predictive tool on top of a data warehouse using our clients database. The finished product is a set of complete dashboards showing business analysis from different dimensions. This will help the business owners analyze their business metrics and make intelligent decisions. The system will also help them to predict future trends using the available data. The project involved exploration, learning and configuration of the Spagi BI tool which is an Open source Business Intelligence Suite. It offers a large range of analytical functions, a highly functional semantic layer often absent in other opensource platforms and projects, and a respectable set of advanced data visualization features. Four dashboards are created which gives the business owner an insight on how the business is doing. The main tab gives you an overview of sales, revenue targets and the best and worst selling products. The products tab gives you insights on products sold together, sales comparison of different products, insights on products returned and the contribution of each product towards sales. The sales dashboard gives you a breakdown on the profit and expenses comparison for the business and an insight on the sales figures comparison in the time dimension. The expenses tab give a detailed analysis on the expenses the business incurred during the business year. The final product will be a mobile app deployed on the server which can be accessed through the internet using any mobile device.

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## **INTRODUCTION**

### **1.1 Background**

Advancement in technology and its wide usage has enabled it to be used by every common man. This has led to huge amounts of data being collected by software systems. Such data needs to be utilized effectively to derive business knowledge which can be used to discover insights, identify patterns and make intelligent business decisions. Customer trends, buying patterns and other pertinent information can be extracted from such huge amounts of data gathered, however it is important that the knowledge extracted is displayed in user friendly and interactive form, easily understandable by the user.

### **1.2 Business Intelligence:**

Business Intelligence is the effective use of data and information to make sound business decisions. It is a set of methodologies that transform raw data into meaningful and useful information for business purposes. It simplifies information discovery and analysis, making it possible for decision-makers at all levels of an organization to more easily access, understand, analyze, collaborate, and act on information, anytime and anywhere. BI can handle large amounts of information to help identify and develop new opportunities. Making use of new opportunities and implementing an effective strategy can provide a competitive market advantage and long-term stability. BI technologies provide historical, current and predictive views of business operations. Business intelligence encompasses the following elements:

- a) Reporting: the process of accessing data, formatting it and delivering it inside and outside the organization
- b) Analysis: identifying patterns and establishing relationships in a group of data
- c) Data mining: the extraction of original information from data
- d) Data quality and interpretation: the greater or lesser correlation between data and the real-world objects they represent
- e) Predictive analysis: a branch of data mining, it attempts to predict probabilities and trends

Often BI applications use data gathered from a data warehouse or a data mart. A data warehouse is a copy of analytical data that facilitates decision support. However, not all data warehouses are used for business intelligence, nor do all business intelligence applications require a data warehouse.

BI gives you the intelligence to predict trends, uncover insights, and operate at continual peak performance. Using BI you get to see more clearly into how your 10

company is performing. You'll have a wealth of business intelligence—presented through insightful, easy-to-act-upon dashboards and reports—and you'll be equipped to outperform your competition.

### **1.3 Customer Requirements:**

Punjab Watch Company is a major player in the wristwatch import industry. With growing business operations, more store openings and more customers, the business owners felt a need to evolve their existing inventory management system which was built using old technology. The old system was built with the aim of gathering data and generating financial reports for the company, however it did not use the data available to generate insights and knowledge for the business owners which would enable them to make sound business decisions and grow their business. The company has loads of data from their business operations in previous years but it isn't being put to good use. The company owners wanted raw data to be converted into meaningful and useful information for business purposes. They felt a need that if the data is manipulated and projected in a way that valuable insights be generated from it, they could harness this knowledge to make use of new opportunities and implement an effective strategy for a competitive market advantage and long-term stability.

### **1.4 Solution proposed:**

After a detailed analysis of the customer's problem, we have decided to build an analytical and predictive tool for the company. The finished product will be a complete executive dashboard which the company owners can use to understand and analyze their business metrics and make intelligent decisions. It will enable them to predict trends, uncover insights, and operate at continual peak performance. They will get to see more clearly into how their company is performing. They will have a wealth of business intelligence—presented to them through insightful, easy-to-act-upon dashboards and reports.

### **1.5 Report Organization**

The report is organized into four chapters.

1. Introduction
2. Literature Review
3. Functionality and Design
4. Implementation and Result Discussion

## LITERATURE REVIEW

### BI Tools

Business intelligence tools are a type of application software designed to retrieve, analyse and report data for business intelligence. The tools generally read data that have been previously stored, often, though not necessarily, in a data warehouse or data mart.

### 2.1 SpagoBI

- 1) Open Source.
- 2) Complete BI Tool

### Modules



Figure 1: Spago BI Architecture Diagram

**2.1.1.1 SpagoBI Server**, the BI platform that offers all the core and analytical functionalities. It also provides two conceptual Models

- 1) **Analytical Model**
- 2) **Behavioral Model**

**2.1.1.2 SpagoBI Studio**, the integrated development environment

**2.1.1.3 SpagoBI Meta**, the metadata environment

**2.1.1.4 SpagoBI SDK**, the integration layer allow using SpagoBI with external tools.

**2.1.1.5 SpagoBI Applications**, a collection of vertical analytical models that are developed using SpagoBI.

## **2.1.2 SpagoBI in Industry**

### **Turin ASL 3**

The TURIN ASL 3 chose SpagoBI to help innovating, its budget card distribution system to all operational units of hospitals and territorial districts.

Outcomes:

- a) Implementing SpagoBI improves decision processes
- b) Budget management was completely automated.
- c) Due to behavioral model of SpagoBI right information was presented to right people.

### **Fiat Group Automobiles**

Fiat Group Automobiles has chosen SpagoBI as the open source business intelligence platform for the realization of link.e.intelligence, the analytical component of the .link product, aiming to support the selling activities of Fiat Group Automobiles international distribution network.

Outcomes

- a) Operational analysis, providing reports with a detailed description of the services provided by the enterprise, in relation to the defined goals; it also offers OLAP documents for free detailed analysis.
- b) Intermediate analysis, providing reports and dashboards with data synthesis on specific sectors.
- c) Directional analysis, providing advanced dashboards composing the enterprise cockpit.

Functionalities	SpagoBI	Pentaho	Pentaho Ent. Ed.	Jasper	Jasper Ent. Ed.
Activities scheduling	√	×	√	×	√
Ad-hoc reporting	×	×	√	×	√
Auditing	√	×	√	√	√
Collaborative BI	√	×	×	×	×
Data Mining	√	√	√	×	×
Dashboard	√	√	√	×	√
Document export	√	√	√	√	√
ETL	√	√	√	√	√
Geo-referenced analysis	√	√	√	×	√
OLAP	√	√	√	√	√
Query by Example	√	×	×	×	×
Report validation workflow	√	×	√	×	×
Reporting	√	√	√	√	√
User profiling	√	×	√	×	√

Figure 2: Comparisons between Spago BI, Pentaho and Jasper BI tools

## 2.2 J2EE (Server)

Java Platform, Enterprise Edition or Java EE is Oracle's enterprise Java computing platform. The platform provides an API and runtime environment for developing and running enterprise software, including network and web services, and other large-scale, multi-tiered, scalable, reliable, and secure network applications

### 2.2.1 J2EE Usage

J2EE has Heterogeneous environment ie Write Once Run Anywhere. It provides a feature-rich set of high quality APIs. Its of very high quality and provides fully integrated support for enterprise concepts – e.g. security, transactions, etc.

## 2.3 Client Side (HTML 5)

HTML5 is a markup language used for structuring and presenting content for the World Wide Web and a core technology of the Internet. It is the fifth revision of the HTML standard.

### 2.3.1 HTML5 Usage

HTML5 is becoming a new standard. Faster and cheaper, it is modern. It supports all mobile devices and is platform independent.

### 2.3.2 HTML5 in industry

#### **Clartelligence**

Designs and develops dashboards that can be viewed on Desktop computers and Mobile Devices.

#### **Roambi**

Roambi is a supplier of mobile analytics and visualization software. For the cloud version of the software, Roambi has redesigned the entire publishing engine to be HTML5-compliant.

## 2.4 HighCharts

Highcharts work in all modern browsers including the iPhone/iPad and Internet Explorer from version 6. You can modify code under any license. Highcharts are solely based on native browser technologies and doesn't require client side plugins like Flash or Java. Furthermore you don't need to install anything on your server. No PHP or ASP.NET. It has simple Configuration Syntax and user can export charts to png, jpg or SVG format.

## 2.5 PhoneGap (MobileApps Development Framework)

PhoneGap is a free and open source framework that allows you to create mobile apps using standardized web APIs.

### 2.5.1 PhoneGap Usage

Phone Gap is platform independent, develop app on HTML5 and run on any mobile device. It is also Open Source.

### 2.5.2 PhoneGap in industry

- a) **BBC Olympics:** PhoneGap app that shows live information about Olympics.
- b) **Fruit Salad:** A very interactive game developed using PhoneGap.

## Methodology

The data was provided to us by the customer in DBF format. Our first task involved the conversion of DBF files to MyExcel files. The Figure below shows the sample converted data.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	DATE	FIVT	VCHNC	ACOD	NAR		GRSVAL	DISPR	DISRS	TOTPCS	DISCOUN	AGE	PROFIT	FREIGHT	NETVAL	AT_CUM	LUMPSUM	BOX	BOXRA	CTNS	CTNRATE	
2	7/30/2005	3	SV	2	0007	AL-NOOR WATCH COMPANY	700.00	0.00	0.00	2	0.00	SHPW		0.00	700.00			0.00	0	0	0	0
3	7/30/2005	3	SV	3	0001	PUNJAB WATCH CO. PH:5555317	1150.00	0.00	0.00	1	0.00	SHPW		0.00	1150.00			0.00	0	0	0	0
4	7/30/2005	3	SV	4	0001	PUNJAB WATCH CO. PH:5555317	390.00	0.00	0.00	1	0.00	SHPW		0.00	390.00			0.00	0	0	0	0
5	7/30/2005	3	SV	1	0002	BUY N SAVE	65685.00	0.00	0.00	238	0.00	SHPW		0.00	65685.00			0.00	0	0	0	0
6	7/30/2005	3	SV	5	0038	LAHORE WATCH	2100.00	0.00	0.00	11	0.00	SHPW		0.00	2100.00			0.00	0	0	0	0
7	7/30/2005	3	SV	6	0023	SWISS WATCH CO.	13595.00	0.00	0.00	43	0.00	SHPW		0.00	13595.00			0.00	0	0	0	0
8	7/30/2005	3	SV	7	0039	ADIL TRADERS	1100.00	0.00	0.00	3	0.00	SHPW		0.00	1100.00			0.00	0	0	0	0
9	7/30/2005	3	SV	8	0009	ARSHAD WATCH	1140.00	0.00	0.00	6	0.00	SHPW		0.00	1140.00			0.00	0	0	0	0
10	7/30/2005	3	SV	10	0041	MASHALAH GENERAL STORE	600.00	0.00	0.00	12	0.00	SHPW		0.00	600.00			0.00	0	0	0	0
11	7/30/2005	3	SV	9	0040	YASEEN SAHIB	1958.00	0.00	0.00	15	8.00	SHPW		0.00	1950.00			8.00	0	0	0	0
12	7/30/2005	3	SV	11	0007	AL-NOOR WATCH COMPANY	380.00	0.00	0.00	1	0.00	SHPW		0.00	380.00			0.00	0	0	0	0
13	7/30/2005	3	SV	13	0044	SHAH JEE	530.00	0.00	0.00	8	0.00	SHPW		0.00	530.00			0.00	0	0	0	0
14	7/30/2005	3	SV	12	0043	GHOUSIA WATCH	450.00	0.00	0.00	5	0.00	SHPW		0.00	450.00			0.00	0	0	0	0
15	7/30/2005	7	AV	1			200.00							200.00								
16	7/30/2005	3	SV	14	0042	BARI WATCH	4320.00	0.00	0.00	24	0.00	SHPW		0.00	4320.00			0.00	0	0	0	0
17	7/30/2005	1	PV	2	0050	!ARIF RASHEED (HARTCO CLOCK)	7200.00	0.00	0.00	23	0.00			0.00	7200.00			0.00				
18	7/31/2005	3	SV	15	0052	FRIEND WATCH	590.00	0.00	0.00	7	0.00	SHPW		0.00	590.00			0.00	0	0	0	0
19	7/31/2005	3	SV	16	0053	IMRAN SHOPING COMPLEX	315.00	0.00	0.00	3	0.00	SHPW		0.00	315.00			0.00	0	0	0	0
20	7/31/2005	3	SV	18	0055	SAAED WATCH	400.00	0.00	0.00	4	0.00	SHPW		0.00	400.00			0.00	0	0	0	0
21	7/31/2005	3	SV	19	0054	SHAKEEL WATCH	510.00	0.00	0.00	3	0.00	SHPW		0.00	510.00			0.00	0	0	0	0
22	7/31/2005	3	SV	20	0056	TIME VISION	6350.00	0.00	0.00	13	0.00	SHPW		0.00	6350.00			0.00	0	0	0	0
23	7/31/2005	3	SV	21	0057	HAJI MANZOOR AHMAD	1815.00	0.00	0.00	6	0.00	SHPW		0.00	1815.00			0.00	0	0	0	0

Figure 3 Sample DBF to Excel converted data

The next stage involved the design of the data warehouse in MYSQL. Star Schema was selected for the warehouse structure.

