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1020818

Business Intelligence for New Restaurants' Decision Makers

MSc Business Information Systems

Masters Thesis Report

Department of Computer Science & Technology

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Abstract

Business Intelligence is a very wide field consisting of collection, consolidation, analysis and better information access. Information access includes ETL, data warehouses, data mining, data query, reporting, multidimensional analysis and other technologies.

This report covers the entire Business Intelligence lifecycle and shows how a restaurant can build robust data integration, reporting and analysis solutions. Microsoft has enabled us to build low cost Business Intelligence tools. These tools will give every employee access to the data required to make informed decisions and the flexibility to work the way they want.

To kick off the project, a survey is undertaken to find out what the Business decision makers think about the current Business Intelligence solutions in the field. The aim of the survey is to help us design our BI project solution.

Before the design and creation of relational databases data marts, the goals and benefits of BI is explained. SQL Server Analysis Services (SSAS) allows us to set up a database that collects millions of data points about the restaurant aggregating them into “Data cubes” of “Measures” and “Dimensions”.

SQL Server Integration allows us to cleanse data and populate the Restaurant Data Marts. After getting a taste of Integration, the project takes advantage of the flexibility of Unified Dimensional Model. Data will also be manipulated and analysed by using MDX scripts and queries.

Data mining is then used to help in discovering insights into the restaurant business problems and identify new opportunities. The results from data mining can then be used to solve complex problems, decrease costs and make smarter decisions.

Interactive reports are then developed and distributed with SQL Server 2008 Reporting services.

Armed with the charts another survey is conducted to find out what the business decision makers think about them.

Acknowledgements

I would like to thank the project Supervisor Dr Paul Sant for his advice and encouragement and the project Coordinator Dr. Fiaz Hussain for his support and motivation during the project. I also would like to thank everyone who criticised, advised and encouraged me during the project.

Thank you all for the opportunity you have given me.

Dedication

I would like to dedicate this work to my wife Beauty and my two daughters Tadiwa and Zinnah who endured my long absences. Without them this work would not have been possible.

Thesis author consent form

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DECISION MAKERS

DEGREE: MSC BUSINESS INFORMATION SYSTEMS

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Terminology Notes and Abbreviations

Artificial keys are now called surrogate keys

Data staging is now known as extract, transform, and load

Abbreviations

BI	Business Intelligence
DW	Data warehouse
ETL	Extract, Transform and Load
ER	Entity Relationship
PK	Primary Key
FK	Foreign Key
OLAP	Online Analytical Processing
SCD	Slowly Changing Dimension
OLTP	Online Transaction Processing
ROLAP	Relational Online Analytical Processing
MOLAP	Multidimensional Online Analytical Processing
HOLAP	Hybrid Online Analytical Processing
UDM	Unified Dimensional Model
XML	Extensible Mark-up Language
MDX	Multidimensional Expression Language
DMX	Data Mining Expression Language
XMLA	XML for Analysis Services
HTTP	Hypertext Transfer Protocol
SOAP	Simple Object Access Protocol
SQL	Structured Query Language
T-SQL	Transact SQL
KPI	Key Performance Indicators
SSAS	SQL Server Analysis Services

Table of Contents

Abstract.....	2
Acknowledgements.....	3
Dedication	4
Thesis author consent form	5
Terminology Notes and Abbreviations	6
Abbreviations.....	6
Introduction	9
Problem Statement.....	9
Aims and Objectives.....	9
Management and Control	10
Improving Business Performance	10
Operational Business Intelligence	10
Process Improvement.....	10
Customer Service Improvement.....	10
Methodologies and Outcomes (Please refer to interim report).....	10
Methodologies.....	10
Outcomes.....	11
Thesis Structure	11
Research.....	13
Specific Studies	13
Relevant Technologies	13
Case Studies – Comparative studies	14
Questionnaire Results.....	15
Project Realisation	22
Technical Requirements.....	22
Design and structural information.....	24
Analysing Cube Content.....	35
Cubism – Measures and Dimensions	35
Special features of OLAP Cubes	38
Data Mining.....	42
Delivering BI with Reporting Services	48
Improvements.....	55
Overall Evaluation	55
2 nd Survey Results	56

Conclusions and Recommendations	59
Academic context and value of Project (Please also refer to the Interim report).....	59
References	60
Appendices.....	61
Appendix A.....	62
Appendix B	63
1 st Survey	66
2 nd Survey	69
Appendix C	72
Appendix D.....	81
Appendix F	83
Appendix G.....	101
Create an Empty RedOnionCookingDM Database in SQL Server	102
Restore the RedOnionCookingDM Database Backup	102
Create an Empty RedOnionSalesDM Database in SQL Server	103
Restore the RedOnionSalesDM Database Backup.....	103
Create an Empty Order Processing System Database in SQL Server	104
Restore the Order Processing System Database Backup.....	104
Appendix H.....	105

Introduction

In modern restaurants, there are now vast amounts of data, brought about by increasing standards, automation and technologies. With all this information the business decision making process has become complicated. To change the current situation of “mass data, poor knowledge”, poor decision making, low profits and poor market share, Business Intelligence technologies are needed.

Restaurant Business Intelligence is a concept of using IT as a tool for achieving competitiveness of business. It improves customer profiling, simpler detection value for customers and creates customer relations and measures how satisfied customers are with the restaurants.

It can detect various incentives to increase sales and revenue, convert potential customers into actual clients, reduce outgoing customers and increase sales to existing customers.

Even if it is designed for decision makers, the majority of managers and employees will benefit from what is being offered. For Business Intelligence to thrive it needs to overcome the fact that most business users feel BI tools are hard to use. It has the opportunity for massive adoption. Adoption of BI is expected to double in the next six years.

Microsoft Excel is the most commonly used BI tool today. It has powerful tools to create spread sheets, analyse data and share information. It is easy to create reports with rich data visualisation (link to database), pivot table views, professional looking charts. If you have huge volumes of data to analyse you can use Power Pivot an Excel Add-in and Slicer tools.

With very little training, restaurant staff can use these tools to design their own reports or views of data and then print or publish them using SharePoint. Other people can then get up to the minute, accurate information. Centralised publishing of reports and analysis help cut down on waste.

Problem Statement

Restaurants have information at their disposal and some restaurants do not even collect information. The challenge is for restaurant executives on how they can effectively use information technologies to gain a competitive advantage. Better access to data does not affect restaurant performance but what the restaurant does with the data is very important.

Most of small restaurants make decisions based on gut feelings. Good decisions are important as they affect costs, sales, margins and people. These restaurants need to make sure their decisions can provide what is appropriate, desired, necessary and correct.

Aims and Objectives

Effective decisions move restaurants toward their goals in a timely manner. The first step in having effective decision making is to be able to set specific, measurable goals. While the goals are being set, the objective is to be able to get useful, accurate information to the decision maker. This will be a foundation of the decision or feedback on a decision. (Larson, 2009)

The project will also show how we can make BI available throughout the organisation. BI involves everyone in the restaurant and beyond to customers and suppliers.

In addition to what was mentioned in the Interim Report, this report will highlight how BI can be used to provide Business Value.

Management and Control

Business Intelligence provides managers with information on what's going on in the business. Information is accessible on a more flexible and timely basis to provide a view of expenses, sales tracking and warehouse capacities.

Business Intelligence will help restaurants pin point details on the cause of why metrics are not on target. Rather than waiting for annual reports decision makers can act there and then. Examples may include reducing overtime for employees, deferring purchases or changing suppliers.(Howson, 2008)

Improving Business Performance

Financial indicators (revenue, margin, cost to serve, profitability etc.) that measure Business performance can be improved if you know where they are at particular moments. BI can boost sales by cross selling products to customers, slow moving stock can be eliminated, and ineffective marketing campaigns can be eliminated quickly.

Business Intelligence without a sound business strategy will not improve business performance.(Howson, 2008)

Operational Business Intelligence

BI plays a critical role in the daily operations of a restaurant. For example customer orders are not accepted if there is nothing in inventory. It can also be used to estimate the wait time for a table based on the number of current customers and average length to dine.

Process Improvement

BI can also be used to streamline processes, by measuring how long sub-processes take and then identifying areas of improvement. For example, waiting time for cooking steak is one process. In the absence of BI, a restaurant may only realize there is a problem when a customer complains. By analysing the inputs, the time, and outputs for each step in the process, BI can identify some bottlenecks.

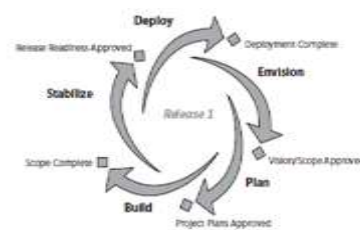
Customer Service Improvement

Business Intelligence can help restaurants provide high customer service levels by providing timely order processing, problem handling and customer needs. The quality of customer service manifests itself eventually as restaurant financials.(Howson, 2008)

Methodologies and Outcomes (Please refer to interim report)

Methodologies

MSF (Microsoft Solutions Framework) is a flexible software development life-cycle that can be applied successfully to Business Intelligence projects. MSF consists of five distinct project phases and five project milestones. These are characteristics of a waterfall method but also have iterations found in a spiral method.



Phases and milestones in Microsoft Solutions Framework (Langit, 2009)

Before the planning stage a survey was taken, to understand the various problems and advantages of having the various Business Intelligence systems in Restaurants.

A survey was also taken after the project was deployed to see if some of the shortcomings have been addressed or some of the advantages have been maintained.

Outcomes

From the first survey we have found that the decision makers lack an understanding of the capabilities of BI and consider BI systems too complex to implement. There is also a general consensus that BI systems are very expensive.

From forums and interviews with developers it is also obvious that a lot do not understand BI core concepts such as OLAP (Online Analytical Processing) dimensional modelling and data mining algorithms. Most of the developers do not understand all the BI components and tools included with Server 2008 SQL Server Analysis Services (SSAS), SQL Server Integration (SSIS) and SQL Server Reporting Services (SSRS).

Finally the rest of the project uses SQL Server 2008 Business Intelligence solutions.

Thesis Structure

Introduction:

Problem

Looks at the background of the need by decision makers to make use of their database

Main Aim

This looks at the key goals and objectives that are needed to be achieved for the project to succeed.

Methodologies & Outcomes

Surveys are undertaken from decision makers who use BI systems. Microsoft Solutions Framework software development method is applied to the Business Intelligence project.

Thesis Structure

This section gives an overview of the structure and content of the project.

Research:

General Background

More detail is in the interim report.

Specific Studies

The specific studies relate to software that is also used in the project and its security protocols. The software should include SQL Server 2008, Visual Studio 2008, Excel 2010, Office SharePoint Server, Visio 2010, SQL Server 2008 Report Builder 2.0, SQL, multidimensional expression (MDX) queries and scripts and Unified Dimensional Model (UDM) language.

Relevant Technologies

To be able to compare with other competing software is a problem since they do not allow you to download and work with it free for 180 days.

Case Studies – Comparative studies

Using surveys, similar products to the project's product are compared and critiqued to see if there is justification to continue development of the product.

Questionnaire Results

In this section the questionnaire and sample results are discussed and analysed, so that they can contribute to the project.

Project Realisation**Technical Requirements**

Through interviews and questionnaires technical requirements that are essential to the project are gathered and analysed. The Project has several different stages and some stages start after one stage has been successfully deployed. The stages mentioned here will not be written down for each and every BI stage.

Design and structural information

Different steps of the design stage are explained and shown through screen shots.

System Implementation

The project has several sections that reflect the different parts of the development process. These include database design, graphics user interface and reports.

Testing and Analysis

The different stages are tested, implemented and compared to other systems.

Improvements

Surveys and questionnaire will enable us to analyse what improvements can be made to improve this project and future projects.

Overall Evaluation

The whole project is evaluated and analysed in the field so that we can see if it is doing what it is supposed to do. This is the section where advantages of a BI system are analysed.

Conclusions and Recommendations

In this section we analyse at what the client says after implementation, what we have learned, and areas for future development.

Academic context and value of Project

Please refer to the interim report

References

A list of all the academic resources used throughout this project.

Appendices

Appendix A: The Project Poster

Appendix B: The Project Questionnaires

Appendix C: Interim progress report

Appendix D: Project Proposal

Appendix E: The structural diagrams in sequential order

Appendix F: Test Data

Appendix G: User Guide

Appendix H: DVD

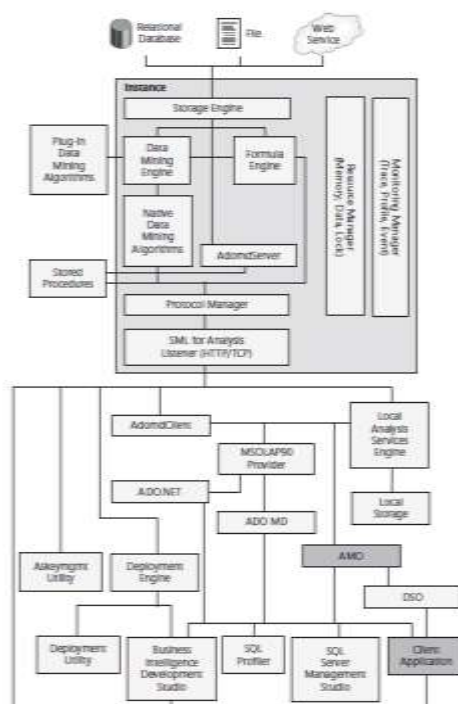
Research

At the time of writing this report there is virtually no academic paper on Restaurant BI systems. There are a couple or so on retail Business Intelligence. The academic papers are saying the uptake of BI has been slow, but there will be an exponential increase in users taking BI.

The research on this project comes from five main components: surveys, literature reviews, peer networking sessions, in-depth case studies and award winning blogs.

Specific Studies

The following diagram shows how a BI solution can be built on all possible components available in SQL Server 2008. Learning BI is about examining the architectural components shown, and how the components relate to each other.

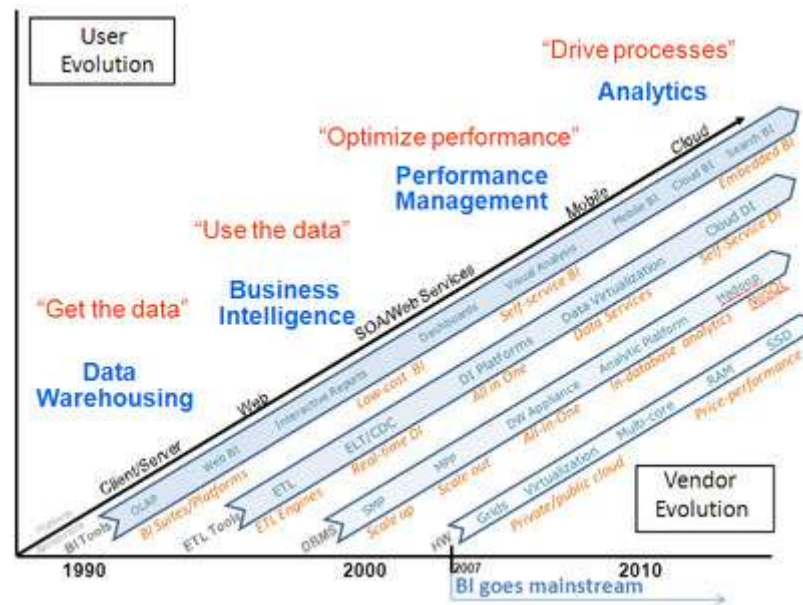


BI component architecture from SQL Server Books Online (Langit, 2009)

Relevant Technologies

To be able to compare with other competing software is a problem since they do not allow you to download and work with it free for 180 days.

Rapid technology change has enabled business intelligence to be available for everyone, not just programmers, technology experts and power users. The volume of digital data has exploded, and on average managers spends two hours a day looking for data. Half of that data is later determined to be useless. When BI is deployed effectively all that data becomes a strategic asset that can be exploited.(Howson, 2008)



Evolution of User and Vendor tools (Eckerson, 2011)

Web-Based BI – This has allowed tools to be deployed across Restaurant intranets and extranets to many customers and employees in a short time. In addition to broadening the reach it has lowered the BI ownership costs.

BI Toolsets and Suites – BI tools have multiple front end components i.e. OLAP, business query tools and dashboards for use by different users and usage scenarios. Previously separate vendors were supplying the different components and the costs used to be quite high. Nowadays a single vendor can offer a full suite or toolset with integrated components. Web based BI has brought economies of scale and provides more functionality to more users at lower costs.

Other Emerging Technologies – BI 2.0 and Web 2.0 technologies are making Business Intelligence more actionable and bolstering prevalence through:-

- Integration of search and making users find relevant information easily.
- Integration with mobile devices
- Mini reports and visualisations are immediately accessible without logging into separate BI application.
- Flashier web based visualizations that are appealing and offering rapid insights into trends.
- Users are able to view tables, sort and filter the data without connecting to the server.
- (SOA) Service Oriented Architecture and mash ups allow components to be embedded in other applications. (Howson, 2008)

Case Studies – Comparative studies

Scanning the UK market for restaurants that are consistently recognized for their business intelligence did not yield results. The idea was to find restaurants honoured by magazines, software vendors and industry analysts. Such industry recognition, as some people would argue is a self-selecting process: if a restaurant does not submit an application analyst firms and magazines will not be aware of their achievements.

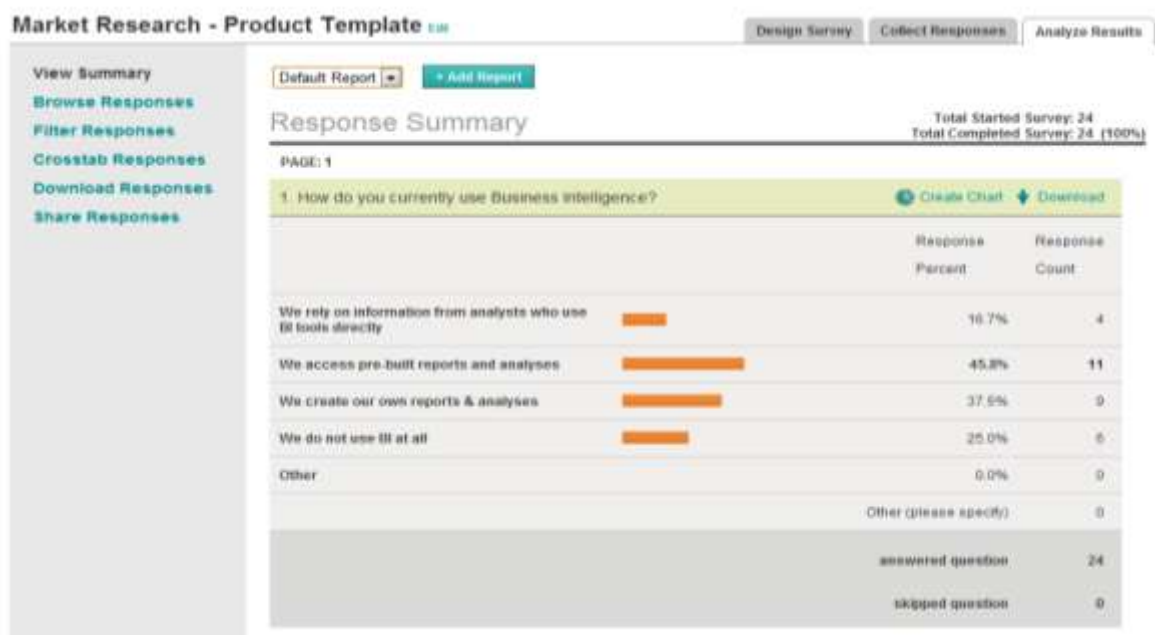
The surveys sent out did not bring any restaurants that claim their BI systems have been successful. For now we do not have any successfully or failed Business Intelligence case studies.

To have enough information to design and build BI solutions, the following questions need to be answered by surveys or interviews. The questions are called scoping questions.

1. What are the current reporting problems i.e. is data missing, is the process of getting data slow or is it too rigid.?
2. Is there a data source that we cannot get data from?
3. Who in the Restaurant needs which data?
4. What type of growth, new business, and new situation will affect our reporting needs over the next 12 months?
5. How effective are the current reporting tools.
6. Can our forecasting process be improved for example do we need more information, or do our cooks or sales people have access to the information they need.
7. What information do we seem not to use.
8. Are there any end user groups that do not have or have limited access to datasets?
9. Are we satisfied with our forecasting scenarios or our ability to execute "What if" Scenarios.
10. Do we proactively use data.(Langit, 2009)

Questionnaire Results

Results from 1st Survey



Results from the survey show that nearly half of respondents access pre-built reports and analyses and they normally create their own reports.

The results can also be exported to IBM SPSS

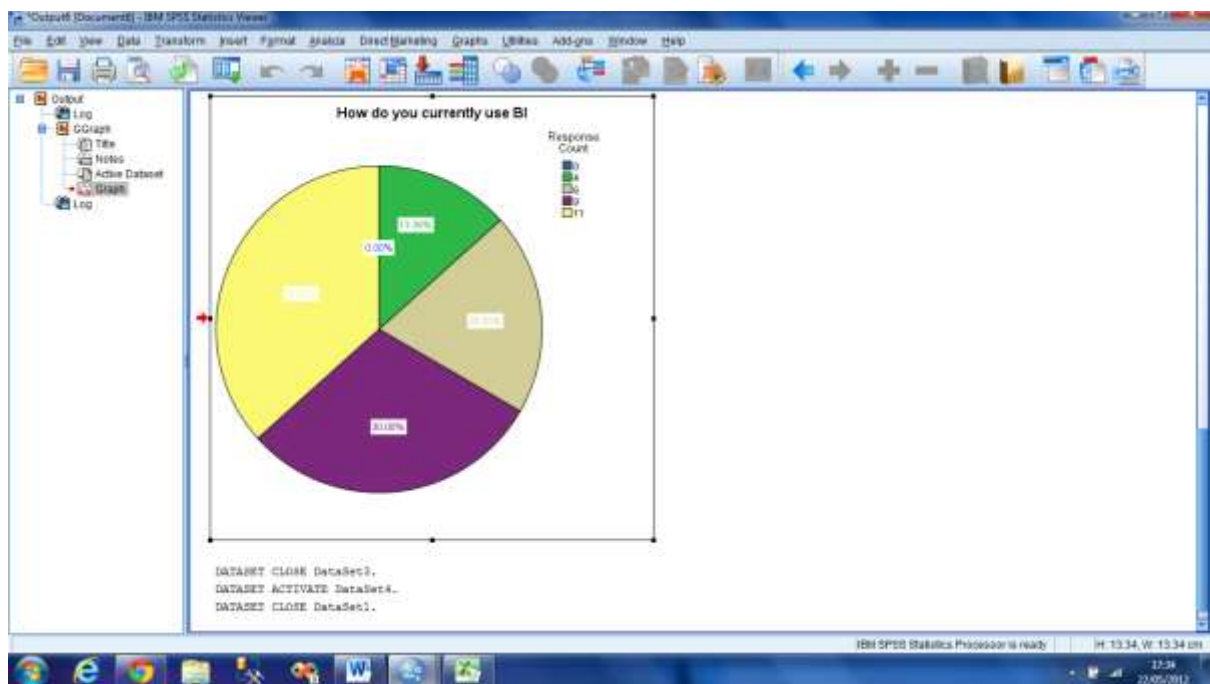
Variable: 3 of 3 variables

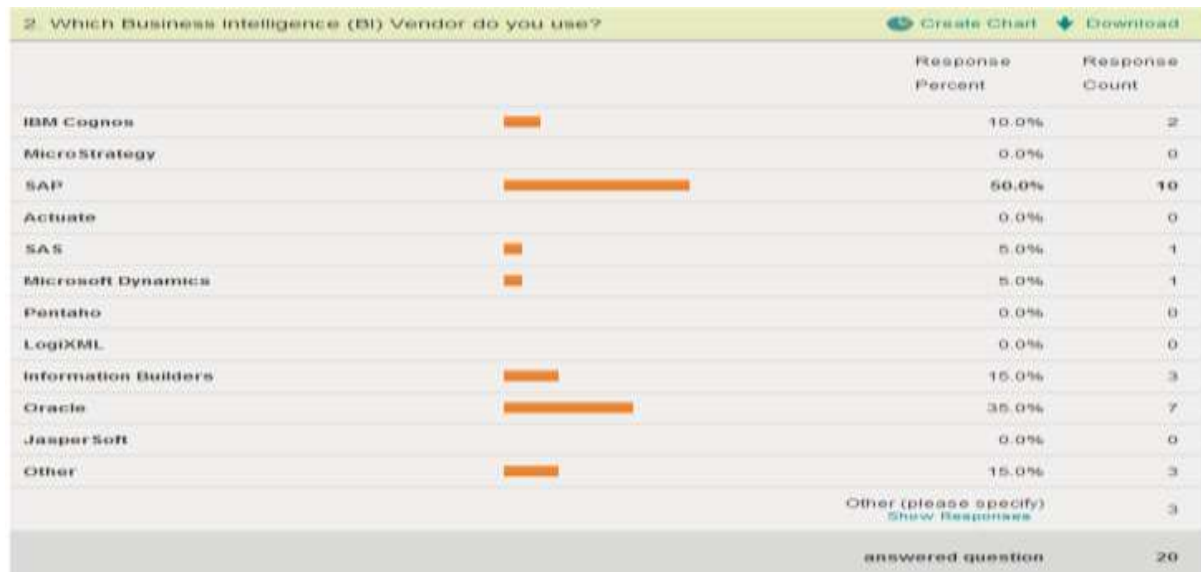
	V1	ResponsePercent	ResponseCount
1	We rely on information from analysts who use BI tools directly	16.70%	4
2	We access prebuilt reports and analyses	45.80%	11
3	We create our own reports & analyses	37.50%	9
4	We do not use BI at all	25.00%	6
5	Other	0.00%	0

Data View Variable View

IBM SPSS Statistics Processor is ready

We can also draw different charts like the following





The most common Business Intelligence suites are SAP, Oracle and Information Builders.



Most decision makers use BI for Improved Business Performance, Cost savings and for better access to data.

4. When considering employees that currently have access to a BI tool versus should have access to a BI tool, how would you break this down by job type? [Download](#)

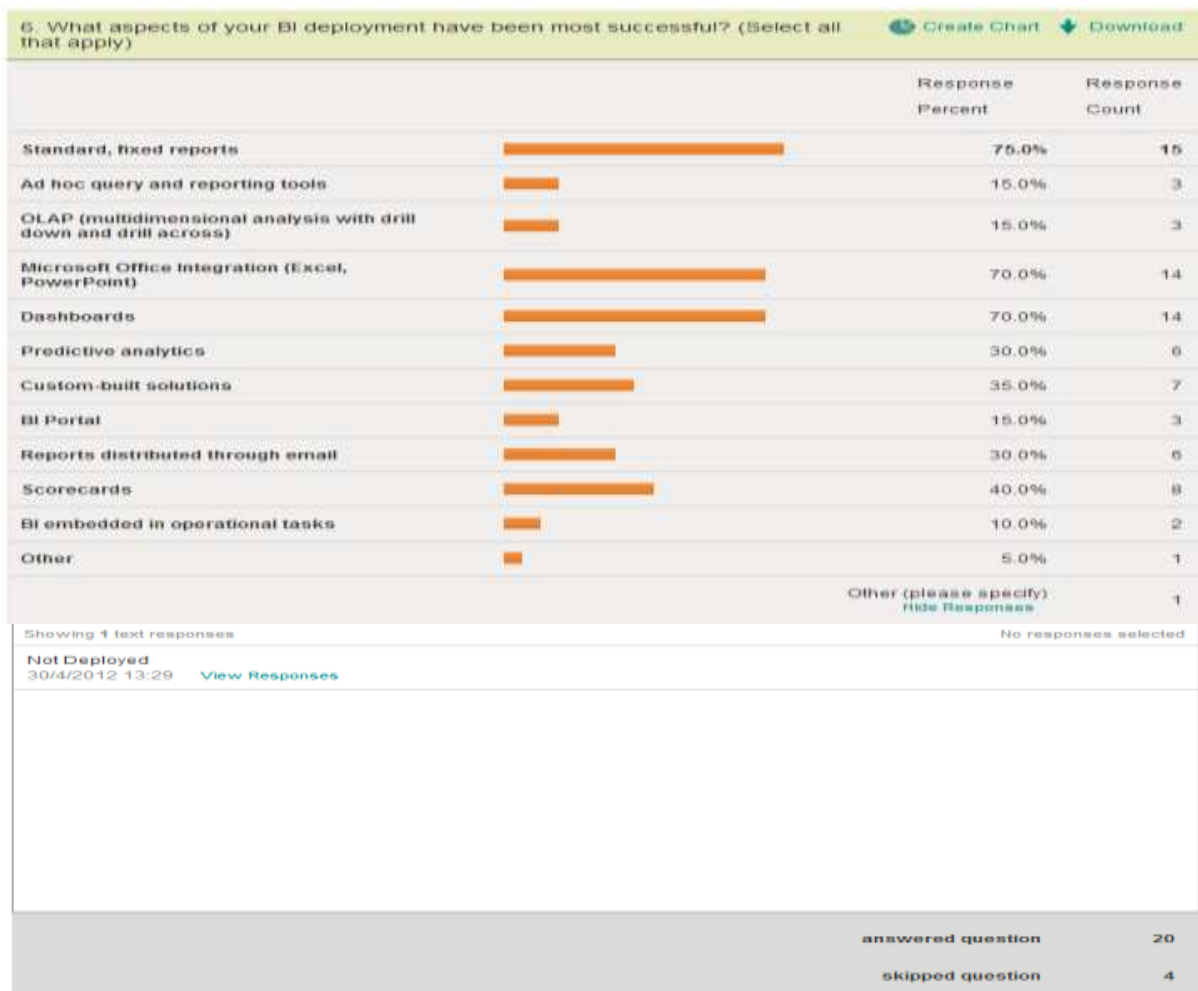
Current %											
	10	20	30	40	50	60	70	80	90	100	Response Count
Managers	11.1% (2)	16.7% (3)	22.2% (4)	16.7% (3)	5.6% (1)	5.6% (1)	11.1% (2)	5.6% (1)	5.6% (1)	0.0% (0)	18
Financial analysts	6.7% (1)	6.7% (1)	6.7% (1)	33.3% (5)	6.7% (1)	6.7% (1)	6.7% (1)	13.3% (2)	0.0% (0)	13.3% (2)	15
Field Staff	27.3% (3)	18.2% (2)	36.4% (4)	9.1% (1)	0.0% (0)	9.1% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	11
Customers	27.3% (3)	27.3% (3)	9.1% (1)	9.1% (1)	18.2% (2)	0.0% (0)	9.1% (1)	0.0% (0)	0.0% (0)	0.0% (0)	11
Suppliers	36.4% (4)	0.0% (0)	18.2% (2)	18.2% (2)	0.0% (0)	9.1% (1)	18.2% (2)	0.0% (0)	0.0% (0)	0.0% (0)	11
Other	0.0% (0)	100.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1
Should %											

	10	20	30	40	50	60	70	80	90	100	Response Count
Managers	0.0% (0)	0.0% (0)	10.5% (2)	0.0% (0)	5.3% (1)	0.0% (0)	15.8% (3)	15.8% (3)	10.5% (2)	42.1% (8)	19
Financial analysts	0.0% (0)	0.0% (0)	5.6% (1)	0.0% (0)	0.0% (0)	5.6% (1)	11.1% (2)	11.1% (2)	16.7% (3)	50.0% (9)	18
Field Staff	0.0% (0)	0.0% (0)	14.3% (2)	14.3% (2)	0.0% (0)	0.0% (0)	35.7% (5)	0.0% (0)	14.3% (2)	21.4% (3)	14
Customers	5.9% (1)	0.0% (0)	0.0% (0)	11.8% (2)	11.8% (2)	17.6% (3)	17.6% (3)	5.9% (1)	0.0% (0)	29.4% (5)	17
Suppliers	5.9% (1)	0.0% (0)	0.0% (0)	17.6% (3)	17.6% (3)	0.0% (0)	17.6% (3)	5.9% (1)	11.8% (2)	23.5% (4)	17
Other	0.0% (0)	50.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	50.0% (1)	0.0% (0)	0.0% (0)	2
Other (please specify) Show Responses											1
answered question											20
skipped question											4

On average there are 30% of BI users, while should use is above 70%

5. How do you rate the following in terms of importance ?							Create Chart	Download
	Extremely Important	Very Important	Moderately Important	Slightly Important	Not at all Important	Response Count		
How successful do you consider your current BI deployment	36.8% (7)	31.6% (6)	26.3% (5)	5.3% (1)	0.0% (0)	19		
How much has BI contributed to your company's performance	21.1% (4)	52.6% (10)	21.1% (4)	5.3% (1)	0.0% (0)	19		
BI program has been well managed	0.0% (0)	33.3% (6)	50.0% (9)	16.7% (3)	0.0% (0)	18		
Stakeholders evangelize the effective use of BI	0.0% (0)	21.1% (4)	57.9% (11)	21.1% (4)	0.0% (0)	19		
BI projects are aligned with Company business unit goals	0.0% (0)	42.1% (8)	52.6% (10)	5.3% (1)	0.0% (0)	19		
Data quality – Clean data	20.0% (4)	55.0% (11)	25.0% (5)	0.0% (0)	0.0% (0)	20		
Appropriate & effective BI tools	10.0% (2)	45.0% (9)	40.0% (8)	5.0% (1)	0.0% (0)	20		
Incorporation of BI into operational processes	10.0% (2)	40.0% (8)	40.0% (8)	10.0% (2)	0.0% (0)	20		
Reliability of BI system	10.0% (2)	45.0% (9)	40.0% (8)	5.0% (1)	0.0% (0)	20		
Fast query response time	20.0% (4)	45.0% (9)	35.0% (7)	0.0% (0)	0.0% (0)	20		
BI system is continuously improved (data & tools)	0.0% (0)	55.0% (11)	35.0% (7)	10.0% (2)	0.0% (0)	20		
Data warehouse updates are real-time	5.0% (1)	45.0% (9)	50.0% (10)	0.0% (0)	0.0% (0)	20		
Quality & expertise of internal BI staff	5.0% (1)	15.0% (3)	75.0% (15)	5.0% (1)	0.0% (0)	20		
Quality & expertise of external consultants	0.0% (0)	30.0% (6)	60.0% (12)	5.0% (1)	5.0% (1)	20		
answered question						20		
skipped question						4		

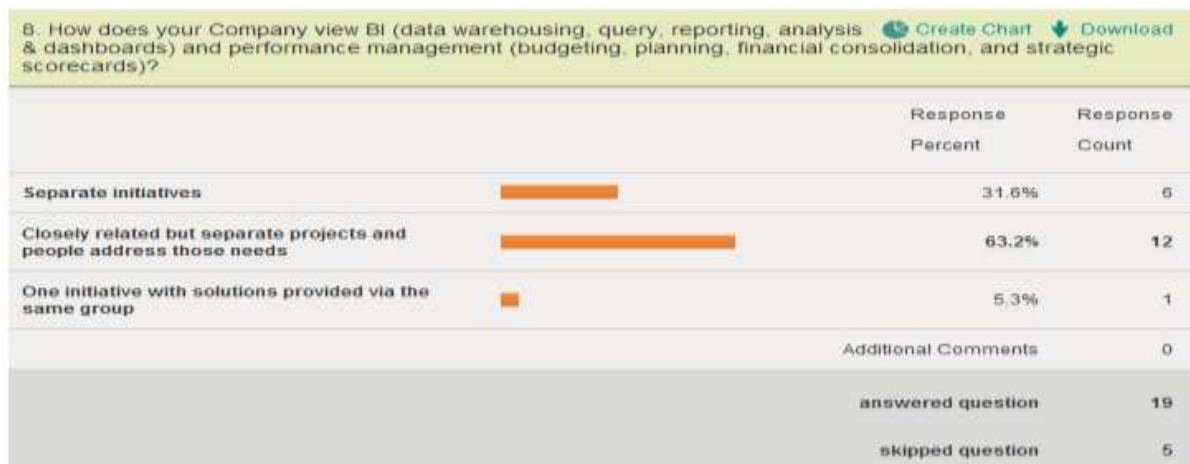
On average 50% think the importance is between moderately important to very important.



The most successful BI tools have been reports, dashboards and integration with MS office packages.



Most users do not develop their own Front ends but use primarily from a single vendor.



Restaurants view BI projects as separate but closely related that address users' needs.



There is a mild level push for BI, but the top of organisations have little understanding of the value that can be added and as such there is little support currently existing for BI.

10. Please provide your organisations' annual revenue, number of employees and contact details Download	
	Response Count
Hide Responses	4
Responses (4) Text Analysis My Categories (0)	
Showing 4 text responses	No responses selected
Red Lion, Amptill Manager 27/4/2012 14:14 View Responses	
£500 000 to £2million 8/4/2012 10:06 View Responses	
350 people, £13million per annum 4/4/2012 10:34 View Responses	
170 employees, ~\$35mm, privately held company 3/4/2012 4:43 View Responses	
answered question	4
skipped question	20

There is very little that we can read from this, except that people like their privacy.

Project Realisation

Technical Requirements

In some cases, we know what information we want. We may have particular answers to certain questions. The questions might be who are our top sales people? What is our revenue? In some situations we not only know what we are looking for, but also have an idea where to find the information when we design our BI solution.

In some cases we know where to look, but it is impractical to search through all the information. In other cases we know the question and we do not know exactly where to look for answers. Data may hold answers to questions we have not even thought to ask. This data may contain correlations, trends, and dependencies at a level of detail that would be impossible for a person to notice or comprehend. These relationships can be discovered by using data mining techniques.

Highly complex mathematical algorithms can be applied to data to find correlations between events and characteristics. For example certain customers purchasing certain drinks are more likely to buy certain food from our restaurants. This information is very useful when planning marketing campaigns. This might help in setting up cross product promotions. (Larson, 2009)

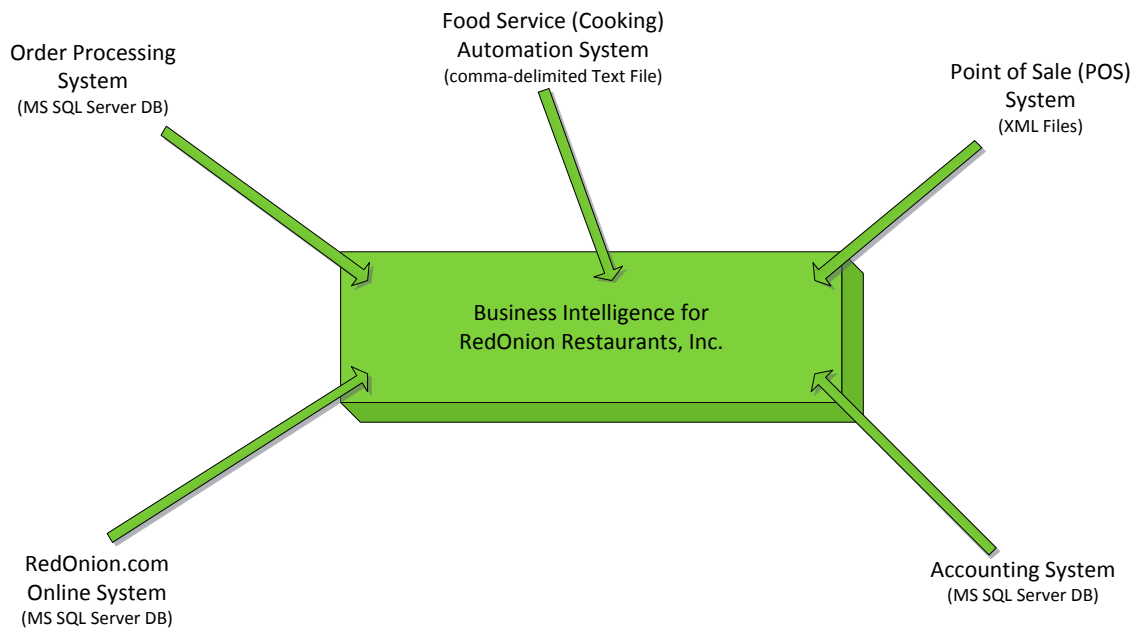
Red Onion Restaurants

Throughout the remainder of this project Red Onion Restaurant serves as our fictional company. It has several product lines. It has five restaurants, sales its products online and sales in bulk to people having parties.