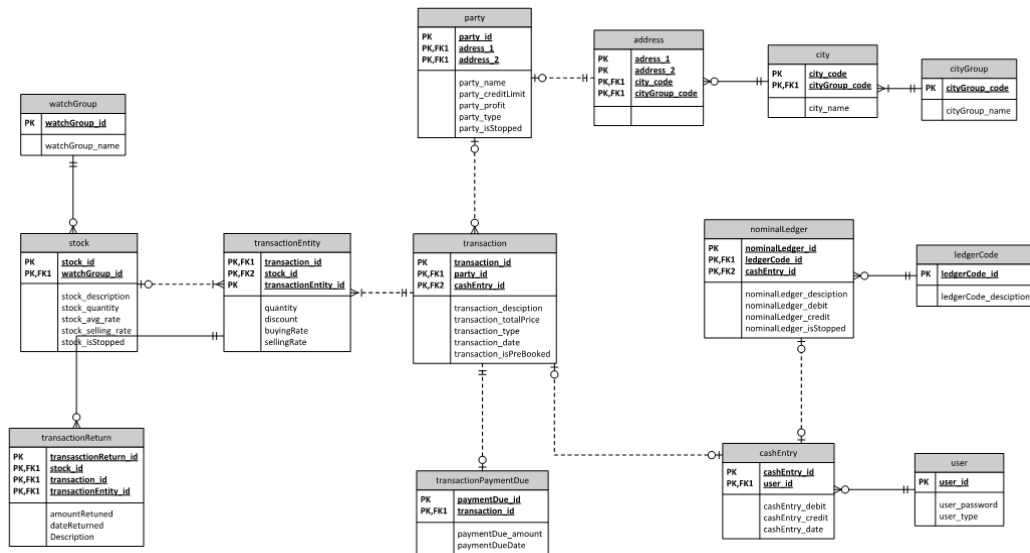


Figure 4 Original customer ERD diagram



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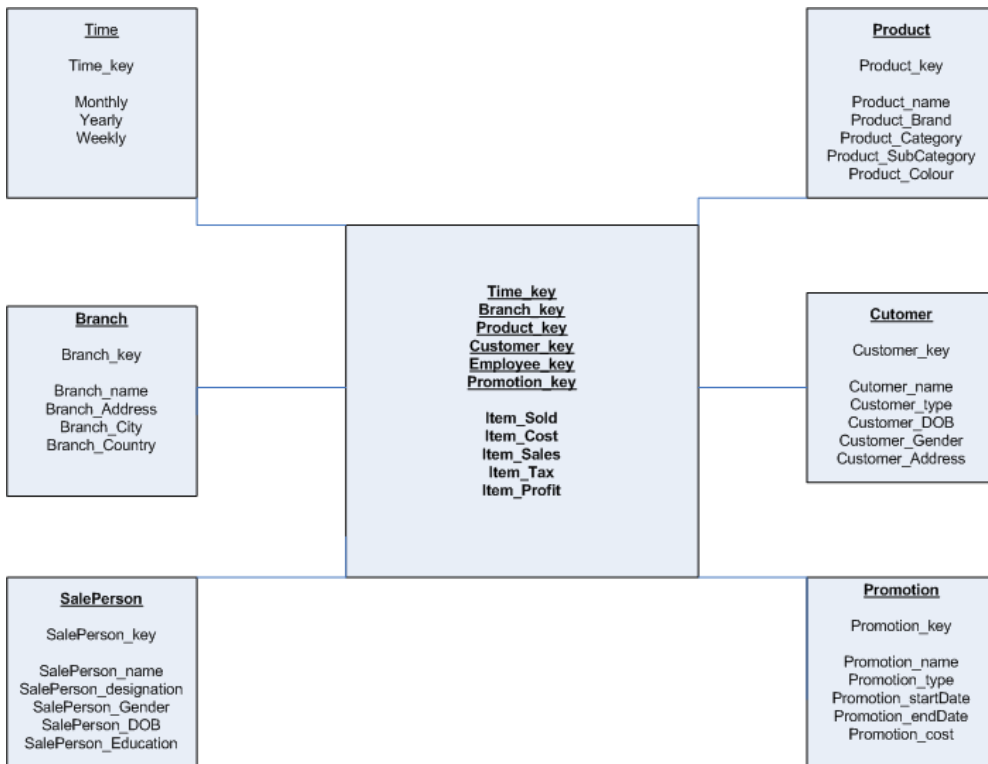


Figure 5 Data warehouse design.

## Prototype Analysis Views

After the construction of the data warehouse we created prototype dashboards of the analysis we intended to do.

### 4.1 Main Dashboard

The main dashboard gave an overview of the sales figures for the day. It also showed the best and the worst selling products for the month as well as the contribution of each product towards the revenue.



Figure 6 Prototype main dashboard

## 4.2 Products Dashboard

The products dashboard gives an overview of the different sales figures from different stores. It gives an overview of the products contribution to sales, an analysis of products sold together, the daily sales per product and the products returned per store.



Figure 7 Prototype products dashboard

### 4.3 Revenue Dashboard:

This dashboard gives an analysis of the breakdown of profits and losses with respect to sales, the contribution of each store towards the business revenue and a comparison of different sales figures through different dimensions.

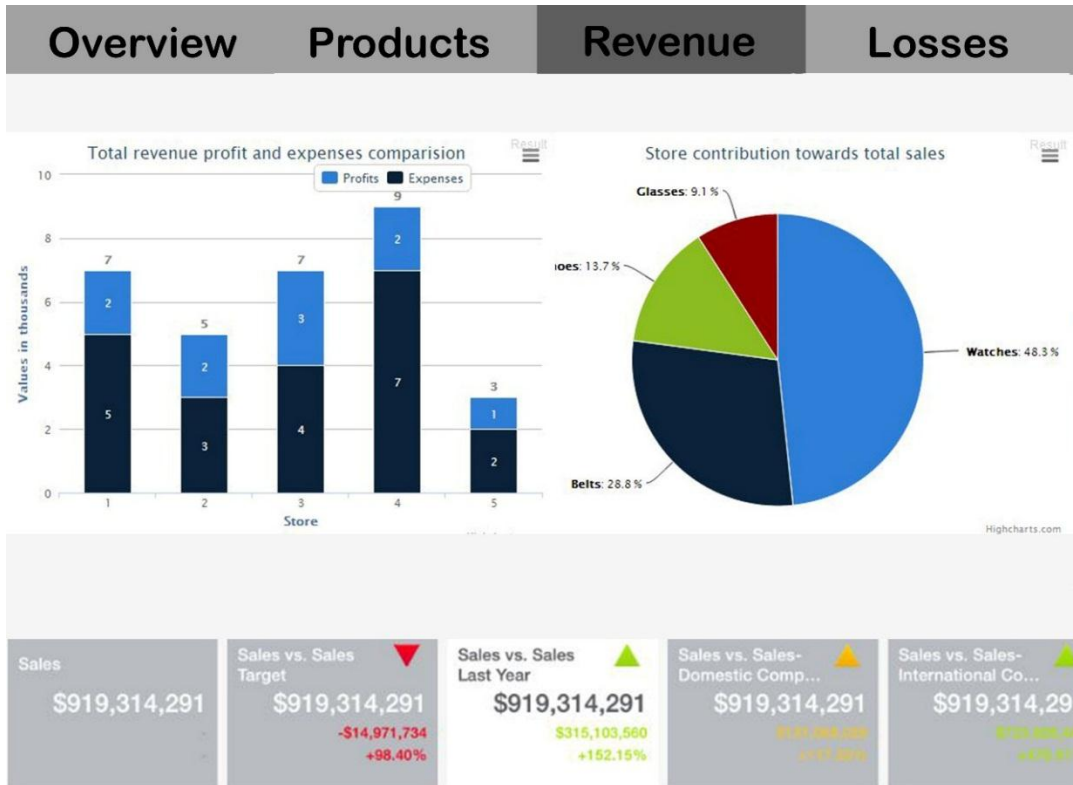


Figure 8 Prototype main dashboard

#### 4.4 Expenses Dashboard

This dashboard gives an analysis of the expenses incurred by the business.

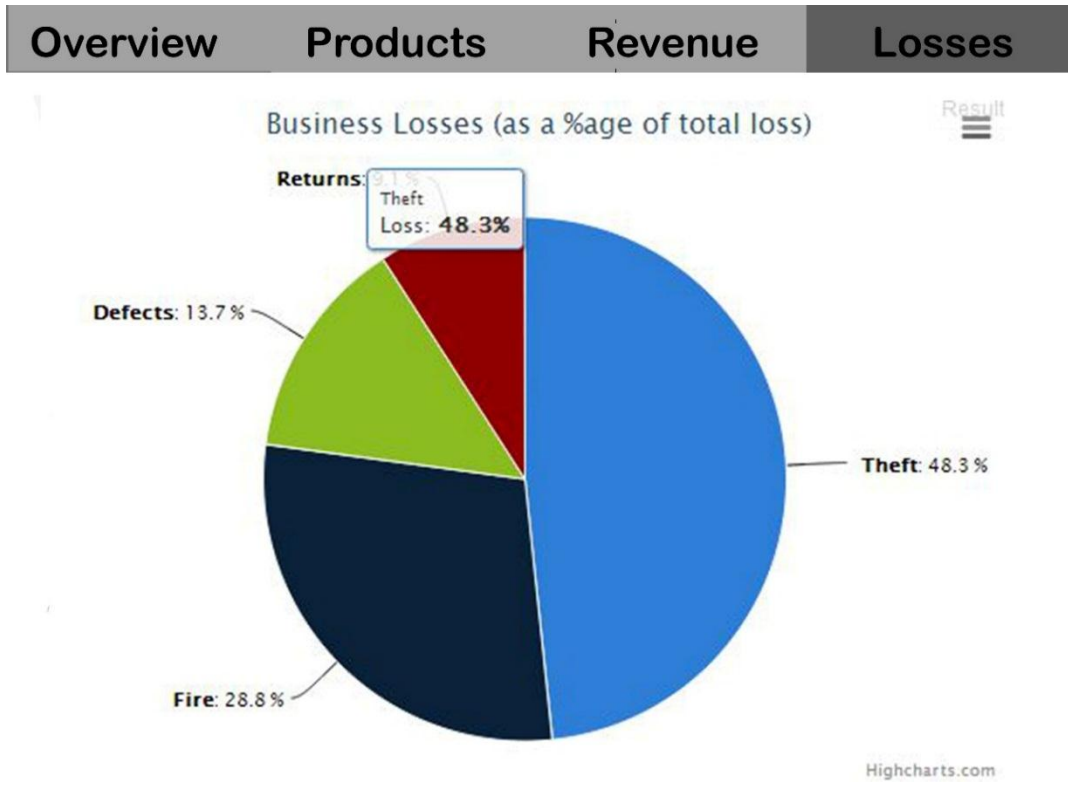


Figure 9 Prototype expenses dashboard

## Installation Manual

### 5.1 Objective

The objective of this user manual is to teach you how to install and configure the Spago BI tool. You should be able to work through the tutorial with little or no outside help. It will also guide you on installing other softwares needed to run the system.

### 5.2 Installation Instructions for Windows 8/7/Vista

#### 5.2.1 Prerequisites (if jdk 1.6 is not installed)

- 1) Install jdk and jre 1.6. New version of jdk causes instability. Please don't experiment with it.
- a) Use the link below to download jdk 1.6

<http://www.oracle.com/technetwork/java/javase/downloads/java-archive-downloads-javase6-419409.html#jdk-6u45-oth-JPR>

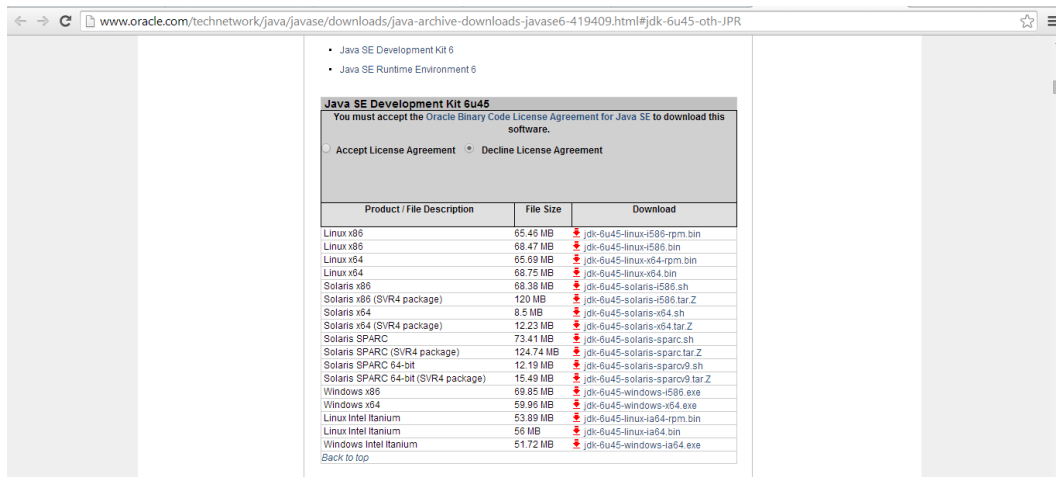


Figure 10 JDK Download View

- b) Download jdk at **C:\Program Files\Java**
- c) After installation the java folder should contain two folders as shown below

# Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

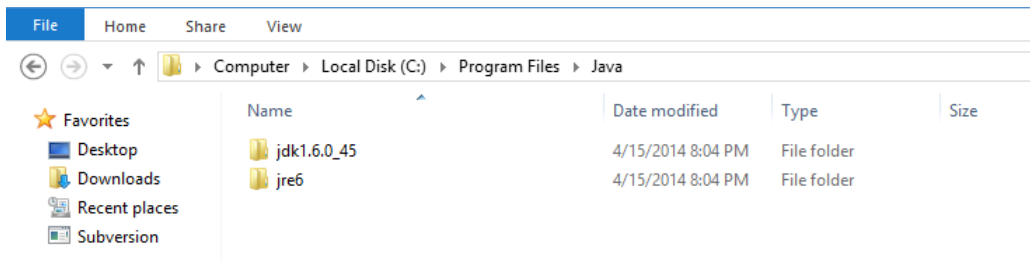


Figure 11 JDK file view

## 5.2.2 SpagoBI Installation Instructions

1) Copy SpagoBI folder from CD to Any Drive

In this Example we'll be using E:\

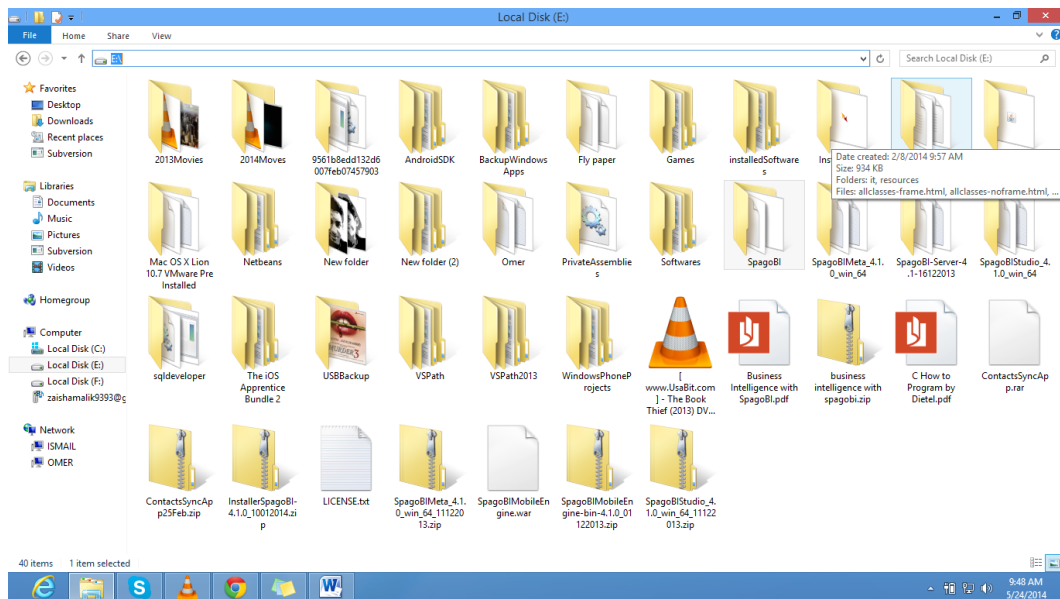


Figure 12 SpagoBI directory view

## 5.2.3 Configuring Environment Variables

a) Open Control Panel Right environment in search bar as shown below

# Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

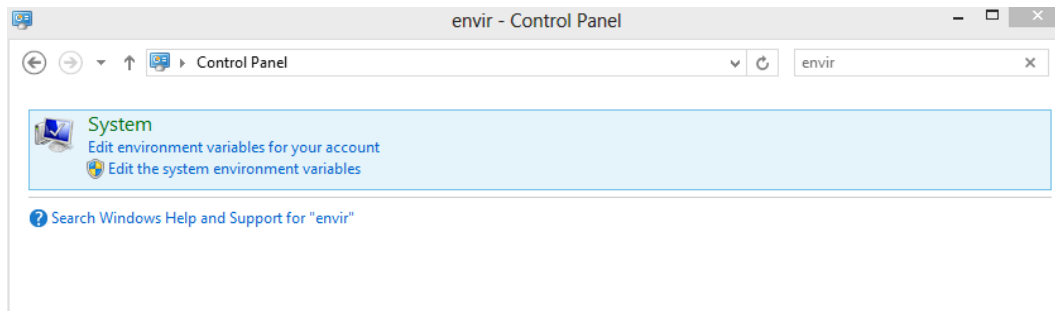


Figure 13 Control panel view

b) Click on edit environment variables. Add the following variables.

Add VAR **CATALINA\_HOME** for value **E:\SpagoBI**(the path should be where you copied spagobi forlder)

Variable	Path	description
<b>CATALINA_HOME</b>	<b>E:\SpagoBI</b>	<b>the path should be where you copied spagobi forlder</b>
<b>JAVA_HOME</b>	<b>C:\Program Files\Java\jdk1.6.0_45</b>	<b>The path should be where you jdk</b>

Figure 14 Environment Variable Configuration



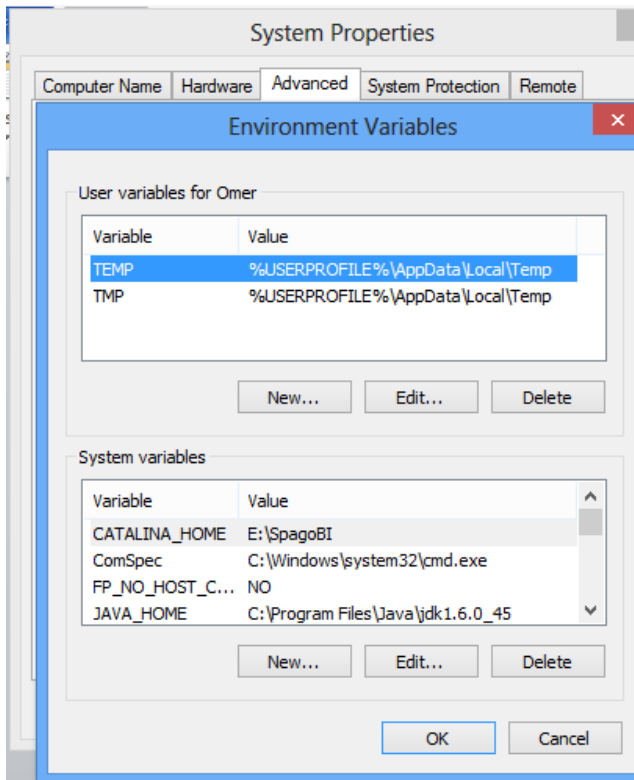


Figure 15 Environment Variables Configuration console

### 5.2.4 My SQL Installation Instructions:

You'll be needing MySQL server and MYSQL work bench.

- 1) Download My SQL server from <http://dev.mysql.com/downloads/mysql/>
- 2) Download My SQL workbench from <http://dev.mysql.com/downloads/tools/workbench/>

Install both work bench and server, work bench actually provide you an interface for interacting with MY SQL Server

#### Easy Way

You can also install MY SQL installer which includes workbench as well as server from link <http://dev.mysql.com/downloads/installer/>

# Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

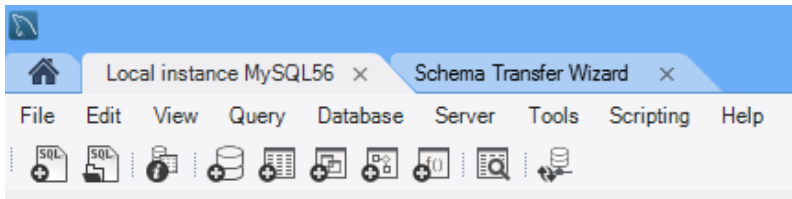


Figure 16 MYSQL view

4) Select Data Import, following wizard will come up as shown below

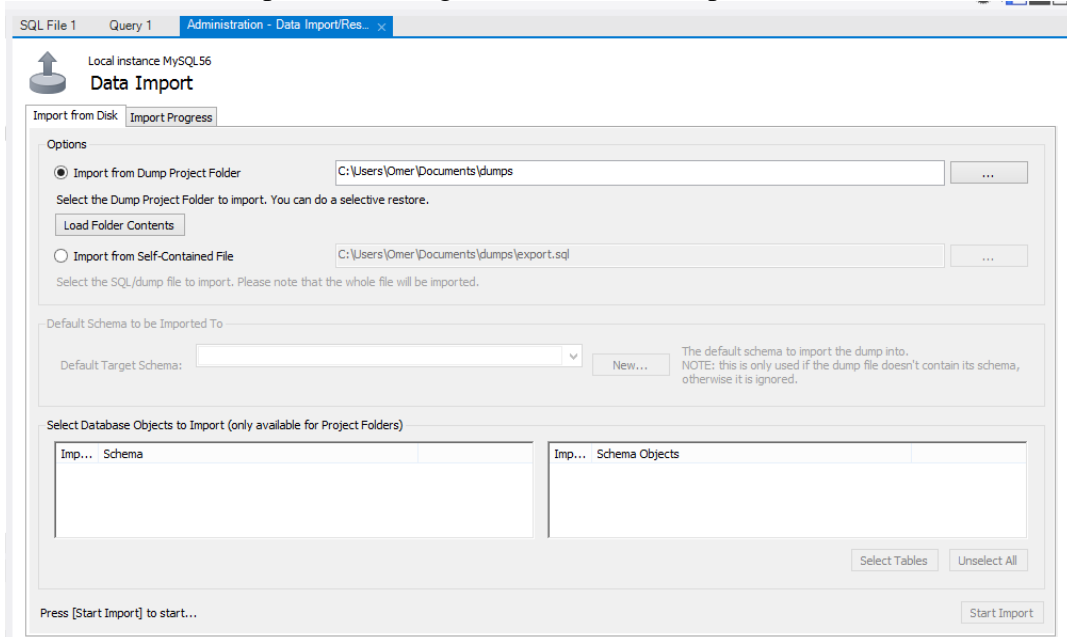


Figure 17 Data Import Wizard View

5) Select Import from self-contained file. Give path of that file from cd (file is named Dump20140524.sql) and start import.

Once import completed you'll see screen similar to shown below

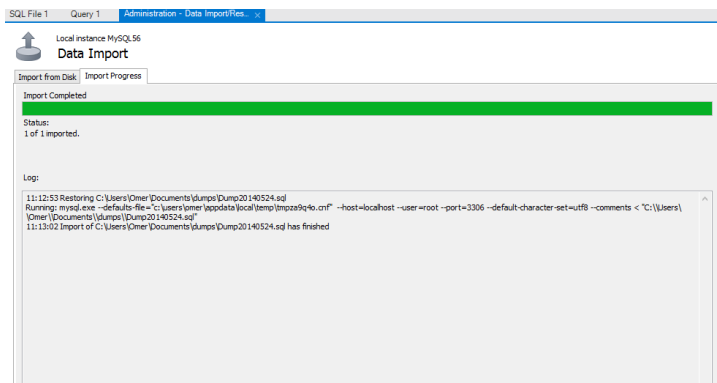


Figure 18 Data import wizard

6) Refresh the schema view and you'll see retailbusinessdatawarehouse as shown below

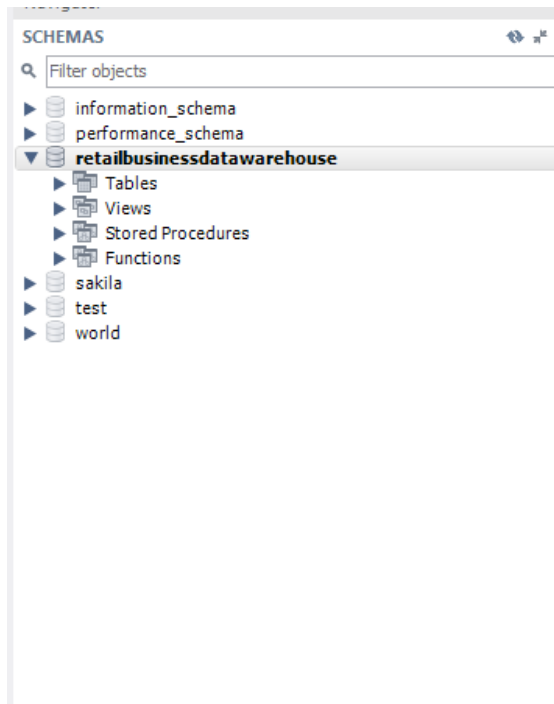


Figure 19 Data population wizard

Congratulations Data Population is complete.