RedOnion Business Needs

RedOnion is launching a new BI project to support its decision making. The project includes a design of a data warehouse structure, population of that data warehouse and the creation of analysis applications to serve decision makers at all levels of the restaurant.

The new BI platform will be based on SQL Server 2008. SQL server 2008 was chosen because it is cheap and its features tools necessary to implement the data warehouse in a short time. RedOnion has five data processing systems that are expected to serve as sources of BI (Business Intelligence).



Sources of Business Intelligence at RedOnion, Inc. (Larson, 2009)

Accounting

The accounting system keeps track of all the financial transactions for RedOnion. It includes the buying of ingredients for cooking. This system uses an SQL Server 2008 database for its backend.

RedOnion.com

The online restaurant is an ASP.NET application. It also uses SQL Server 2008 as its backend database. All sales through the restaurant are paid with a credit or debit card. All the customers must provide name, address, phone number, and email address with each purchase.

The online restaurant tracks the transporting of the orders. It handles and food returned by the customers. The restaurant saves information on product promotions and discounts that run on the restaurant site.

Point of Sale

The point of sale system manages the cash registers at each of the five Restaurants. The system tracks inventory at each restaurant using UPC (Universal Product Code) barcode stickers. The system handles product rejected, cash and credit card transactions. Information from each of the five POS systems is exported to an XML file. This file is transferred nightly, using (FTP) File Transfer Protocol, to a central location. These XML files serve the source for loading POS data into the BI systems.

Order Processing

The order processing system manages the inventory amounts for all the products. It tracks party order and products sold. It also tracks order fulfilment, including food transport. It generates invoices and handles the payment of those invoices and records any food returned. It uses SQL Server 2008 database as its backend.

Food Service (Cooking) Automation

The system tracks the ingredients used to make each Menu. It uses a proprietary data-storage format. Data can be exported from the cooking automation system to a comma-delimited text file. This text file serves as the source for loading the cooking data into the BI systems.

Design and structural information

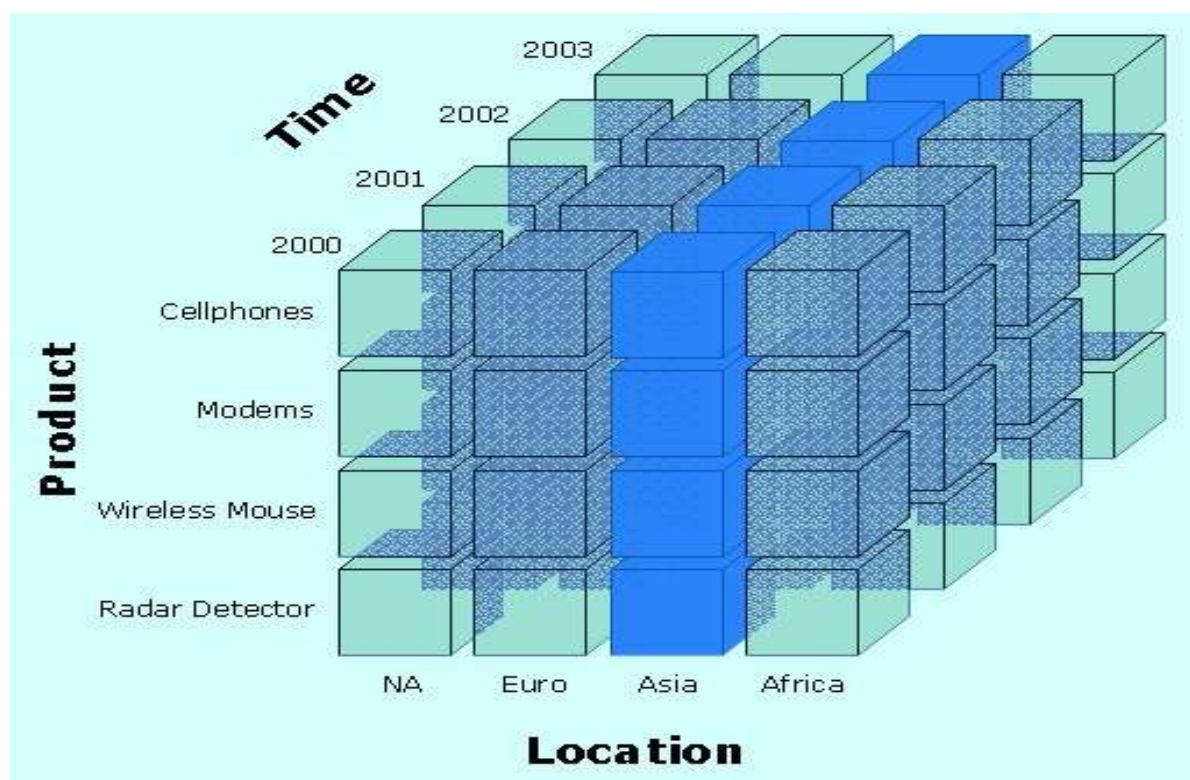
The Source of Business Intelligence

The majority of BI for most restaurants comes from transactional data. When transactions are managed by and stored on computers, this is referred to as online transaction processing (OLTP). OLTP hold raw data we need to calculate business intelligence. If OLTP systems are used to create BI, aggregates can tax the system. This will have detrimental effect on the restaurants' daily operations.

When the information in OLTP is moved to a different data store that does not infer with daily operations it is now known as data mart. A data mart is a relational database designed for speed and requires fewer table joins when data is output for analysis and reporting. Data can be denormalized for the sake of speed. Data marts are updated regularly to facilitate effective decision making. However these data loads should not be so frequent as that can cause unneeded stress on the OLTP systems.

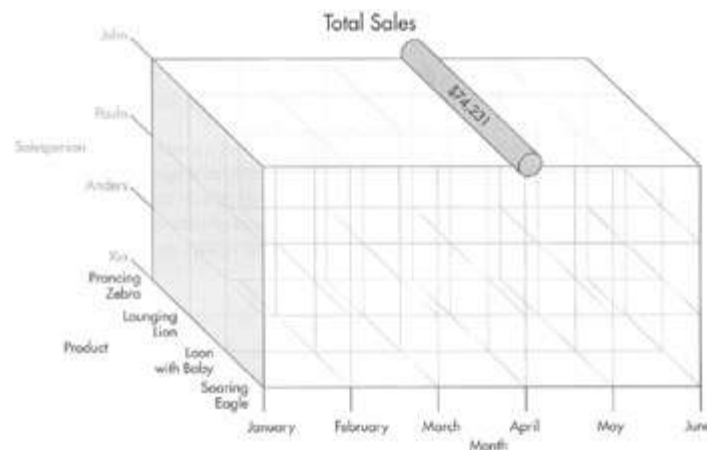
Data cleansing transforms data from OLTP into a format without inconsistencies. In addition it removes or repairs any data that does not meet the business rules required by the measures in the data mart. It is done as part of a process ETL (Extract, Transform and Load).

OLAP (Online analytical processing) systems enable users to view, retrieve, slice and dice the business data. OLAP systems focus on cubes. (Larson, 2009)



Sales Cube Example (Practical, 2012)

Cube with Aggregation



Total sales cube with an aggregation for total sales in April (Larson, 2009)

Defining Business Intelligence Structures

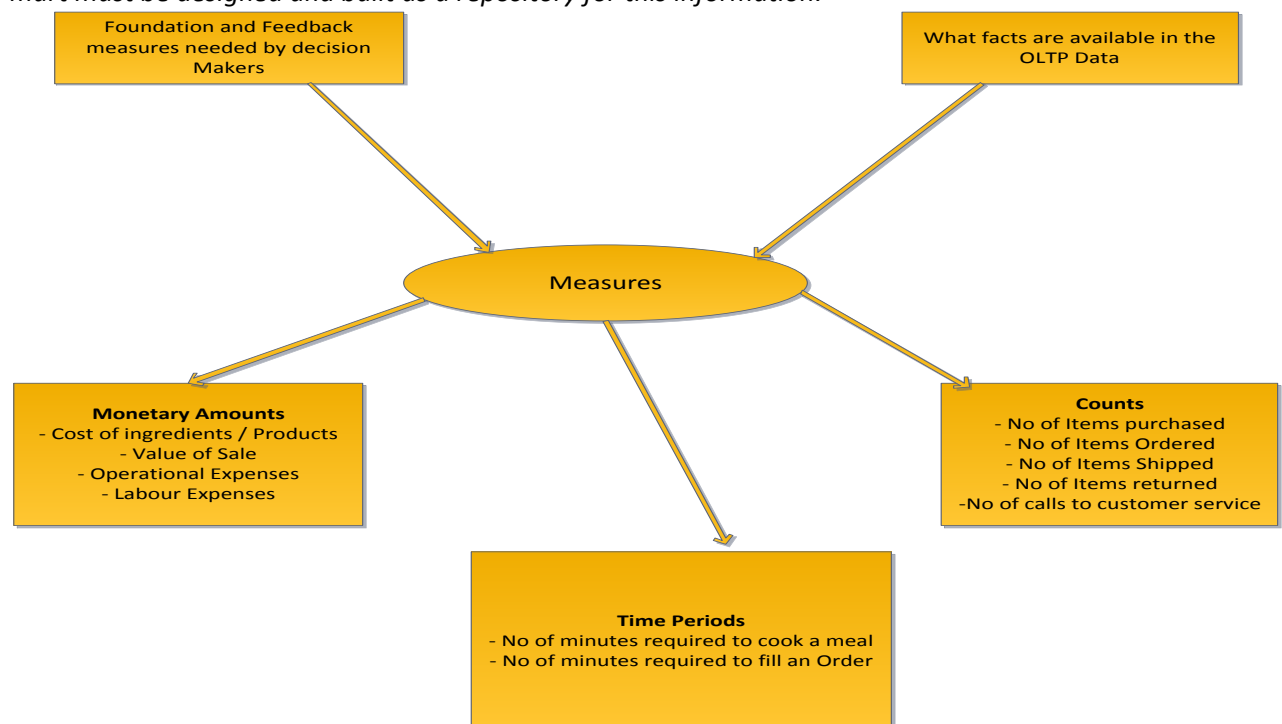
After identifying the information needed by our decision makers, the design of data marts begins. Basically they need to answer the following questions: What foundation and feedback information do they need? How will the information be sliced and diced for analysis.

Since decision makers ultimately determine the success or failure of a project, they need to be involved in the design of the data mart structure.

Data marts are architected using a star schema or a snowflake. All the information for a hierarchy in a star schema is stored in the same table. (Laberge, 2011)

Designing a Cooking Data Mart

Business Need: Restaurants need to analyse statistics from the cooking automation system. There is no cooking database, so everything has to be logged to comma-Delimited text files. The data mart must be designed and built as a repository for this information.



Designing data marts (Larson, 2009)
Required measures for Cooking

Measure	OLTP Fields
Number of accepted products	Reject Flag
Number of rejected products	Reject Flag
Elapsed Minutes for cooking	NOT AVAILABLE

Finalized measures for Cooking

Measure	OLTP Fields	Data Type	Formula
Number of accepted products	Reject Flag	INT	Count when reject flag is false
Number of rejected products	Reject Flag	INT	Count when reject flag is true
Elapsed Minutes for cooking	Start of Cooking date & time, End of Cooking date & time	Decimal (6,2)	DATEDIFF (mi, [Start of cooking date & time], [End of cooking date & time])

Required dimensions for the cooking Data mart

Dimension	OLTP Fields
Product	Product
Product Subtype	Not available
Product Type	Not available
Batch	Batch
Chef	Chef
Ingredients	Not available
Country	Not available
Day	Start of cooking date and time
Month	Start of cooking date and time
Quarter	Start of cooking date and time
Year	Start of cooking date and time

Finalized dimensions and hierarchies for the cooking data mart

Dimension	OLTP Fields	Data Type	Parent Dimension
Product	Product	INT	Product Subtype
Product Subtype	Not available	INT	Product Type
Product Type	Not available	INT	None
Batch	Batch	INT	None
Chef	Chef	INT	None
Ingredients	Accounting System.Ingredients	Nvarchar(30)	None
Country	Accounting System.Country	Nchar(10)	None
Day	Start of cooking date and time	INT	Month
Month	Start of cooking date and time	INT	Quarter
Quarter	Start of cooking date and time	INT	Year
Year	Start of cooking date and time	INT	None

The Cooking data mart schema with measures in a Fact table

CookingFact	
Field Name	Data Type
AcceptedProducts	INT
RejectedProducts	INT
ElapsedTimeForCooking	Decimal(6,2)

The Cooking data mart schema with dimension tables added

<u>ManufacturingFact</u>	
FieldName	Data Type
AcceptedProducts	Int
RejectedProducts	Int
ElapsedTimeForCooking	Decimal(6,2)
DateOfCooking	Date Time

<u>DimChef</u>	
FieldName	Data Type
ChefNumber(PK)	Int
ChefName	Nvarchar(50)

<u>DimProduct</u>	
FieldName	Data Type
ProductCode(PK)	Int
ProductName	Nvarchar(50)

<u>DimIngredients</u>	
FieldName	Data Type
Ingredients(PK)	Nvarchar(30)

<u>DimProductSubType</u>	
FieldName	Data Type
ProductSubTypeCode(PK)	Int
ProductSubTypeName	Nvarchar(50)

<u>DimCountry</u>	
FieldName	Data Type
CountryCode(PK)	Char(10)
CountryName	Nvarchar(30)

<u>DimProductType</u>	
FieldName	Data Type
ProductTypeCode(PK)	Int
ProductTypeName	Nvarchar(50)

<u>DimBatch</u>	
FieldName	Data Type
BatchNumber(PK)	Int
BatchName	Nvarchar(50)

The Cooking data mart schema with hierarchies added

<u>ManufacturingFact</u>	
FieldName	Data Type
AcceptedProducts	Int
RejectedProducts	Int
ElapsedTimeForCooking	Decimal(6,2)
DateOfCooking	Date Time

<u>DimProduct</u>	
FieldName	Data Type
ProductCode(PK)	Int
ProductName	Nvarchar(50)

<u>DimProductSubType</u>	
FieldName	Data Type
ProductSubTypeCode(PK)	Int
ProductSubTypeName	Nvarchar(50)

<u>DimProductType</u>	
FieldName	Data Type
ProductTypeCode(PK)	Int
ProductTypeName	Nvarchar(50)

<u>DimBatch</u>	
FieldName	Data Type
BatchNumber(PK)	Int
BatchName	Nvarchar(50)

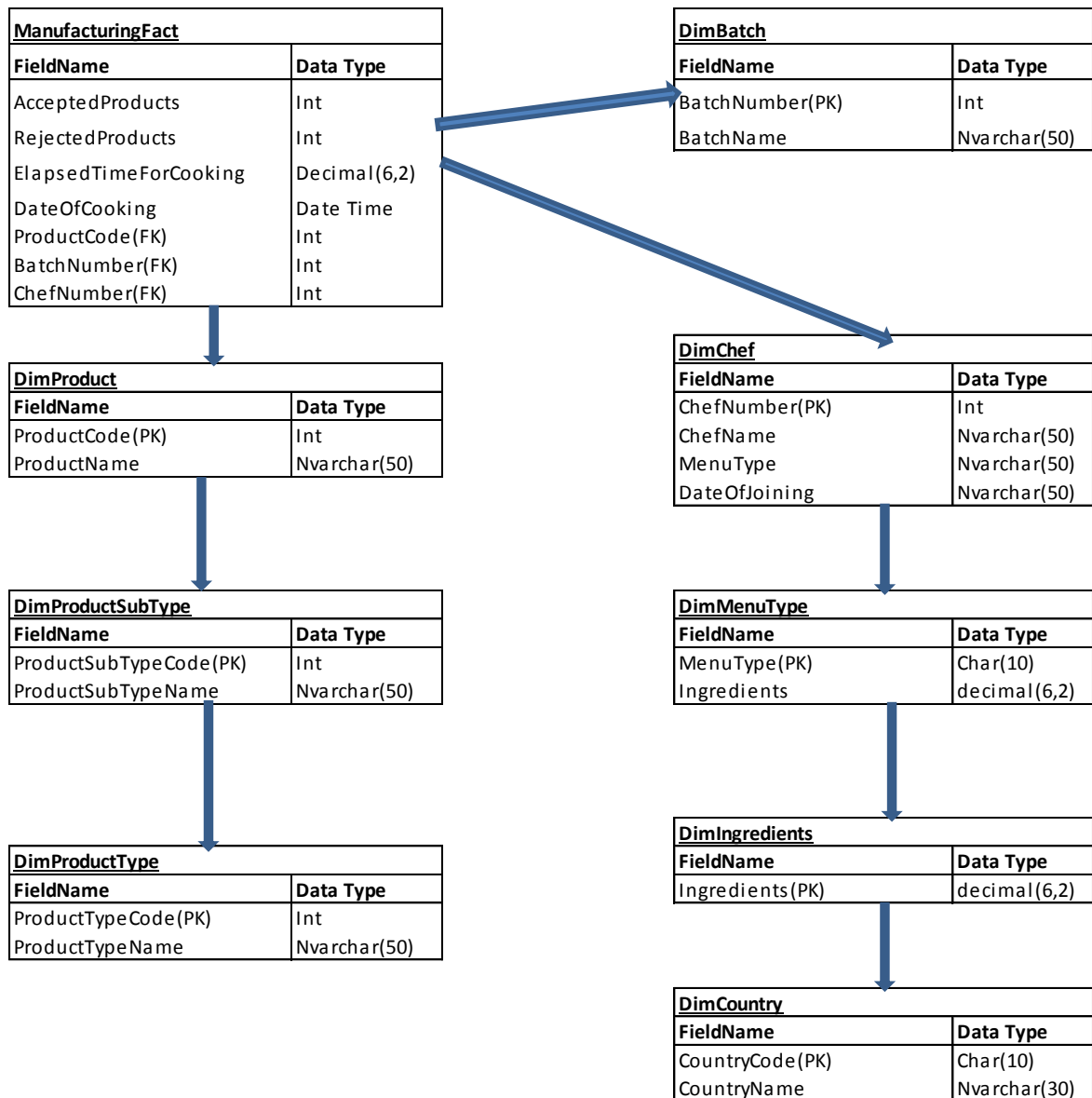
<u>DimChef</u>	
FieldName	Data Type
ChefNumber(PK)	Int
ChefName	Nvarchar(50)
MenuType	Nvarchar(50)
DateOfJoining	Nvarchar(50)

<u>DimMenuType</u>	
FieldName	Data Type
MenuType(PK)	Char(10)
Ingredients	decimal(6,2)

<u>DimIngredients</u>	
FieldName	Data Type
Ingredients(PK)	decimal(6,2)

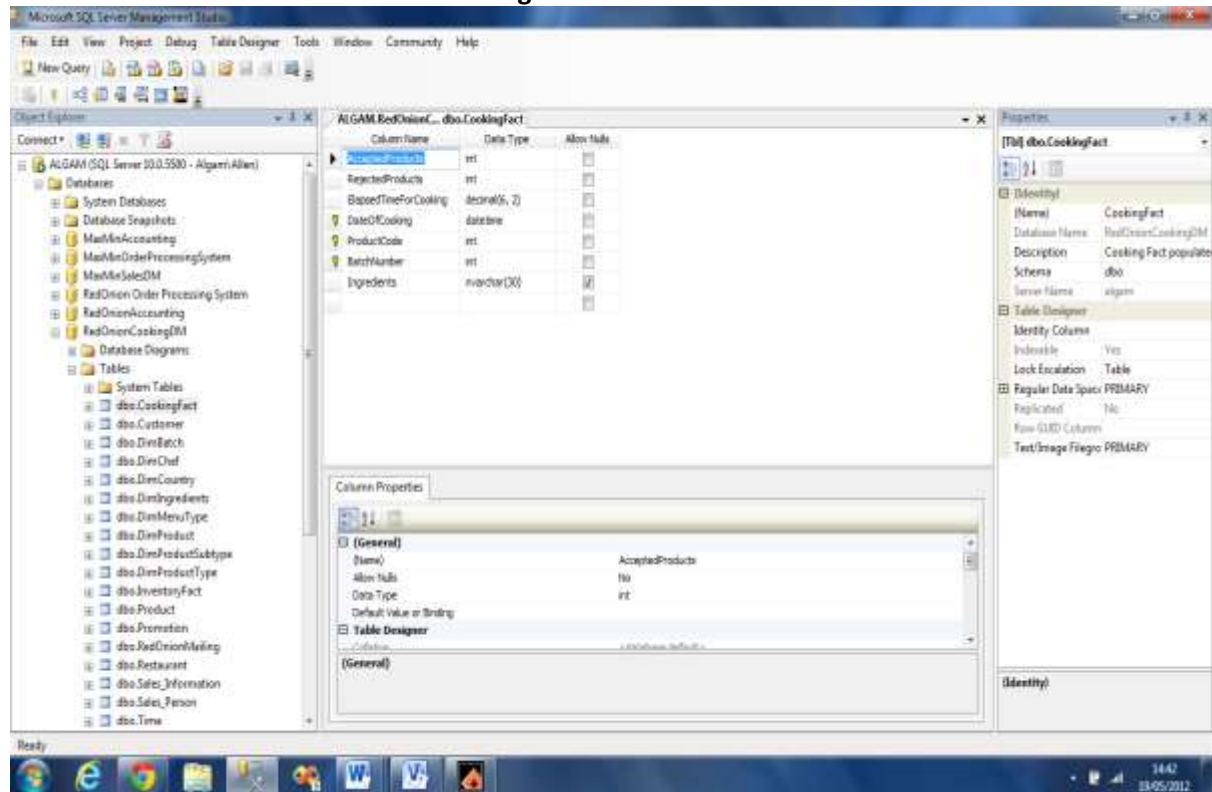
<u>DimCountry</u>	
FieldName	Data Type
CountryCode(PK)	Char(10)
CountryName	Nvarchar(30)

The completed Cooking data mart schema

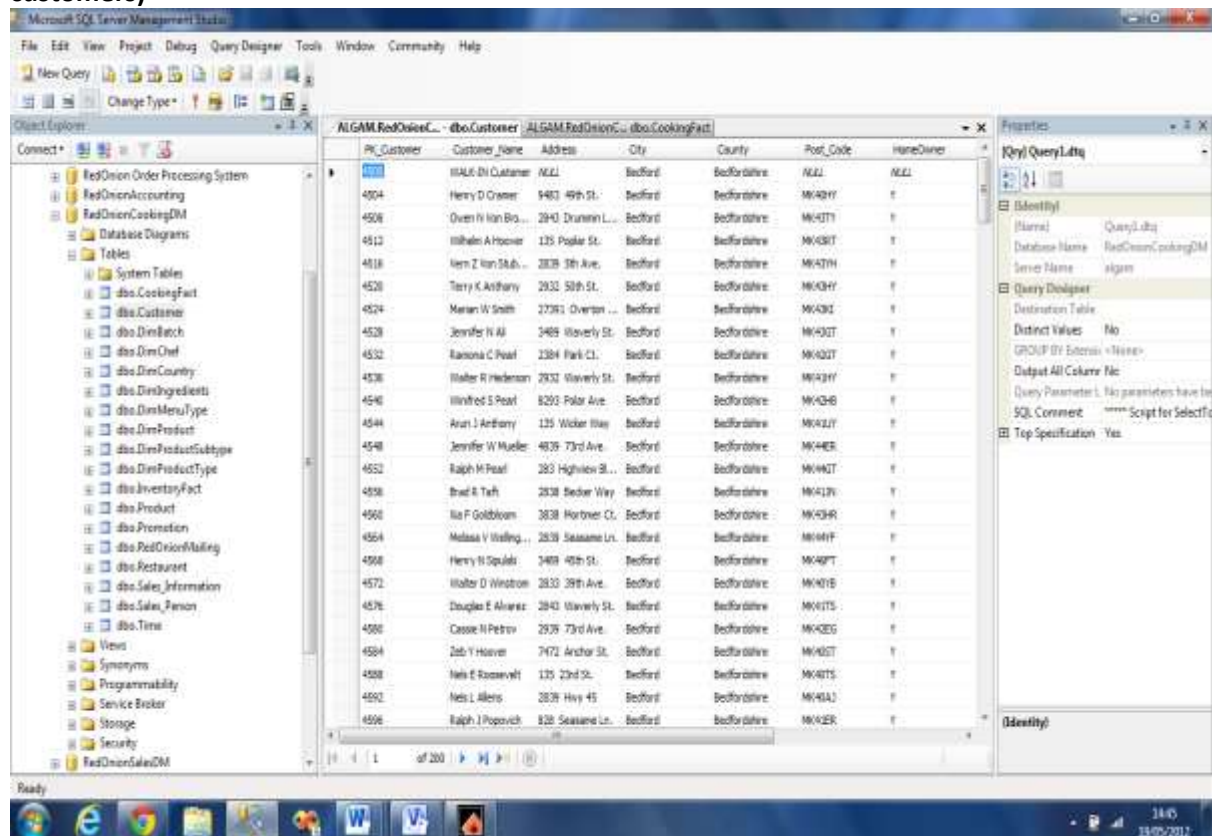


Since our data mart is complete, it is time to turn the design into database tables. Foreign key constraints put a strain on the database engine during data loads. Instead of foreign keys we will depend on our ETL (Extract, Transform and Load) process in SQL Server Integration Services for enforcing data integrity.

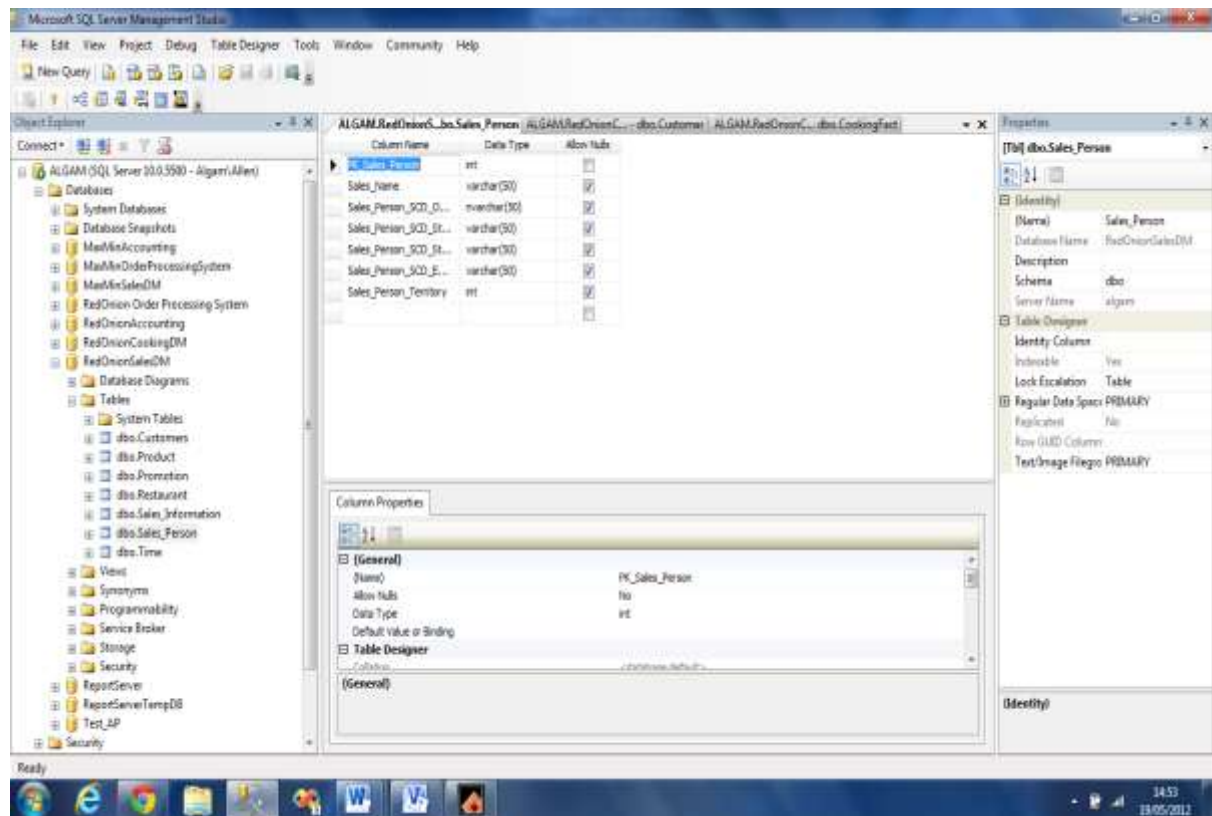
Screen shots of tables in RedOnionCookingDM data mart



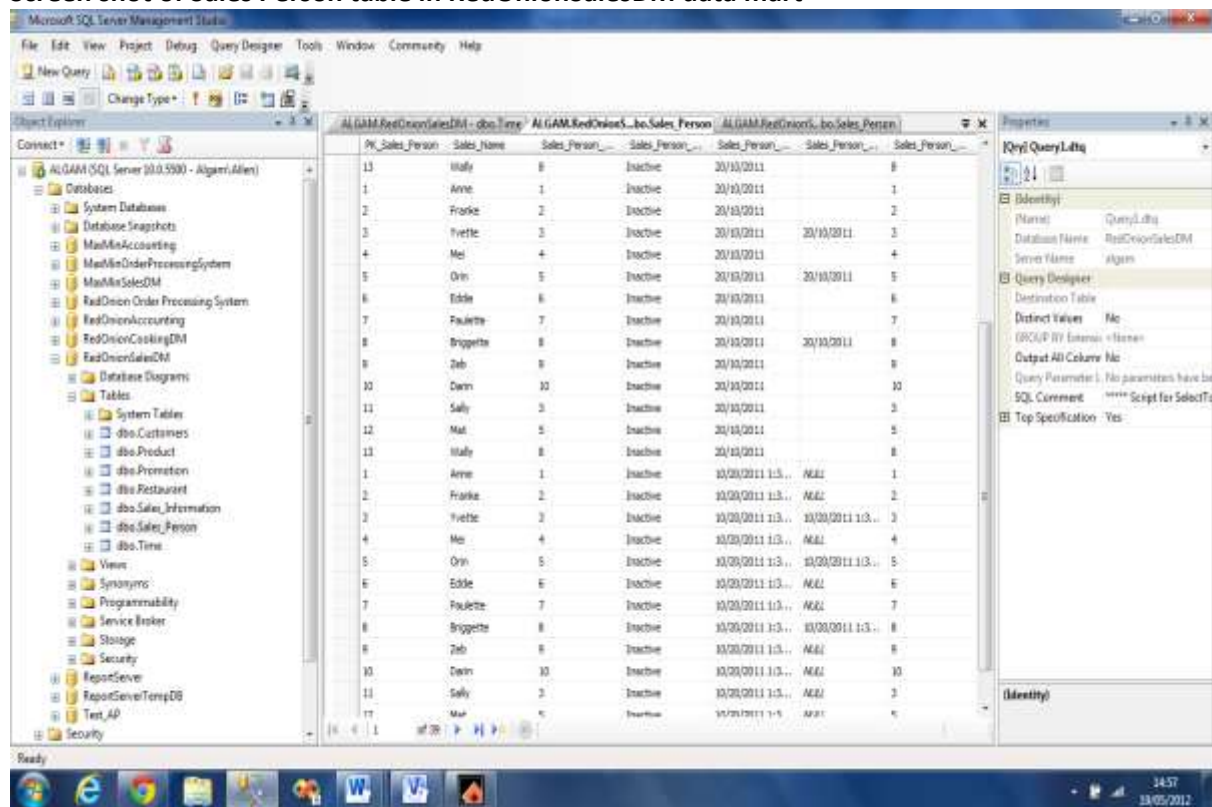
Screen shot of Customer table in RedOnionCookingDM data mart (Only displays the first 200 customers)



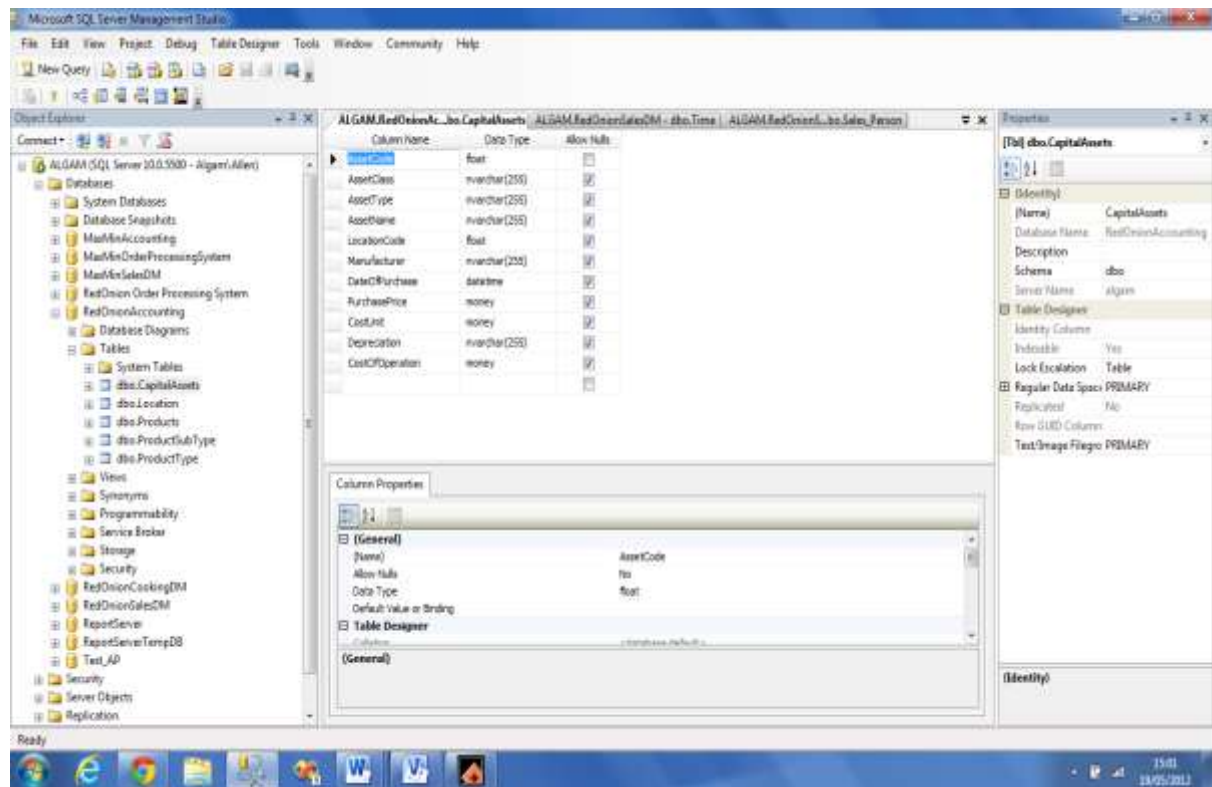
Screen shots of tables in RedOnionSalesDM data mart



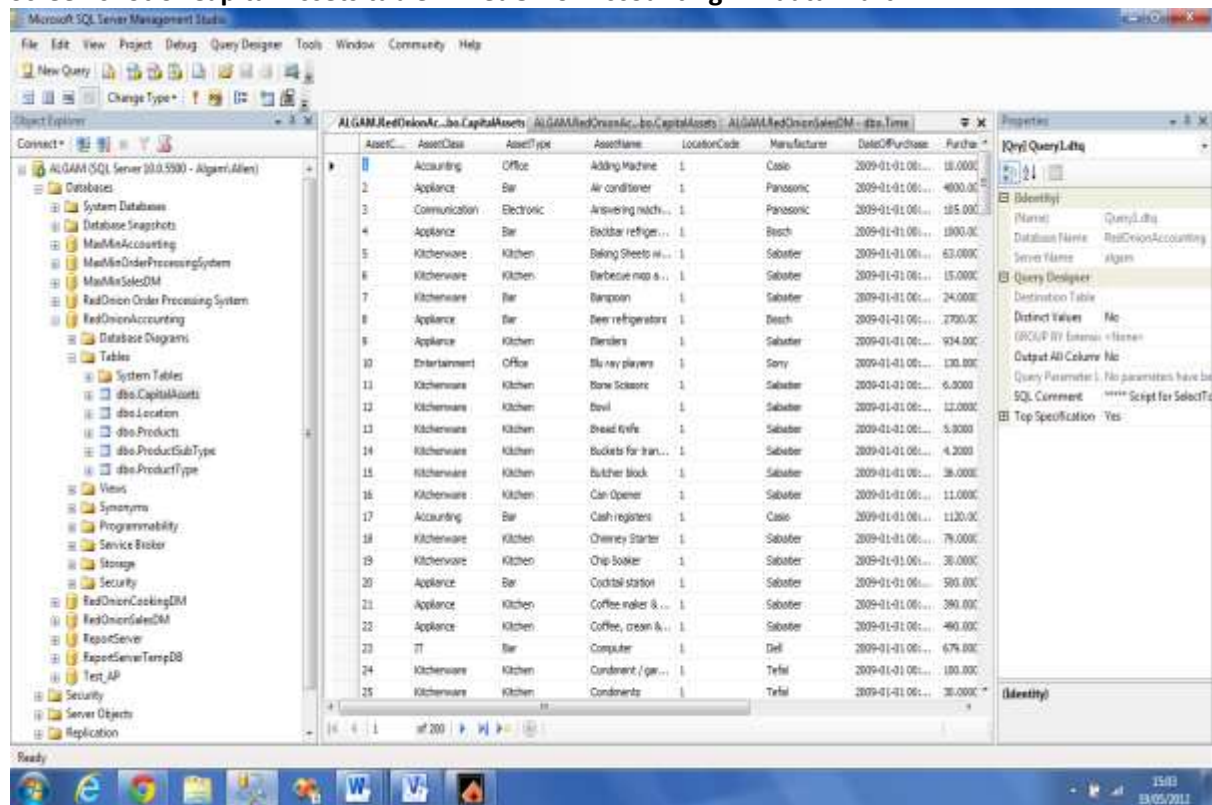
Screen shot of Sales Person table in RedOnionSalesDM data mart



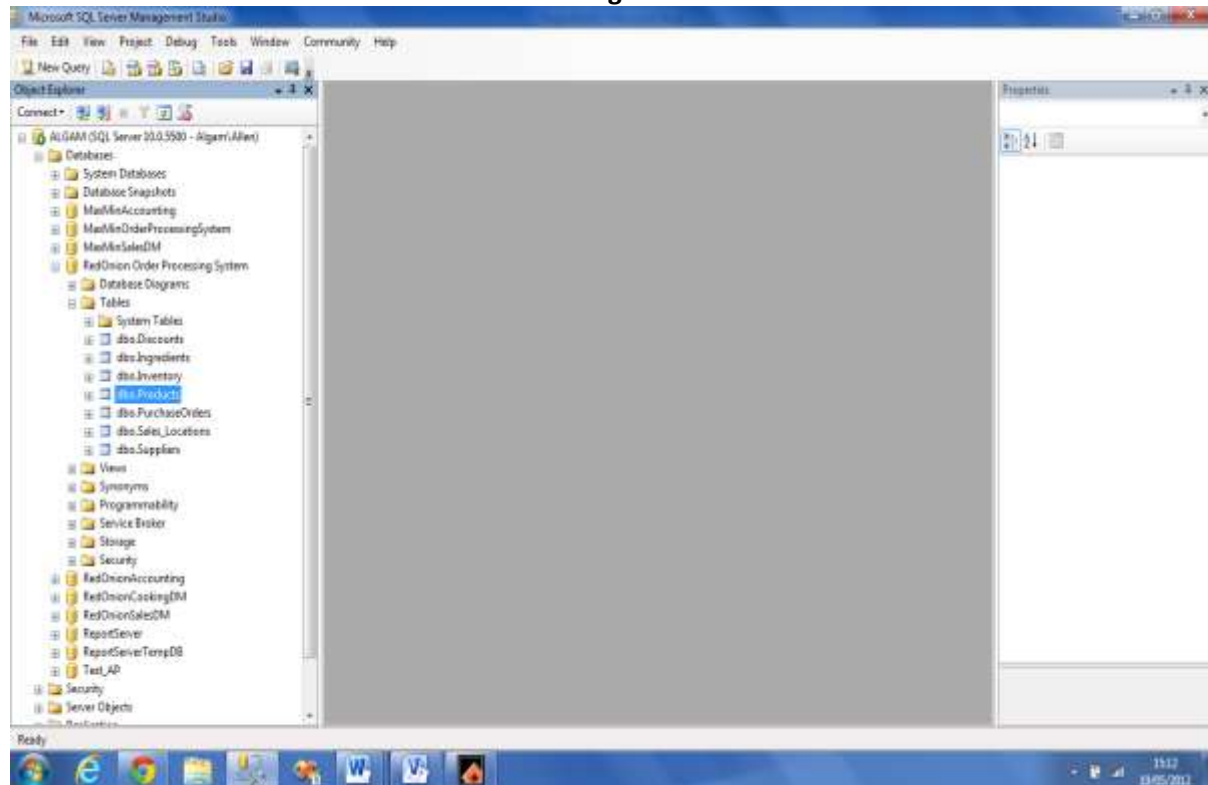
Screen shot of tables in RedOnionAccountingDM data mart



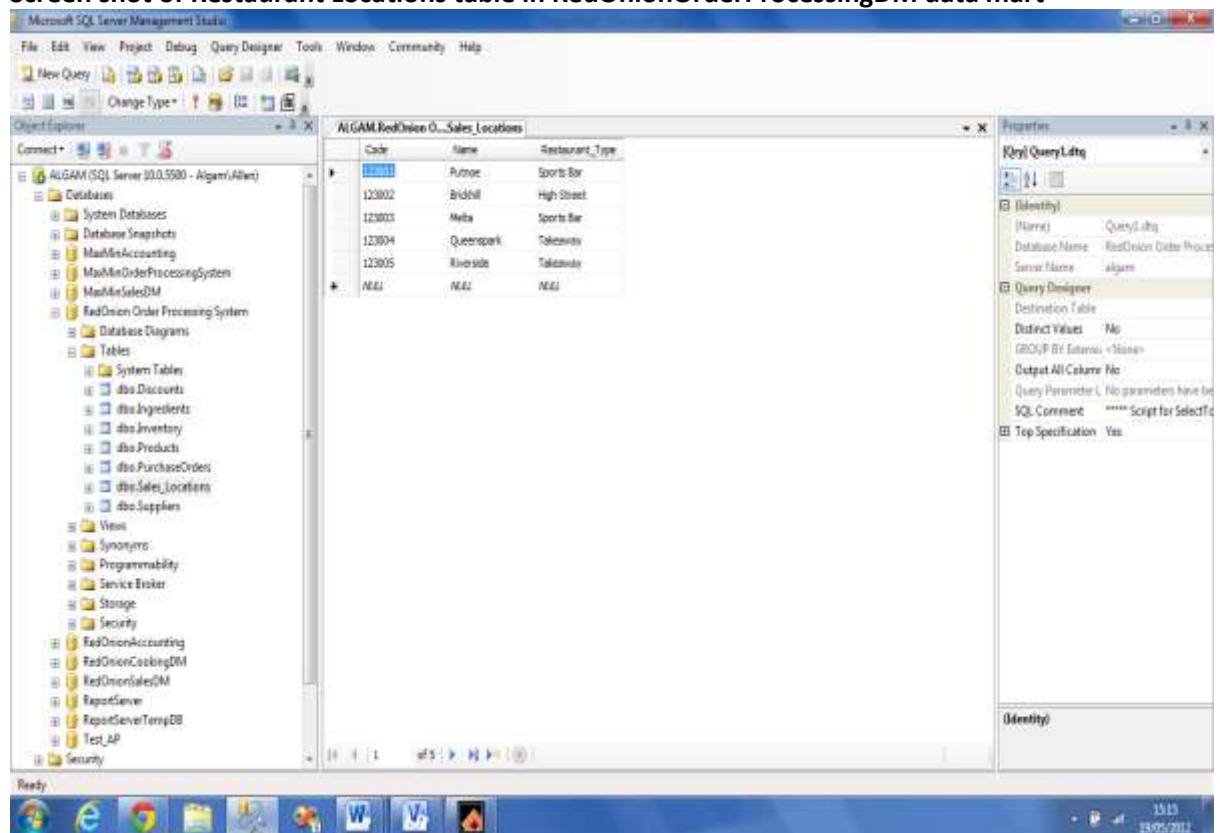
Screen shot of Capital Assets table in RedOnionAccountingDM data mart



Screen shot of tables in RedOnionOrderProcessingDM data mart



Screen shot of Restaurant Locations table in RedOnionOrderProcessingDM data mart

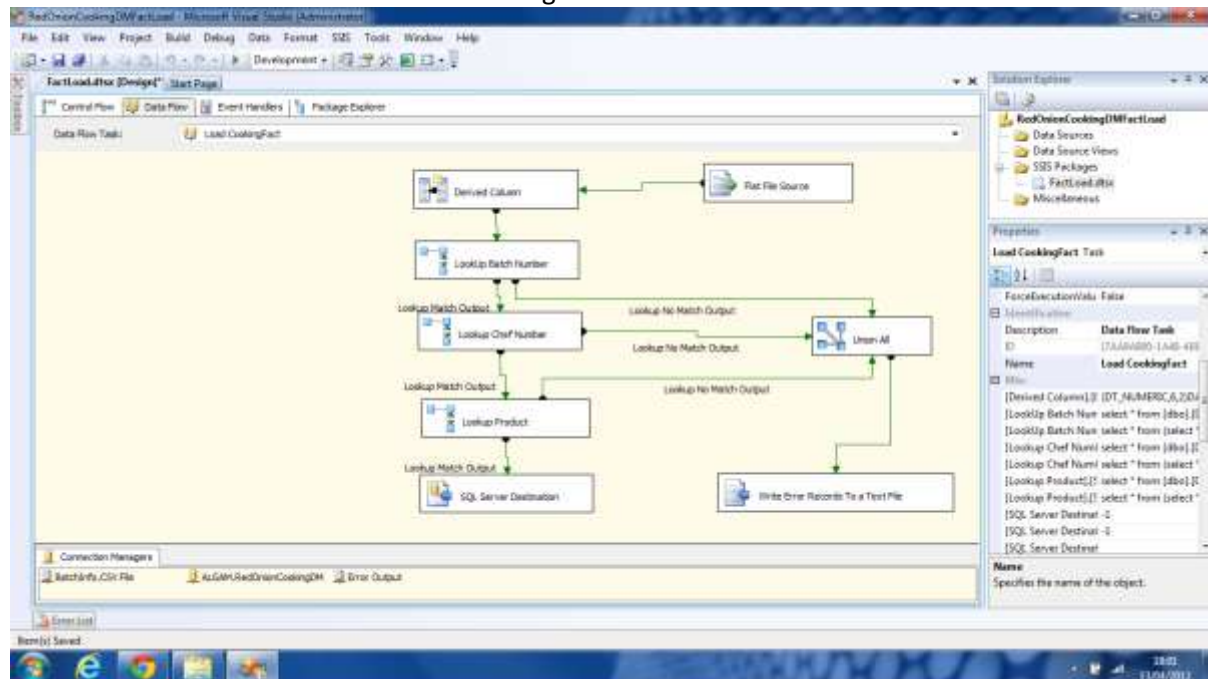


Populating Data Marts

For this project loading data is what takes time since there is no information we can use to populate my databases. Some of the data can be found on the internet as examples. Where you cannot find examples, writing SQL queries might save time otherwise it takes a lot of time.

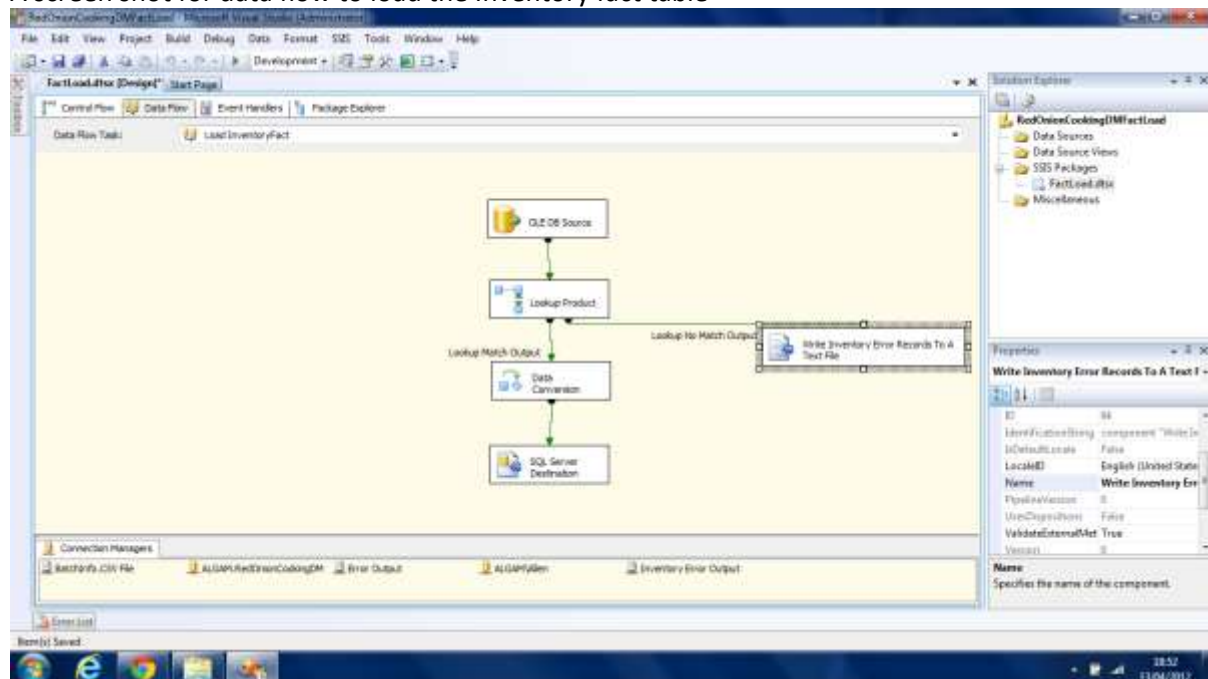
We can use Integration Services to cleanse data and load it into our data marts.

Screen shot for data flow to load the Cooking fact table



If there are any errors they are written to a text file named CookInfoErrors.txt located on the desktop.

A screen shot for data flow to load the Inventory fact table

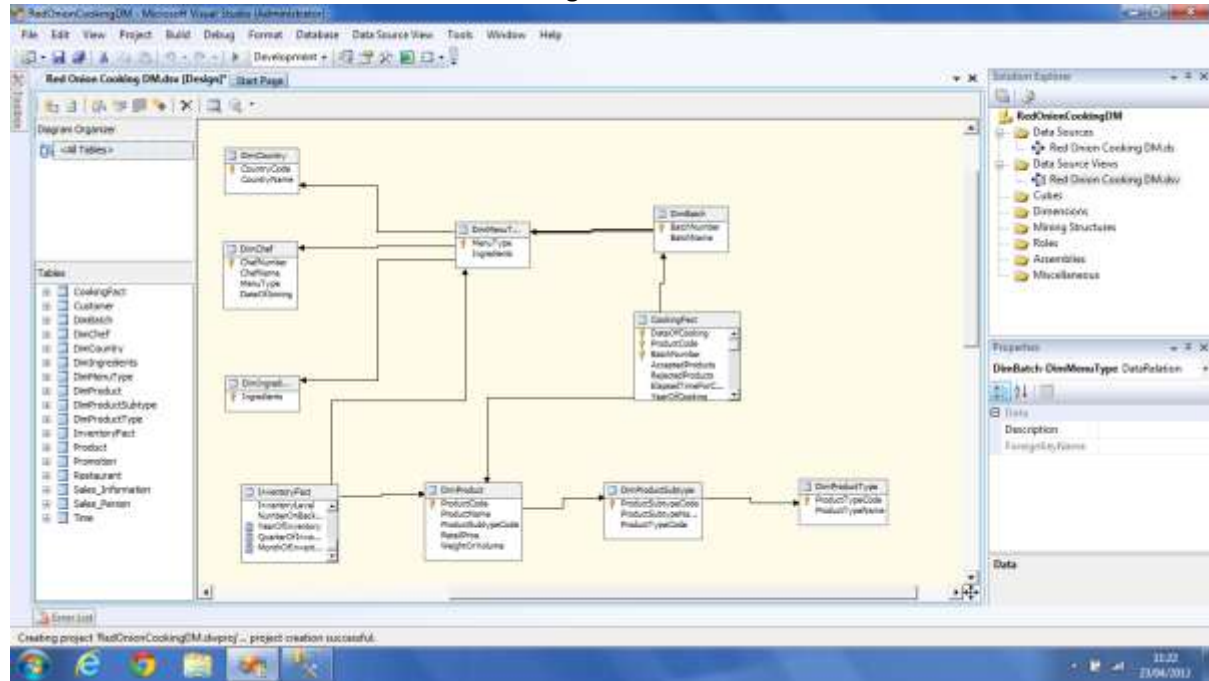


Analysing Cube Content

Cubism – Measures and Dimensions

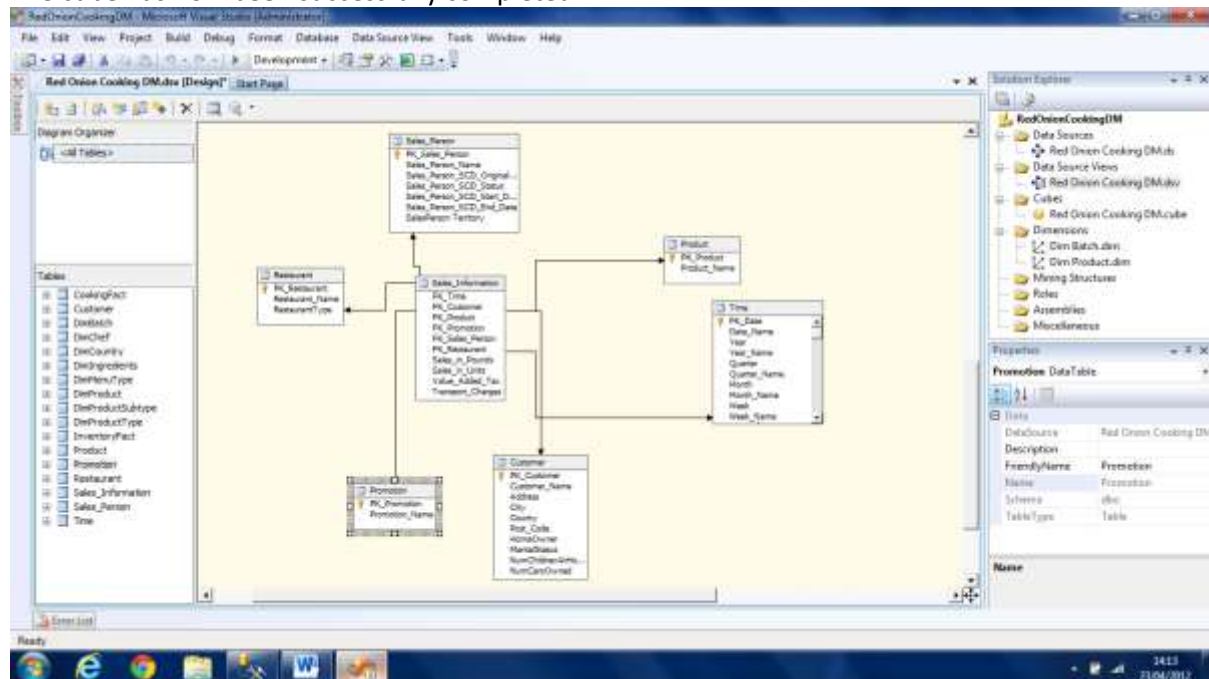
Business need: To perform multidimensional analysis on the information in the Cooking data mart, we now need to create an OLAP cube on top of an existing data mart.

The Data Source View for the RedOnionCookingDM data source view



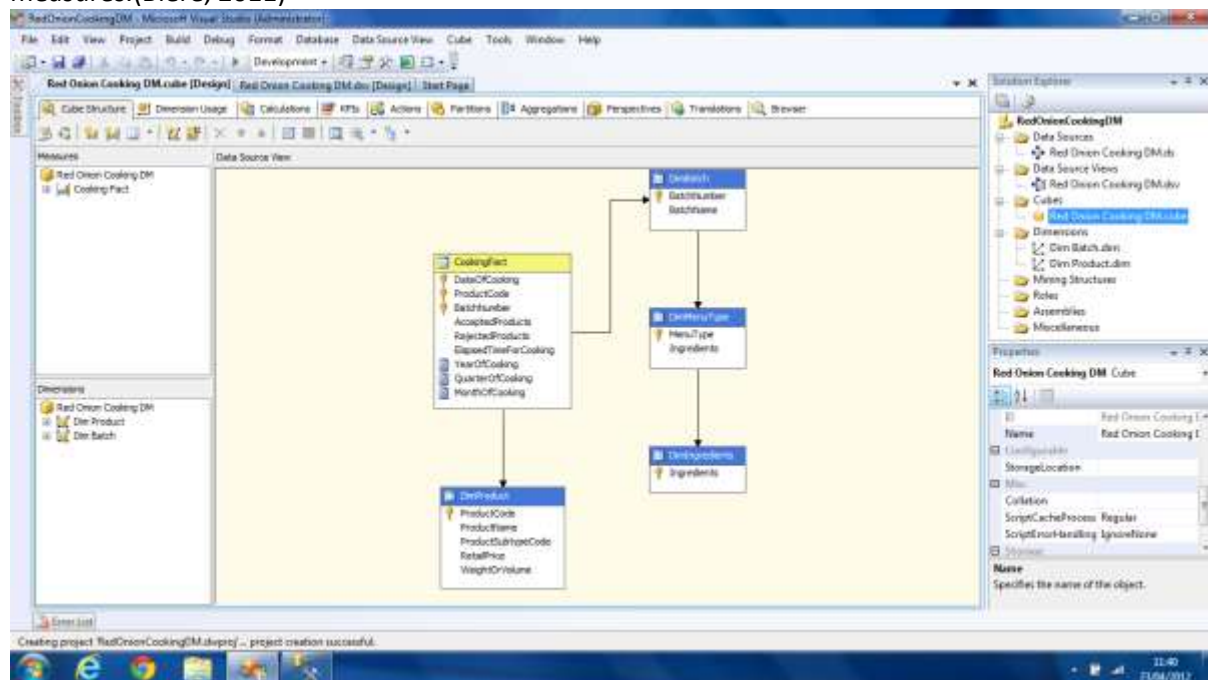
There is no time dimension, which has to be created manually.

The cube has now been successfully completed.



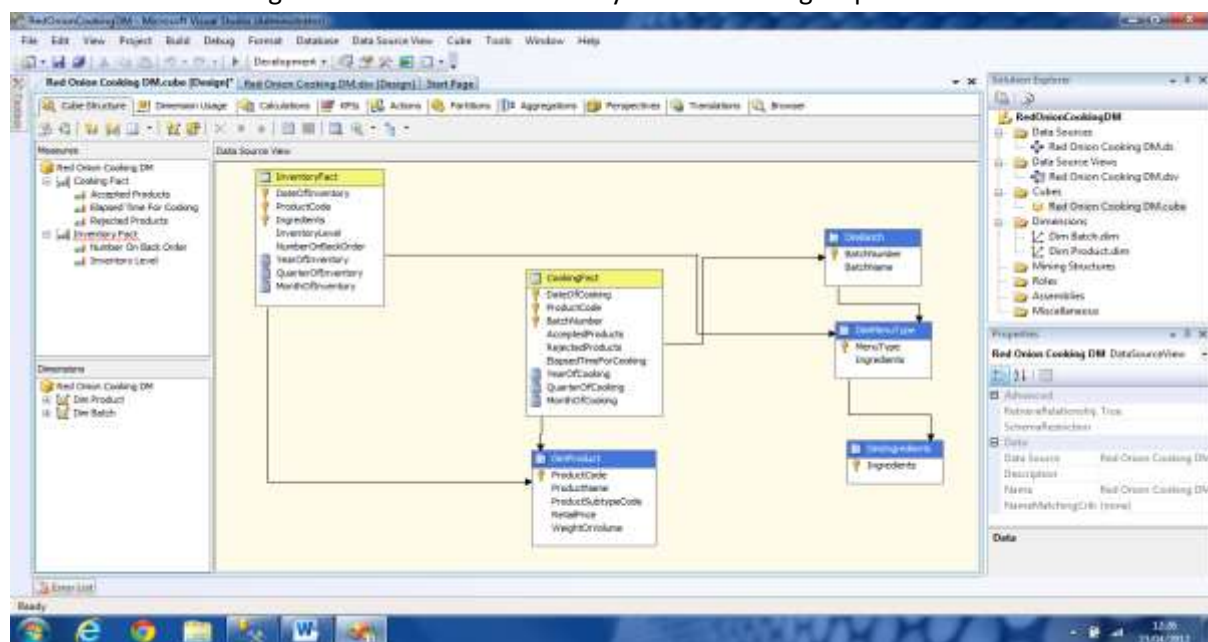
Measures

Measures provide the actual information that users of the cubes are interested in. They are the bits of numerical data that is needed to aggregate. They come from the fields in the fact tables in the data mart. SQL Server Analysis Services provides a number of features for managing measures. (Biere, 2011)



MDX is a special language designed to handle advanced formulas and mathematics required by OLAP analysis. MDX has advanced features for navigating through the hierarchies and dimensions of OLAP cubes. The features are not found in T-SQL.

The RedOnion Cooking DM cube with the Inventory Fact Measure group

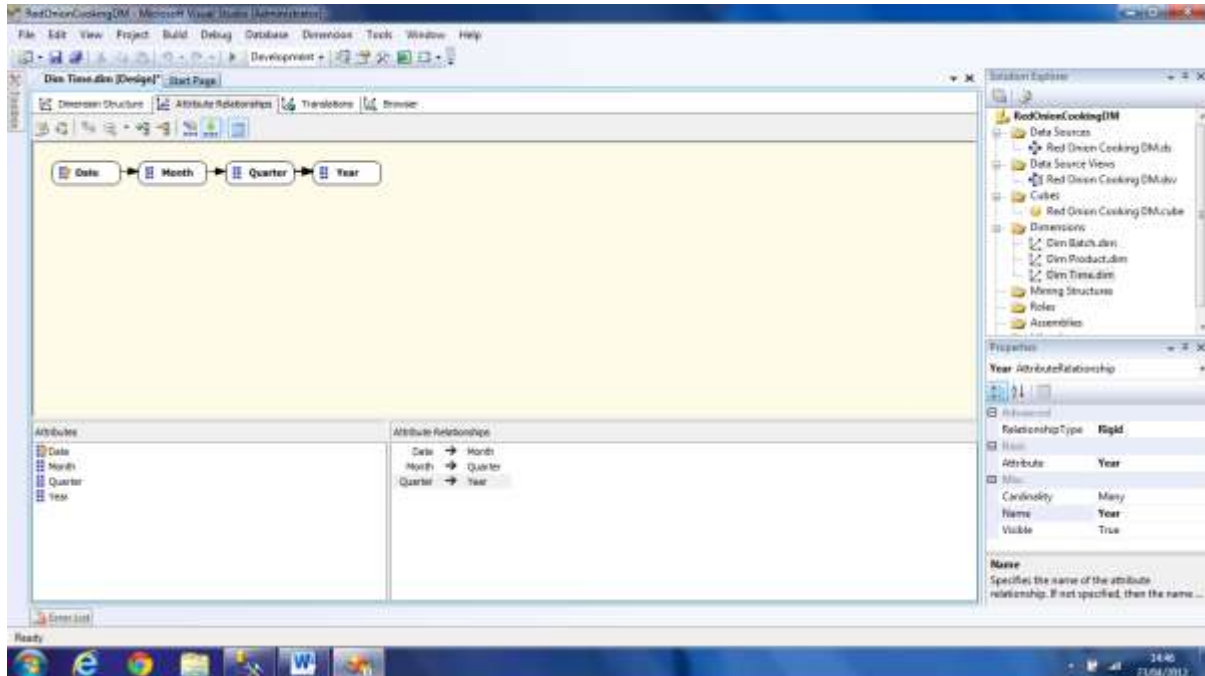


The red wavy line appears under the entry for Inventory Fact measure group in the Measures window. The reason for this error notification is because we have not yet related this new measure group to any dimensions.

Dimensions

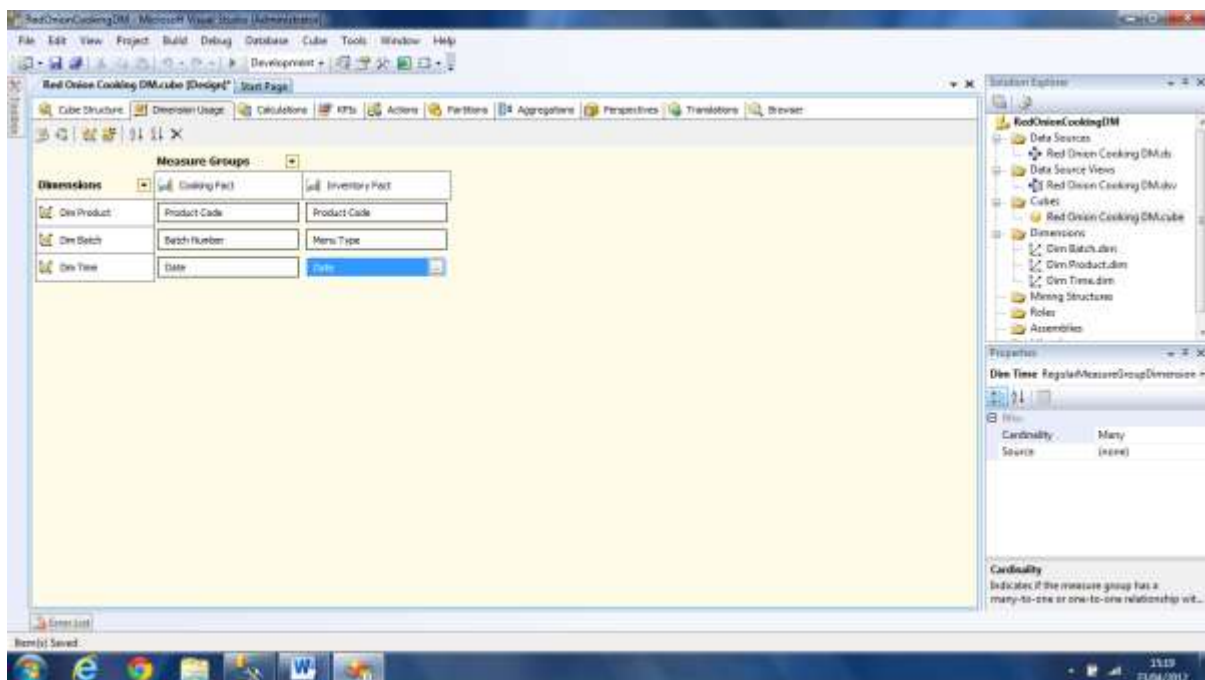
Dimensions give cubes their true analytical power. They enable us to slice and dice the measures in the cube until we find meaningful BI hidden among all of the numbers.

An Attribute Relationships tab



Business need: - We need time dimension in the RedOnionCookingDM cube to be able to perform any meaningful analysis on the cube.

The Dimension usage tab of the RedOnionCookingDM cube

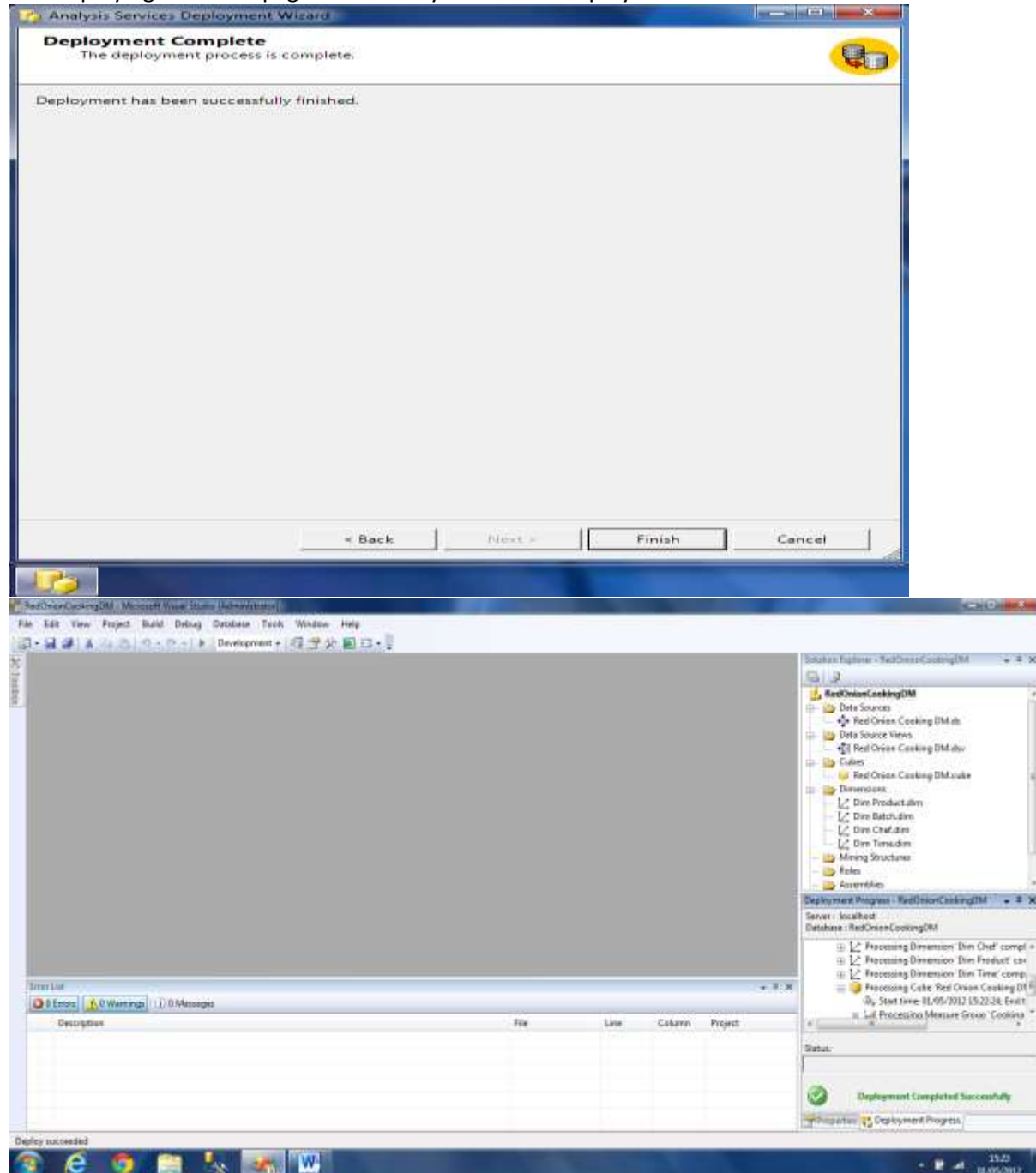


Special features of OLAP Cubes

Deploying and Processing OLAP Cubes

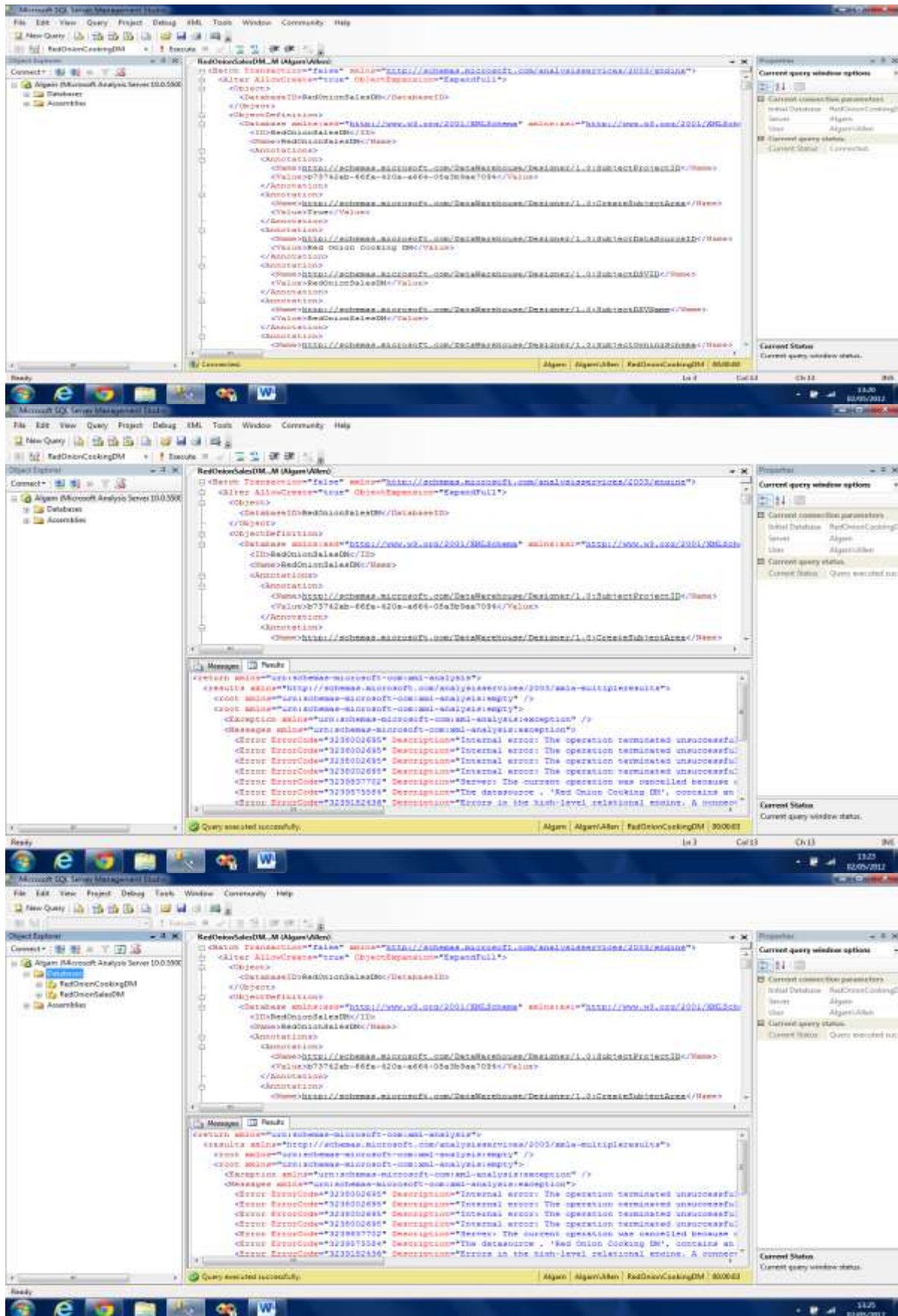
We can deploy the cubes to SQL Server Analysis Service databases, before we can begin to query aggregates from cubes. Special features available in OLAP cubes will be become available after deployment.

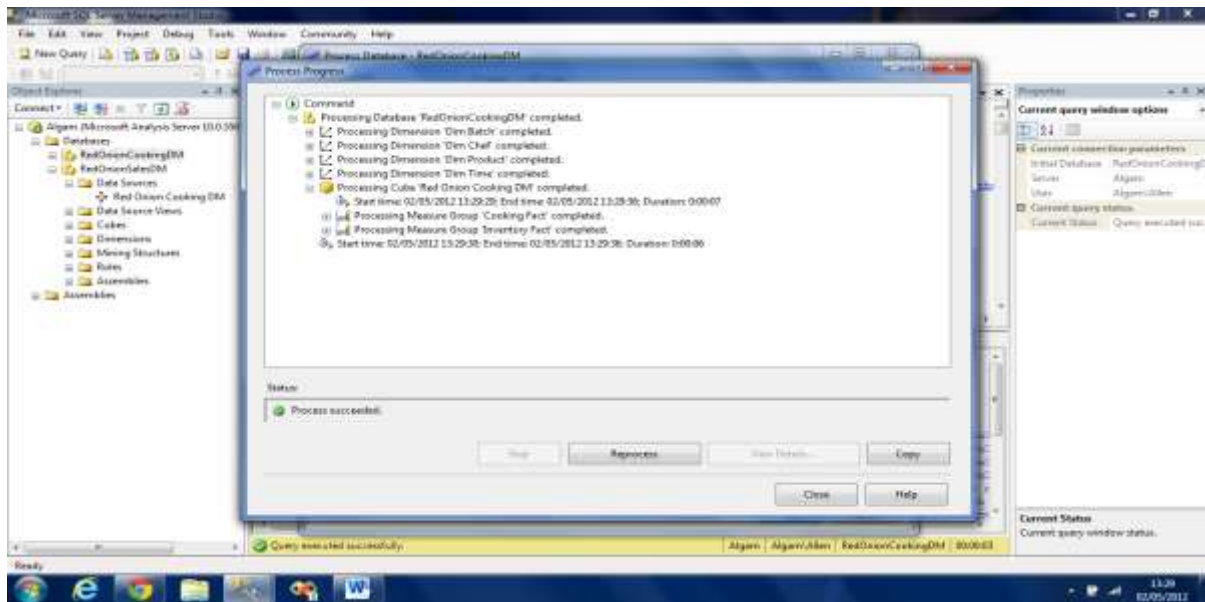
The Deploying Database page of the Analysis Services Deployment Wizard



RedOnionsalesDM deployment

The SQL Server Management studio executes the script and creates the RedOnionsalesDM Analysis database.