## SpagoBI Usage Manual

### 6.1 Objective:

The tutorial also give a detailed step by step process on how to create your own interactive charts and convert them into a dashboard using SPAGO BI

### 6.2 Launching SPAGO BI

1) Go to **E:\SpagoBI\bin** or where SpagoBI is copied

2) Double Click on SpagoBI.bat to start SpagoBI server

File Name	Modified	Type	Size
SpagoBIStartup.bat	2/2/2014 6:59 AM	Windows Batch File	3 KB
SpagoBIStartup.sh	2/2/2014 6:59 AM	SH File	1 KB
startup.bat	2/2/2014 6:59 AM	Windows Batch File	2 KB

3) Following screen will appear

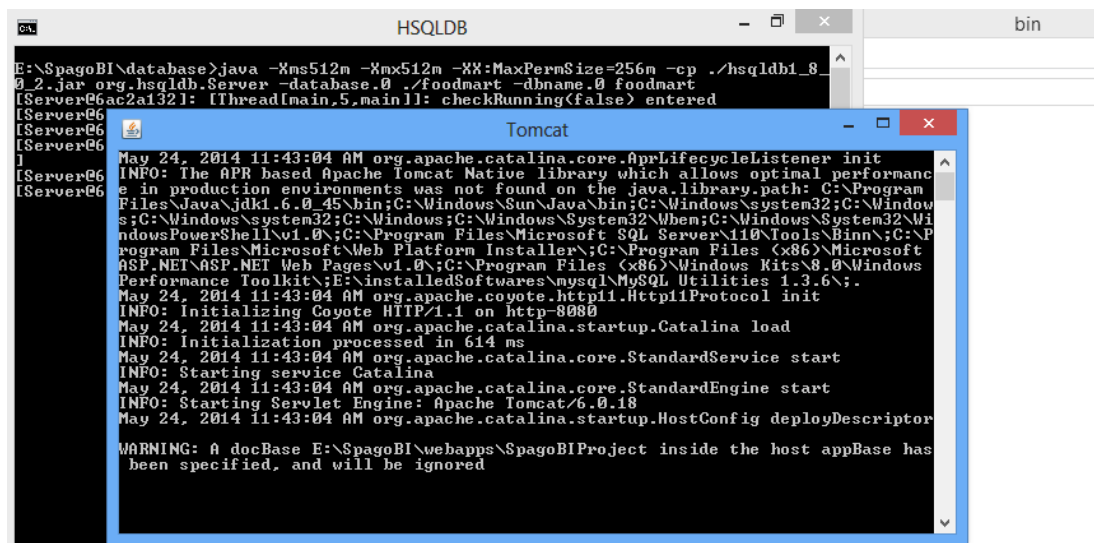


Figure 20 SPAGO BI Server startup

4) Wait for the server to Start

5) Open any browser and type localhost:8080/SpagoBI for the following to appear

# Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

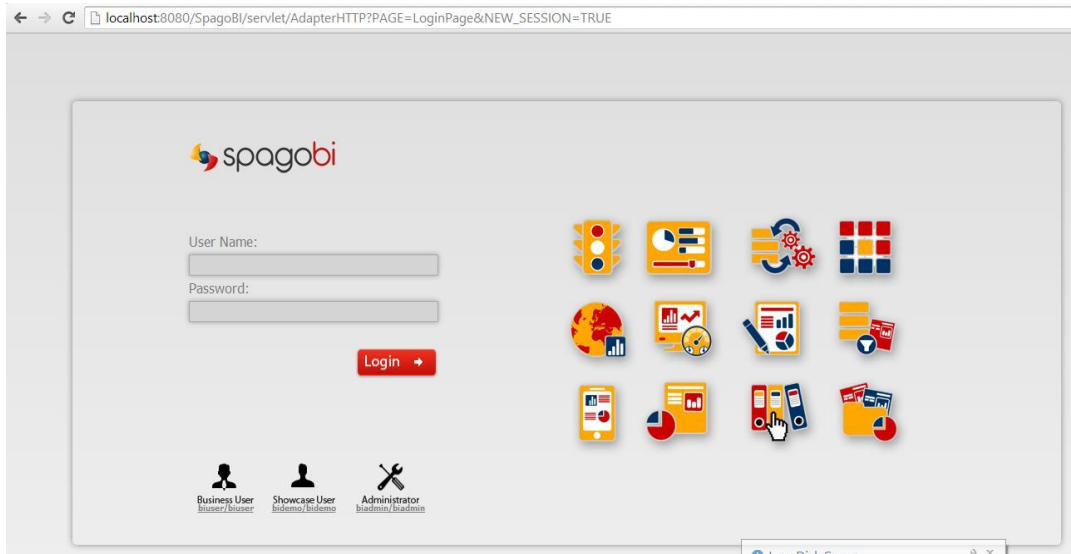


Figure 21 SPAGO BI homepage

6) Use biadmin as username and biadmin as pass for logging in as admin

Use omer username and omer pass for logging in as user

7) Click on Folder at the Left side of screen after login



Figure 22 SPAGO BI side menu

Click on Analytical Documents -> Cockpits

## Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

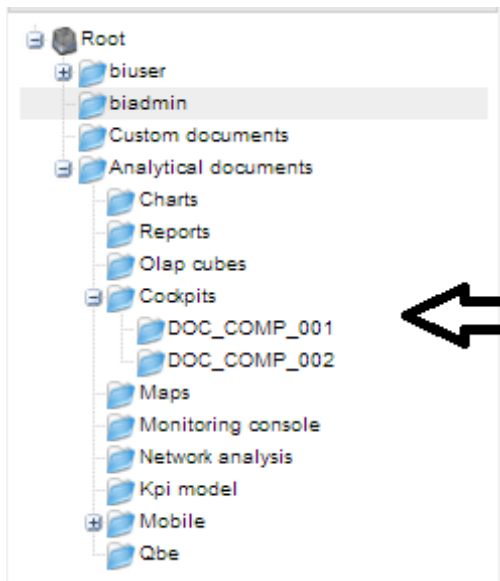


Figure 23 SPAGO BI document view

You'll see the dashboards as mentioned below. Click on any one to execute the dashboard

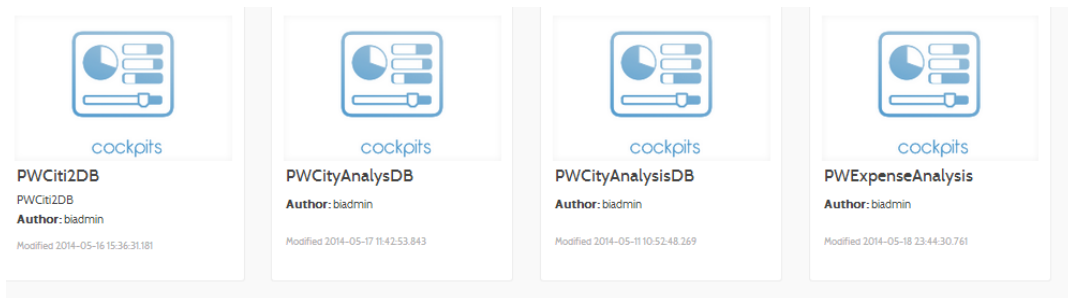


Figure 24 Documents folder

- a) PWCityAnalysDB
- b) PWProductAnalysisDB
- c) PWExpenseAnalysisDB

By Clicking Following Documents you'll see Dashboards as show below

# Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

## Product Analysis DB

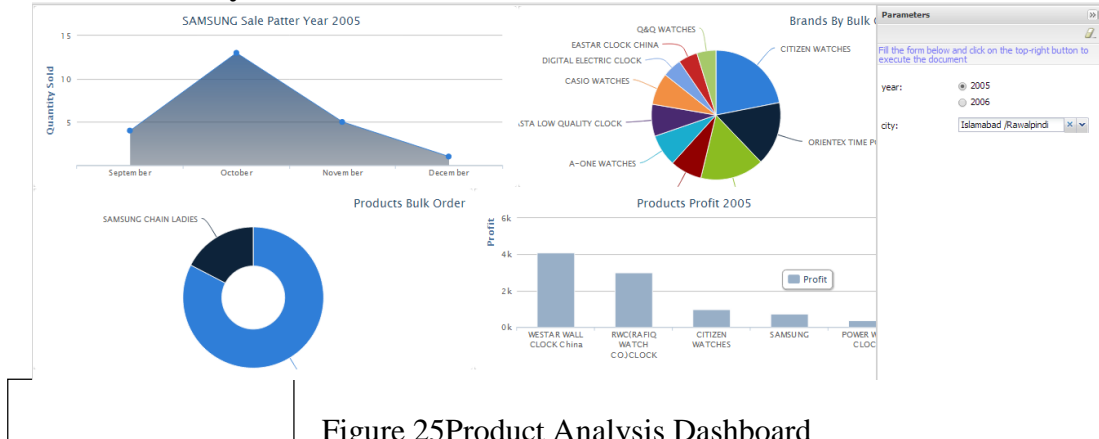


Figure 25 Product Analysis Dashboard

## Expense Analysis DB

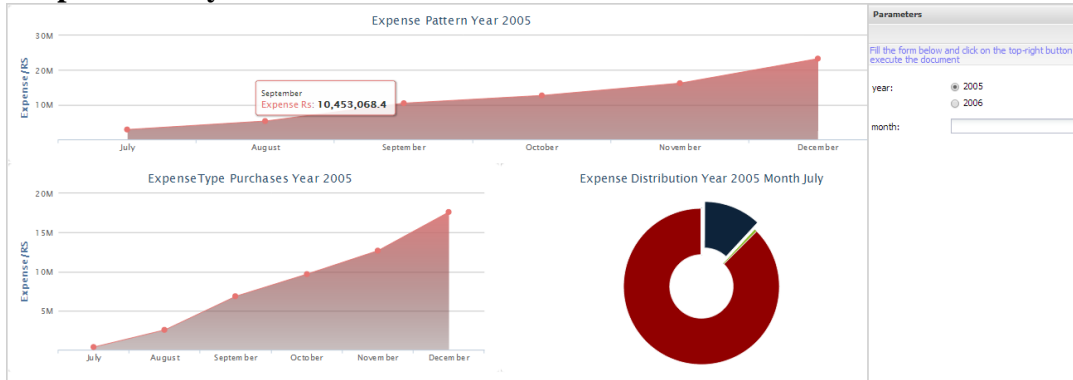
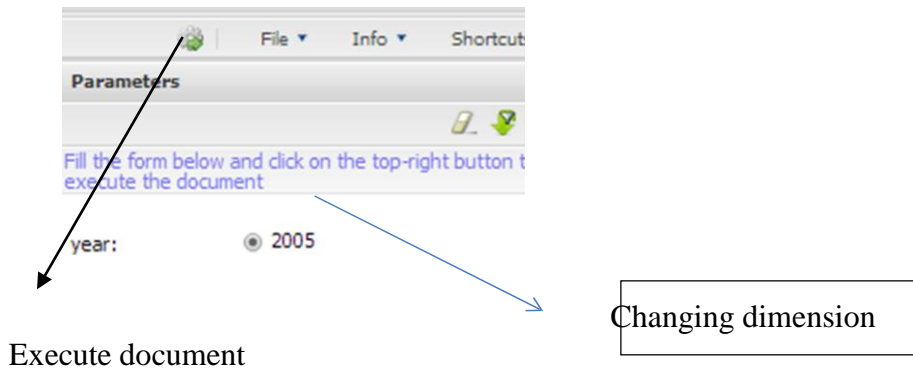


Figure 26 Expense Analysis Dashboard

8) Change the parameters in each of the DB and execute the document again you'll get different dimensional analysis.



### 6.3 Configuring SpagoBI Studio:

In SpagoBI studio, user can design interactive dashboards, charts, reports and cockpits using various charts like high chart, jfree and ext chart.

Copy SpagoBI Studio folder from DVD to any directory. Open the folder and double click on SpagoBI.exe to open Studio

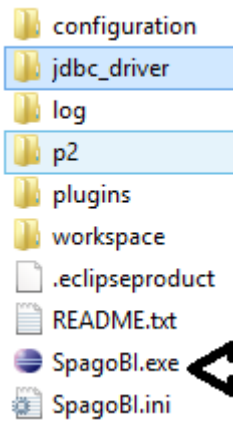


Figure 27 Configuring Studio

Following Screen will appear as shown below

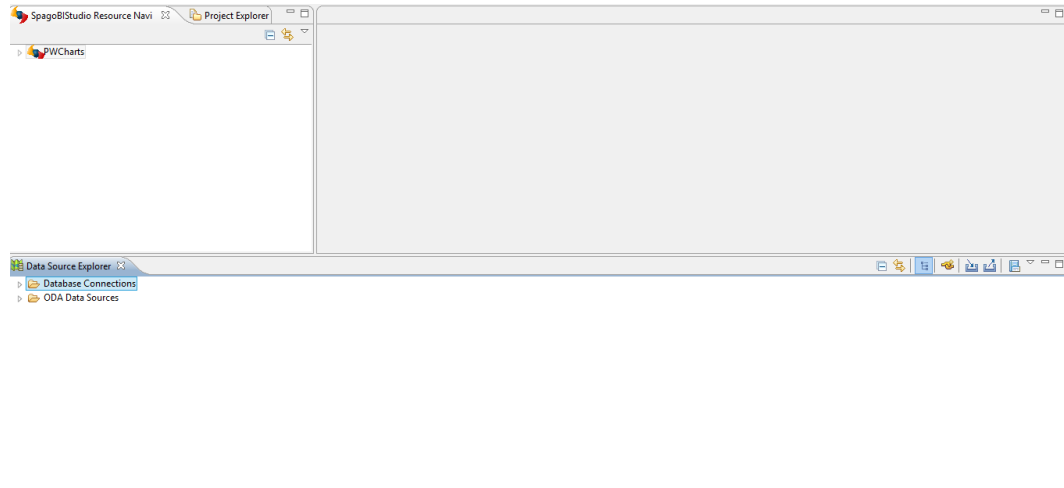


Figure 28 SPAGO Studio main view

#### 6.3.1 Connection with MySql Server(or any Data Base)

Click on Database Connections as show below. Right click on it to make new connection.