Key Performance Indicators (KPI)

Key Performance Indicators represents performance measures against strategic objectives. For example:

- **Customer Performance** Metrics for customer satisfaction, customer retention, customer loyalty, speed and accuracy of issue resolution.
- **Sales Operations** New pipeline accounts and conversion of inquiries into leads.
- **Service Performance** Delivery performance, return rates, customer complaints resolution rates and repeat business.
- **Sales forecast / plan** Metrics for forecast-to-plan ratio and total closed contracts.
- **Inventory Levels**
- **Profitable levels**

In many instances these metrics represent critical drivers of strategic outcomes.(E. Turban, 2011a) The goal of using Business Intelligence to develop KPI is to provide our restaurant decision makers with the following:

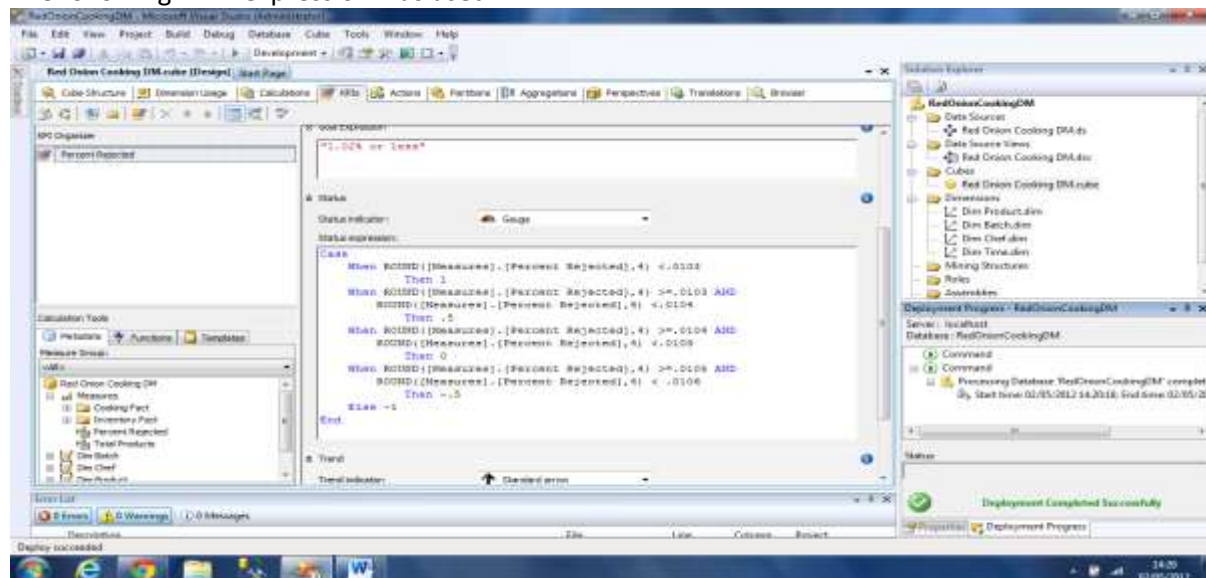
1. Detect events – can uncover fraudulent events in say procurement
2. Prompt Decision Makers to take corrective action – for example substitute an ingredient which may be out of stock from one supplier.
3. Analyse data in real time
4. Collect data about the operational processes themselves(R. Sabherwal, 2011)

In Microsoft SQL Server decision makers often monitor these key aspects of the restaurant at a single glance. KPIs are often used as part of a digital dashboard. They can be used by restaurants to:

- Communicate and refine its business strategy through balanced scorecards for management
- Increase visibility of the restaurant's strategic goals
- Increase morale and motivation and empower users – by giving workers the appropriate tools to empower them to work proactively
- Provide a consistent view of the business – right information to the right decision maker at the right time.
- Increase coordination of activities that contribute to the restaurant's competitiveness.(R. Sabherwal, 2011)

Business Need The KPI was created showing the status of the food per cent rejected as a calculated measure.

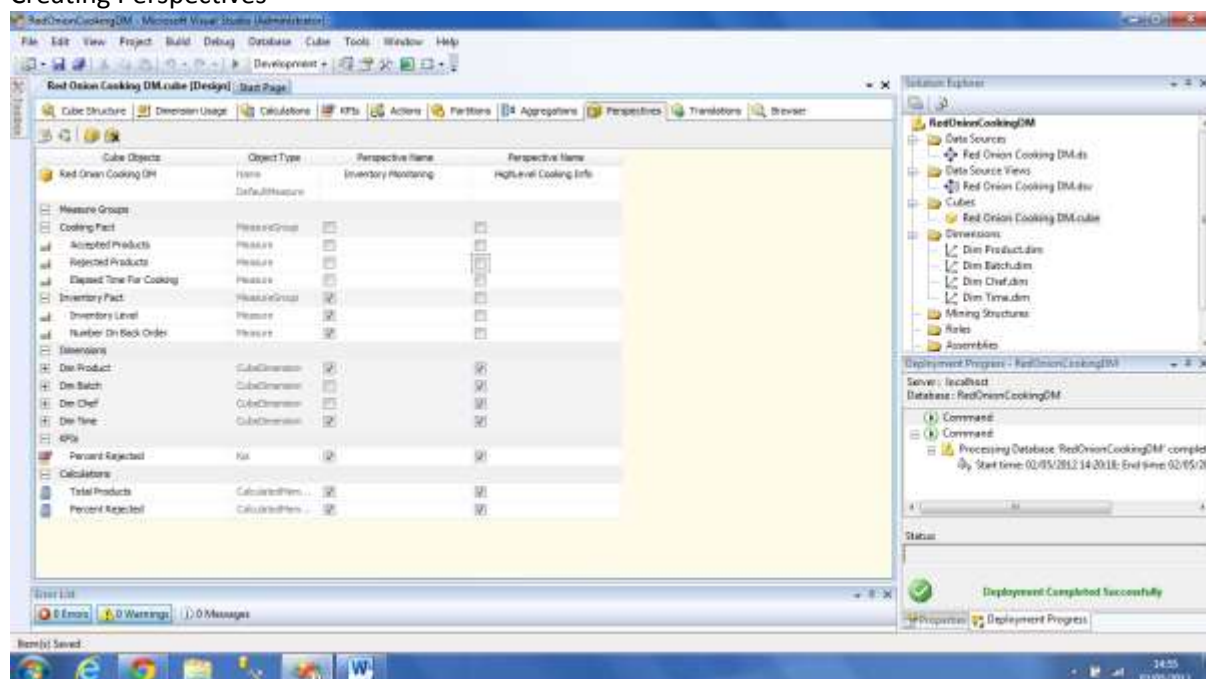
The following MDX expression was used.



Perspectives

In life, different objects look different to different people depending on how you look at them – depending on your perspective. In SQL Server we can define different perspectives so that the cubes look different depending upon the user. This means we can provide our users with what they need and not overwhelm them with things that are not necessary.

Creating Perspectives



Setting Security within an OLAP Cube

Perspectives are very useful for organizing Restaurant information in a cube, but it does not limit access to only those items. To secure portions of the cube from unwanted access we need to define security roles for the users.

Defining security roles permits or restricts access to items within a cube, measures, dimensional members and dimensions. Users can be prevented from doing certain administrative tasks like viewing or processing cubes and structures. These roles are associated with Windows logins and Windows groups. (Larson, 2009)

Data Mining

The data that the restaurant has is its life history. It contains information from where the restaurant is coming from. It will also provide clues on where the restaurant is going to. Trying to make sense of all the data is where data mining comes in.

Data mining is defined as “ the use of a complex mathematical algorithm to sift through data to identify patterns, correlations, and clustering within the data”(Larson, 2009)

Regression

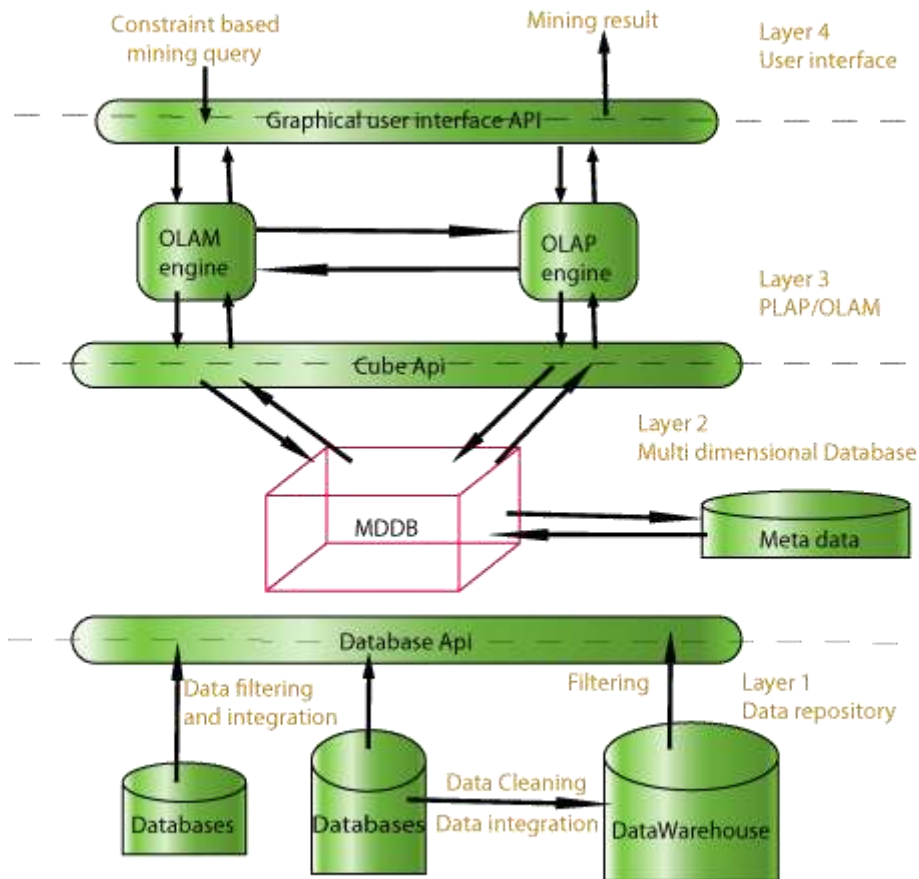
Our restaurant food or drinks may be seasonal, or with peaks when they are football matches. The regression algorithm analysis discovers these peaks while analysing sales figures from the past and then continues those trends when predicting future sales.

Segmentation

If groups of companies normally book their Christmas parties with us, an analyst may look at the most profitable group for the restaurant. Using this information this group of companies might then become the focus of our sales and marketing efforts.

Sequence analysis can be applied to events occurring in a sequence. If customers buy products in an certain sequence we can then predict which products can be bought next.

With data mining we can determine with confidence what the present trends are. We can make intelligent decisions based on these trends.

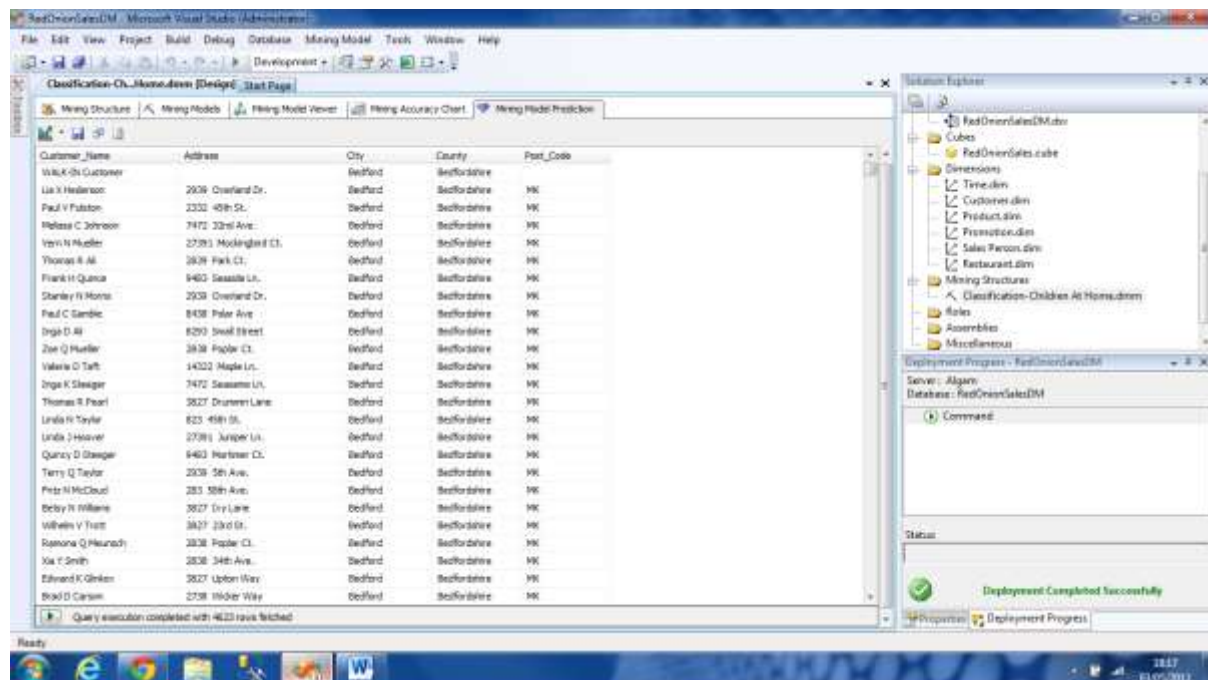


Architecture of OLAM (On line Analytical Mining)(Dataminingtools, 2009)

Defining a Data Mining Model

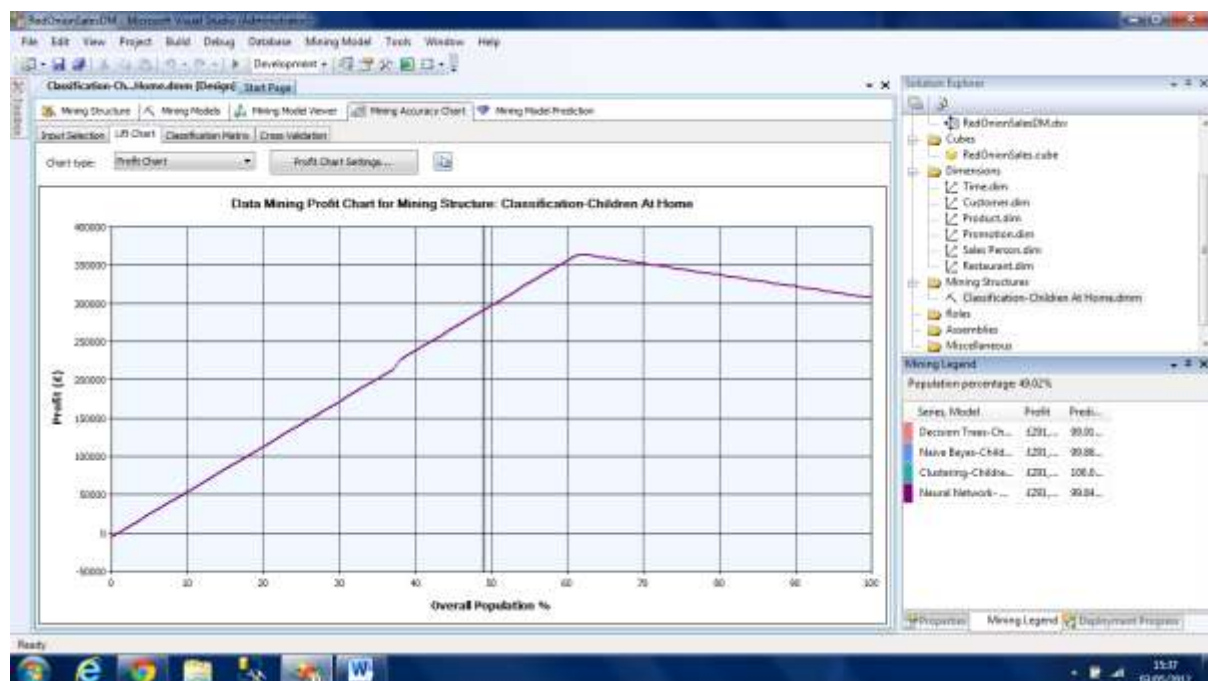
Business Need Restaurant marketing department would like to do a targeted mailing promotion to customers with 2 children at home. The marketing department does not have a list of customers without children. It has a list of 5000 customers with number of cars owned, Marital status and whether their property is rented or not.

Creating a Data mining Model (please refer to screen shots in appendix for more information)



Let us suppose Red Onion purchases a mailing list with 100 000 names. Fixed costs are £5000. Variable cost £3 and on average the return per individual is £15.

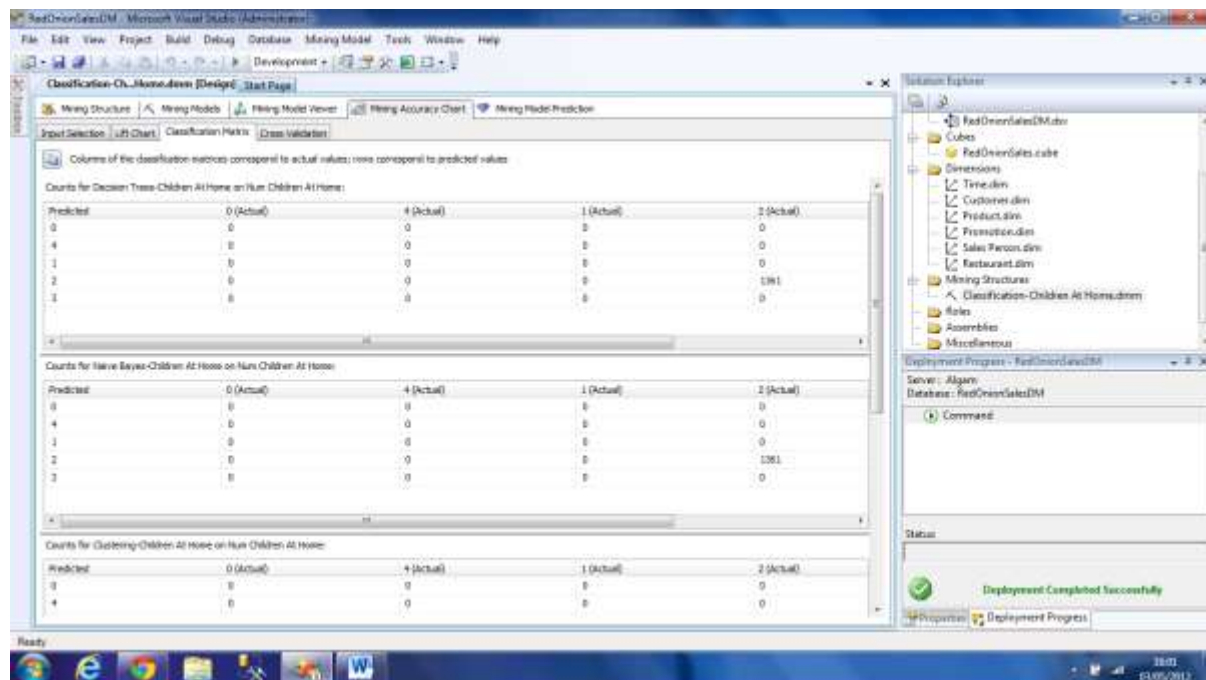
We can create a profit chart



From the mining model prediction diagram RedOnion Will make about £360000 in profit after the cost of mailing. Mailing to more people does not significantly improve our chances of getting sales, although there is any increase in costs. After this point, the expected profit is expected to go down.

Classification Matrix

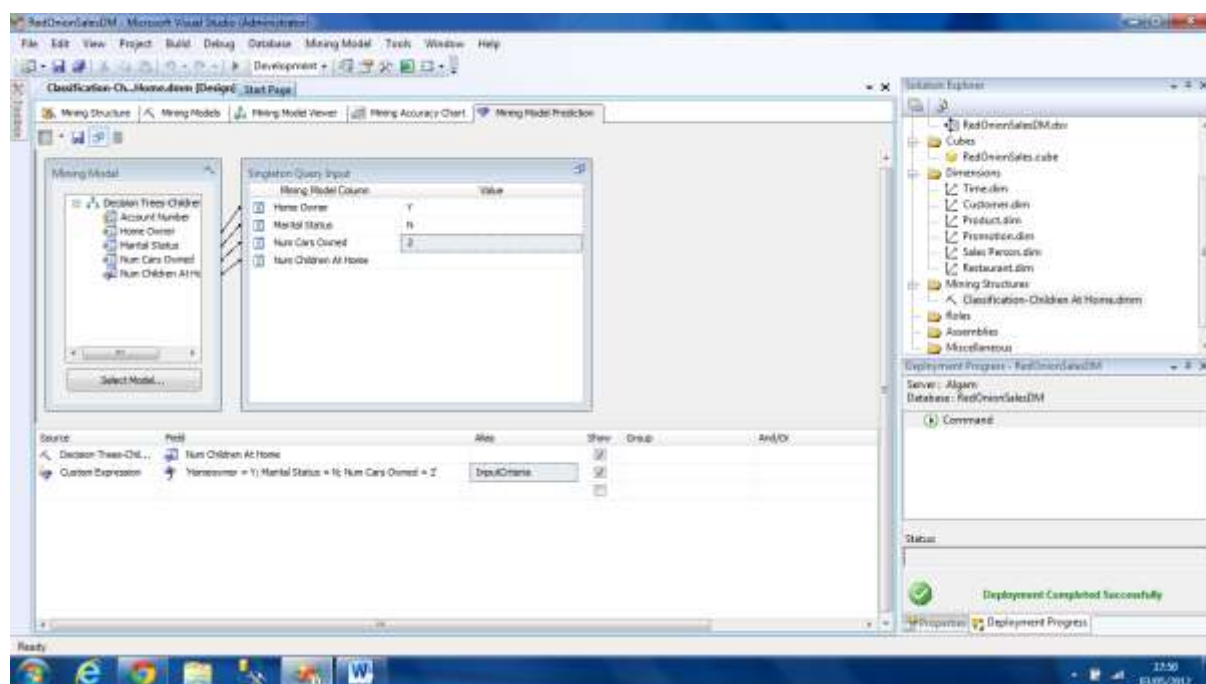
Obviously, we do not expect perfect prediction results from the mining models. The Classification matrix will let us view what mistakes our models have made.

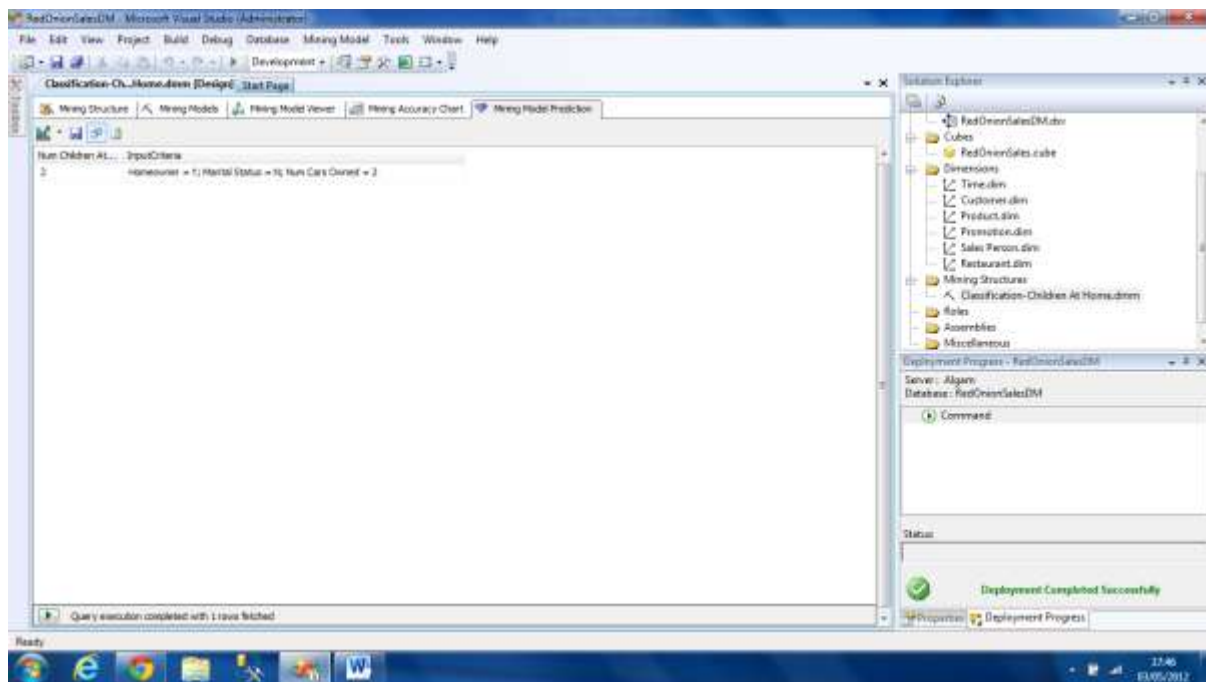


Cross Validation

This is a tool to compare the accuracy of several mining models within the mining structure.

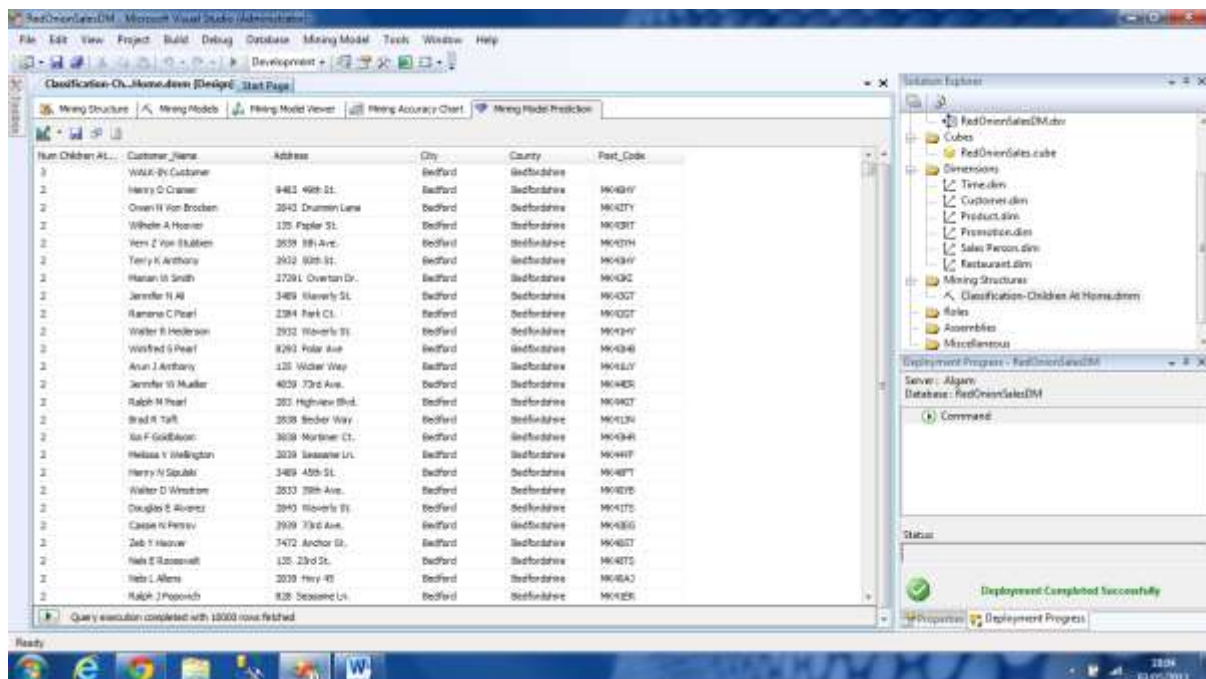
Creating a Singleton Query





The model predicts, for someone who is a homeowner, not married and owns 2 cars will most likely have 2 children at home.

Creating a Prediction Join Query using the Mining Model Prediction



The marketing department can see households with the number of children at home in the first column.

A (Data Mining Extensions) DMX prediction join query

```

SELECT
    t.[Customer_Name],
    t.[Address],
    t.[City],
    t.[County],
    t.[Post_Code]
From
    [Decision Trees-Children At Home]
PREDICTION JOIN
    OPENQUERY([Red Onion Cooking DM],
        'SELECT
            [Customer_Name],
            [Address],
            [City],
            [County],
            [Post_Code],
            [HomeOwner],
            [MaritalStatus],
            [NumCarsOwned]
        FROM
            [dbo].[Customer]
        ') AS t
ON
    [Decision Trees-Children At Home].[Home Owner] = t.[HomeOwner] AND
    [Decision Trees-Children At Home].[Marital Status] = t.[MaritalStatus]
AND
    [Decision Trees-Children At Home].[Num Cars Owned] = t.[NumCarsOwned]
WHERE
    [Decision Trees-Children At Home].[Num Children At Home] =2

```

With these DMX queries, you can write queries in SQL Server Management Studio against the mining models without the graphical interface. Security needs to be set appropriately so that power users do not damage accidentally or maliciously.

Delivering BI with Reporting Services

After creating a report, it can then be sent to the user through the Report Manager website. It may be sent in response to a web service request that came from a program. It can also be emailed to a user who has subscribed to the service.

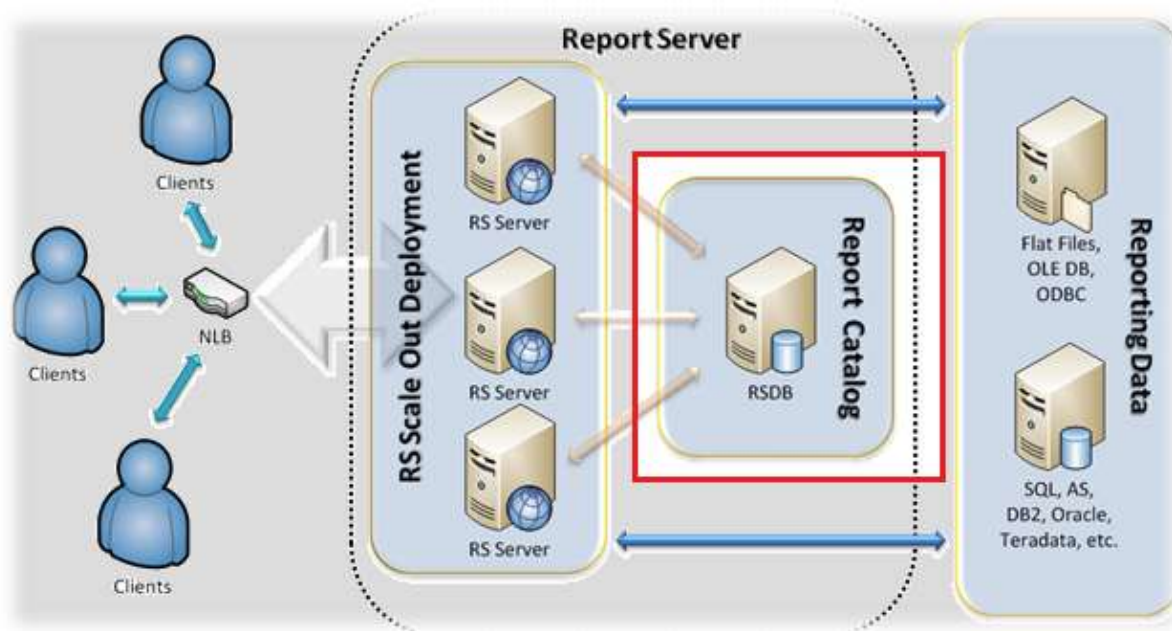
Report Manager Website

Users can request reports from the report server through the Report Manager Website. Users can search for the reports they want from the Report Manager Website. Report Manager can set security roles for each report. Security roles control which folders and reports can be viewed by the user.

Reports in Report Manager are always displayed as HTML (Hypertext Mark-up Language). Users can then export it into any other available format.

Web Service Interface

Reports can also be delivered to other software applications. This is done through a series of web services. A program calls for a report and a completed report is returned to the program that originated the request as a response to the web service request.



Reporting Services Scale Out Architecture (Lee, 2008)

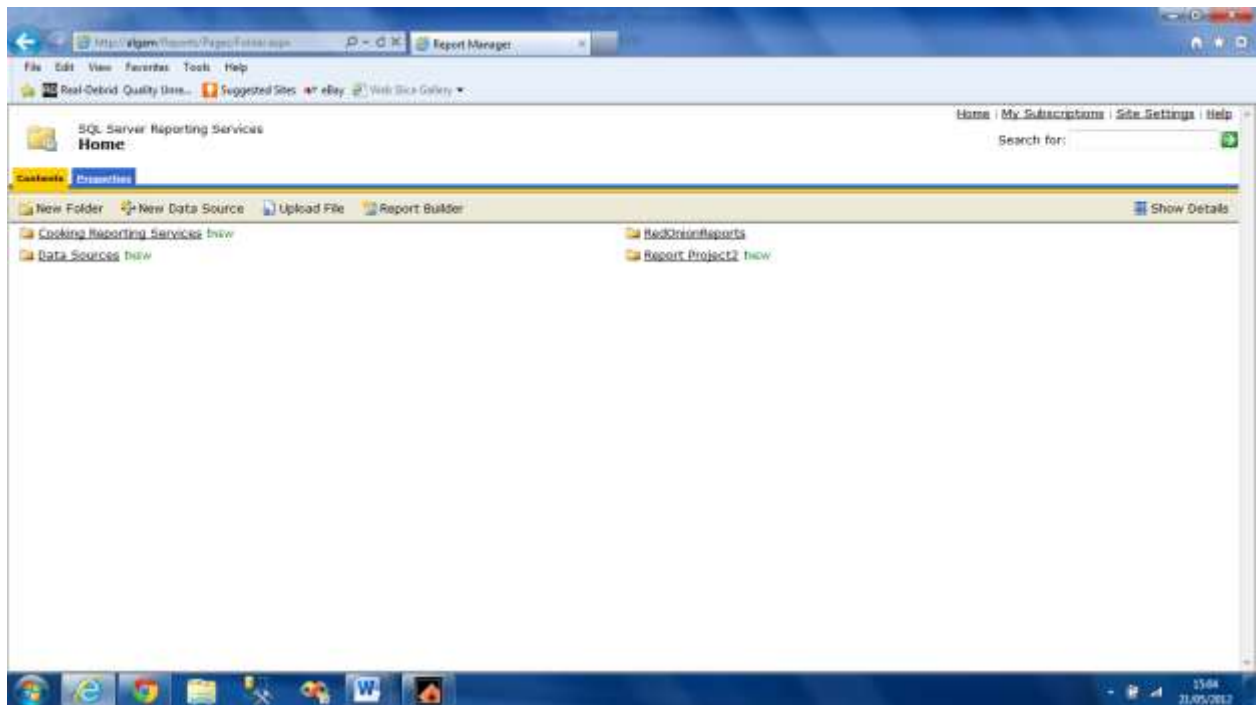
The default URL for the Reporting Manager is as follows, where **MyComputerName** is the name of the computer hosting Reporting Services.

<http://MyComputerName/reports>

Deploying the model

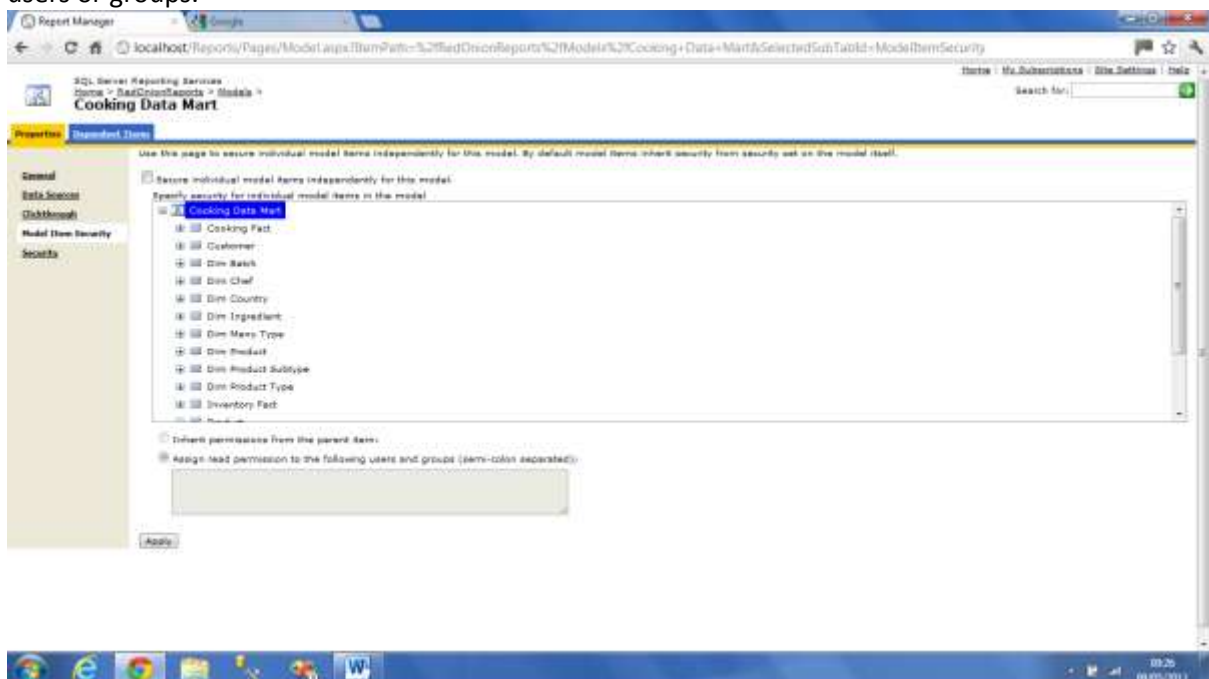
On entering the following URL on the browser of choice, <http://Algam/ReportServer> you can view where the model was deployed. You can also launch the Report Builder without first going to the Report Manager by using this URL

<http://Algam/ReportServer/ReportBuilder/ReportBuilder.application>



Securing the Model

The Model Item Security page provides a way to make security role assignments at a more granular level. On this page you can assign read permissions for individual entities or attributes to individual users or groups.



The Item Model Security page

Cleaning Up the Report Model

There are a number of refinements that still have to be done to the model by hand before the users can retrieve the reports.

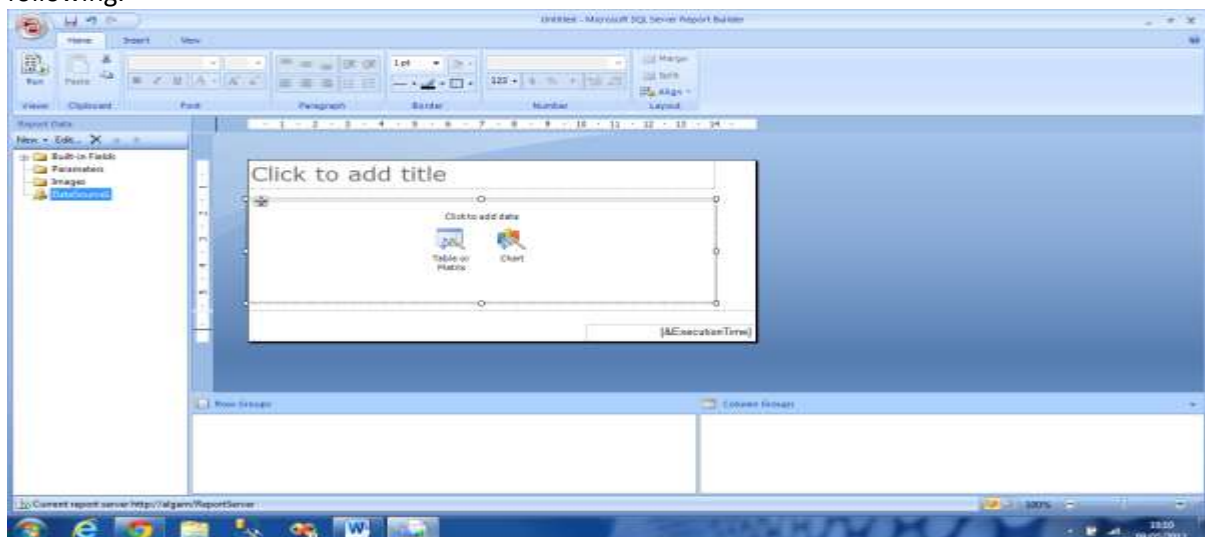
- Remove unwanted attributes
- Remove numerical aggregates that do not make sense
- Rename entities if necessary
- Clean up the Lookup folder
- Use folders to organize roles, entities and attributes
- Rearrange attribute, role and entity order
- Manually create calculated attributes
- Add meaningful descriptions
- Create perspectives

Using Reporting services without the Report Manager

For some unknown reason I could not have SharePoint or Web Developer run on my Windows 7 home edition without any problems. Some files are missing and some cannot install properly without uninstalling SQL Server and Visual Studio first.

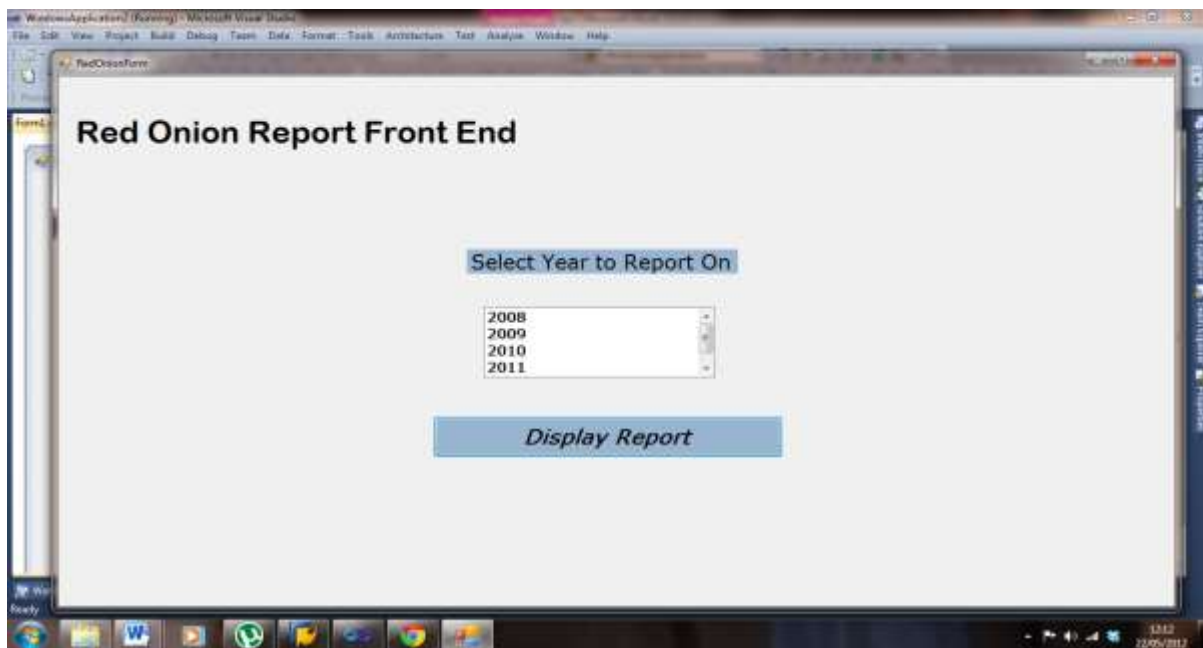
Report Building

Users can use Report Builder to build reports. The Report Builder screen shots look like the following.

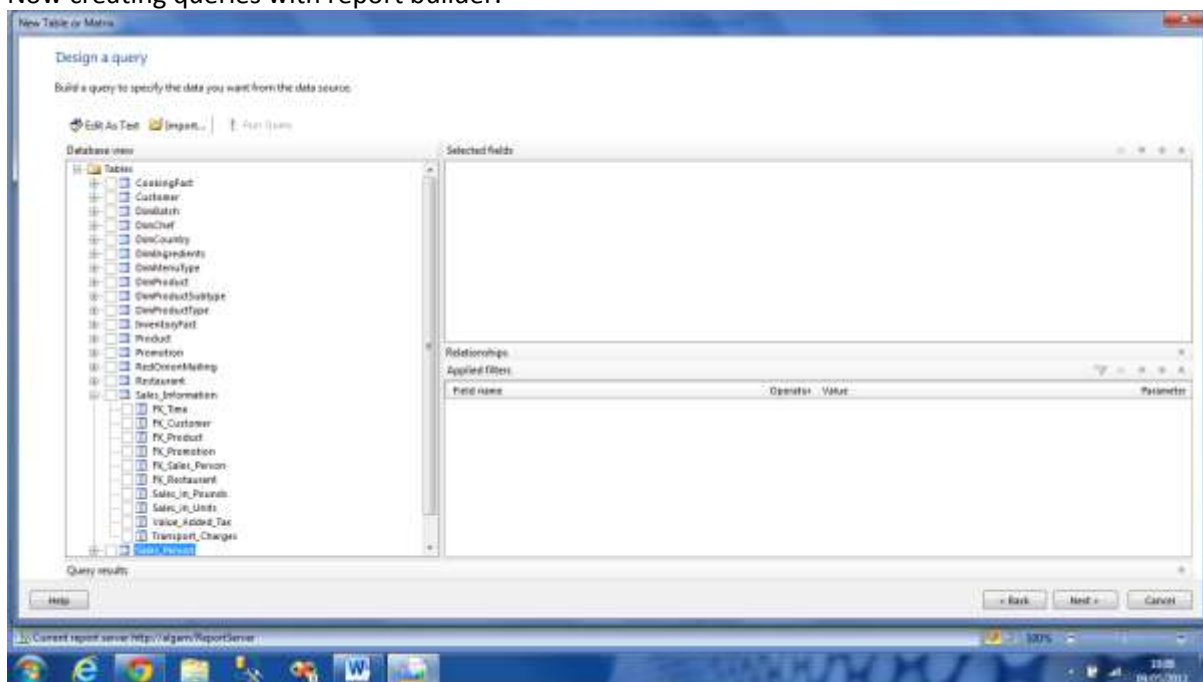


For some unknown reason the Front-End web form could not come out on the project computer. The following web form was then done on other computer, just to show how it was going to come out.

The reports are deployed on a web site which does not look very good, that is why I wanted the other form.



Now creating queries with report builder.

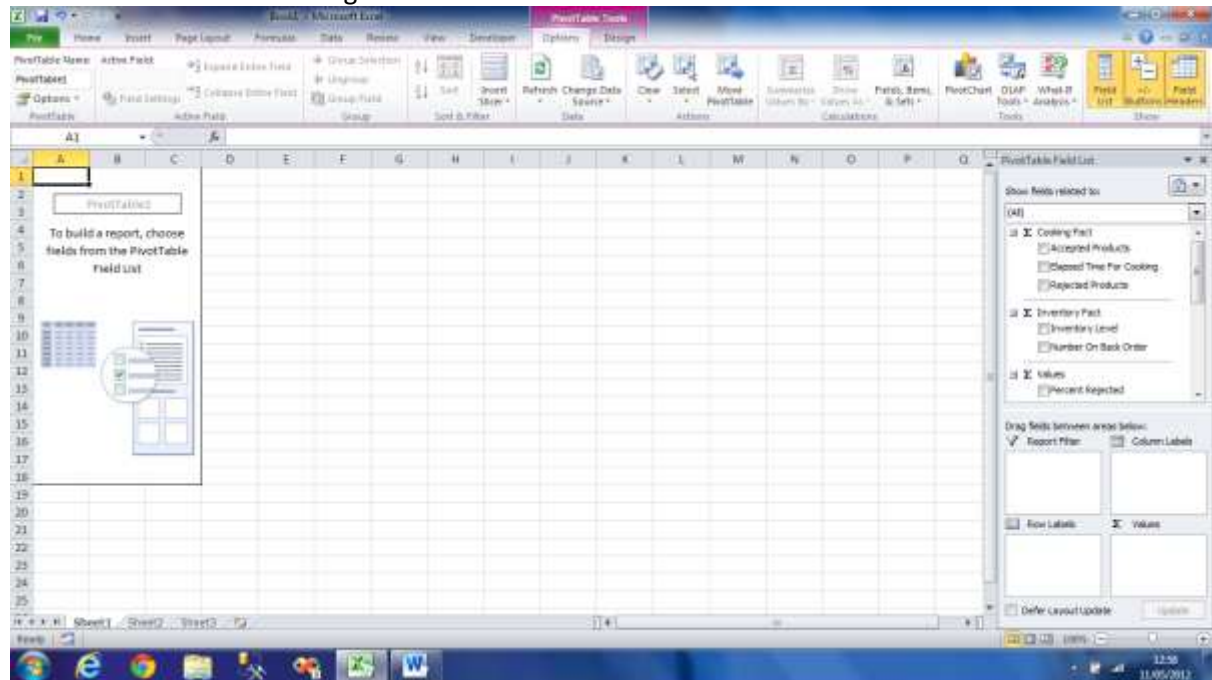


Microsoft Excel

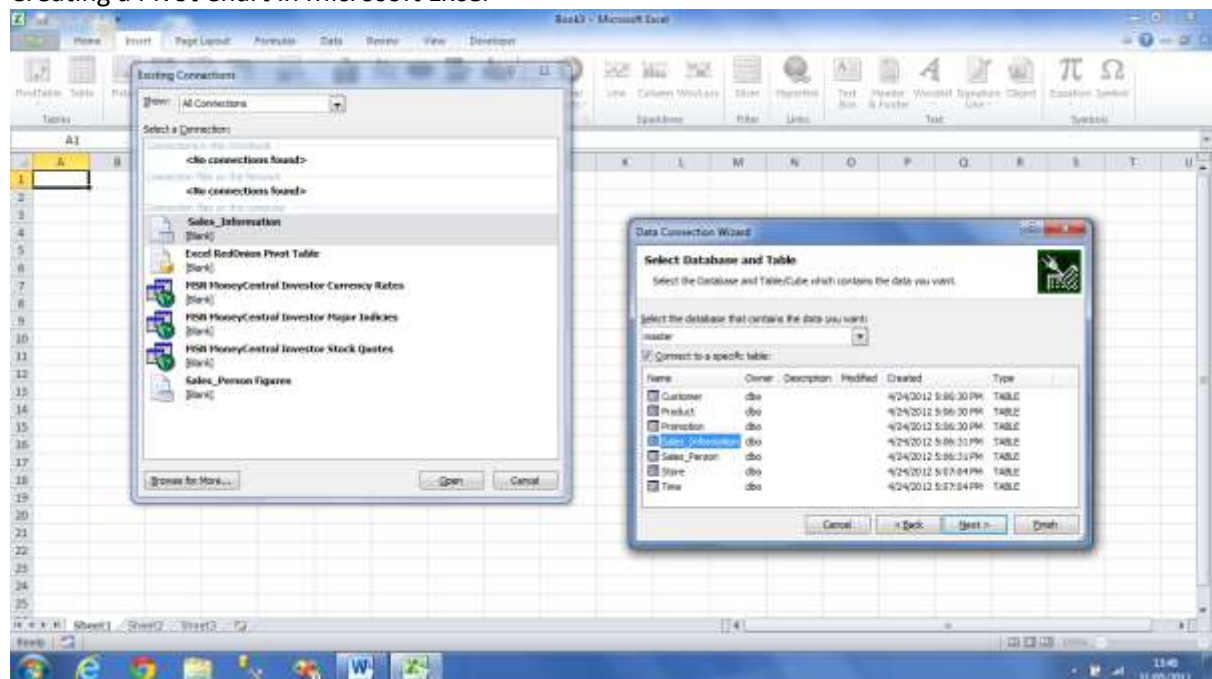
Most decision makers are quite comfortable with applications in Excel. Business Intelligence information can be incorporated and manipulated in MS Excel. You can do this with Pivot tables and Pivot Charts.

Creating an Excel Pivot Table

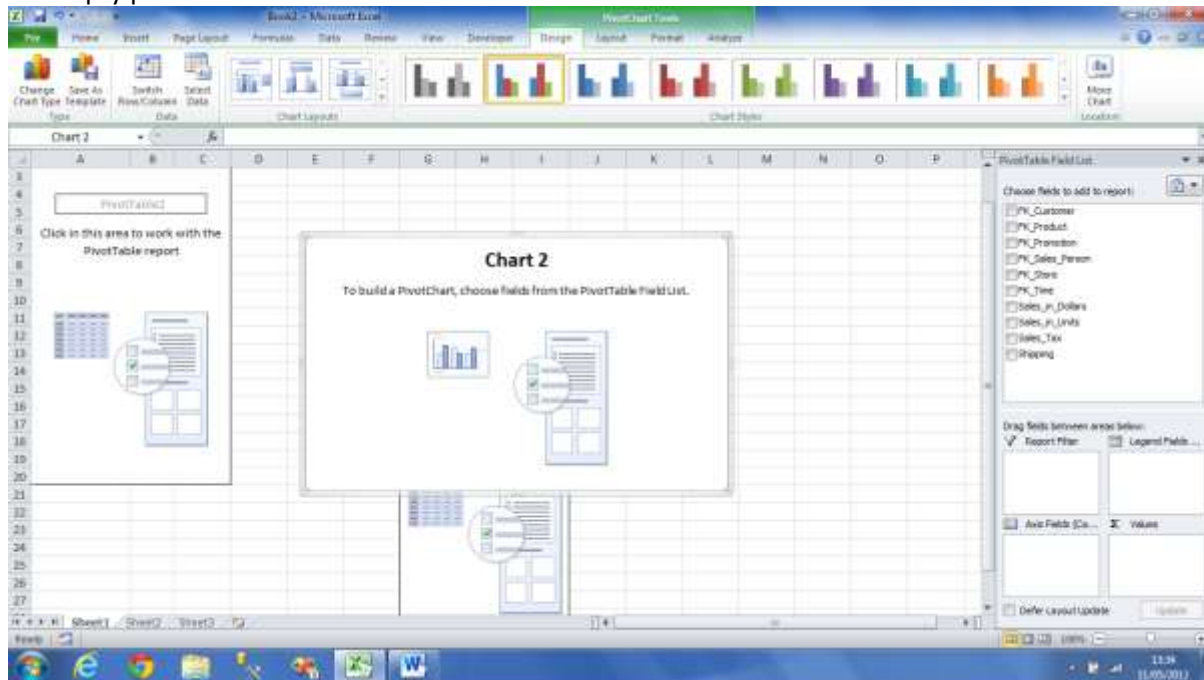
A "Create Pivot Table" Dialog box



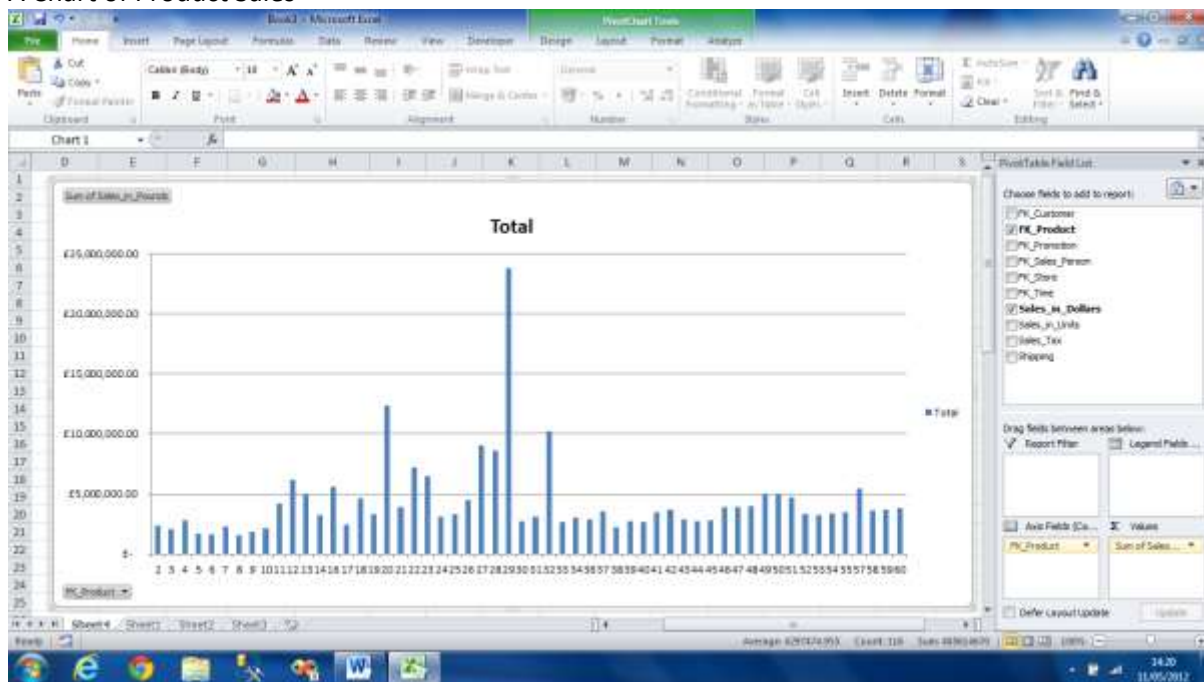
Creating a Pivot Chart in Microsoft Excel



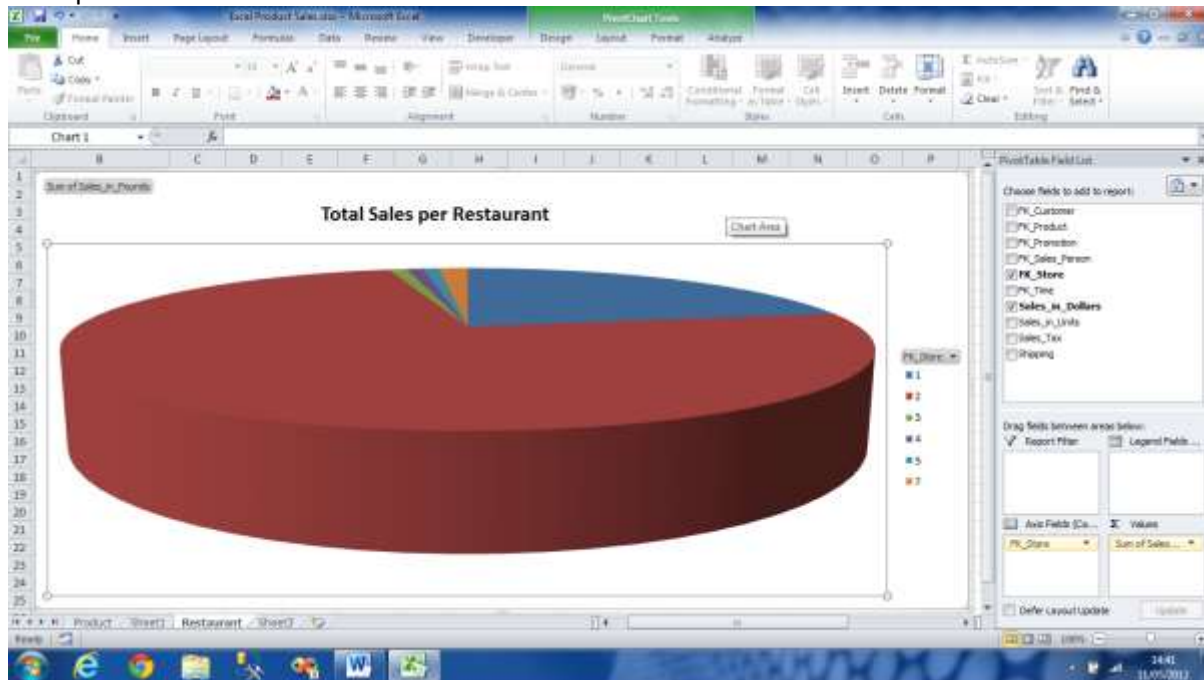
An Empty pivot Chart



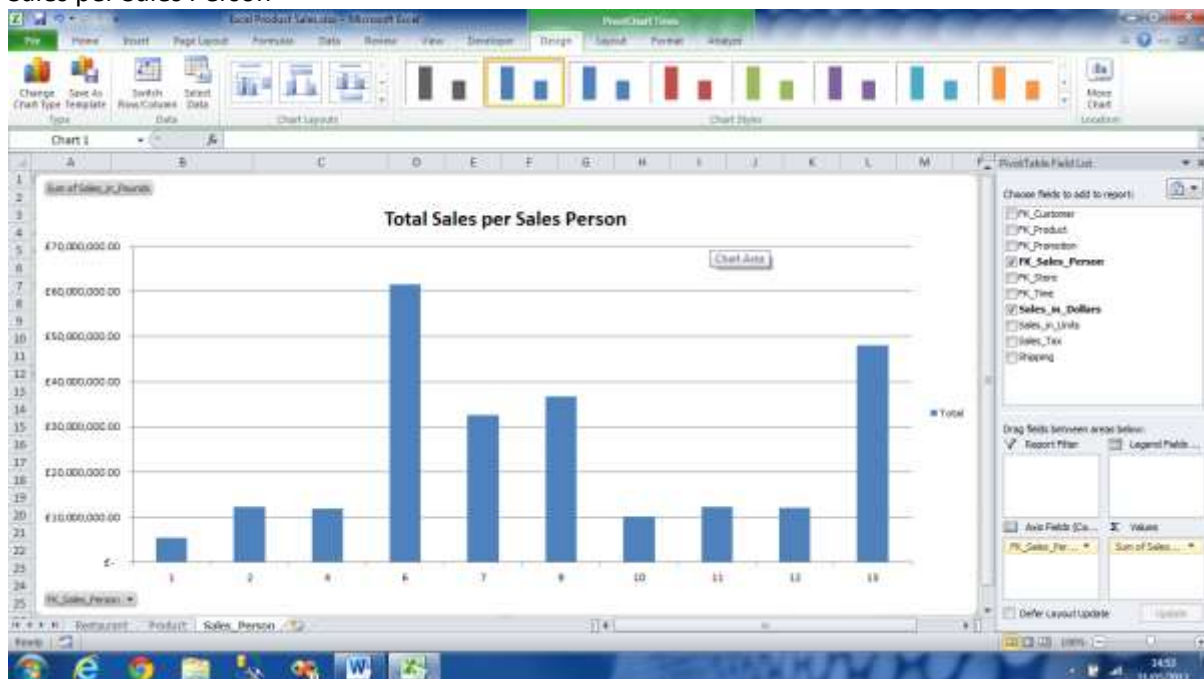
A Chart of Product Sales



Sales per Restaurant



Sales per Sales Person



Improvements

To enable all the users to design their own reports in a familiar environment, the next project would be better if designed straight from data warehouse not from data marts.

Windows 7 Home edition, operating system was not the best choice to implement this project. The reports would have been better looking if the operating system was Microsoft Windows Server 2008 Enterprise Edition. With this operating system you can install the latest Microsoft Web Developer 2012 and Microsoft SharePoint 2012.

Overall Evaluation

Overall the Project went well, and the reports would give a business decision maker an edge over the competitors. It provides accurate information when needed and a real time view of the Restaurant performance. Such information is a must for all types of decisions, for strategic planning and survival. Some of the Business values of BI analytical applications are as follows:

- Personalizing customer relationships for higher satisfaction and retention.
- Targeting customers based on their need to increase their loyalty to the restaurants' product lines.
- Increasing campaign profitability by focusing on the most likely to buy
- Make individual business interaction decisions based on the overall profitability of the customers.
- Quickly determine fraud and take immediate action to minimize costs
- Preventing loss of high value customers and letting go of lower value customers
- Interacting with customers based on their preference and the need to manage costs.(E. Turban, 2011a)

2nd Survey Results

Response Summary

Total Started Survey: 24
Total Completed Survey: 24 (100%)

PAGE: 1



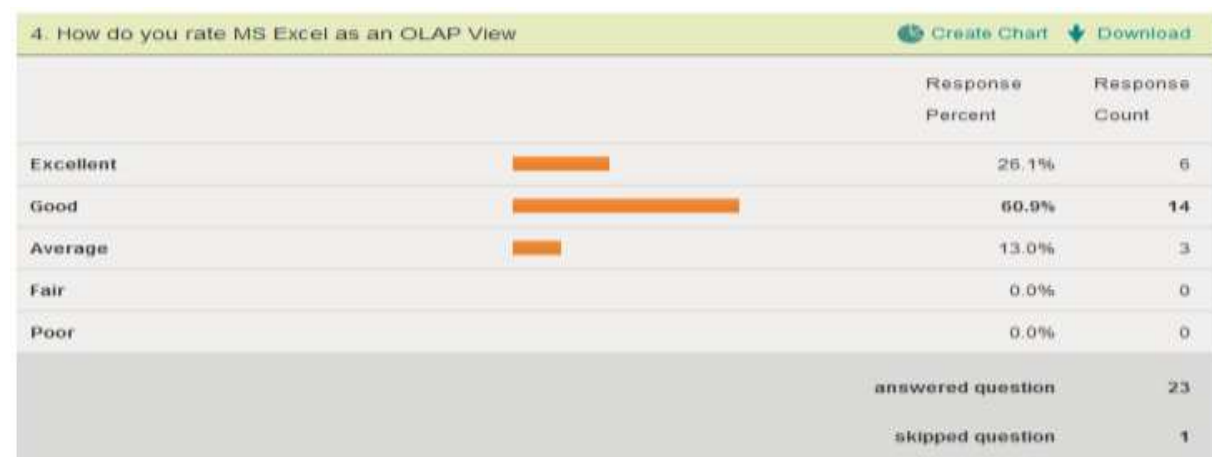
50% of the people surveyed design their own dashboards



75% of the people surveyed believe predicative analysis technologies will achieve greater success with Business Intelligence projects.



The majority of BI projects of our respondents are less than five years old.







Most people consider Microsoft Excel as a good Business Intelligence tool.









Most of the people surveyed believe the Dashboards Charts are quite good.

6. Any other insights or comments you wish to provide to make the BI initiative successful?		
	Response Count	
	0	
answered question	0	
skipped question	24	

Unfortunately no one gave any suggestions to improve the BI initiative.

7. What best describes your role?			Create Chart	Download
		Response Percent	Response Count	
Corporate IT Professional		16.7%	4	
Business User		45.8%	11	
Hybrid Business / IT Person		37.5%	9	
Vendor (Sales, Services, Support, Development)		4.2%	1	
Academic		0.0%	0	
answered question			24	
skipped question			0	

Our sample includes mainly Business people who like computers.

8. Which best describes your business unit or functional unit			Create Chart	Download
		Response Percent	Response Count	
Finance		8.3%	2	
Sales, Marketing, Customer Service		33.3%	8	
Operations		33.3%	8	
Human Resources		4.2%	1	
Logistics		25.0%	6	
Purchasing		8.3%	2	
Other		0.0%	0	
Additional Comments			0	
answered question			24	
skipped question			0	

Most of the people in the sample are from operations

10. Privacy is respected. No information will be shared with 3rd parties. All survey results are only for this school project. May we contact you in relation to this project?			Create Chart	Download
		Response Percent	Response Count	
YES		20.8%	5	
NO		79.2%	19	
answered question			24	

Most people do not want to be contacted later. That is the reason why they did not leave any contact details.

Conclusions and Recommendations

The Project shows how easy it is to use business Intelligence tools in SQL Server 2008. Restaurant decision makers can use and also create powerful analysis tools to define, build, deploy and analyse with greater efficiency and speed.

The complexity and mystery surrounding data enterprise-wide reporting, data mining, warehousing, and integration of those items with business line applications is eliminated. The process which used to be a lengthy, risky and expensive venture is now manageable.

Many small and midsize restaurants would never dream of creating data ware houses, data marts or using OLAP cubes or data mining. These restaurants stand to gain a lot if they would implement the steps in this project. If the business projects are implemented carefully with users in mind, they can benefit from these projects.

Big restaurants can also implement BI with an incremental approach. This approach can lead to much higher success. SQL Server 2008 allows for an iterative style without the all-or-nothing approach of the past. It will enable you to get more than expected, in less time and with less money than budgeted.

Academic context and value of Project (Please also refer to the Interim report)

The Business environment keeps on changing and is becoming more and more complex. Small and medium size restaurants are constantly under pressure to respond quickly to changing conditions. They are also required to be innovative in the way they operate. Such activities require that restaurants be agile and make frequent and quick tactical, strategic and operational decisions. Making such decisions requires relevant information, data and knowledge. Processing these, to make the needed decisions quickly and on real time requires some IT support. (E. Turban, 2011b)

This project is about using Business Intelligence as computerized support. This Business Intelligence Project requires knowledge from all Business Information System subjects. (For example aligning Business Intelligence with Business Strategy, involving decision makers in the design, Regression analysis, writing scripts and so on)

I will not be surprised if Business Intelligence will be a module taught on its own after learning the other modules.

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R. SABHERWAL, I. B.-F. 2011. *Business Intelligence: Practices, Technologies and Management*, John Wiley & Sons

Appendices

Appendix A: The Project Poster

Appendix B: The Project Questionnaires

Appendix C: Interim progress report

Appendix D: Project Proposal

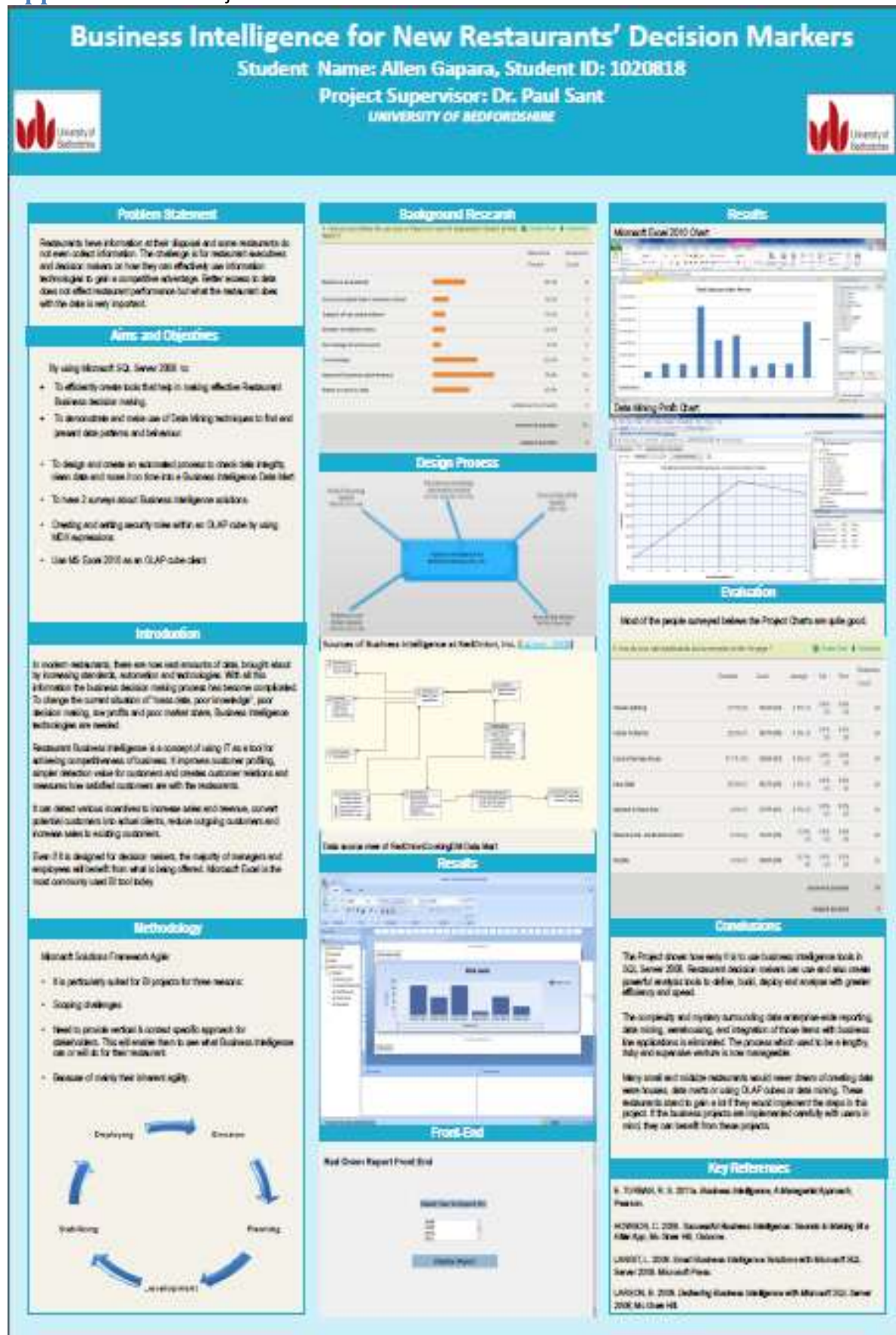
Appendix E: The structural diagrams in sequential order

Appendix F: Screen shots

Appendix G: User Guide

Appendix H: DVD

Appendix A: The Project Poster



Appendix B: The Project Questionnaires

The image displays three screenshots of an email inbox interface, likely from a web browser. The interface includes a left sidebar with navigation options (Inbox, Starred, Important, Sent Mail, Drafts, Misc, Chat) and a search bar. The main area shows a list of emails, each with a checkbox, a star icon, a recipient list, a subject line, and a date.

Top Screenshot: Shows emails from 28 Mar. The subject line for all emails is "Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...".

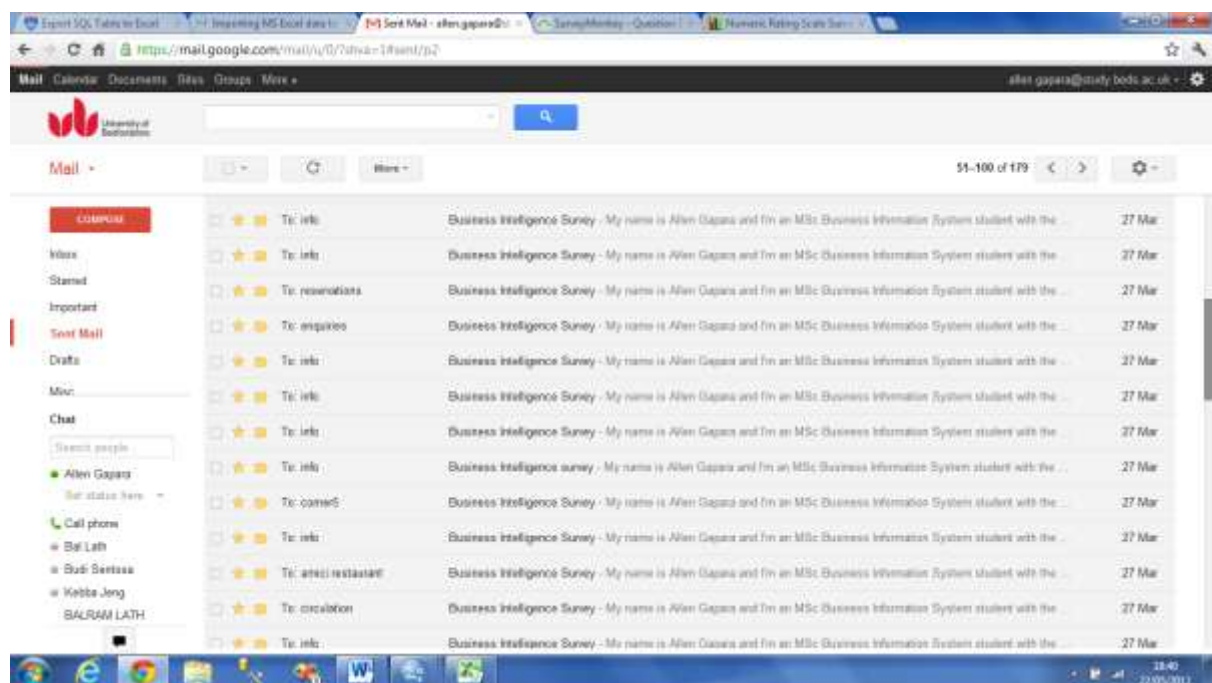
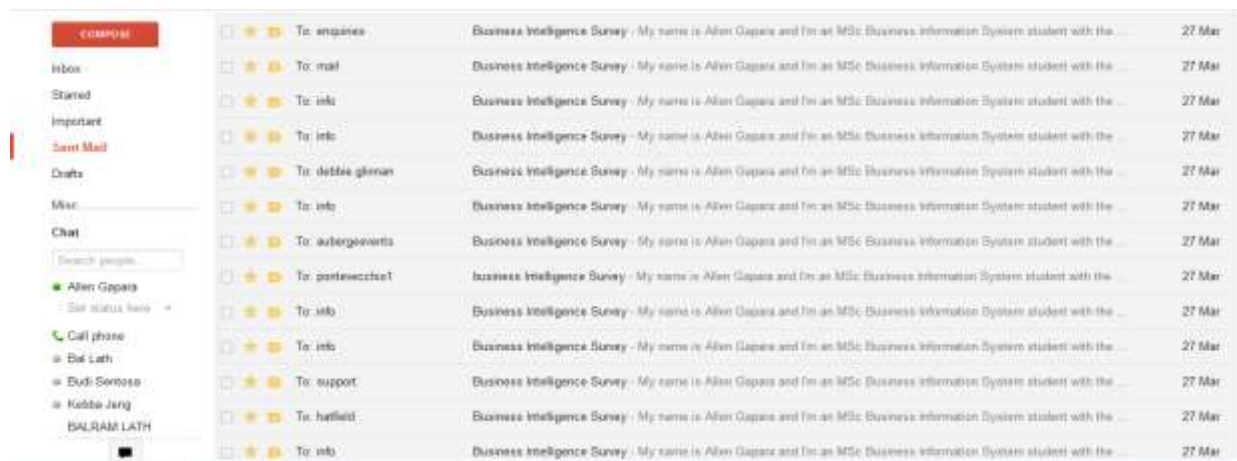
Recipient	Subject	Date
To: ladwa.zinnahj	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: ladwa.zinn...	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: H9998	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: alay	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: quid	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: leedsingham-agency	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: hotel	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar
To: info birmingham	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	28 Mar

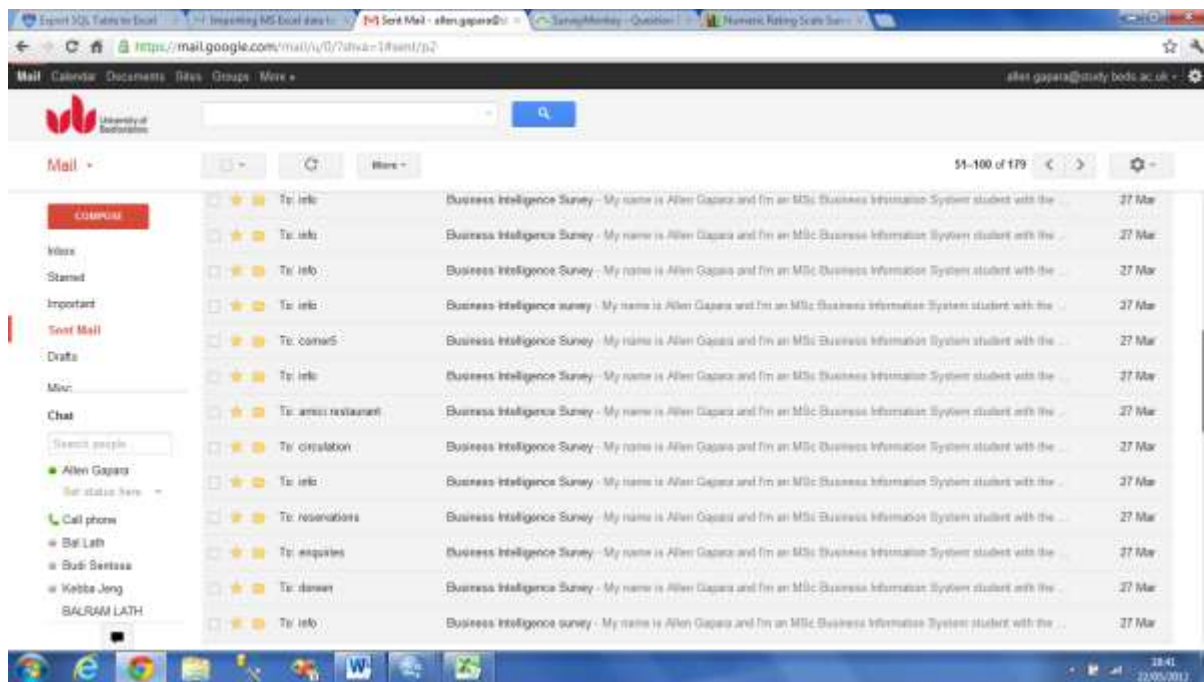
Middle Screenshot: Shows emails from 27 Mar. The subject line for all emails is "Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...".