Following screen will appear. Choose MY SQL in this case.



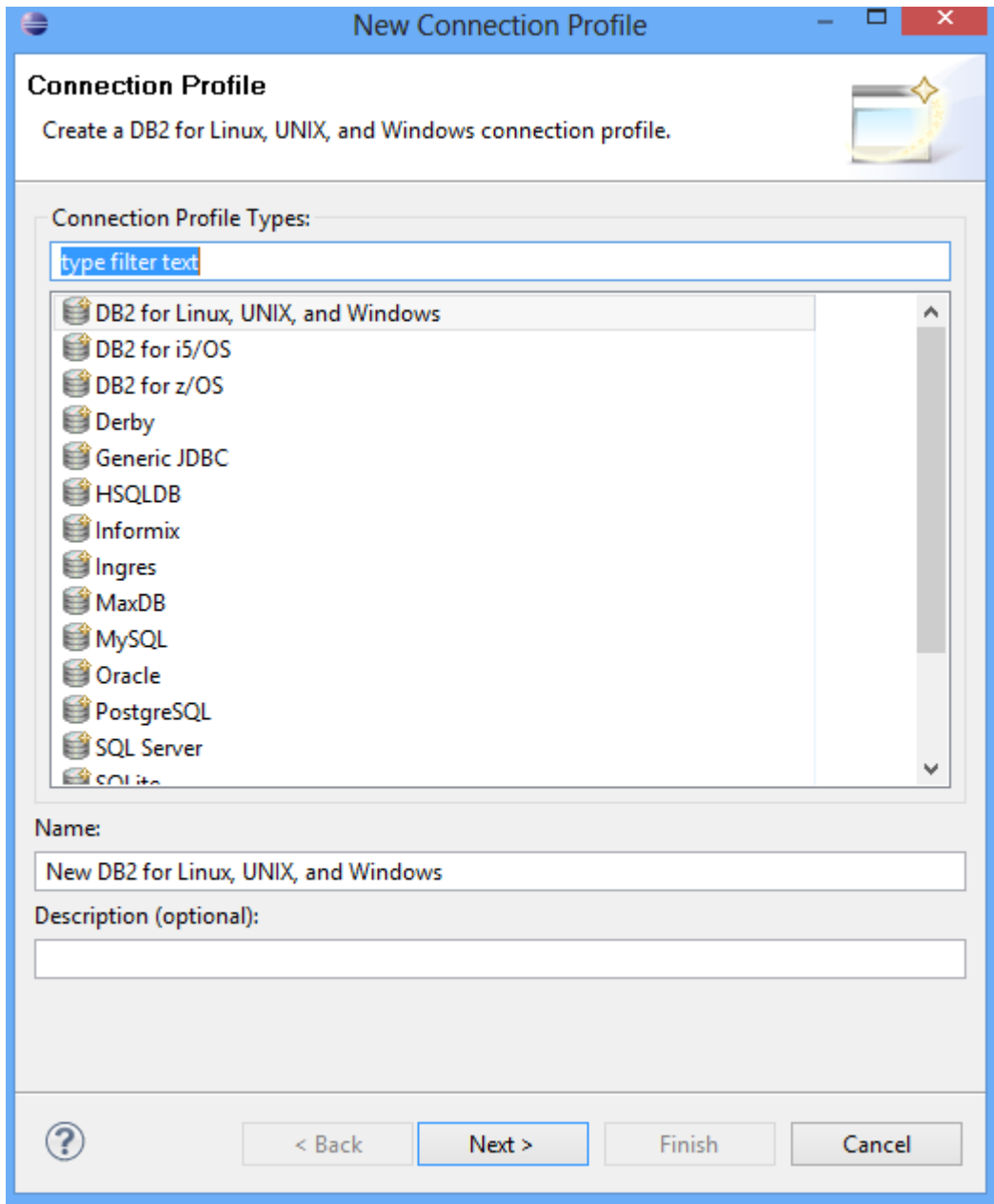
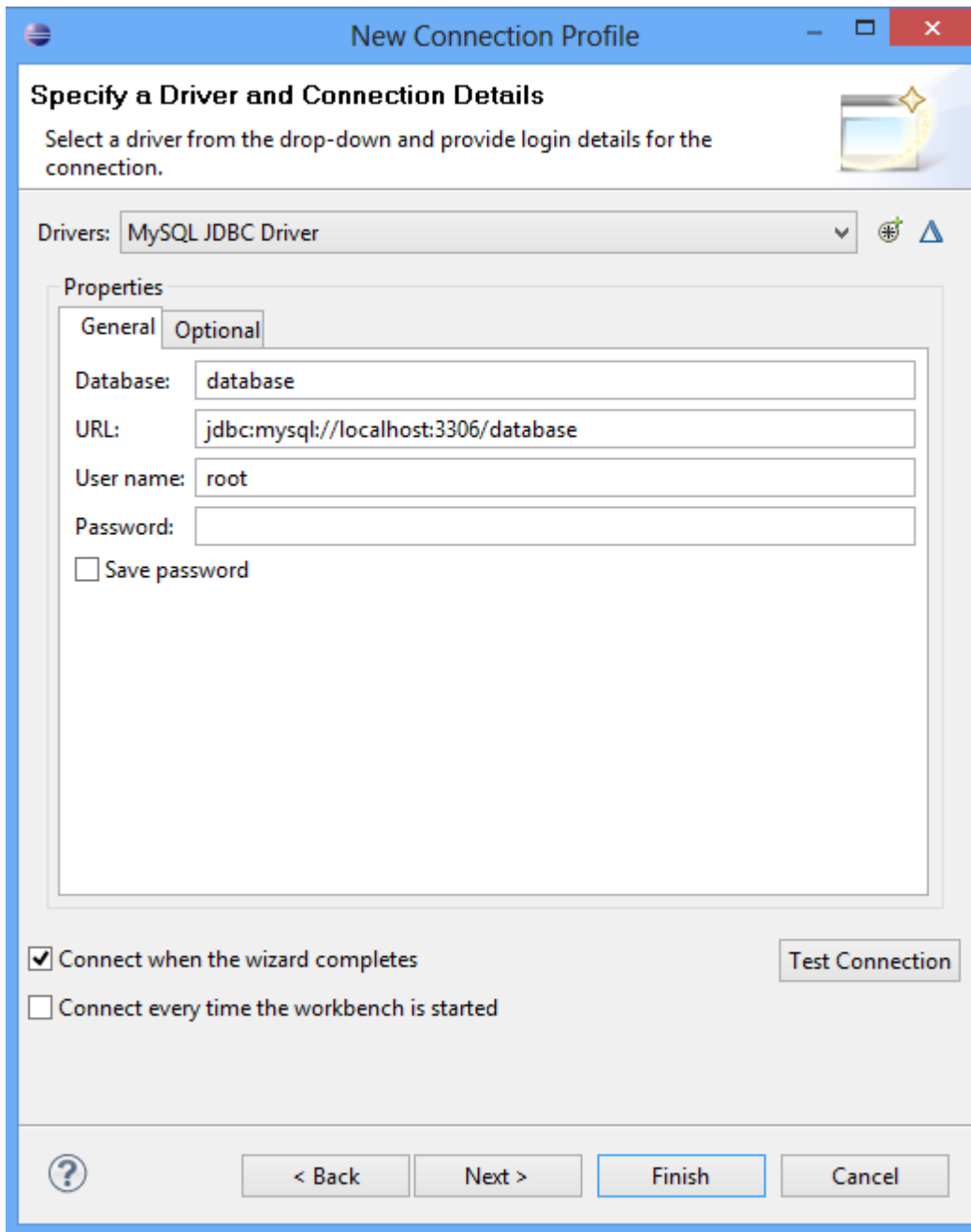


Figure 29 Database connection snapshot

Click next, and enter database name, user name and password, as shown below.

Test the connection if it succeeds.

Database name:	Retailbusinessdatawarehouse
username	root
Password	root



*Figure 30 MYSQL Driver connection snapshot*

Congratulations. You have successfully connected SpagoBI Studio with your database.

### **6.3.2 SpagoBI Studio Connection with SpagoBI Server:**

Click on new Project, you'll see screen as shown below after naming the project we named PWCharts for this project.

Note: we'll use this same project in next tutorial for making charts.

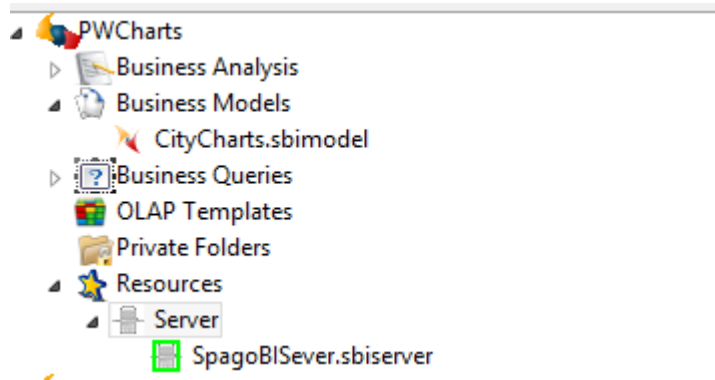


Figure 31 Studio Connection screenshot

Click on Resources. Then Right Click on Server and click new server. A screen similar to below will appear. Enter information in, as shown in the picture below.

Password = biadmin

Please note that URL link should be same of that of SpagoBI server.

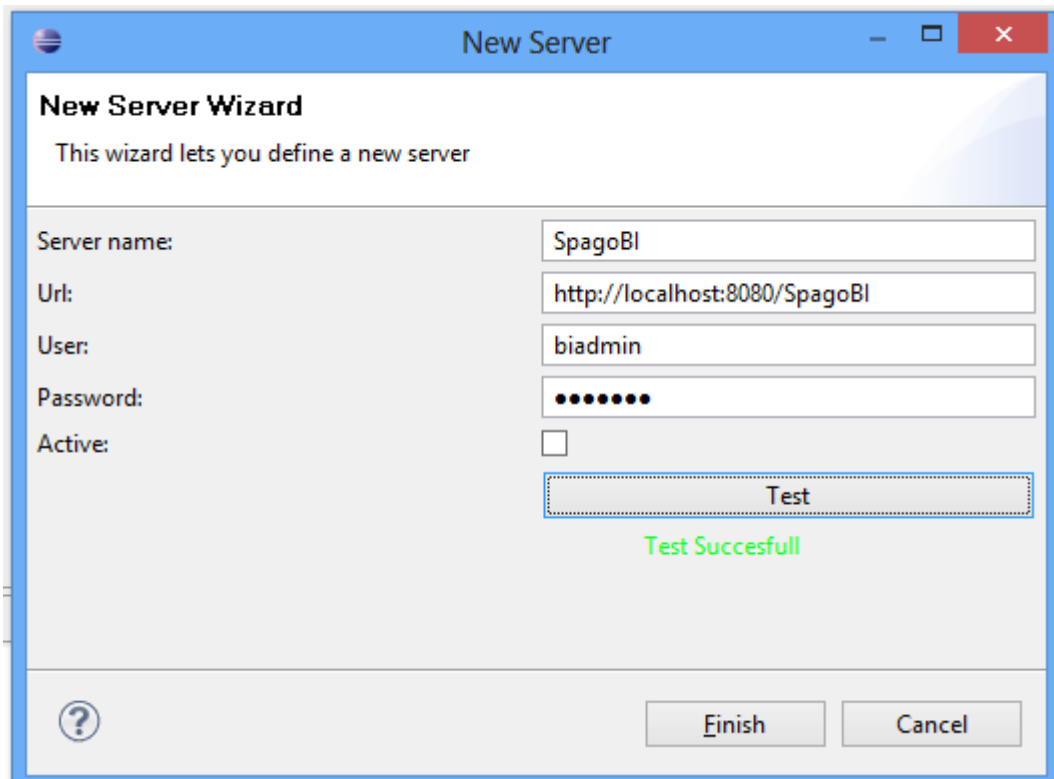


Figure 32 New Server Configuration Window

Next we'll see how we can develop Charts using SpagoBI Studio.

## 6.4 Creating a Chart on SpagoBI

In this part we'll show how we can design Charts on SpagoBI Studio using HighCharts.

We'll be using bar chart for showing profit and cost share on Y axis with Cities at bottom. The final chart would be similar to this.