Recipient	Subject	Date
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: reservations	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: rock	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: angares	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: alio	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: royalsuptoad	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: JivesA	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: reservations	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: reservations	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: latesca.milkeynes	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar

Bottom Screenshot: Shows emails from 27 Mar. The subject line for all emails is "Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...".

Recipient	Subject	Date
To: info birmingham	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: general	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: lin	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: albery	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: bookings	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: sarange	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: reservations	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: angares	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar
To: info	Business Intelligence Survey - My name is Allen Gopara and I'm an MSc Business Information System student with the...	27 Mar





1st Survey

Q1 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

1. How do you currently use Business Intelligence?

- ☐ We rely on information from analysts who use BI tools directly
- ☐ We access pre-built reports and analyses
- ☐ We create our own reports & analyses
- ☐ We do not use BI at all
- ☐ Other

Other (please specify)

Q2 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

2. Which Business Intelligence (BI) Vendor do you use?

- ☐ IBM Cognos
- ☐ MicroStrategy
- ☐ SAP
- ☐ Actuate
- ☐ SAS
- ☐ Microsoft Dynamics
- ☐ Pentaho
- ☐ LogiXML
- ☐ Information Builders
- ☐ Oracle
- ☐ JasperSoft
- ☐ Other

Other (please specify)

Q3 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

3. How do you define the success or failure for your BI deployment (Select all that apply?)

- ☐ Return on investment
- ☐ User perception that is mission critical
- ☐ Support of key stake holders
- ☐ Number of defined users
- ☐ Percentage of active users
- ☐ Cost savings
- ☐ Improved business performance
- ☐ Better access to data

Additional Comments

Q4 [Edit Question](#) [Move](#) [Delete](#)

4. When considering employees that currently have access to a BI tool versus should have access to a BI tool, how would you break this down by job type?

	Current %	Should %
Managers	<input type="text"/>	<input type="text"/>
Financial analysts	<input type="text"/>	<input type="text"/>
Field Staff	<input type="text"/>	<input type="text"/>
Customers	<input type="text"/>	<input type="text"/>
Suppliers	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>

Other (please specify)

5. How do you rate the following in terms of importance ?

	Extremely Important	Very Important	Moderately Important	Slightly Important	Not at all Important
How successful do you consider your current BI deployment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much has BI contributed to your company's performance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BI program has been well managed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stakeholders evangelize the effective use of BI	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BI projects are aligned with Company business unit goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data quality – Clean data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Appropriate & effective BI tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of BI into operational processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reliability of BI system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fast query response time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BI system is continuously improved (data & tools)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data warehouse updates are real-time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality & expertise of internal BI staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality & expertise of external consultants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. What aspects of your BI deployment have been most successful? (Select all that apply)

- ☐ Standard, fixed reports
☐ Ad hoc query and reporting tools
☐ OLAP (multidimensional analysis with drill down and drill across)
☐ Microsoft Office Integration (Excel, PowerPoint)
☐ Dashboards
☐ Predictive analytics
☐ Custom-built solutions
☐ BI Portal
☐ Reports distributed through email
☐ Scorecards
☐ BI embedded in operational tasks
☐ Other

Other (please specify)

Q7 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

7. How would you describe the front-end BI tools?

- ☐ We use multiple modules (query, reporting, OLAP) primary from a single vendor
☐ We use multiple modules (query, reporting, OLAP) primary from multiple vendors.
☐ We mostly custom develop our own BI front ends

[Upgrade to Add More Questions](#) [Split Page Here](#)

Q8 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

8. How does your Company view BI (data warehousing, query, reporting, analysis & dashboards) and performance management (budgeting, planning, financial consolidation, and strategic scorecards)?

- ☐ Separate initiatives
☐ Closely related but separate projects and people address those needs
☐ One initiative with solutions provided via the same group

Additional Comments

Q9

Edit Question ▼ Move Delete

9. Any other insights or comments you wish to provide on why your BI is succeeding or failing?

Q10

Edit Question ▼ Move Delete

10. Please provide your organisations' annual revenue, number of employees and contact details

Importing MS Excel data to SurveyMonkey Audience SurveyMonkey - Survey Re: surveymonkey.com/MySurvey_ResponsesDetail.aspx?tem=18%2FSoCfW5%2b%2FHjA%2F0dIZTcVurMwRw0iEKTjPvjDU1299GQb505zTf7dMhQAUwCU7Hw

SurveyMonkey®

Generate Sign Out Help

Home My Surveys Resources Plans & Pricing Create Survey

You have a BASIC account | To remove the limits of a BASIC account and get unlimited questions, upgrade now!

Market Research - Product Template

Design Survey Collect Responses Analyze Results

View Summary

Browse Responses

Filter Responses

Crosstab Responses

Download Responses

Share Responses

Default Report + Add Report

Browse Responses

Displaying 2 of 24 respondents

Prev Next Jump To: 2 Go

Response Type: Normal Response

Collector: Gaps/BI_Survey (Web Link)

Custom Value: empty

IP Address: 97.121.6.174

Response Started: Monday, April 2, 2012 9:36:28 PM

Response Modified: Monday, April 2, 2012 9:42:37 PM

Edit Response Delete

1. How do you currently use Business Intelligence?

We create our own reports & analyses

2. Which Business Intelligence (BI) Vendor do you use?

68

2nd Survey

Upgrade to Add More Questions

Q1 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

1. Do you design your own dashboards?

- ☐ Yes, The Restaurant does
- ☐ Yes, Someone designs for us
- ☐ Yes, I design them myself
- ☐ No, We do not
- ☐ Other

Other (please specify)

Q2 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

2. Which emerging technologies will help achieve greater success?

- ☐ Web based BI tools
- ☐ Dashboards
- ☐ Scorecards
- ☐ Search-enabled BI (Google interface to BI)
- ☐ MS Office enables
- ☐ Predictive analysis
- ☐ Integration with Mobile devices
- ☐ Other

Other (please specify)

Q3 [Edit Question](#) ▼ [Add Question Logic](#) [Move](#) [Delete](#)

3. For how many years has your BI deployment been available?

 ▼

[Upgrade to Add More Questions](#)

[Split Page Here](#)

Q4 [Edit Question](#) ▼ [Add Question Logic](#) [Move](#) [Delete](#)

4. How do you rate MS Excel as an OLAP View

☐ Excellent ☐ Good ☐ Average ☐ Fair ☐ Poor

Q5 [Edit Question](#) ▼ [Move](#) [Delete](#)

5. How do you rate dashboards and scorecards on the 1st page ?

	Excellent	Good	Average	Fair	Poor
Visual Lighting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Colour Scheme	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Covers the key Areas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
User-Built	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Updated in Real time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relevant and useful Information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flexible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6 [Edit Question](#) ▼ [Move](#) [Delete](#)

6. Any other insights or comments you wish to provide to make the BI initiative successful?

[Upgrade to Add More Questions](#)

[Split Page Here](#)

Q7 [Edit Question](#) ▼ [Add Question Logic](#) [Move](#) [Delete](#)

7. What best describes your role?

- ☐ Corporate IT Professional
☐ Business User
☐ Hybrid Business / IT Person
☐ Vendor (Sales, Services, Support, Development)
☐ Academic

Q8 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

8. Which best describes your business unit or functional unit

☐ Finance

☐ Sales, Marketing, Customer Service

☐ Operations

☐ Human Resources

☐ Logistics

☐ Purchasing

☐ Other

Additional Comments

Q9 [Edit Question](#) [Move](#) [Delete](#)

9. Please provide your contact details?

[Upgrade to Add More Questions](#) [Split Page Here](#)

Q10 [Edit Question](#) [Add Question Logic](#) [Move](#) [Delete](#)

10. Privacy is respected. No information will be shared with 3rd parties. All survey results are only for this school project. May we contact you in relation to this project?

☐ YES ☐ NO

Appendix C: Interim Report



1020818

BI Project report

Table of Contents

Aim and Objectives	4
Introduction	4
Current Business Intelligence Situation	4
Why Business Intelligence is important to Restaurants	5
Reasons for choosing Microsoft SQL Server	6
Literature Review	7
Critical Success Factors of BI Implementation	7
Restaurant Business Intelligence future trends	7
Pre-Packaged solutions.....	7
New technology	7
Data Governance	8
Combining Warehousing and Operational Systems	8
Powerful Excel.....	8
Integration of Data.....	8
Semantic Technologies	8
Open-Source	8
Conclusion.....	8
References	9

Aim and Objectives

By using Microsoft SQL Server 2008 R2;

- To efficiently create tools that help in making effective Restaurant Business decision making.
- To demonstrate and make use of Data Mining techniques to find and present data patterns and behaviour.
- To design and create an automated process to check data integrity, clean data and move it on time into a Business Intelligence warehouse. (For more details , please refer to project proposal)

Introduction

Business Intelligence as a term was first used by the Gartner group in the mid-1990s. However as a concept it has its roots in (MIS) Management Information System reporting systems of the 1970s. By 2005 Business intelligence systems started to include artificial intelligence (AI) capabilities as well as very powerful analytical capabilities. [2]

The architecture of BI includes 4 main components, data warehouses (source data), business analytics (collection of tools for mining, manipulating and analysing data), Business Performance Management –BPM (for monitoring and analysing performance) and User Interface (dashboard). [2]

Current Business Intelligence Situation

For small to midsize business owner data warehouse is often incomplete or non-existent. The result is a lack of business intelligence. Decisions are often made on gut feelings. This is one of the major factors of business failure. Instead of gut feelings, this report will show you decision making tools to use.

The optimal BI model would integrate Accounting, CRM and Human Resources into one database. Owners of smaller independent business all too often work in the business instead of working on the business.

The success of business is driven by how you measure Key Performance Indicators (KPIs). With KPI's, the business success is planned and without KPIs, failure often comes as a surprise. For example, in Restaurants, customers are very important, so it is critical to measure the following KPIs, Customer Retention, Customer Referrals, Customer Acquisition, market-share, customer satisfaction and loyalty.

The implementation of a (BI) business intelligence system is a complex undertaking which requires considerable resources. The business intelligence market appears vibrant and the importance of BI system is now more widely accepted. However there are no studies of restaurant BI. [10]

Not only will this project contribute to the academic literature on this topic but it will also benefit organisations in several different ways as well.

Why Business Intelligence is important to Restaurants

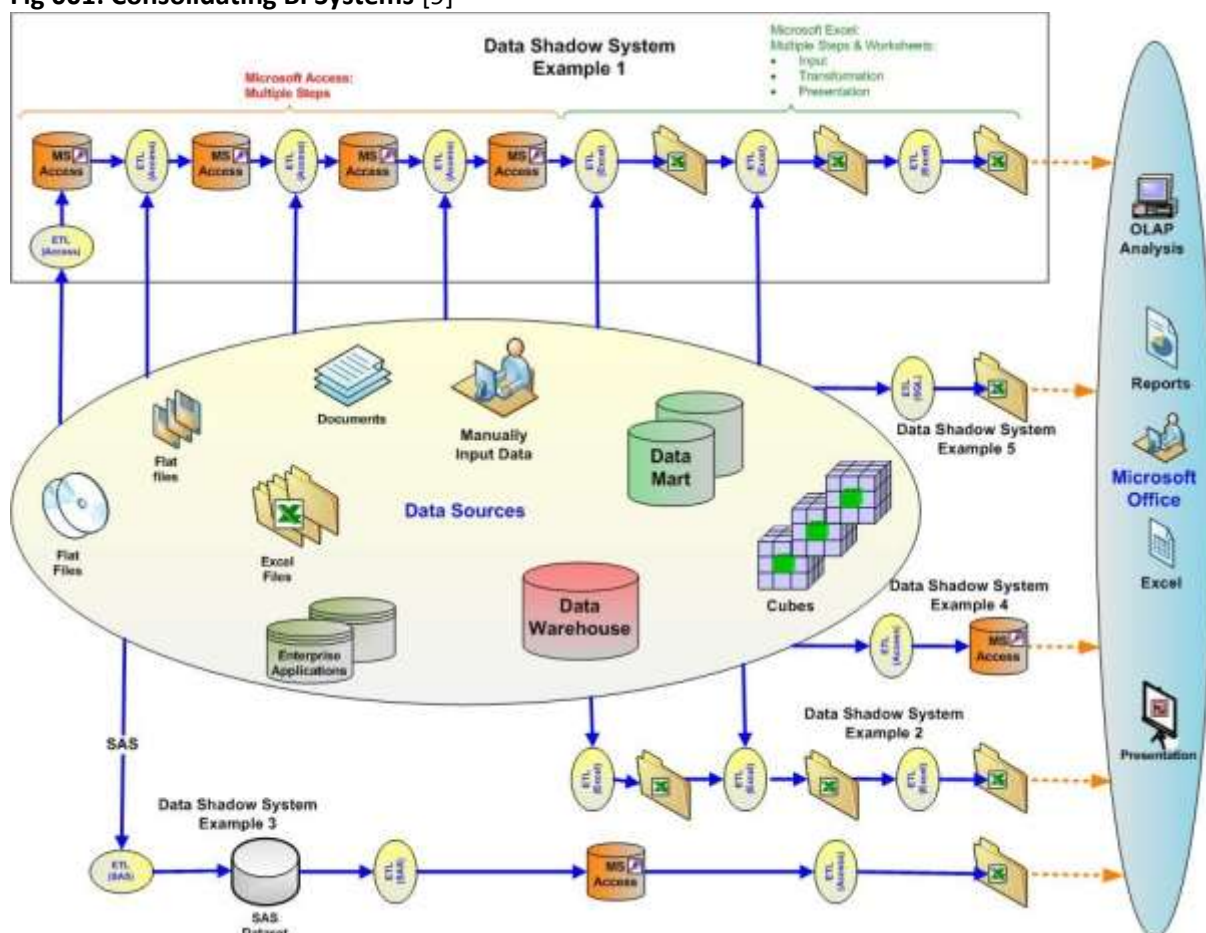
Business Intelligence gathers real-time or near real-time data. BI reports will allow employees to effectively respond to challenges and opportunities. Business can then reduce costs and slow / increase production in response to sales and market conditions. [1] If for example, certain foods or drinks are consumed during certain days when there is a particular sport on TV, then it would make sense to increase their stocks during these games.

Restaurants should embrace continuous innovation and improvements while leveraging three basic approaches to business intelligence, deciphering what has happened, impacting the organisations' here and now and creating the organisations new future. [5]

With effective BI, restaurants can not only reduce costs, but get real-time information to the right employees faster, find profitable customers, help track key metrics and rapidly analyse data. [7]

Restaurants can improve operational efficiencies, which can include time-to-process-order, time-to-wait-to-be-served and customer complaints. Business Intelligence can help and guide in decision-making by keeping the products and services competitive.

Fig 001: Consolidating BI Systems [9]



Reasons for choosing Microsoft SQL Server

Microsoft SQL Server, Excel, Visio, Report builder, Power Pivot and Microsoft SharePoint, all give tools to visualise and analyse data and make it come alive. Microsoft BI was named the industry leader by Gartner in the BI Platforms Magic quadrant. In general Microsoft is offering customers low-cost-bundling.

With little training some staff members will be able to use these tools to create and design reports / views of the data. They can then publish them using SharePoint so that other staff members can see them when they are required. Centralised reports help cut down waste.

With large volumes of data to analyse, you can use an Excel add-in called Power Pivot. It connects to SQL Server to analyse and join multiple tables of data. This applies even to different data sources.

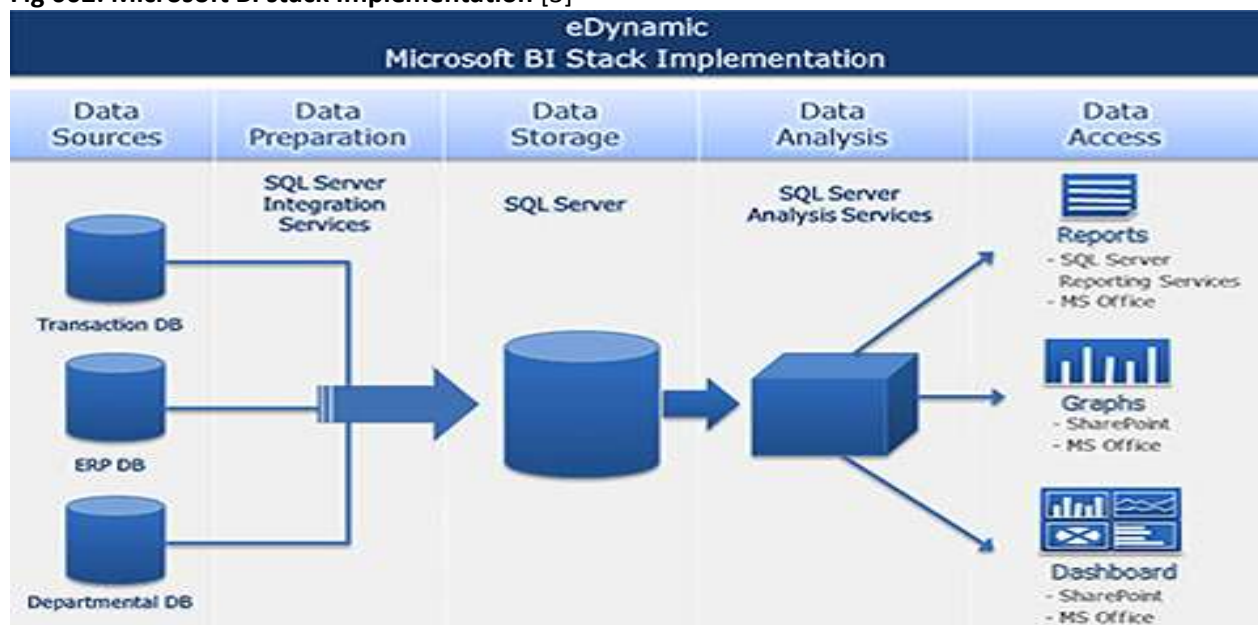
For analysing the performance and trends in an organisation SQL Server Analysis Services is the best in terms of power-to-price ratio. [6]

Microsoft Business Intelligence is an obvious choice for companies already operating in a Microsoft environment, by extending capabilities to gain more value on a more powerful platform. You will then realise powerful synergies with offer Microsoft applications.

Business solutions from Microsoft offer best value, complete integration and pervasive deployment to deliver the most cost effective than competitive solutions. They offer lower support, maintenance, and training costs. Companies need solutions that are easy to use and implement. Microsoft BI is accessible to all employees. When more employers make informed decisions the productivity of the workforce rises. [7]

Most organisations use (SSIS) SQL Server Integration Services to move data between PerformancePoint Server and source systems. Microsoft Office Excel 2007 is the most commonly used BI tool today. It provides all the functionality to create spread sheets, analyse data and share information. Many companies around the world use office excel to identity trends and analyse business results. [7]

Fig 002: Microsoft BI stack Implementation [3]



Literature Review

Business Intelligence: The process of gathering information in the field of business; the process of turning data into information and item into knowledge. (Gartner)

Business intelligence is very important in business decision making and yet very few Restaurants use it. Big Restaurant chains can get one of the big Business Intelligence vendors to install the software for them. That is why I have chosen to do a project to involve new restaurant BI business. Research on small restaurants' business BI does not exist. According Gartner, BI is used aggressively by just 15-20% of business users. Most business users feel BI tools are hard to use.

The project will try to make BI tools easy to use. Users who want to customize reports will also find it easy to do and the whole project will be done with a user perspective in mind. In order to encourage

rapid massive adoption, serious attention will be given to dashboard designs. Digital dashboards are popular BI tools in Restaurant because they are visual, hands-free and easy to read.

Critical Success Factors of BI Implementation

The critical success factors of the restaurant depend on what the restaurant really needs. If you know the business needs then you know the factors. If you are new to the business you need to look at the other businesses, like yours. You look outward to other players in the industry to see what they have done with similar tools. In General, learn from their mistakes. In this project there will be a survey to find out what restaurant staff really want or expect from a Business Intelligence system.

BI can have complicated ETL functionality. In designing this system, common and practical features will be used. Results from the survey will help us find out the simple and most cost-effective features needed.

Since the project is for a new owner of a new restaurant, adoption by top management is not an issue. Proper training will need to be given to workers, so that they can take it up as their own. Employees need to take pride in owning a BI system in their company. [10]

Restaurant Business Intelligence future trends

Pre-Packaged solutions

“Strategy-Driven” software will definitely emerge to cover business processes; whether performance-based, predictive of future trends, optimising transactions or monitoring goals. Instead of restaurants having to get several software packages for a BI solution, the trend will be that they will be integrated data solutions.

New technology

Making use of new technology like Complex Event Processing, that uses algorithms to make decisions quickly. This will reduce reaction times for reporting and predictive analytics. The challenge of BI solutions has always been waiting for huge amounts of data to be analysed.

Data Governance

The focus is getting correct and accurate data before organizational changes are implemented. Garbage-in, garbage-out; software is only as good as its data.

Combining Warehousing and Operational Systems

Instead of simply generating reports and simple queries, the new system will focus on decision making, even automatic decision making.

Powerful Excel

Microsoft Excel will continue to be prominently used by companies and home-users. It will provide new analytic and charting options at lightening speeds.

Integration of Data

New technologies to not only store data but to instantaneously process it, decipher and integrate the information back into applications.

Semantic Technologies

Dealing with unstructured data in a more effective and efficient way. Content monitoring, advanced classification and filtering allow data and content to be normalized.

Open-Source

There may still be a limited market for open-source BI. Those open-source solutions will be used together with closed-source applications.

There are other trends which have not been mentioned, like Data Virtualization which do not have a direct impact on small restaurant businesses. In general the future of BI solutions will be focusing on predictive analysis, data integration and cost-effective solutions for organisations of every size. [1]

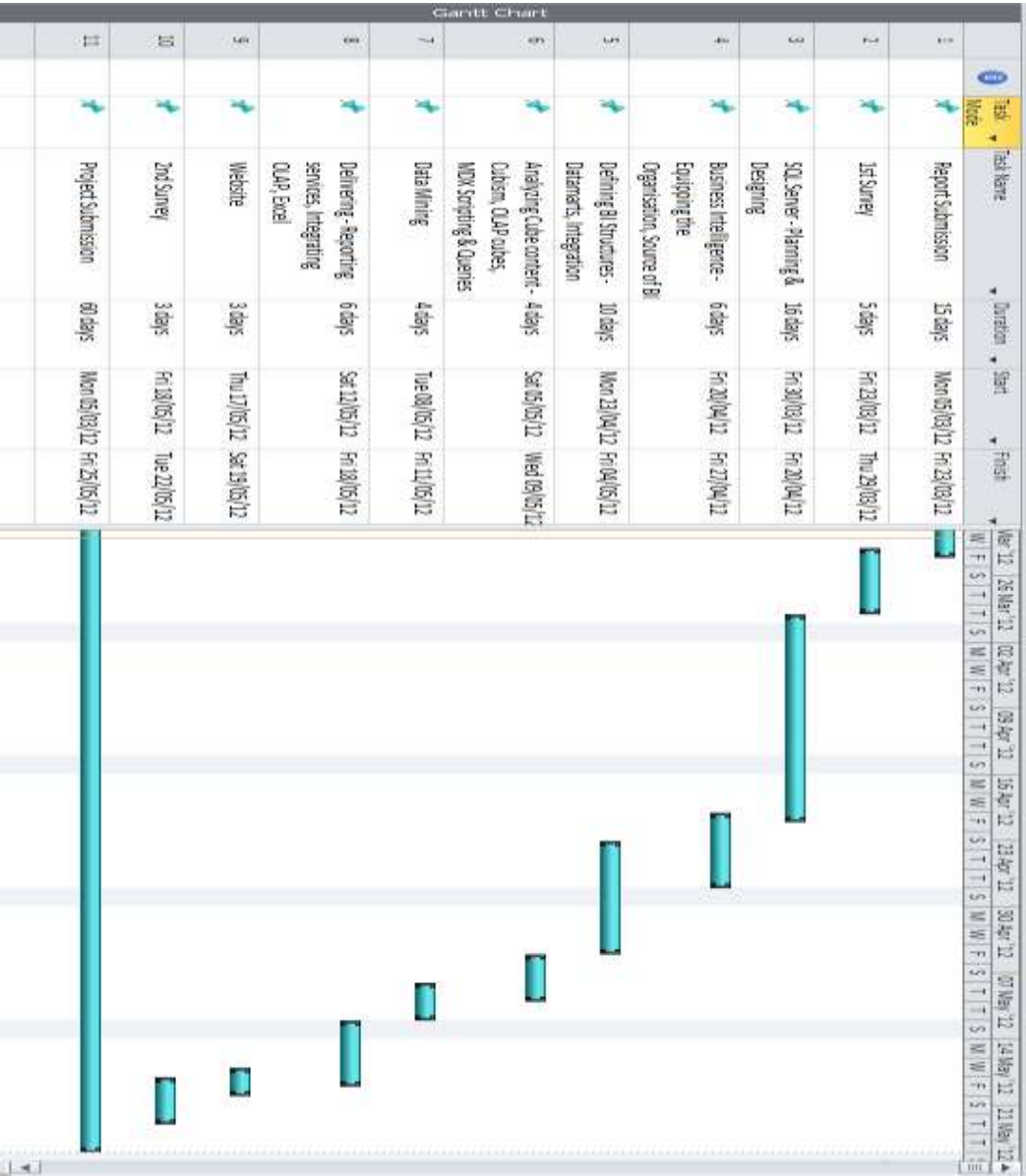
Conclusion

The BI field in industry and research is vibrant today. As computer memory becomes cheaper, hardware technology advances data acquisition is becoming cheaper and massive. Unstructured data is being exploited to add as another source of data.

At the same time as cloud data services are take root and more people are taking up next-generation mobile devices there will be more rapid changes in BI back-end architecture. With these changes they will be ample opportunities and technical challenges for BI software ahead, to shape and reshape the landscape. [8]

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Appendix D: Project Proposal**MSc Project Proposal Form**

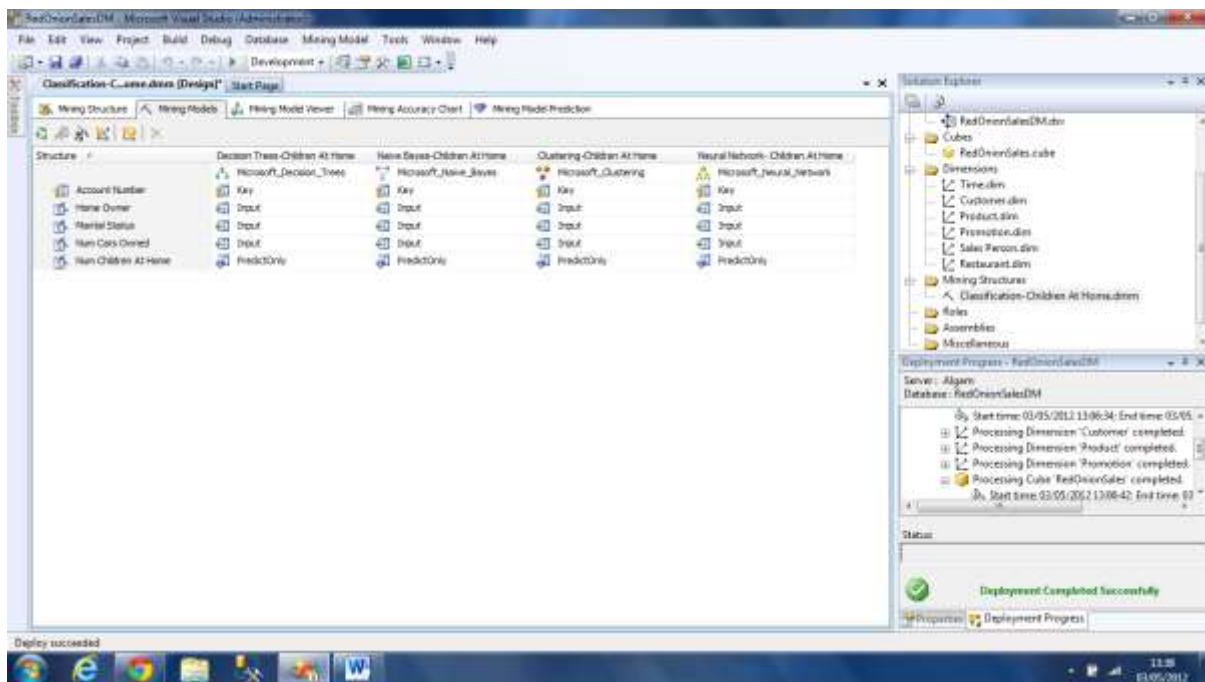
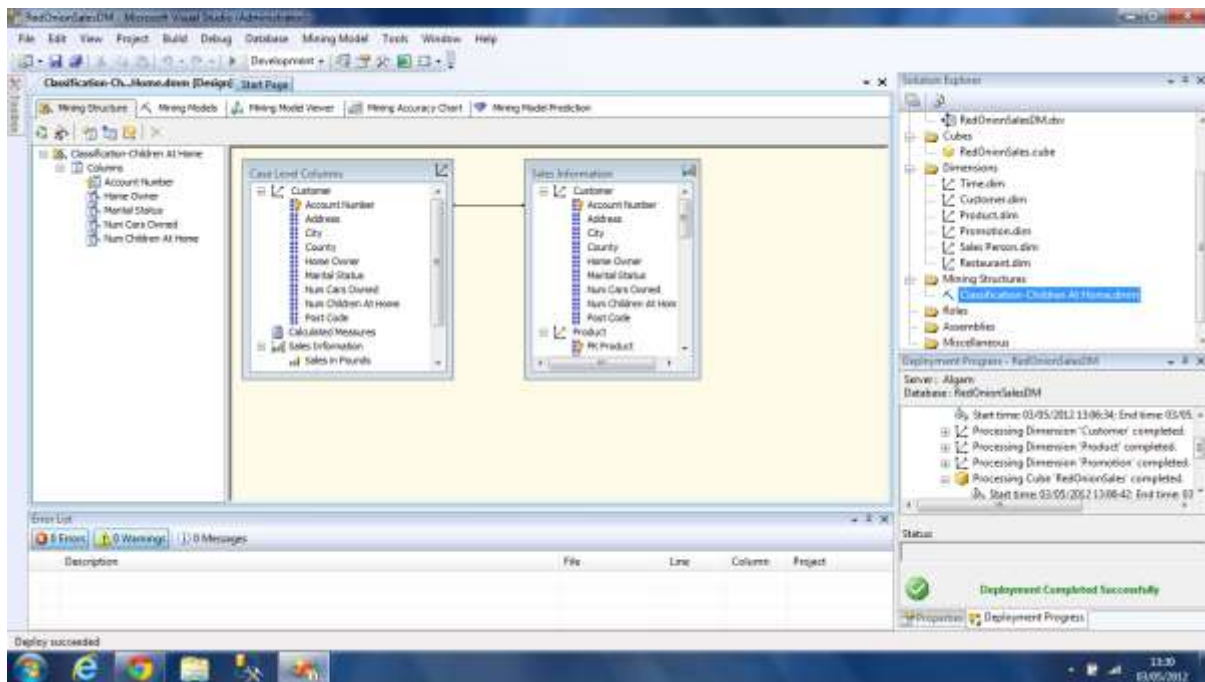
AY11/12, Semester 2

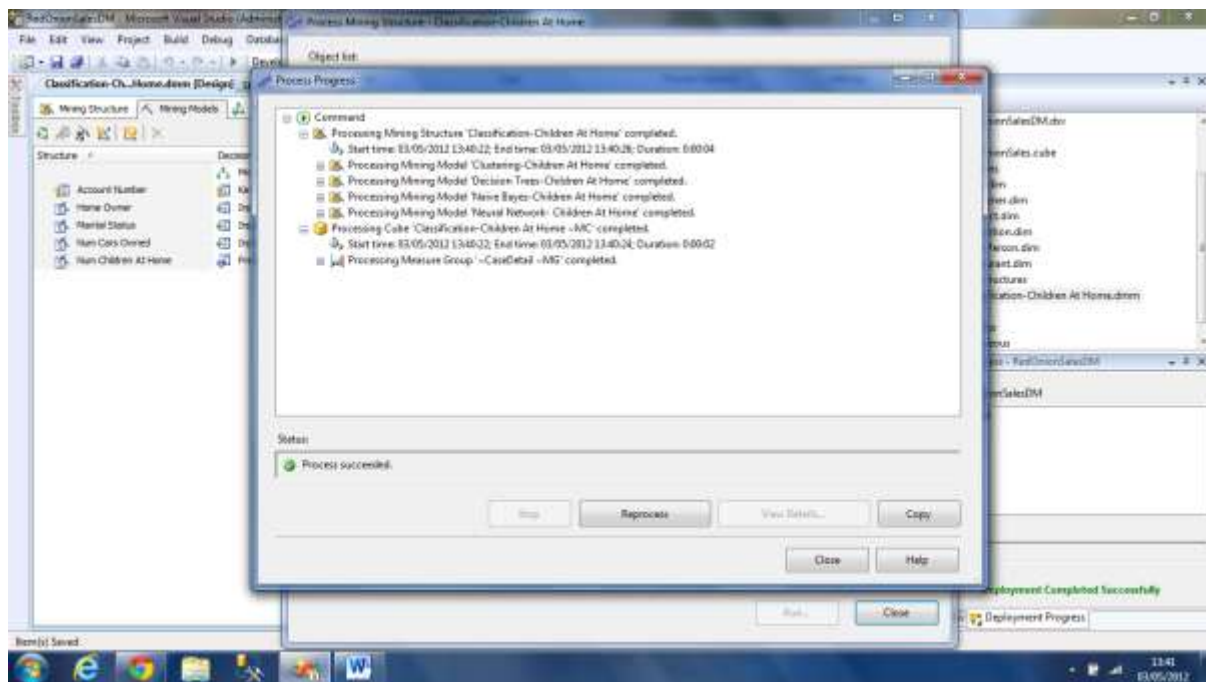
Student Number	1020818
Student Name	Allen Gapara
Degree Course	Business Information Systems
Supervisor Name	Dr. Paul Sant
Title of Project	Business Intelligence for New Restaurants' Decision Makers
Description of your artefact	<ul style="list-style-type: none"> ▪ The project demonstrates the use of Data Mining techniques to find and present data patterns and behaviour. ▪ It uses OLAP (Online Transaction processing) features, KPI (key performance indicators), MDX (Multidimensional expression), UDM (Unified Dimensional Model), queries and scripts to slice, dice and summarize information. ▪ Design and create an automated process to check data integrity, clean data and move it on time into a Business Intelligence warehouse. ▪ The Extract, Transform and load (ETL) processes extract data to copy from OLTPs and cleanse it before loading it into a Data Mart. ▪ Creating and setting security roles within an OLAP cube by using MDX expressions. ▪ To create a website of the restaurant. ▪ KPIs are used as part of a concept of Digital Dashboards. ▪ Analysis services project to create OLAP structures. ▪ Use Reporting services and Accelerators to deliver information to decision makers in the organisation. ▪ There will be 2 surveys about BI software. ▪ Use Microsoft Office 2010 as a Data Mining tool. ▪ Use MS Excel 2010 as an OLAP cube client. ▪ The Business Intelligence tools in SQL Server 2008 offers tremendous capabilities to create powerful analysis tools.