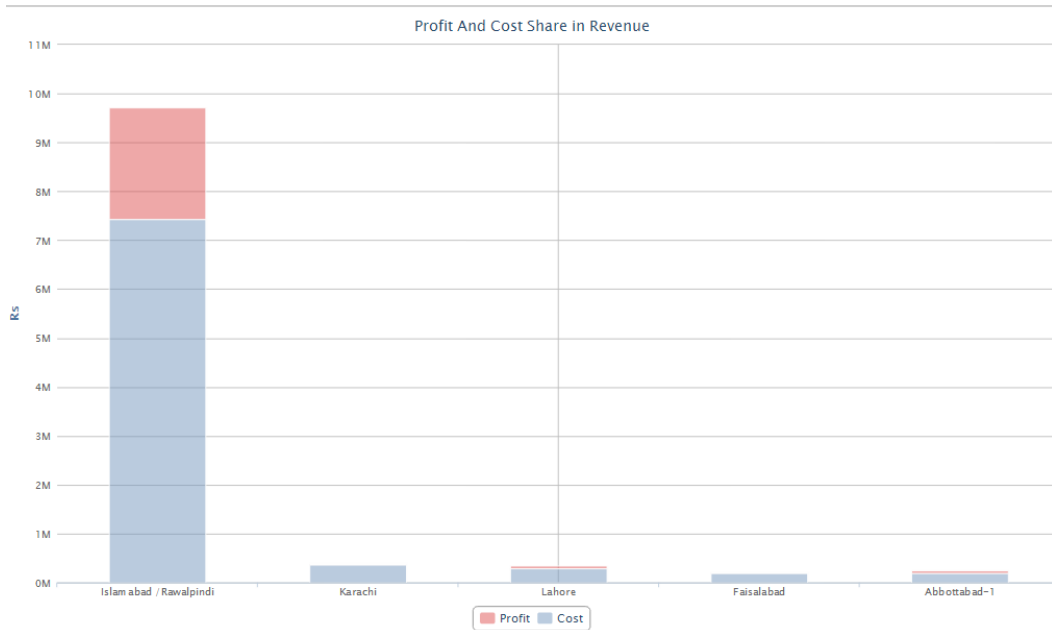


Figure 33 Final Chart View

Open SpagoBI Studio and Open PWCharts project, we created while configuring SpagoBI.

Right Click on Business Analysis.

Click on Charts and Select HighCharts.

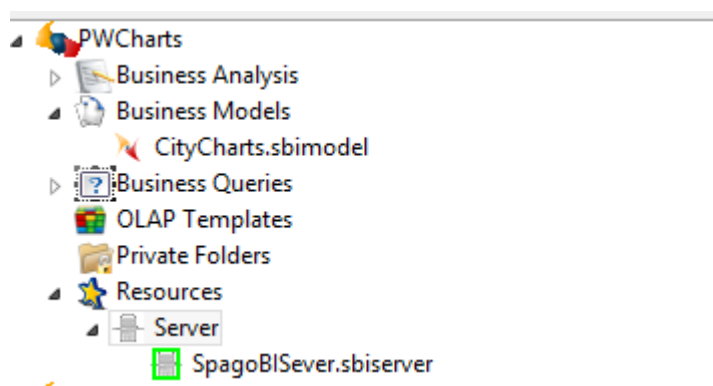


Figure 34 Spago BI menu view

Name the Chart and Select the Chart type as show below.

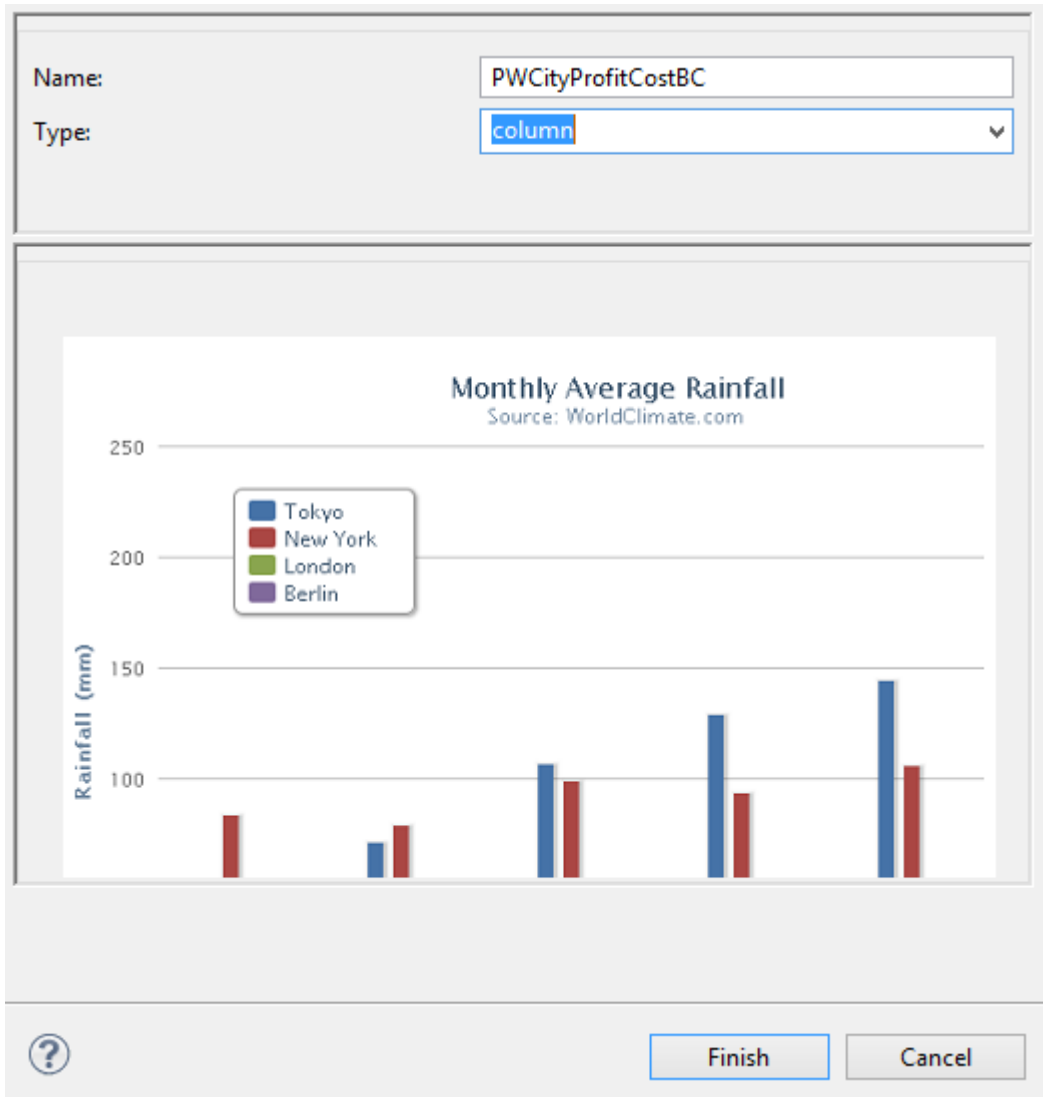


Figure 35 Chart selection view

Click on Finish and your chart is created.

Right Click on Chart and Click on Open in Text Editor a screen with text will appear as shown below.

```
<HIGHCHART>
  <!-- chart object properties -->
  <CHART type='column' zoomType='x' />

  <!-- title object properties -->
  <TITLE text='Profit And Cost Share in Revenue'>
  </TITLE>

  <!-- plot object properties (specific for the type of the
chart) -->
  <PLOT_OPTIONS >
    <COLUMN stacking='normal' />
  </PLOT_OPTIONS>

  <!-- xAxis object properties -->
  <X_AXIS title='Cities' alias='city' />

  <!-- yAxis object properties -->
  <Y_AXIS min='0'>
    <TITLE text='Rs' />
  </Y_AXIS>

  <!-- tooltip object properties -->
  <TOOLTIP backgroundColor='#FCFFC5' crosshairs='true'
enabled='true' shadow='true' formatter='percentage'>
  <!-- <STYLE color='#FF00FF' fontWeight='bold'
fontSize='16px' padding='5px' />-->
  </TOOLTIP>

  <!-- series properties -->
  <SERIES_LIST allowPointSelect='true'>
    <SERIES name='Profit' color='rgba(223, 83, 83, .5)'
alias='profit' />
    <SERIES name='Cost' color='rgba(119, 152, 191, .5)'
alias='cost' />
  </SERIES_LIST>
</HIGHCHART>
```

Figure 36 Sample code

The whole skeleton would be provided to you, you only have to map the data from query to chart.

For x axis the column name which return city names = city so alias = city

```
<X_AXIS title='Cities' alias='city'
```

For y axis we have two series as the data is divided into profit and cost so we'll use two series with alias named profit and Cost

## Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

```
<SERIES_LIST allowPointSelect='true'>
  <SERIES name='Profit' color='rgba(223, 83, 83, .5)'
alias='profit' />
  <SERIES name='Cost' color='rgba(119, 152, 191, .5)'
alias='cost' />
</SERIES_LIST>
```

Note: alias name = column name we'll go into detail once we'll be designing a query.

Save the Chart, our next task is to design a query.

### 6.5 Creating a Query on SpagoBI Server

Open SpagoBI Server.

After logging in as admin, click on GearIcon and then Click on Dataset as shown below.

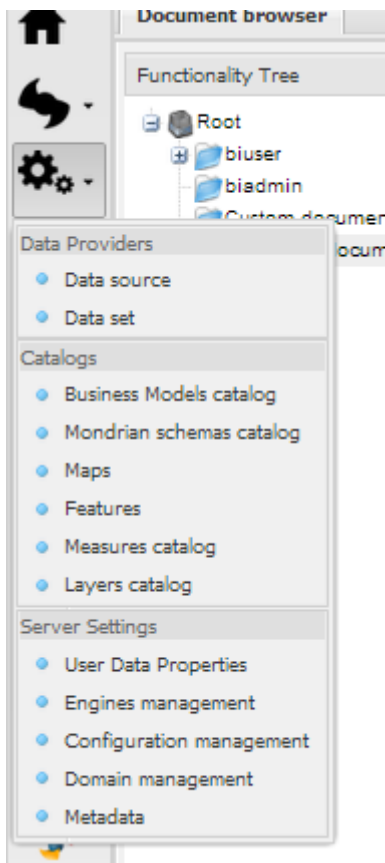
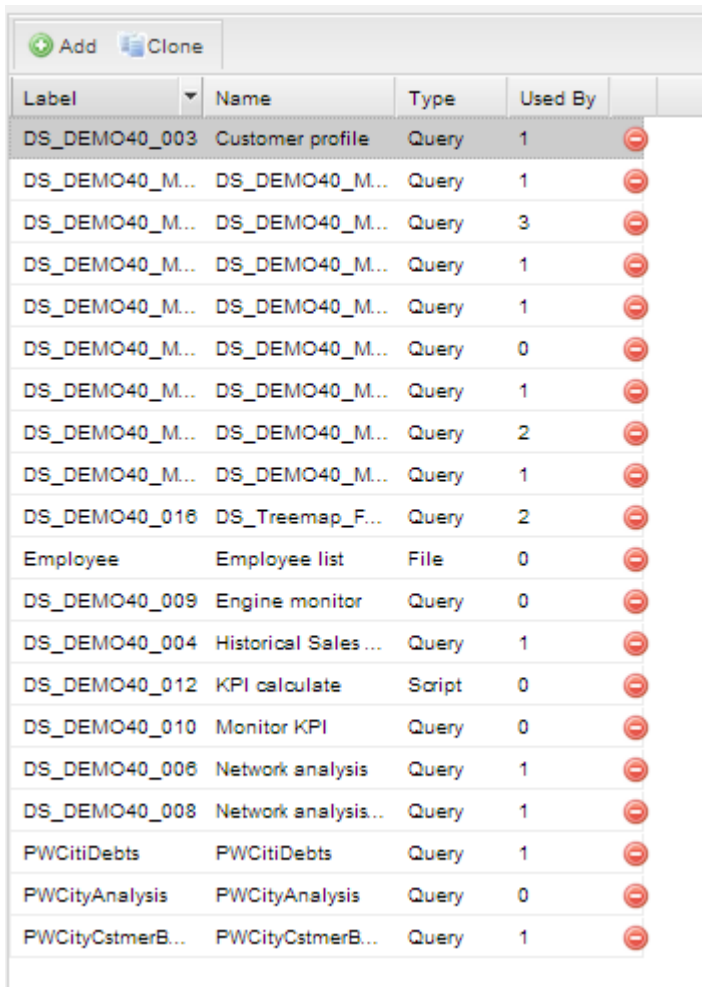


Figure 37 Dataset View menu

A screen will appear. Click on **Add** Icon.

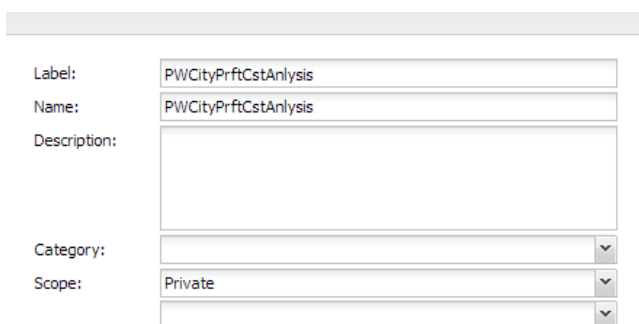
## Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses



Label	Name	Type	Used By	
DS_DEMO40_003	Customer profile	Query	1	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	1	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	3	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	1	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	1	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	0	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	1	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	2	⊖
DS_DEMO40_M...	DS_DEMO40_M...	Query	1	⊖
DS_DEMO40_016	DS_Treemap_F...	Query	2	⊖
Employee	Employee list	File	0	⊖
DS_DEMO40_009	Engine monitor	Query	0	⊖
DS_DEMO40_004	Historical Sales ...	Query	1	⊖
DS_DEMO40_012	KPI calculate	Script	0	⊖
DS_DEMO40_010	Monitor KPI	Query	0	⊖
DS_DEMO40_008	Network analysis	Query	1	⊖
DS_DEMO40_008	Network analysis...	Query	1	⊖
PWCitiDebts	PWCitiDebts	Query	1	⊖
PWCityAnalysis	PWCityAnalysis	Query	0	⊖
PWCityCstmerB...	PWCityCstmerB...	Query	1	⊖

Figure 38 Add dataset

Fill in the Label and Name field



Label:

Name:

Description:

Category:

Scope:

Figure 39 Configure Dataset

Choose Dataset type as Query. Write query here, but make sure the name of column should be same as in you put in alias.



## Financial Executive Dashboard Using Open Source BI Tools for Small Scale Businesses

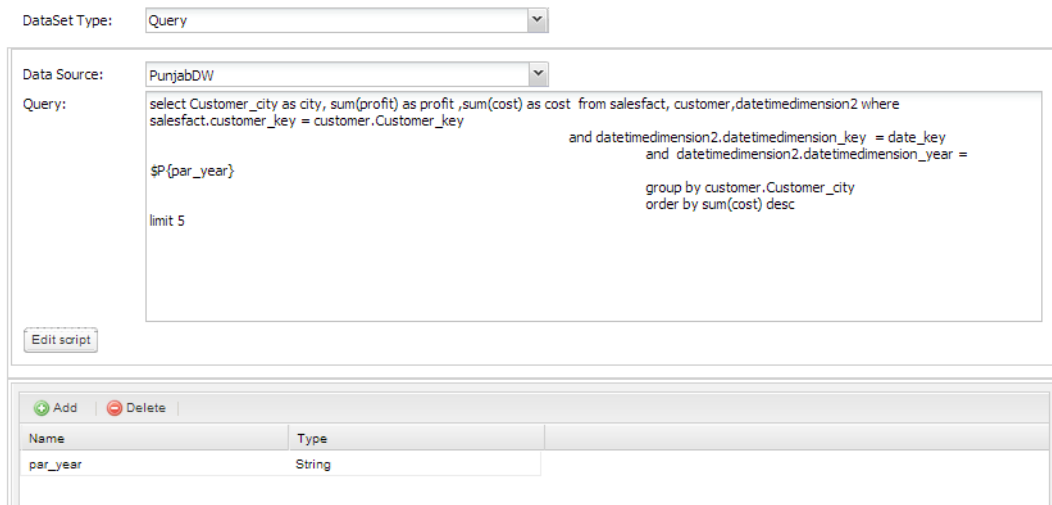


Figure 40 Query creation wizard

Click on preview and then execute query. You'll see the result as shown below.

Note: Make sure alias in chart and name of columns is same.

	city	profit	cost
1	Islamabad /Ra...	2,272,348.45	7,436,616.79
2	Karachi	22,095.00	360,236.00
3	Lahore	58,424.00	295,671.75
4	Faisalabad	8,854.74	197,697.10
5	Abbottabad-1	56,472.18	186,589.50

Figure 41 Sample query data

Save the query, now you have a dataset, for the chart.

### 6.6 Uploading Chart on SpagoBI Server:

Open SpagoBI Studio.

Right click on PWCityAnalysisChart and click on deploy.

Fill in the fields and shown below, make sure you choose where the doc should be deployed, as selected on the right side of the form.

**Engine:** Select appropriate engine for rendering Chart.

**DataSet:** This would be PWCityProfitCostData we made earlier (selecting wrong dataset would cause error while executing dataset).

**DataSource:** This is the name of database or dataware house. In our case we will be using PunjabDW.

Click on finish if all is well your chart would be uploaded

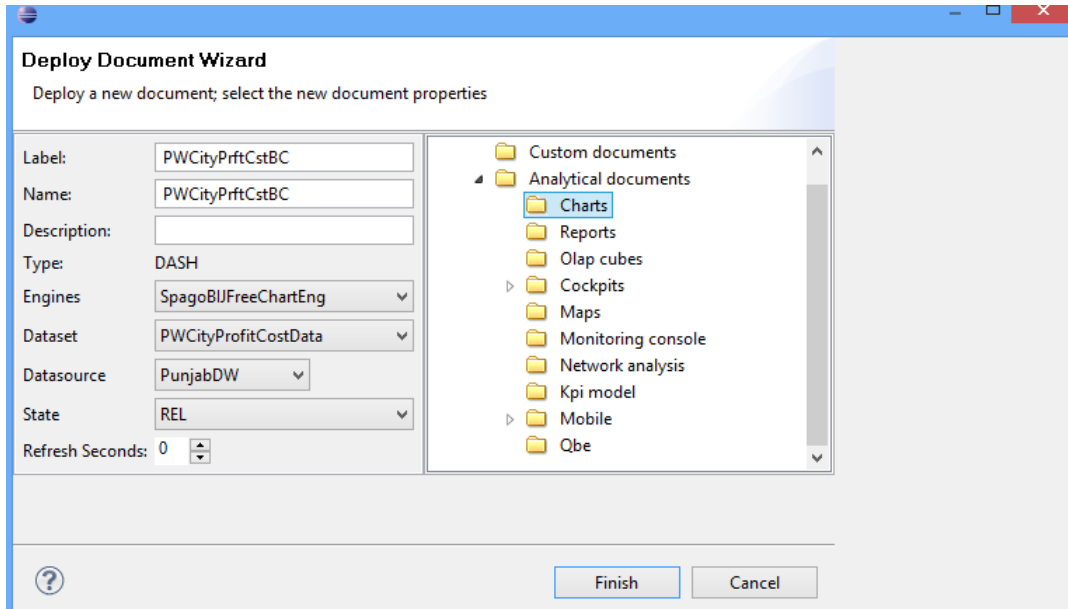


Figure 42 Deploy chart wizard view

## 6.7 Executing Chart on SpagoBI Server:

Open SpagoBI Server

Click on Folder->Analytical documents -> Charts

Find Chart named PWCityPrftCstBC and Click on it. You'll see chart similar to shown below.

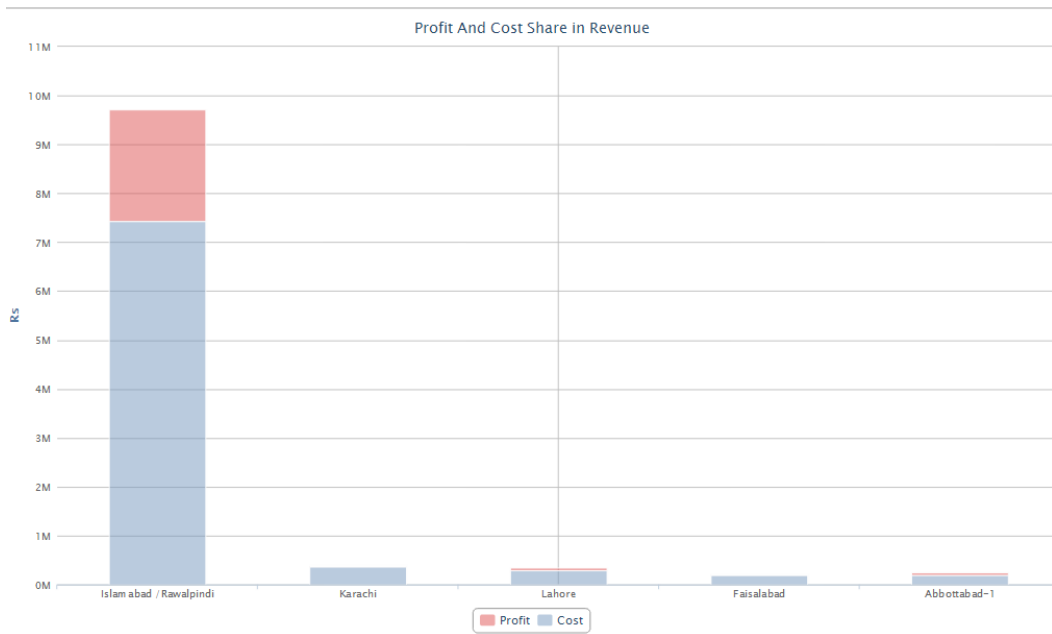


Figure 43 Chart view

### 6.8 Adding Parameters to Chart:

The chart we saw above showed static data. In order to change the year and see previous years data dynamically we need to modify our document.

In SpagoBI queries can be changed dynamically using Parameters and values are input from user.

Open SpagoBI Server and go to where Charts are stored (see previous tutorial to see where charts are stored)

Folder->Analytical Documents->Charts->PWCityPrftCstBC.

Move the cursor on top of chart, you'll see a view similar to the one below, click on eye.



Figure 44 Document edit view

A new document will be opened for configuring the chart. On the bottom you'll see **New** tab button Click on it and fill as filled below. Save to document by clicking Floppy Disk image on top of the document.

**Title:** Name of parameter

**Analytical driver:** Choose **manual** as we want user to input manually(we'll learn more about analytical driver in next few steps)

**URL Name:** Please remember this name because we'll mapping this to query (this is actually the variable that maps user input value to query)

DOCUMENT ANALYTICAL DRIVER DETAILS	
Title	year *
Analytical driver	manual input * 🔍
Url Name	par_year *
Priority	1 ▼
Visible	<input checked="" type="checkbox"/>
Required	<input type="radio"/> True <input checked="" type="radio"/> False
Multivalue	<input type="radio"/> True <input checked="" type="radio"/> False

Figure 45 Add parameter view

After saving the chart we'll add parameter to the Query or the dataset.

### 6.8.1 Adding Parameters to Query:

Go to Gadget Icon->dataset-> PWCityProfitCostData query or whatever you named it. Add `$P{par_year}` at the point you want query to be dynamic, the input value of user will be mapped to query in this way.

Click on Add below and add parameter name and its data type in our case its string, as shown below.

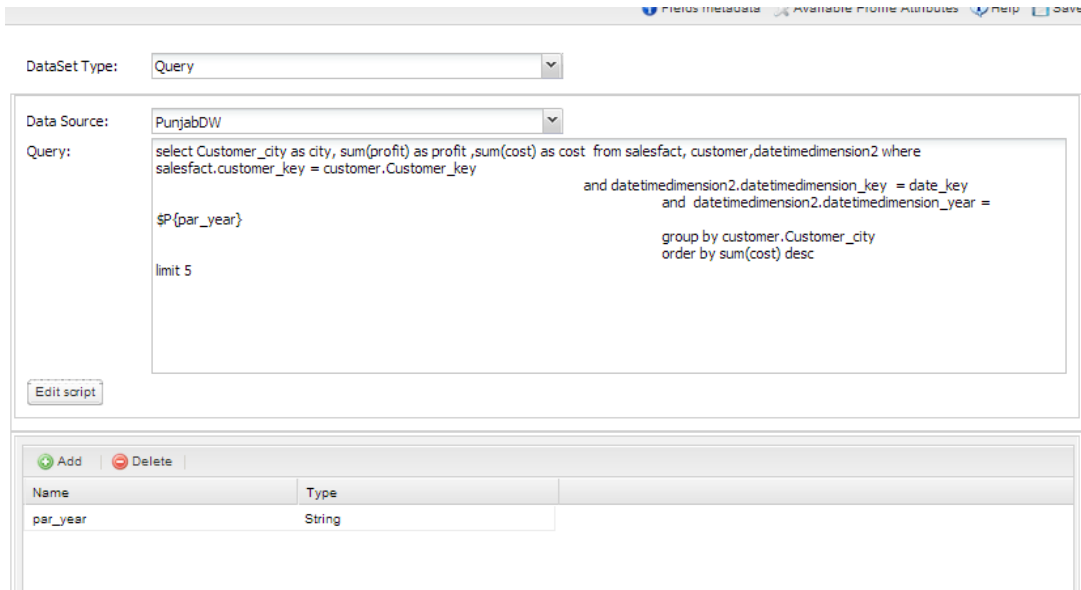


Figure 46 Dataset query view

Click on preview and insert 2005 and then execute the query. Now only data related to 2005 will be displayed as shown below



Figure 47 Parameter enter view

	city	profit	cost
1	Islamabad /Ra...	2,272,348.45	7,436,616.79
2	Karachi	22,095.00	360,236.00
3	Lahore	58,424.00	295,671.75
4	Faisalabad	8,854.74	197,697.10
5	Abbottabad-1	56,472.18	186,589.50

Figure 48 2005 data

Now Open the chart and insert 2005 and execute chart, you'll see result.

In the same way you can add multiple parameters to analyze data using multiple dimensions.