<p>What methodology (structured process) will you be following to realise your artefact?</p>	<p>Microsoft Solutions Framework Agile:</p> <p>It is particularly suited for BI projects for three reasons:</p> <ul style="list-style-type: none"> ■ Scoping challenges ■ Need to provide vertical & context specific approach for stakeholders. This will enable them to see what Business Intelligence can or will do for their restaurant. ■ Because of mainly their inherent agility. 	
<p>How does your project relate to your degree course and build upon the units/knowledge you have studied/acquired</p>	<p>The Project uses knowledge & skills from all the subjects. In brief it covers:</p> <p>Data Modelling: - Data mining is a core part of Business Intelligence solutions.</p> <p>Business Data Analysis: - Using statistics to analyse data.</p> <p>Financial Analysis: Using Managerial Accounting techniques for decision making.</p> <p>Project Management: Methodologies used in working in projects.</p> <p>Applied Programming: Learning programming languages.</p> <p>Marketing: Working on the project with a user perspective.</p> <p>Computer Security: Making sure the database and websites are secure.</p> <p>MIS: Using IT to gain a competitive advantage.</p>	
<p>Resources</p>	<ul style="list-style-type: none"> ■ Microsoft SQL server 2008 Enterprise ■ Microsoft Office 2010 Professional ■ Microsoft Visual Studio 2008 ■ Microsoft Office SharePoint 2010 Enterprise ■ Microsoft SQL Server 2008 Report Builder 2.0 ■ IBM SPSS 17 Statistical Analysis Software ■ Microsoft SQL Server 2008 Data mining Add-ins for Office 2010 ■ Microsoft Windows 7 ■ MDX Scripting & Queries 	
<p>Have you completed & submitted your ethics form?</p>	<p>Yes</p>	

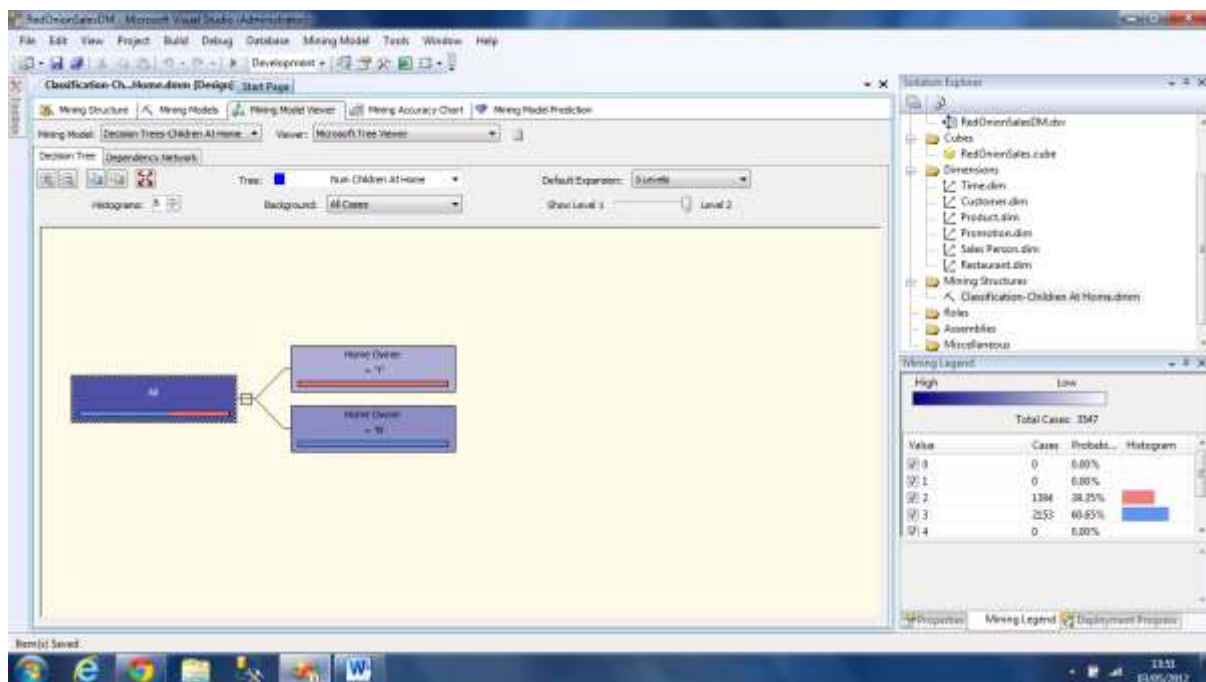
Appendix F

Defining a Data mining Model

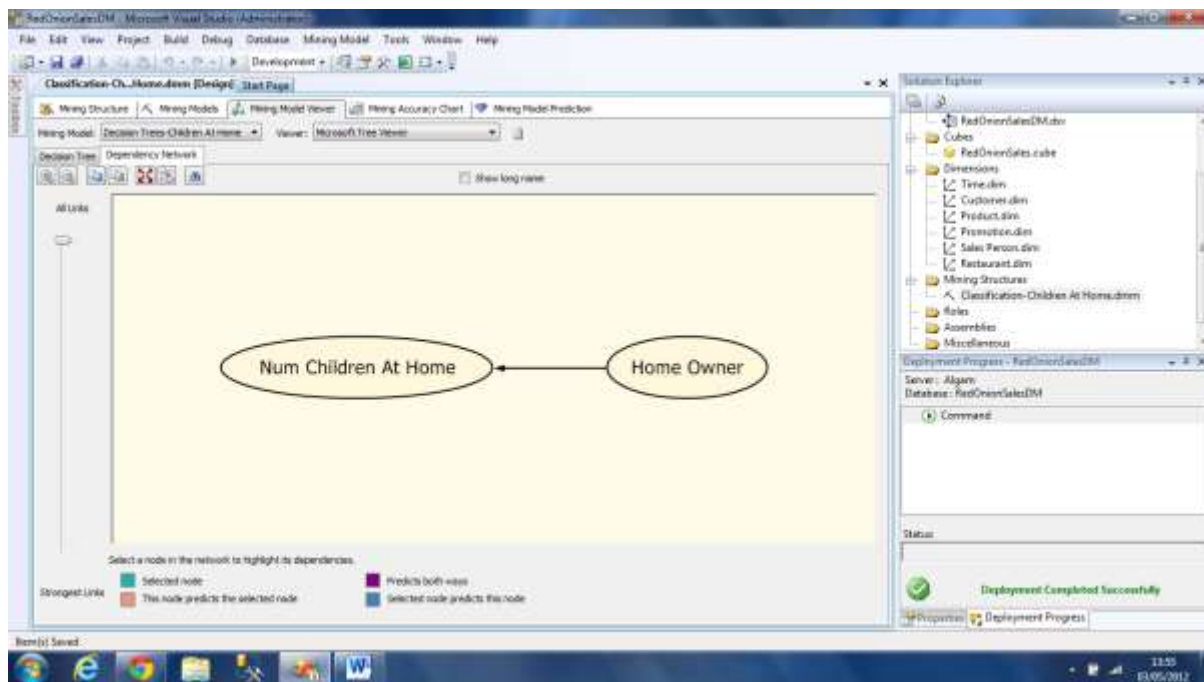




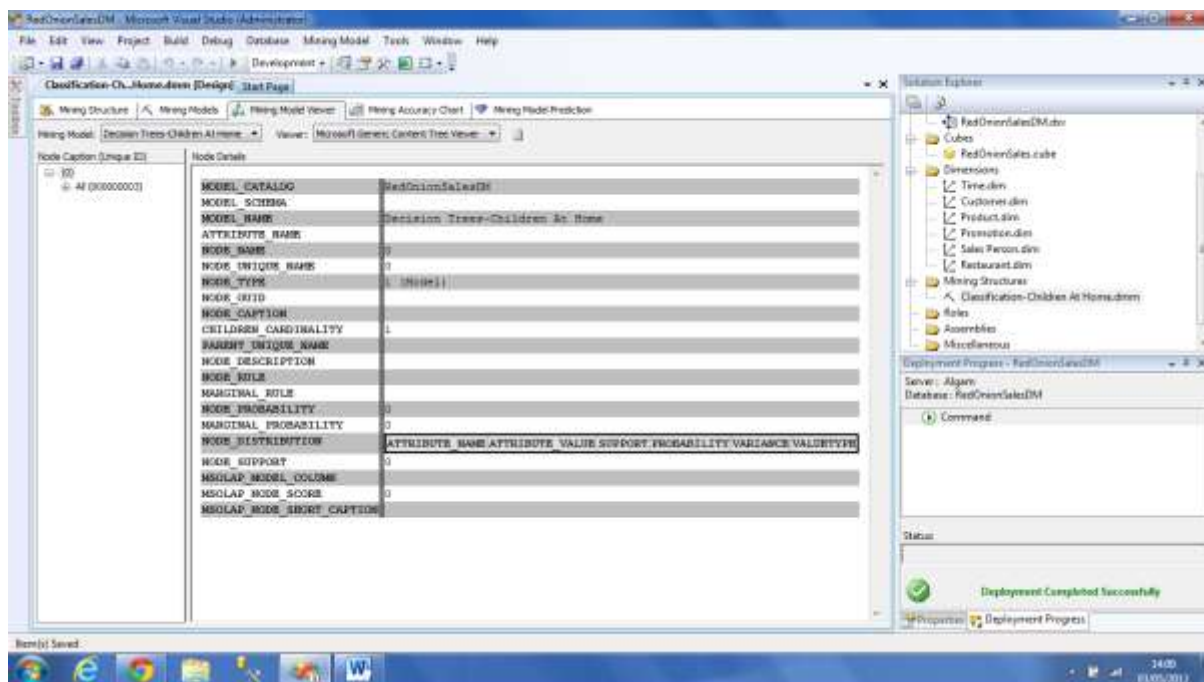
The decision tree view for the Microsoft Decision tree Algorithm



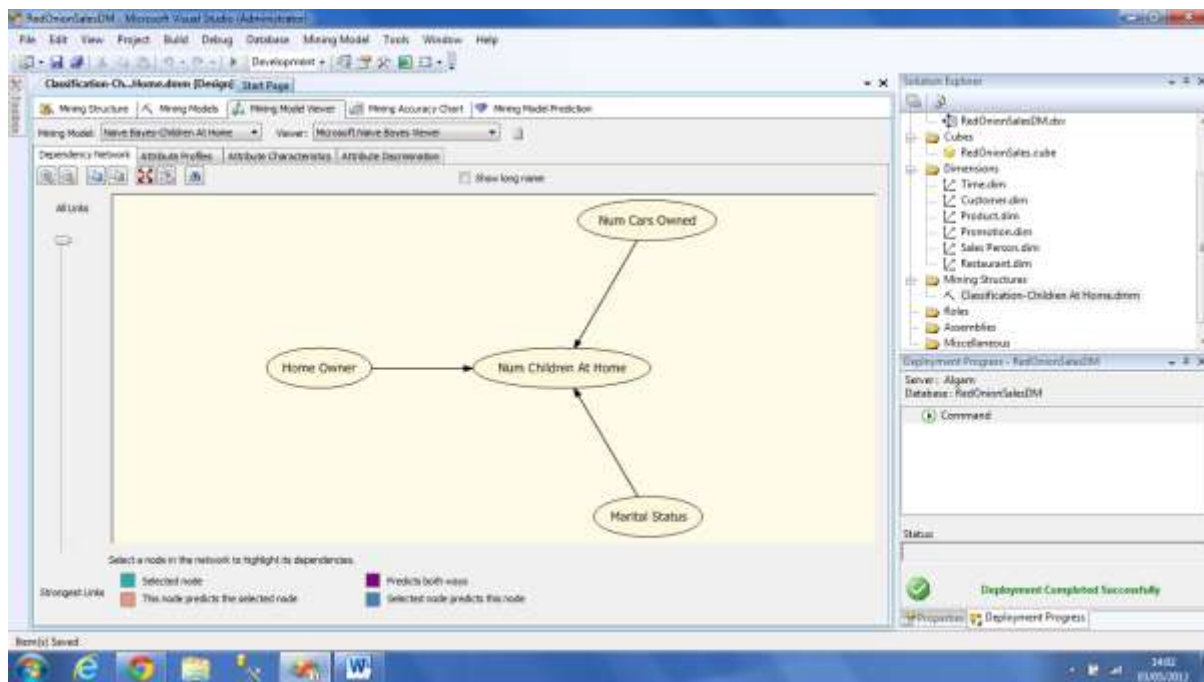
The dependency Network tab for the Microsoft Decision tree Algorithm



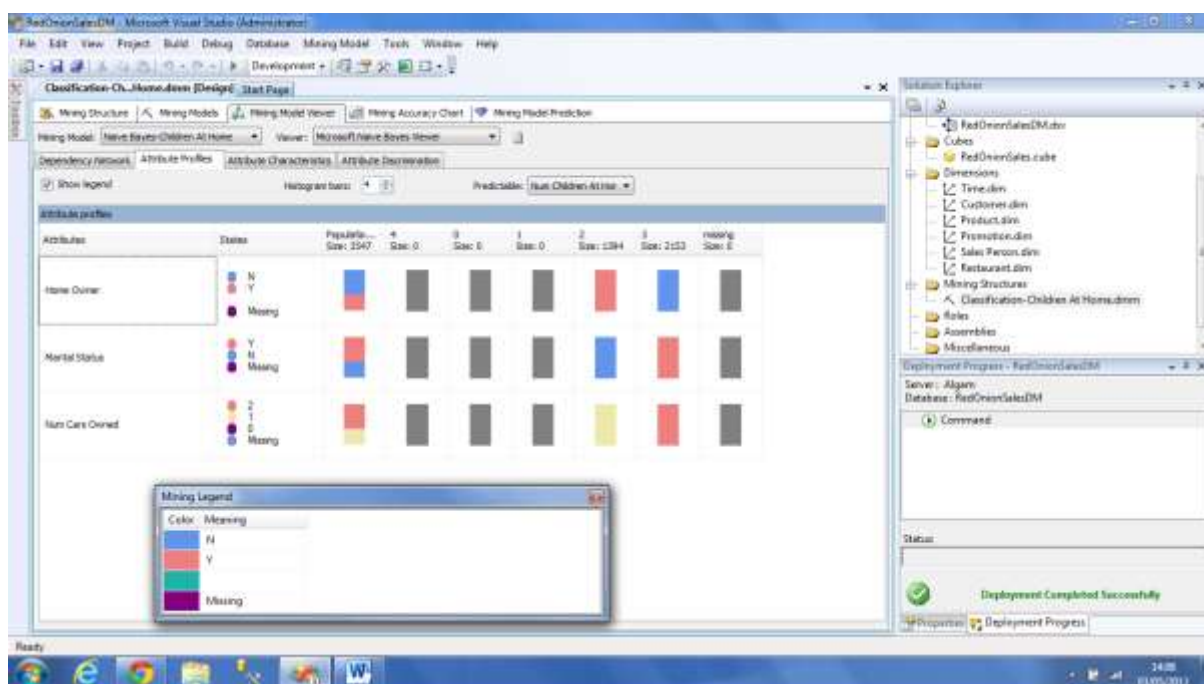
Microsoft Generic Content Tree Viewer



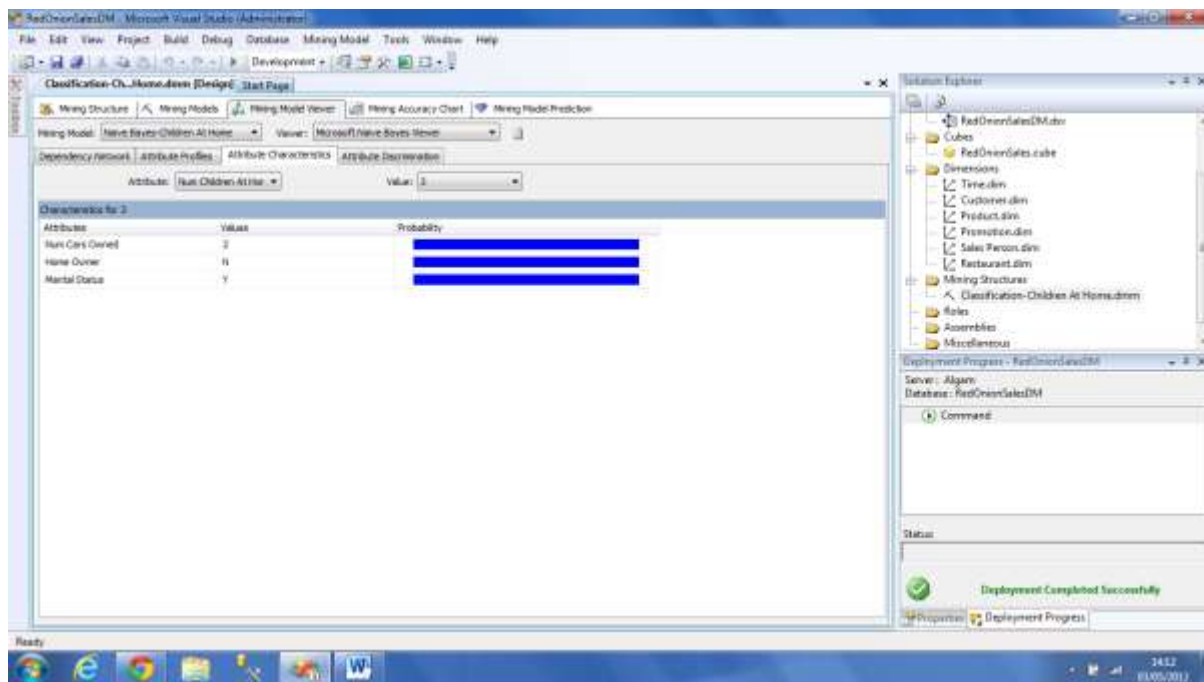
Microsoft Naïve Bayes Viewer – Dependency Network



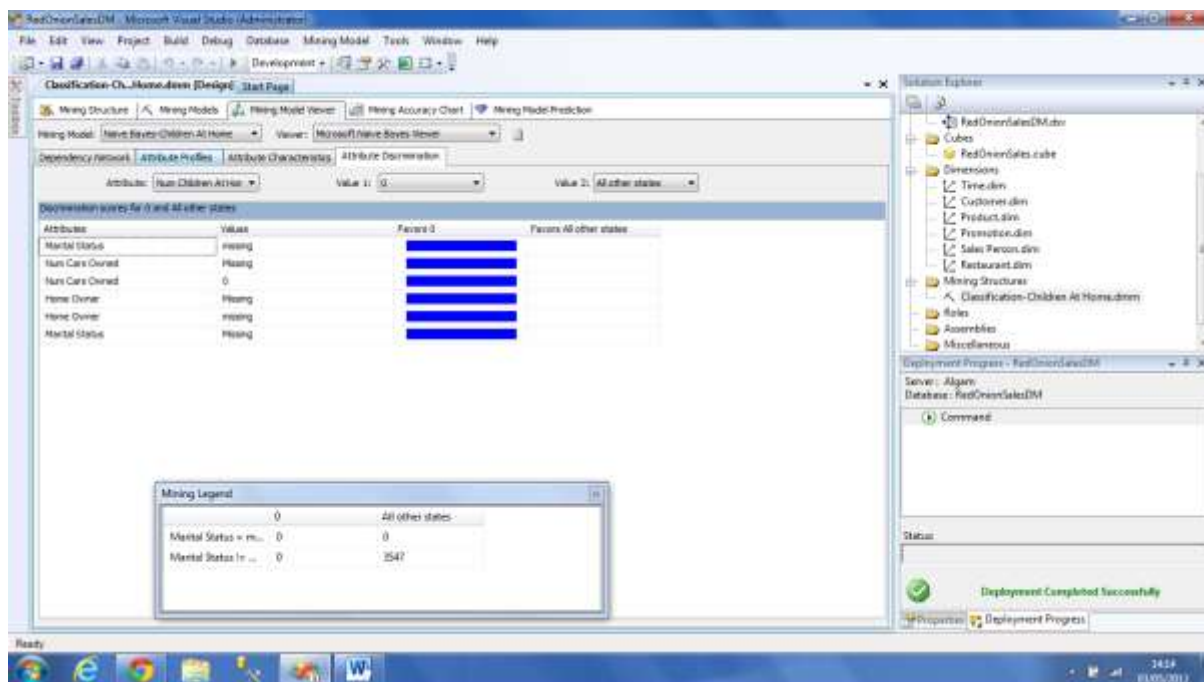
The following diagram shows the distribution of each attribute value for the various predictable values.



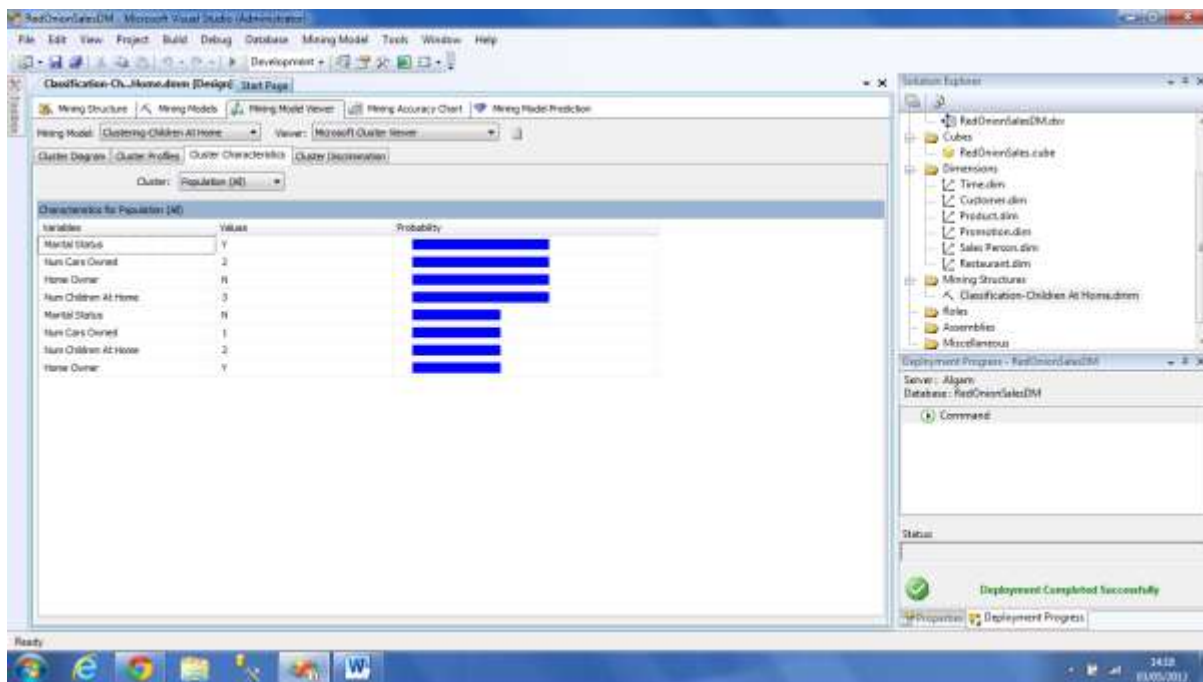
Microsoft Naïve Bayes Attribute characteristics



Microsoft Naïve Bayes Attribute discrimination

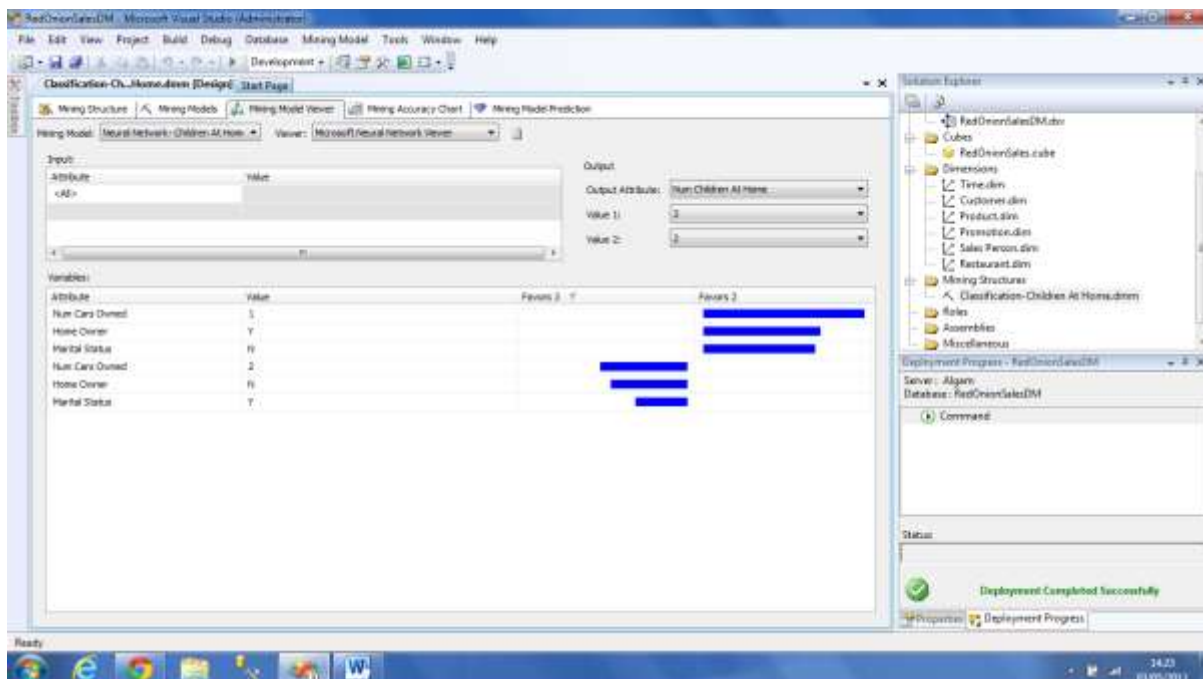


Microsoft Clustering: Cluster Characteristics

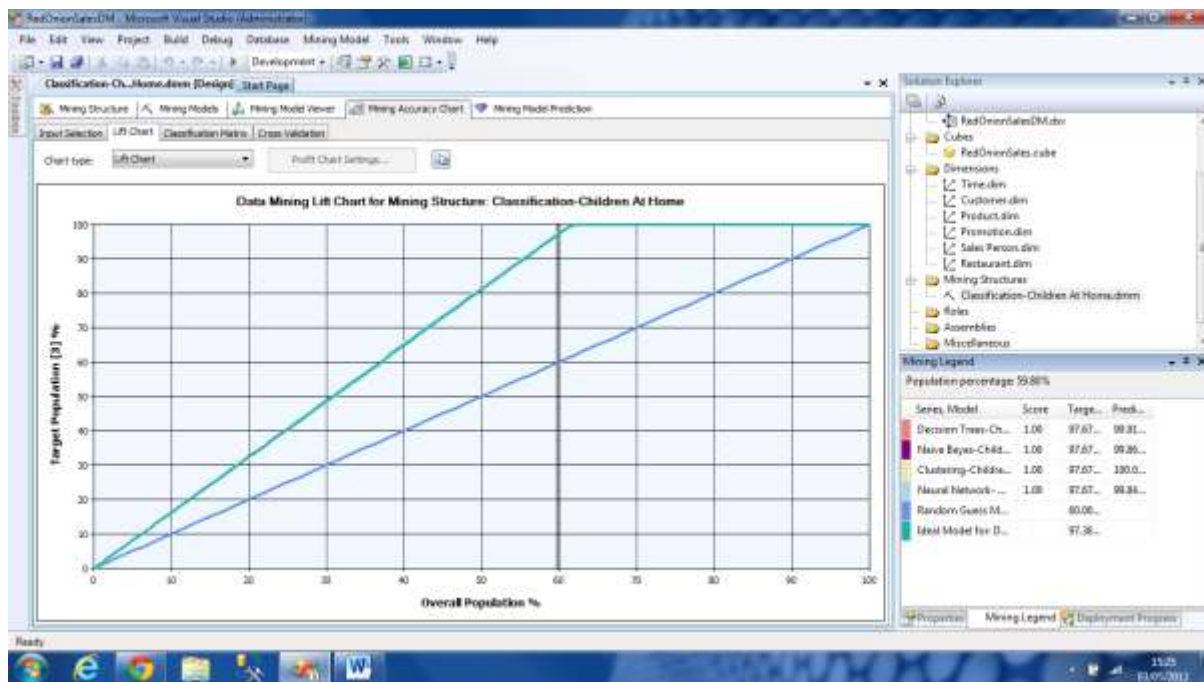


Microsoft neural network: Discrimination Viewer

The Algorithm is somehow similar to other algorithms. It lets us determine the characteristics that best predict our predictable value.



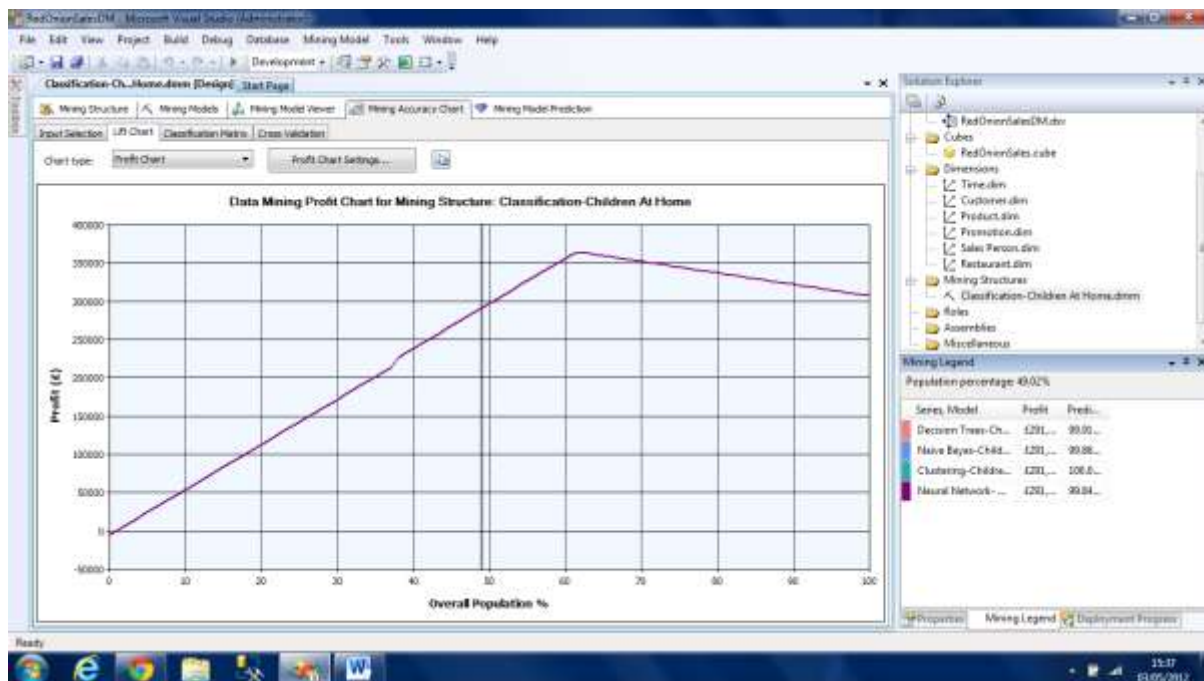
Lift Chart with a prediction Value of 3 specified at 60%



Creating a profit chart

Let us suppose Redonion purchases a mailing list with 100 000 names. Fixed costs are £5000.

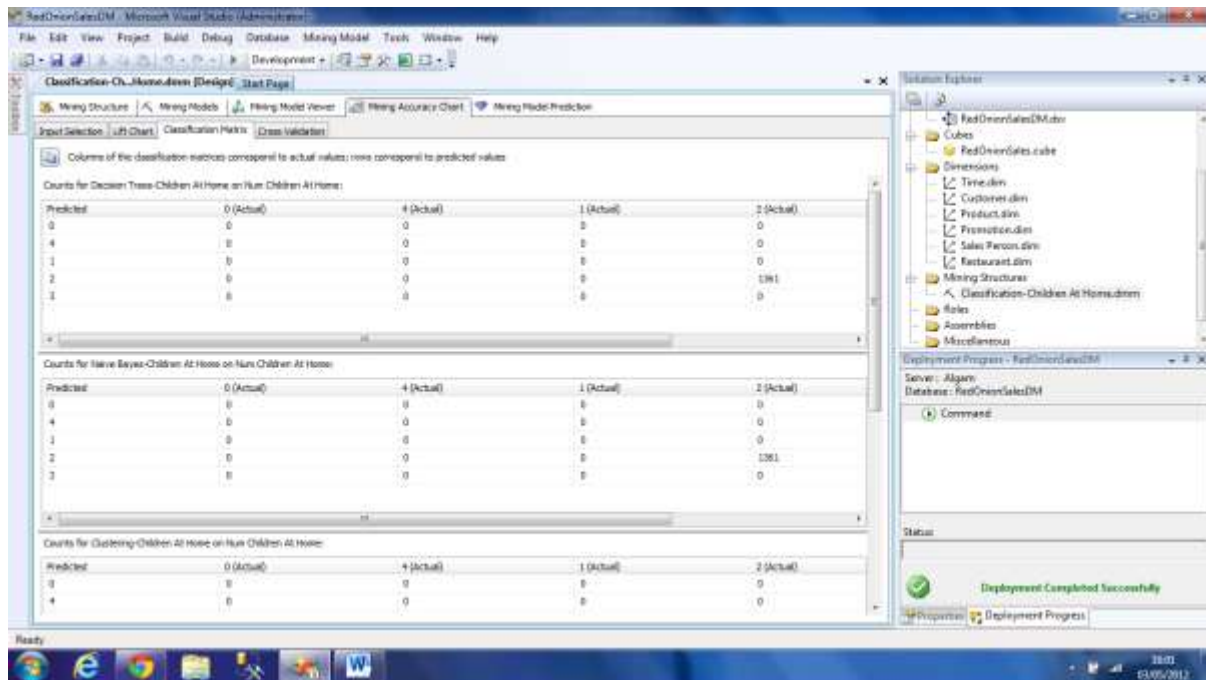
Variable cost £3 and on average the return per individual is £15.



From the mining model prediction diagram RedOnion Will make about £360000 in profit after the cost of mailing. Mailing to more people does not significantly improve our chances of getting sales, although there is any increase in costs. After this point, the expected profit is expected to go down.

Classification Matrix

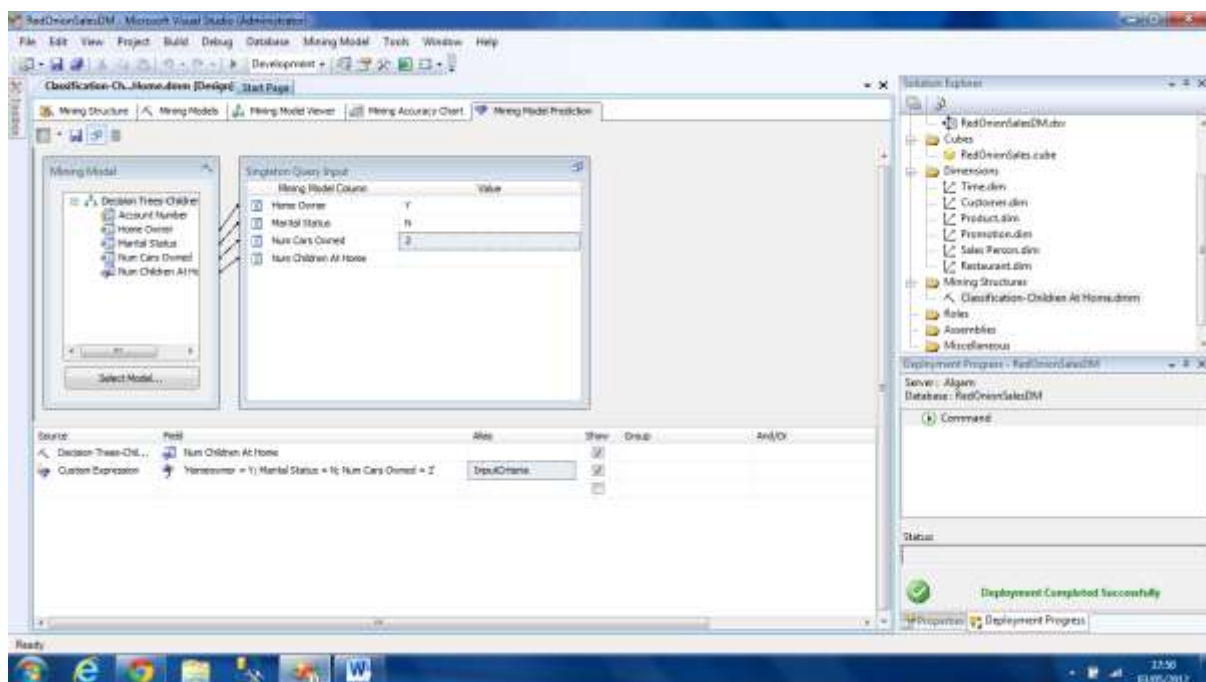
Obviously, we do not expect perfect prediction results from the mining models. The Classification matrix will let us view what mistakes our models have made.

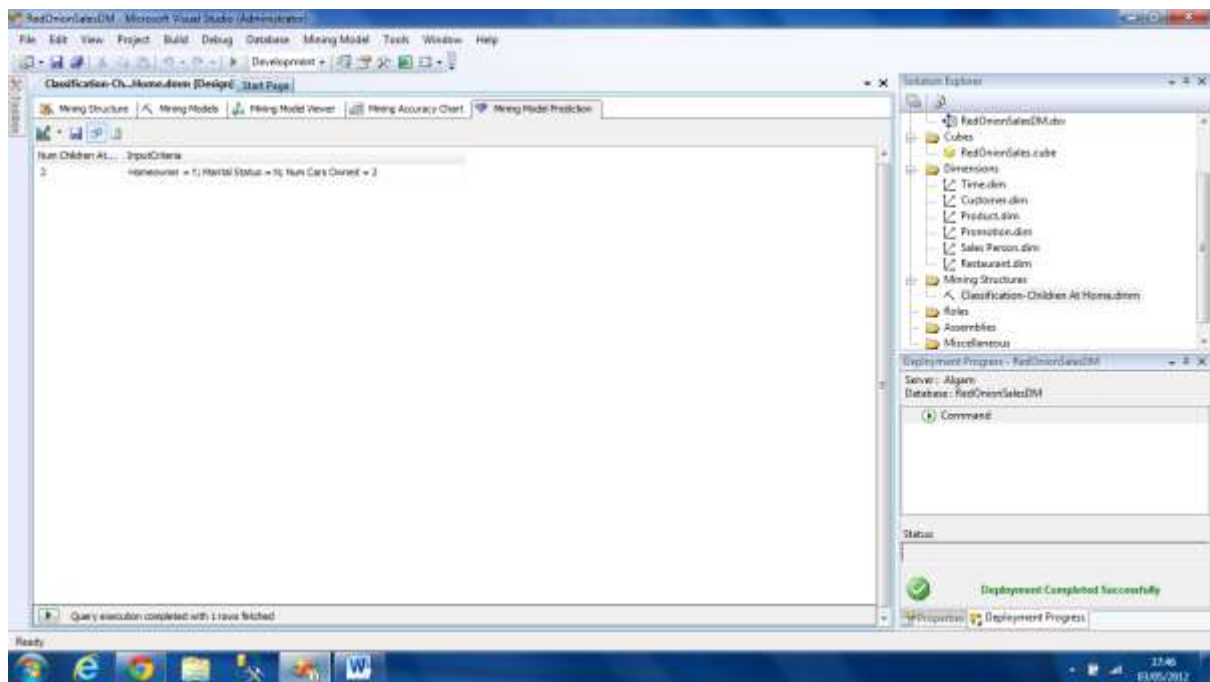


Cross Validation

This is a tool to compare the accuracy of several mining models within the mining structure.

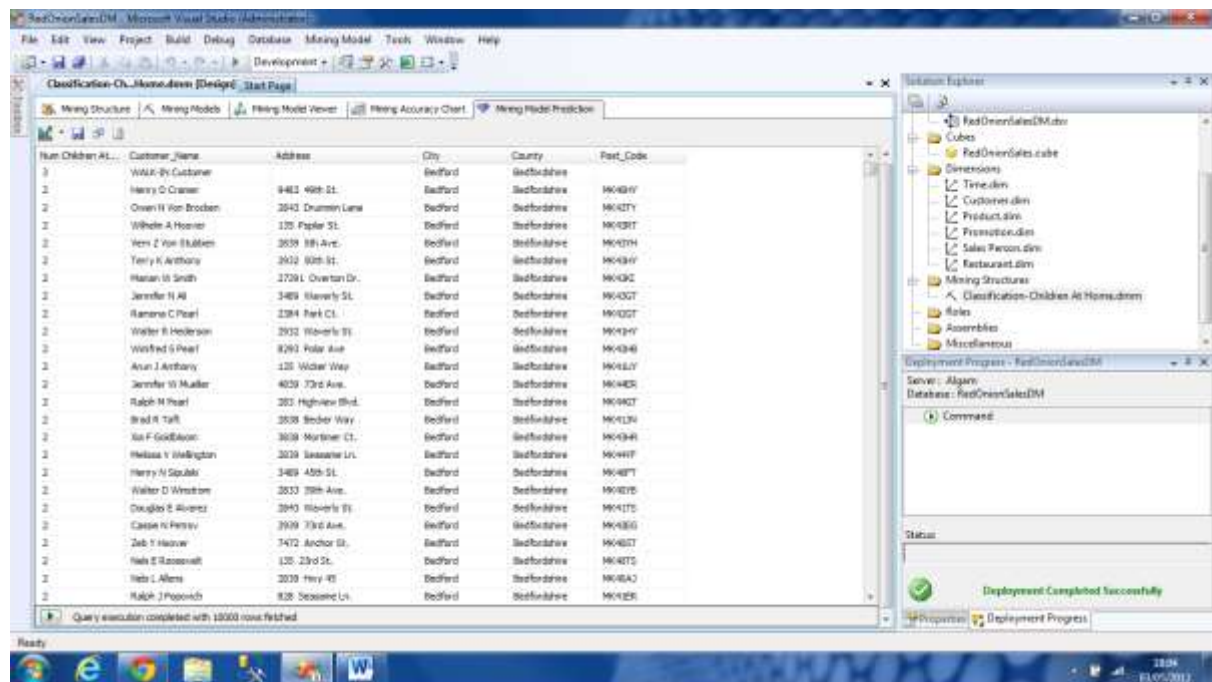
Creating a Singleton Query



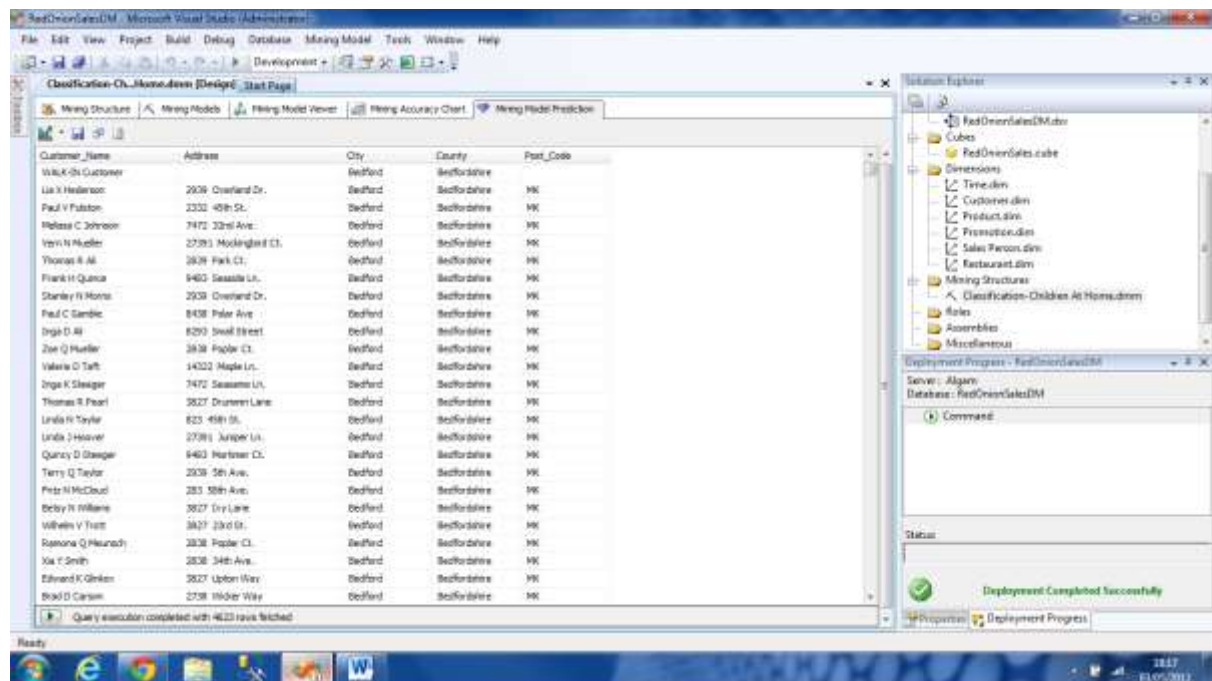


The model predicts, for someone who is a homeowner, not married and owns 2 cars will most likely have 2 children at home.