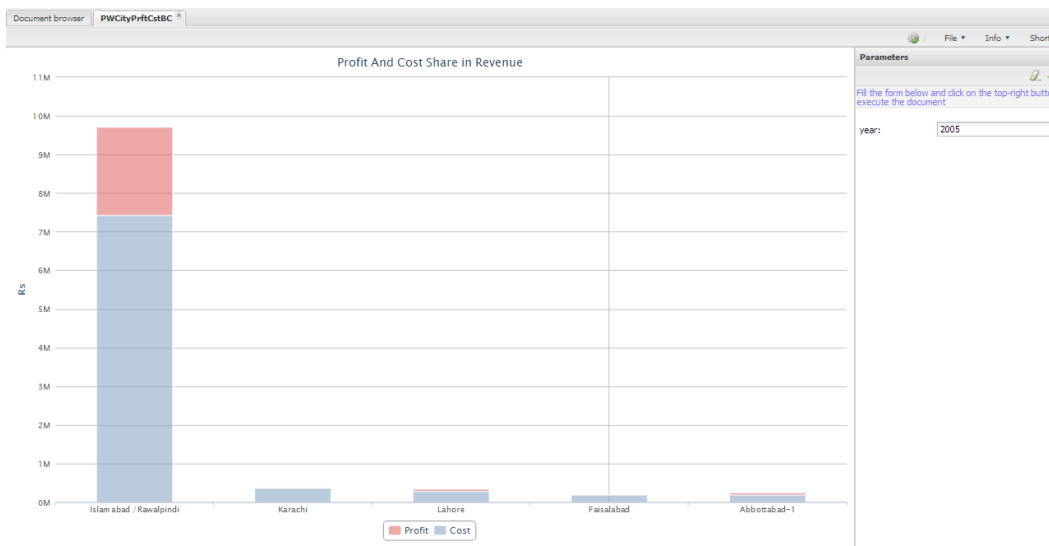


Figure 49 Bar chart view

## 6.9 Creating a Drill Down Chart with Passing Parameters:

Suppose the user wants to see how much profit and cost each customer is contributing in that city. If user clicks on Islamabad/Rawalpindi another chart opens which shows profit and cost share of each customer in that city. To achieve this we need to link this chart with the next chart so that name of city is passed to next chart so it can be used as dynamic parameter.

```
<DRILL document="PWCstmerCtyPrftCst">  
<PARAM_LIST>  
<PARAM name="city" type="CATEGORY"/>  
</PARAM_LIST>  
</DRILL>
```

Figure 50 Drill down view

The above lines could be added to PWCityPrftCstBC so that when user clicks on any bar it will navigate to another document named PWCstmerCtyPrftCst which will show Profit Cost Share by customers.

Type = category means value of x-axis of chart would be passed to another chart.

```
-->  
<DRILL document="PWCiti2DB">  
<PARAM_LIST>  
  <PARAM name="par_city" type="CATEGORY"/>  
  <PARAM name="par_year" type="RELATIVE"/>  
</PARAM_LIST>  
</DRILL>
```

Figure 51 Other parameters view

The above line of code is similar to above but it has multiple parameters, and one has type relative.

Type = relative means value of input user would be passed to the next chart.

Note: On the document that is navigated to, you have to add parameters to **Query** and **Chart** as if user is giving inputs. As we saw in above tutorial **Adding Parameters in Chart**.

## 6.10 Creating a Dashboard:

Dashboards allow user to view multiple Charts, cockpits and reports in one view. SpagoBI Studio allows the user to create and manage dashboards easily and upload dashboards to the SpagoBI Server.

Steps:

Open SpagoBI Studio.

Right Click on Business Analysis ->Cockpits -> Composed Document

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Name the Composed Document

You'll see the empty document made as shown below.

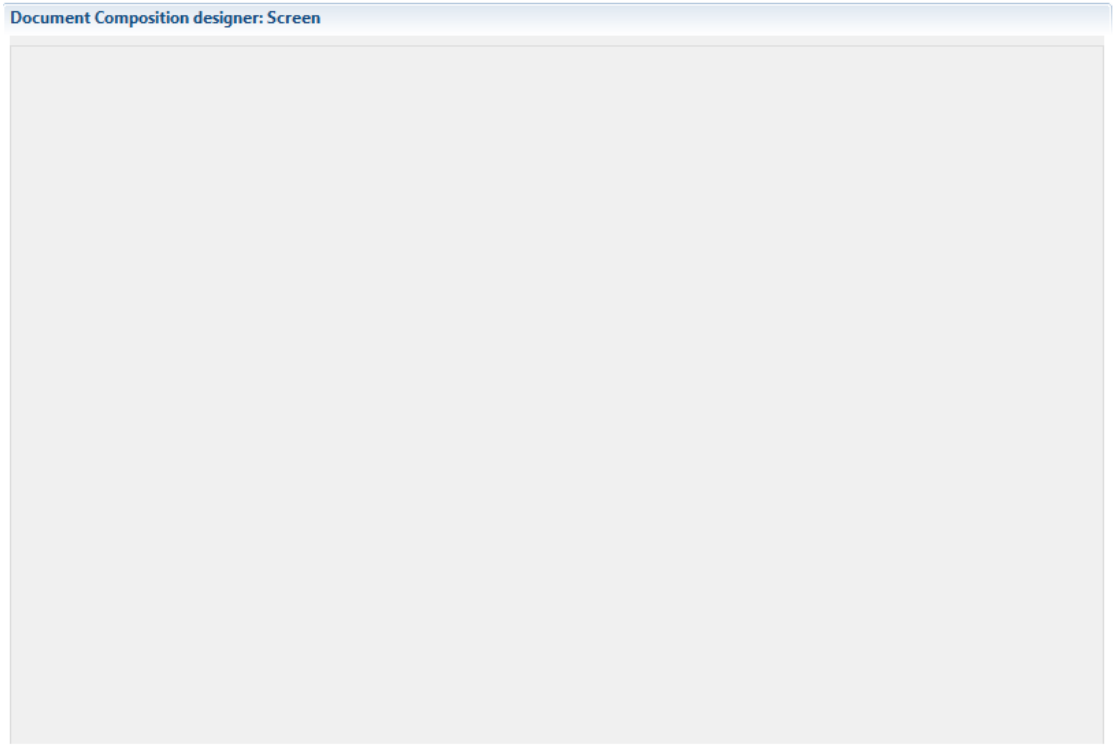


Figure 52 Empty Document View

Right Click on Document and Click to add Doc. The document you add are container for the charts. Add these containers.

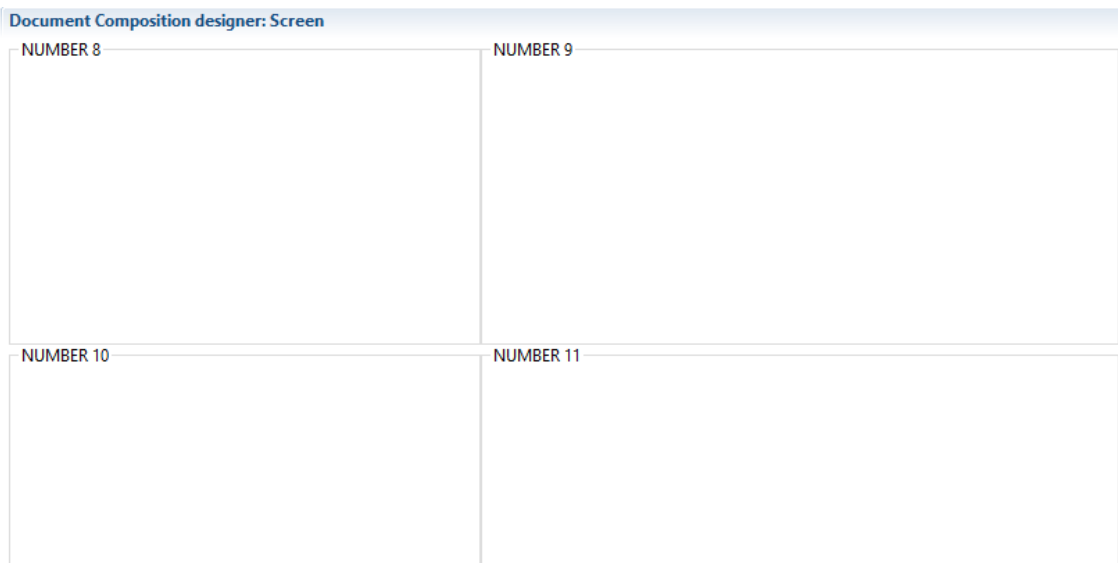


Figure 53 Document containers view



Drag and drop charts (from left View) you want to add to that dashboard. The end result should look like this

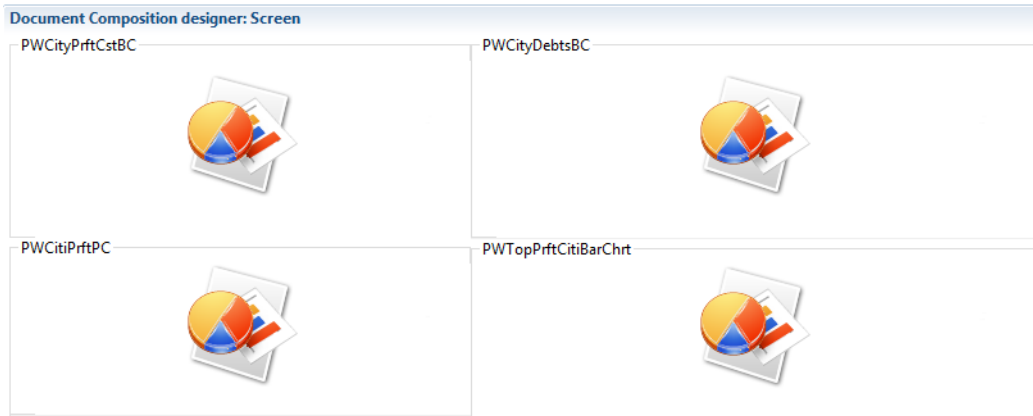


Figure 54 View after documents are added

Save the Dashboard and Right Click on it to deploy it to the server. A screen as shown below would be shown. Fill the name and label for the dashboard and deploy it.

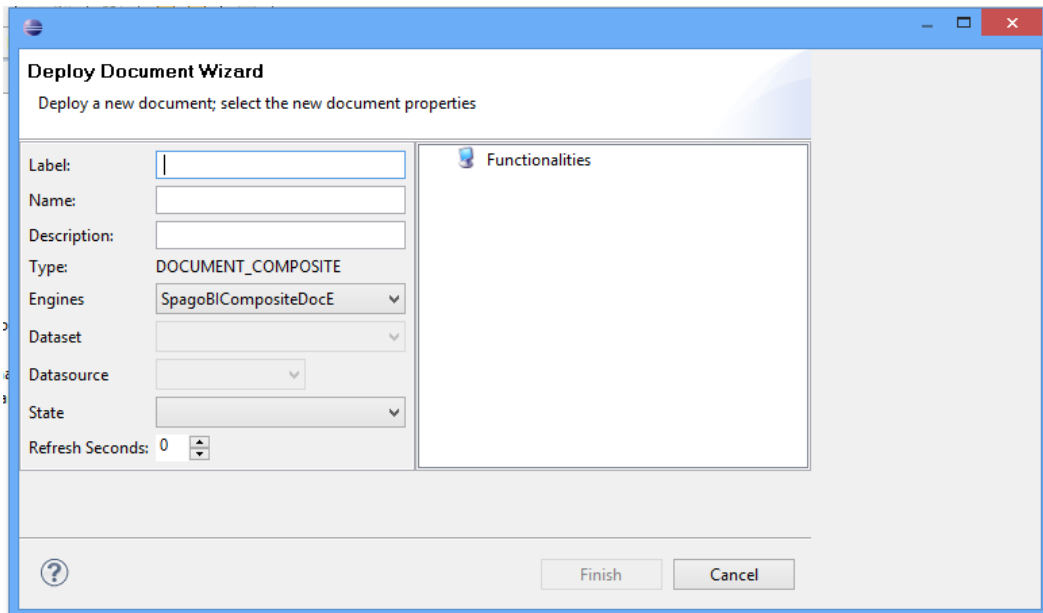


Figure 55 Deploying on the server

## **Results and Conclusion**

The dashboards are created on a general pattern keeping in mind the requirements of any small scale business. These dashboards give the business owner a complete overview on how his business is performing. Each dashboard gives an analysis from a new dimension. With features such as drill down and passing parameters, the dashboards can be manipulated as per the customers need.

SPAGO BI is an emerging business intelligence tool in the industry. Although still in its infancy stage, this tool provides excellent features which can be used to analyse data and create beautiful dashboard. Since it is completely opensource, it is easily affordable by small scale businesses who can use this tool to implement business intelligence on their inventory control systems.

## **Recommendations**

SPAGO BI is an emerging business intelligence tool in the industry. Although still in its infancy stage, this tool provides excellent features which can be used to analyse data and create beautiful dashboard. Since it is completely opensource, it is easily affordable by small scale businesses who can use this tool to implement business intelligence on their inventory control systems.

In the implementation of this project we learnt how important Human Computer Interaction is in the development of a product. The main challenge was to design the dashboards in a way that the user gets to see the trends at a glimpse. The design had to be user friendly and attractive. Another challenge was to make the charts as interactive and colorful as possible to attract the user. Drill down options and navigation was included so that the user could go and get information in depth from various charts.

A number of problems were incurred when attempting to earn the tool. Almost no online help is available. Tutorials are nonexistent and we learnt the whole tool by trial and error method using minimal guidance from the products' wiki forums. Since the tool is in its infancy stages it is also a bit unstable and lots of problems occurred during the implementation process. Mobile support for this tools is also not available and is still under development stage.

## **Future Extensions**

Future work on this tool is viable through the integration of WEKA with SPAGO BI. Both are opensource but since WEKA is established it can be used to implement the majority of the BI features in cases where SPAGO BI does not provide much support and help. WEKA is difficult to use while SPAGO BI provides the same features in a more user friendly and interactive way, however the drawback here is the tool is still in its infancy stage and will need time before it offers all the features WEKA does.

## References

SPAGO BI wiki by SPAGO world:

<http://www.spagoworld.org/xwiki/bin/view/SpagoBI/>

SPAGO BI tutorial by SPAGO LABS:

<http://spagolabs.wordpress.com/2013/04/25/7/>

SPAGO BI Wiki: <http://wiki.spagobi.org>