Creating a Prediction Join Query using the Mining Model Prediction



The marketing department only wants to see households that have (predicted) 2 children at home and not to see the column of children.



A (Data Mining Extensions) DMX prediction join query

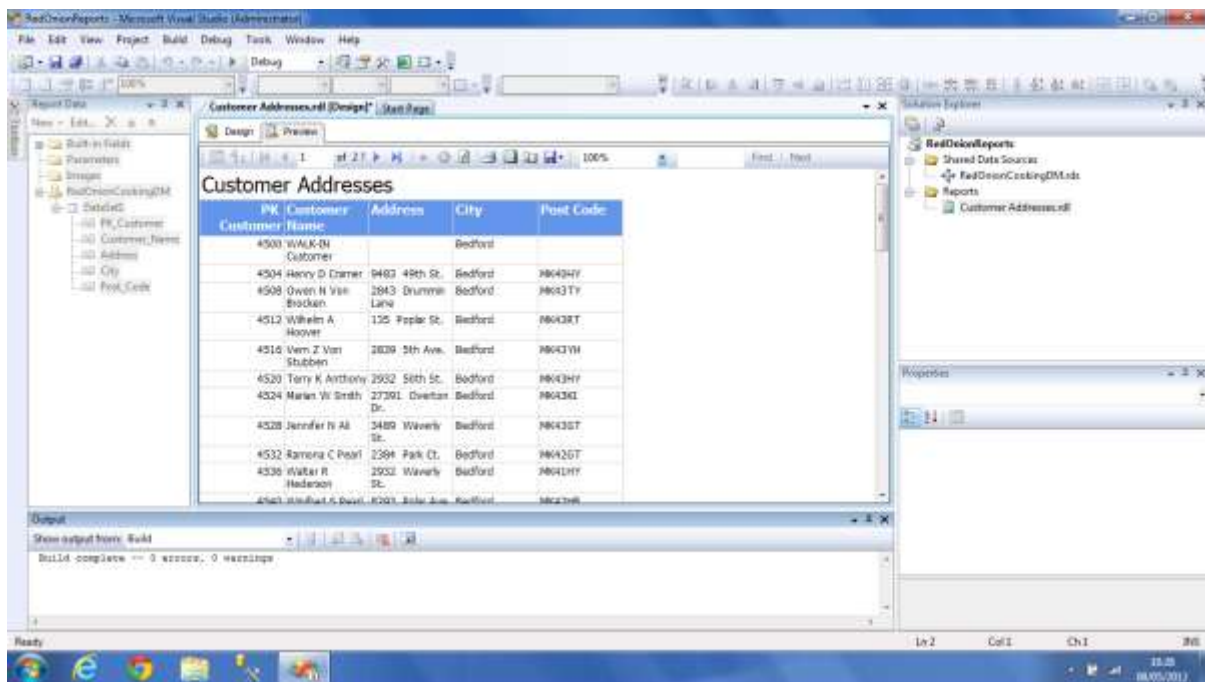
```

SELECT
    t.[Customer_Name],
    t.[Address],
    t.[City],
    t.[County],
    t.[Post_Code]
From
    [Decision Trees-Children At Home]
PREDICTION JOIN
    OPENQUERY([Red Onion Cooking DM],
        'SELECT
            [Customer_Name],
            [Address],
            [City],
            [County],
            [Post_Code],
            [HomeOwner],
            [MaritalStatus],
            [NumCarsOwned]
        FROM
            [dbo].[Customer]
        ') AS t
ON
    [Decision Trees-Children At Home].[Home Owner] = t.[HomeOwner] AND
    [Decision Trees-Children At Home].[Marital Status] = t.[MaritalStatus]
AND
    [Decision Trees-Children At Home].[Num Cars Owned] = t.[NumCarsOwned]
WHERE
    [Decision Trees-Children At Home].[Num Children At Home] =2

```

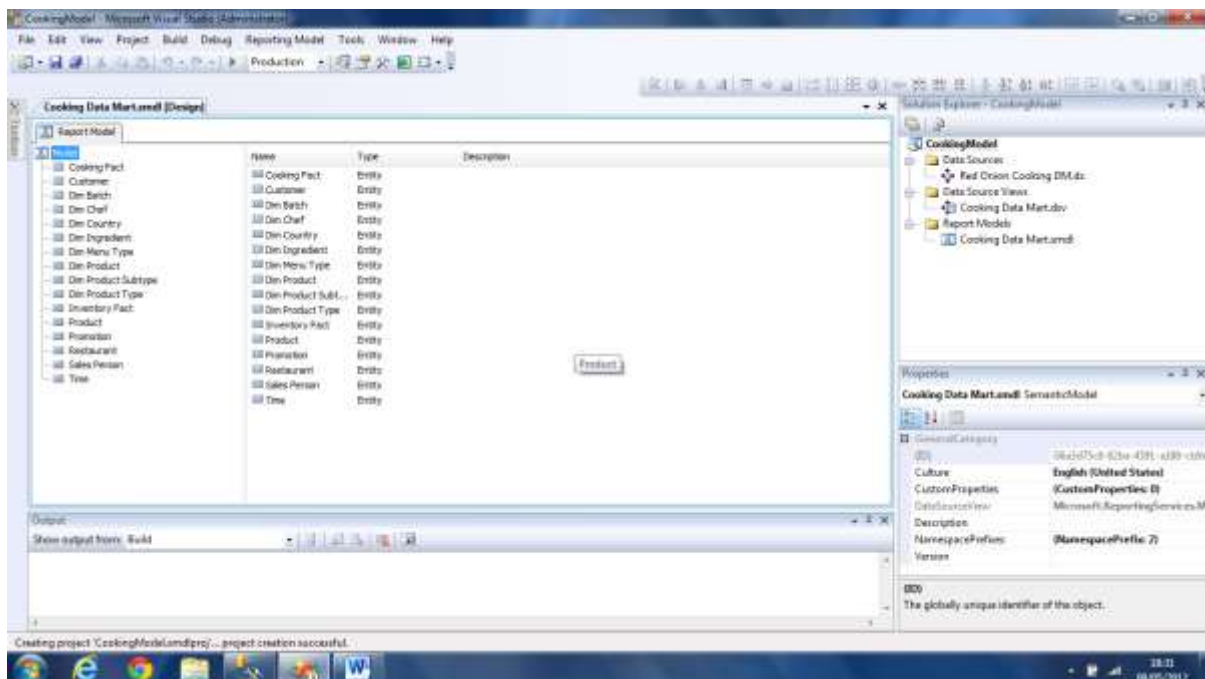
With these DMX queries, you can write queries in SQL Server Management Studio against the mining models without the graphical interface. Security needs to be set appropriately so that power users do not damage accidentally or maliciously.

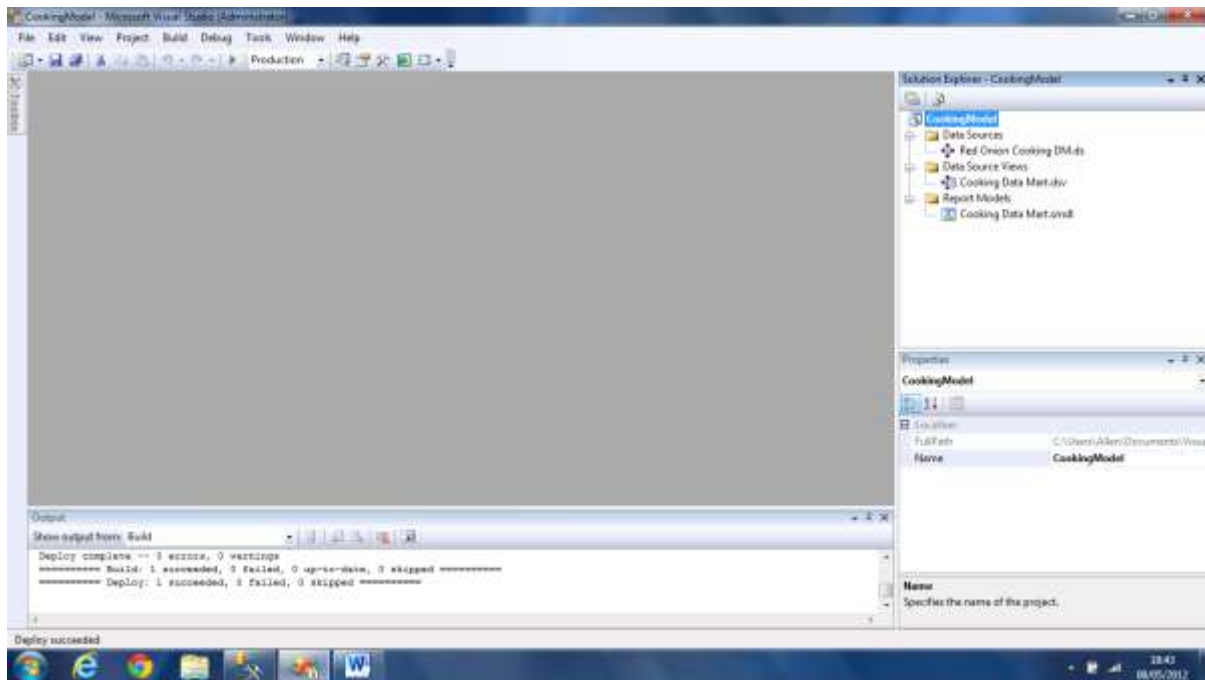
Creating Reports using Tablix report items and using query parameters



Creating a report model and then deploying the model to the report server.

Business need: The need to set up an ad hoc reporting environment for the employees. The report is to be used to implement this ad hoc reporting.

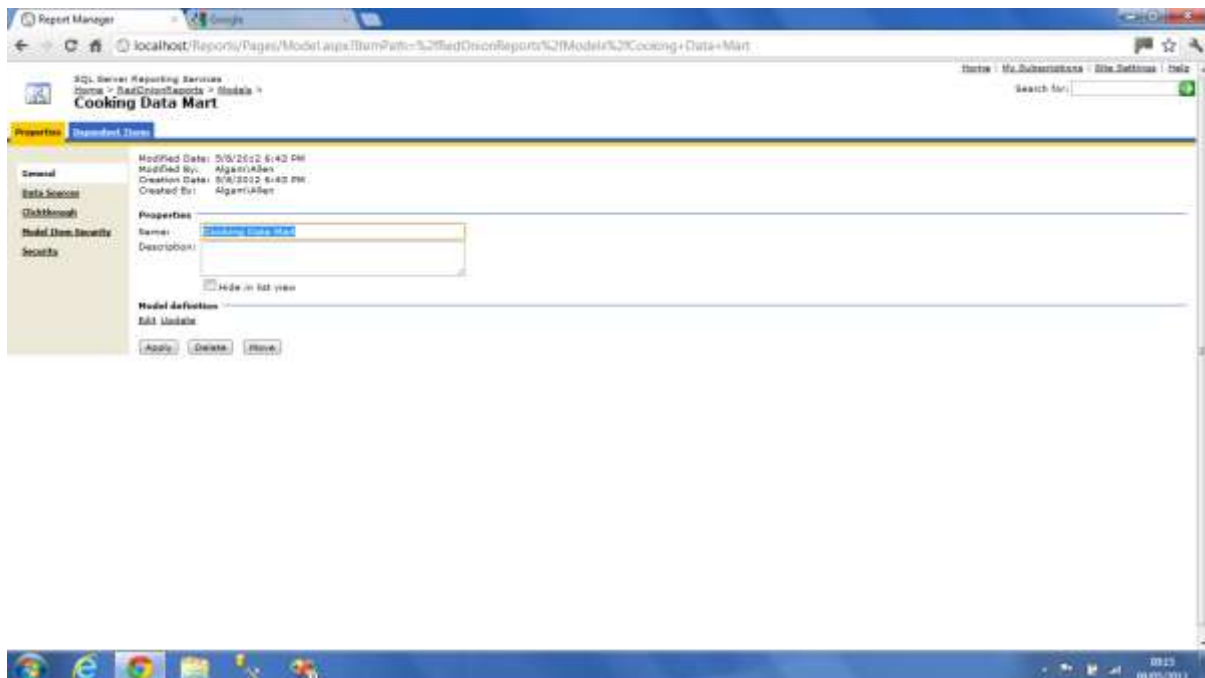




Deploying the model

On entering the following URL on the browser of choice, <http://Algam/ReportServer> you can view where the model was deployed. You can also launch the Report Builder without first going to the Report Manager by using this URL

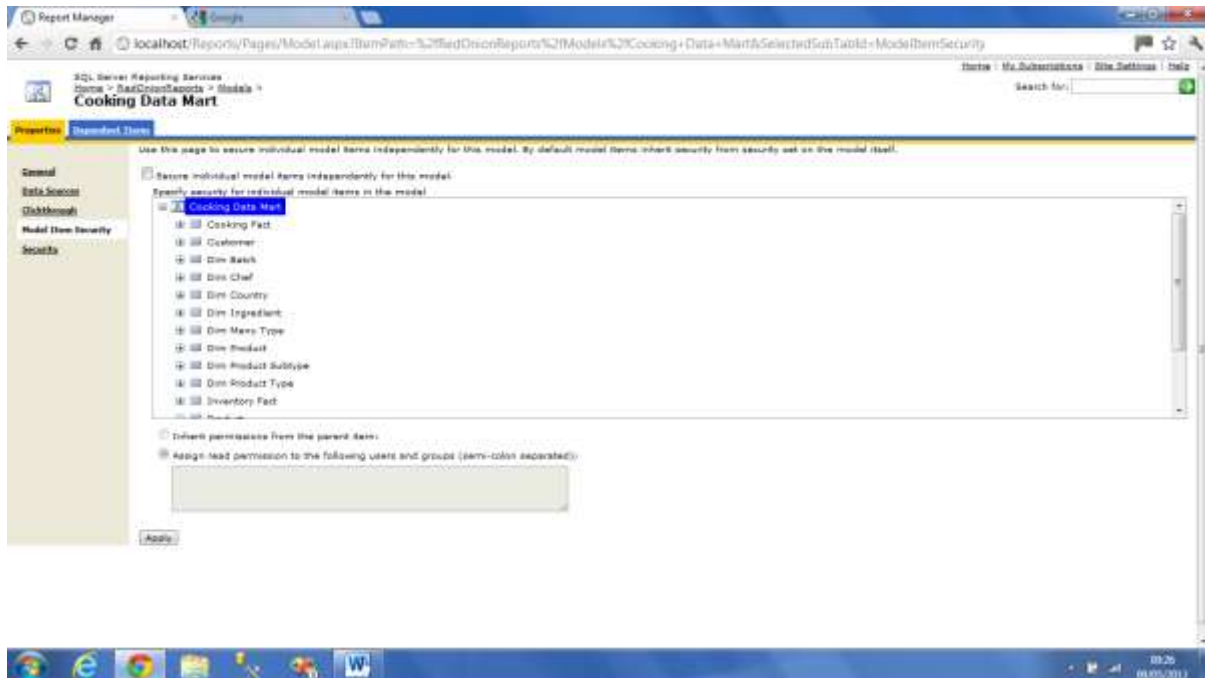
<http://Algam/ReportServer/ReportBuilder/ReportBuilder.application>



The Cooking Data Mart Report Mode deployed to the report Server.

Securing the Model

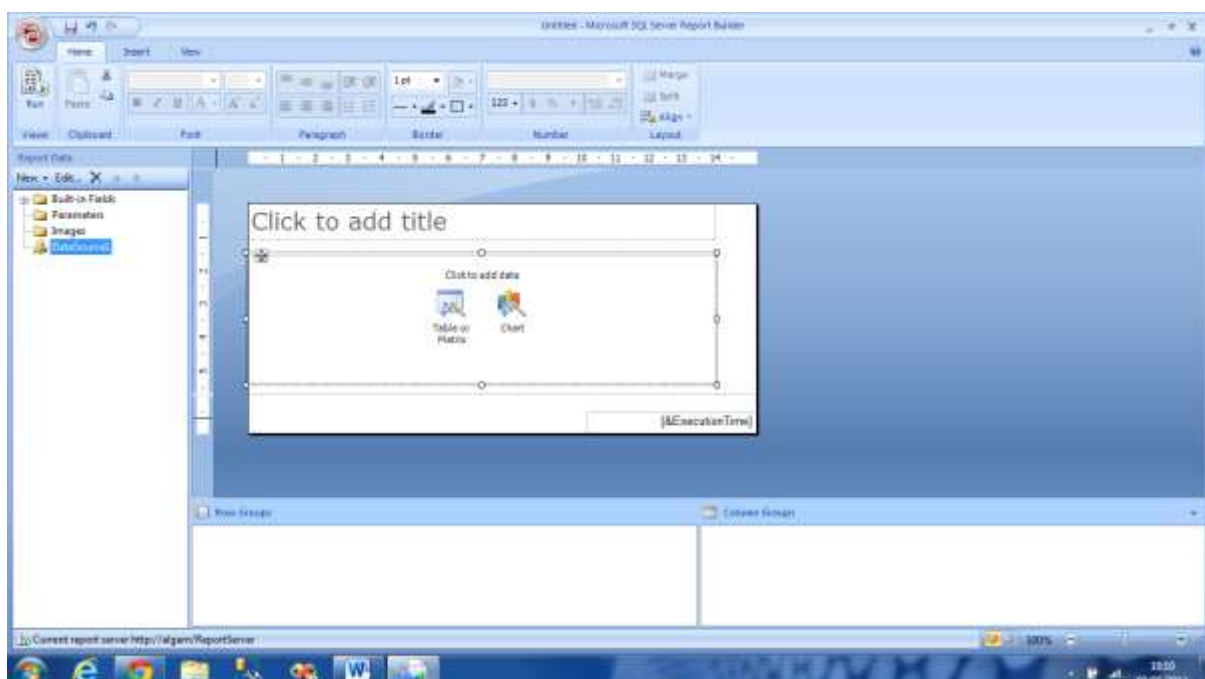
The Model Item Security page provides a way to make security role assignments at a more granular level. On this page you can assign read permissions for individual entities or attributes to individual users or groups.



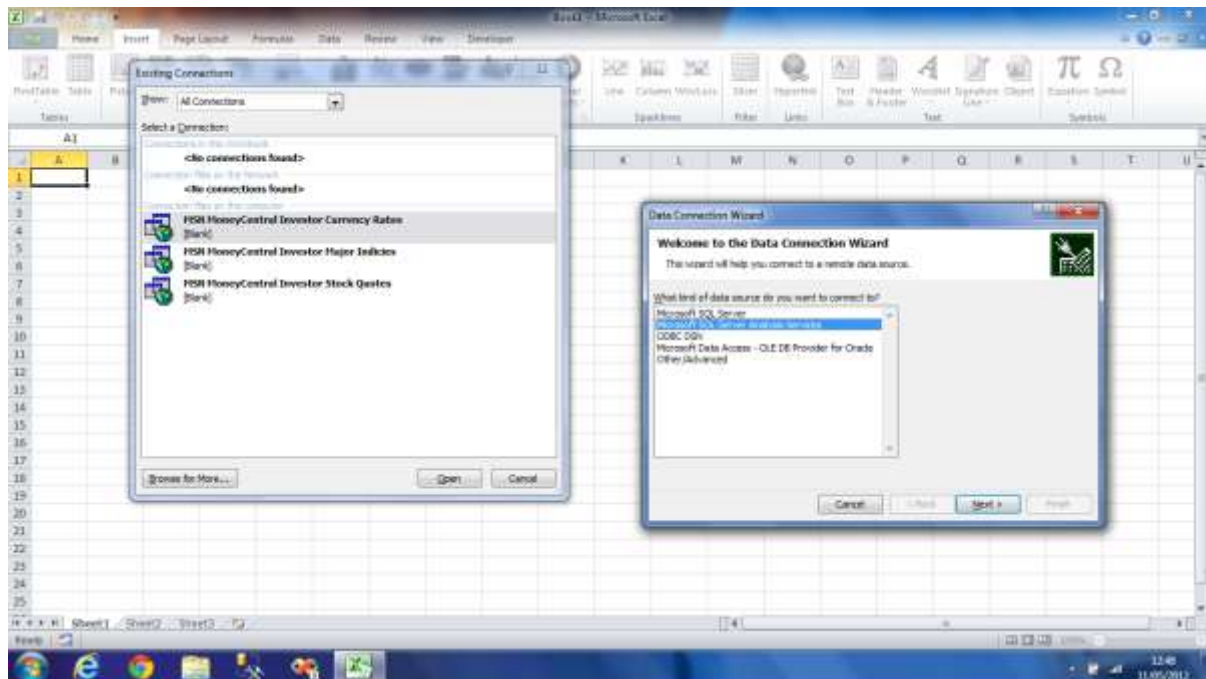
The Item Model Security page

Report Building

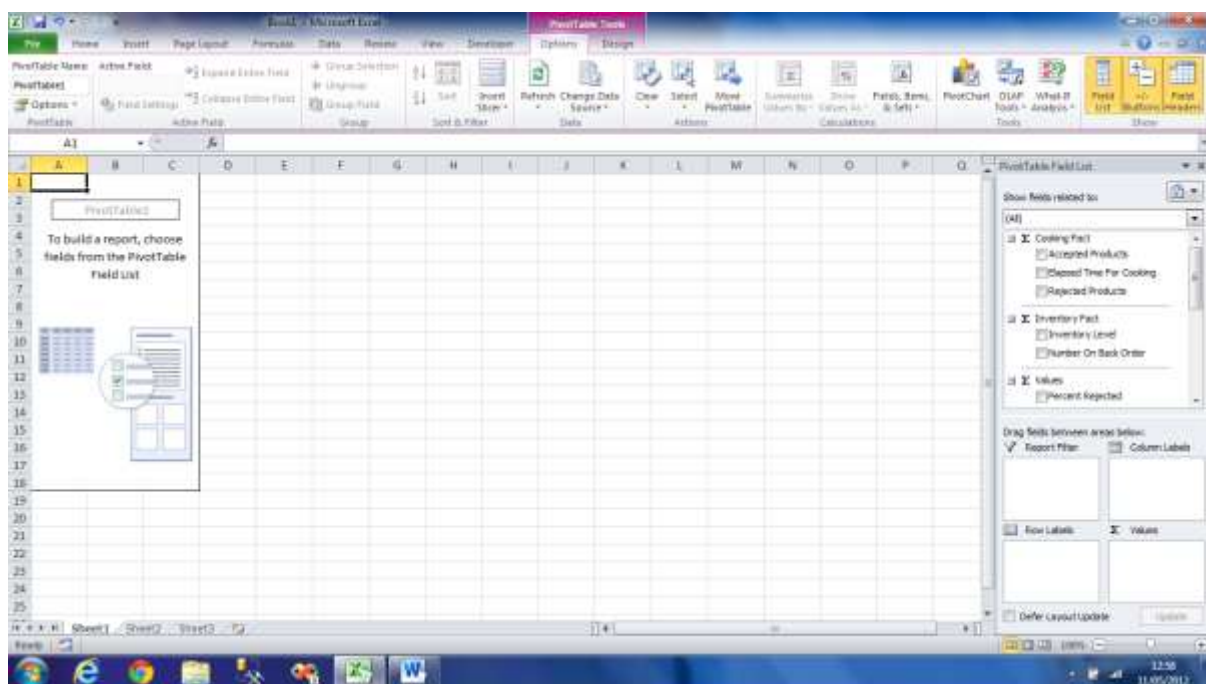
Users can use Report Builder to build reports. The Report Builder screen shots look like the following.



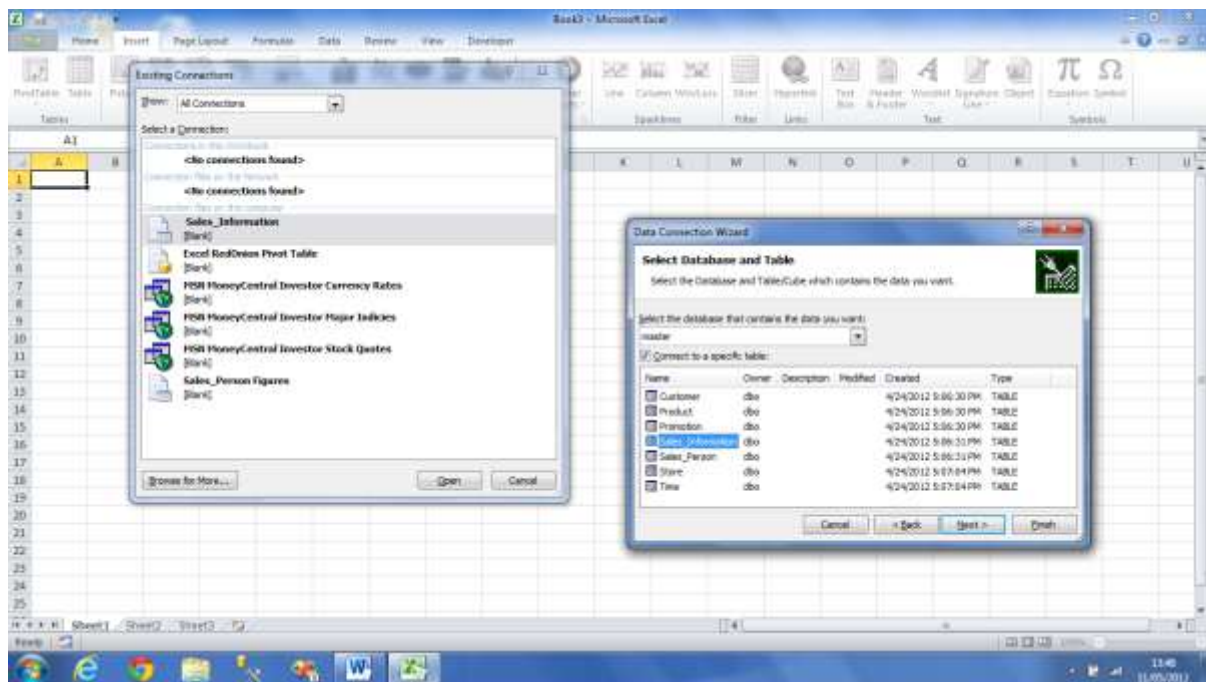
Creating an Excel Pivot Table



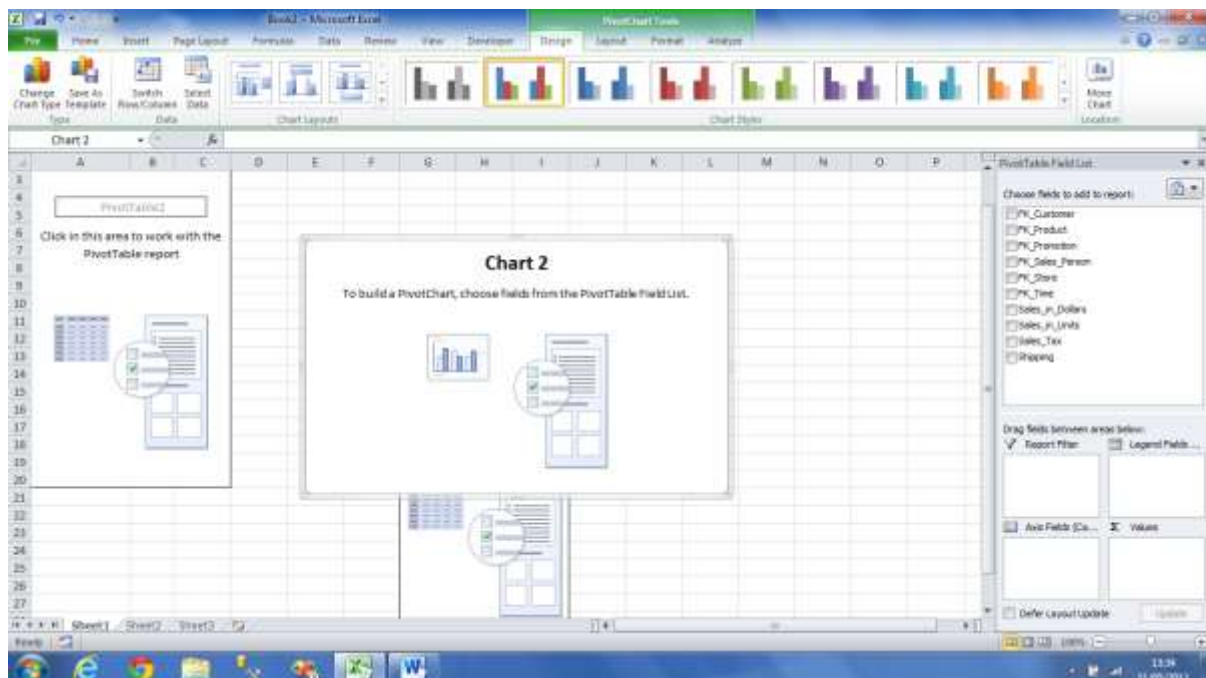
A Create Pivot Table Dialog box



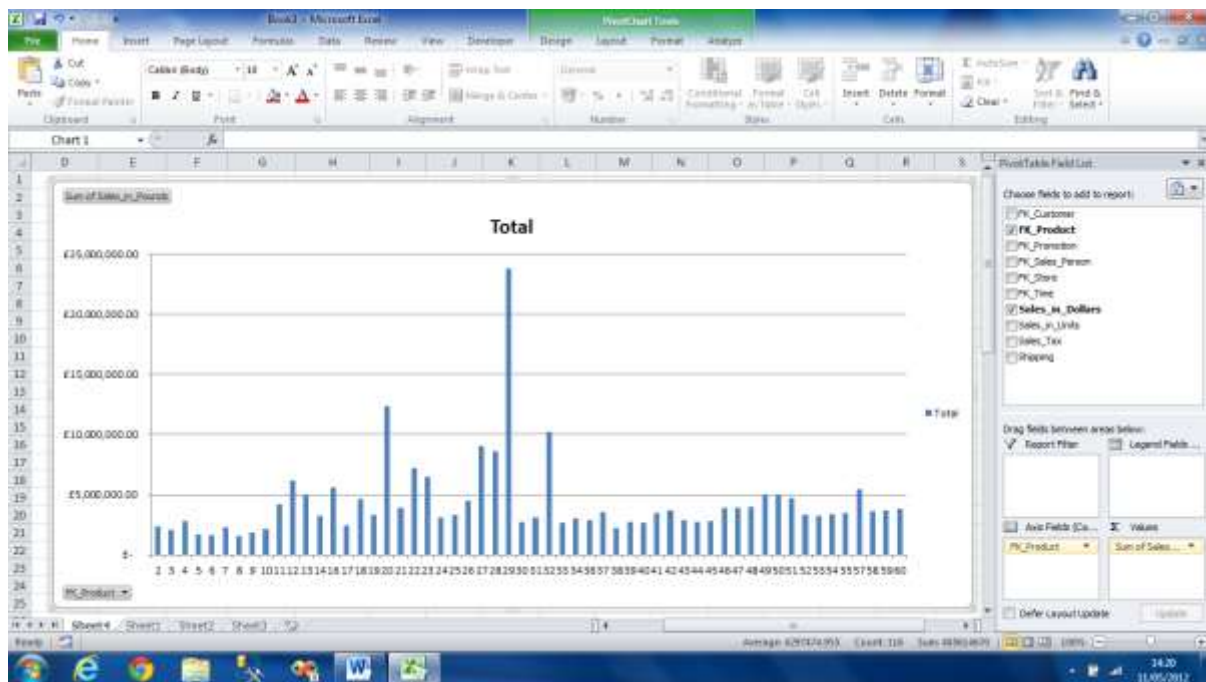
Creating a Pivot Chart in Microsoft Excel



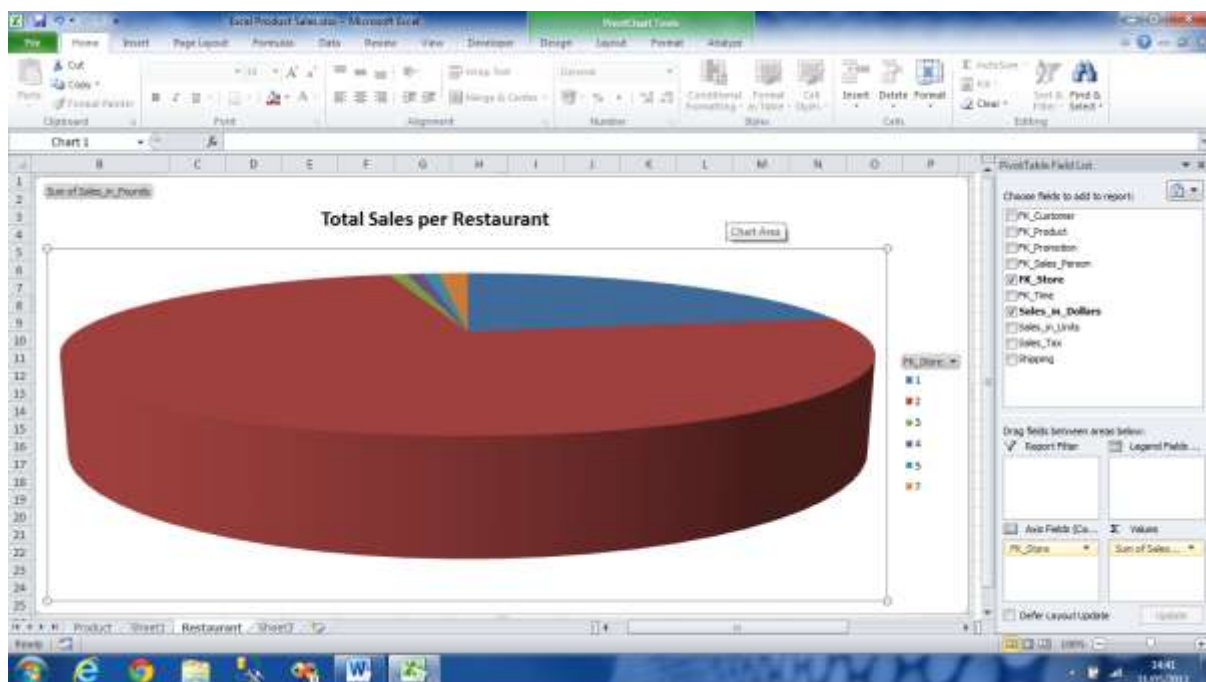
An Empty pivot Chart



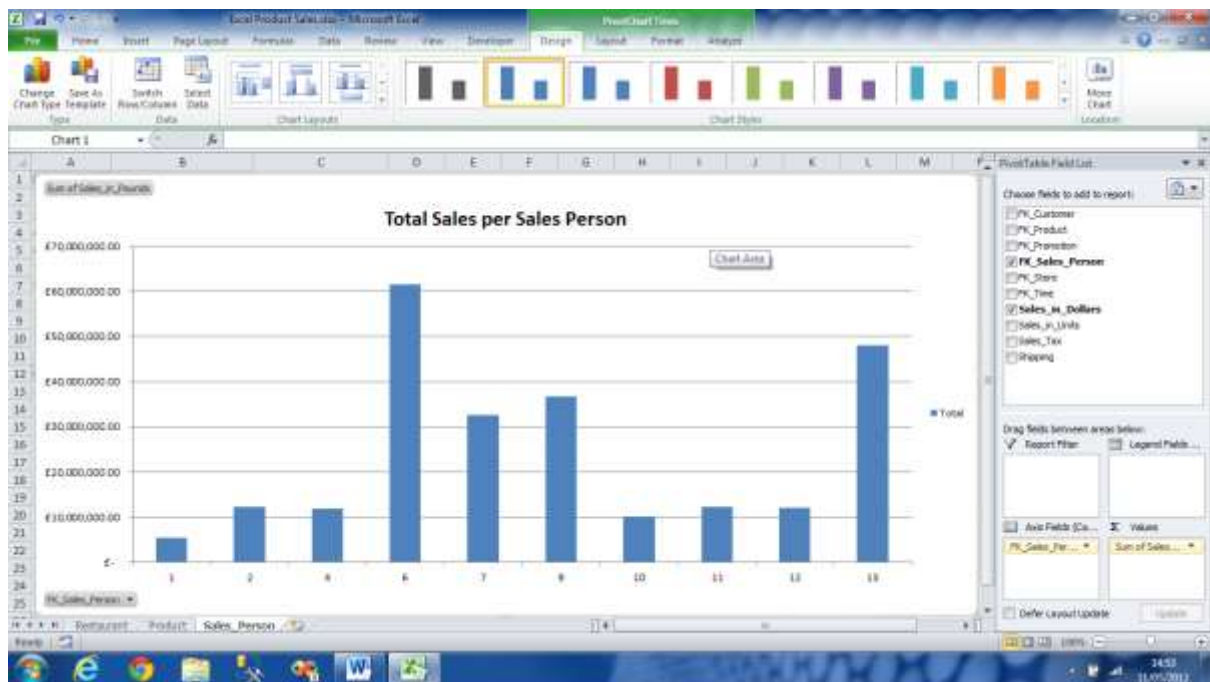
A Chart of Product Sales



Sales per Restaurant



Sales per Sales Person



Appendix G: User Guide

Hardware and Software Requirements

You'll need the following hardware and software to work with the information provided in this Project:

- Microsoft Windows 7 or Microsoft Windows Server 2008 Enterprise edition or later. The Enterprise edition of the operating system is required if you want to install the Enterprise edition of SQL Server 2008.
- Microsoft SQL Server 2008 Standard edition or later. Enterprise edition is required for using all features discussed in this book. Installed components needed are SQL Server Analysis Services, SQL Server Integration Services, and SQL Server Reporting Services.
- SQL Server 2008 Report Builder 2.0.
- Visual Studio 2008
- Office SharePoint Server 2007 (Enterprise Edition or Windows SharePoint Services 3.0).
- Office 2007 Professional edition or better, including Excel 2007 and Visio 2007.
- SQL Server 2008 Data Mining Add-ins for Office 2007.
- 1.6 GHz Pentium III+ processor or faster.
- 1 GB of available, physical RAM.
- 10 GB of hard disk space for SQL Server and all samples
- Video (800 by 600 or higher resolution) monitor with at least 256 colours.
- CD-ROM or DVD-ROM drive.
- Microsoft mouse or compatible pointing device.

The windows login details used are as follows Server Name – Algam, User: Allen, password (login password) 07772067390. To view all reports you need to log in as administrator

Instructions for installing databases are shown below

Installing the RedOnionCookingDM Database for use with Delivering Business Intelligence with Microsoft SQL Server 2008

Create an Empty RedOnionCookingDM Database in SQL Server

1. Open SQL Server Management Studio.
2. Use **File | Open | File** from the main menu to open the "Create RedOnionCookingDM Database.sql" file. When prompted, connect to the SQL Server database server that will host the RedOnionCookingDM database. Be sure to use credentials that have rights to create a database on this server.
3. Execute this script to create the database.
4. Close the query window containing the "Create RedOnionCookingDM Database.sql" script.

Restore the RedOnionCookingDM Database Backup

1. In the SQL Server Management Studio, right-click the Databases folder in the Object Explorer window and select "Refresh" from the context menu.
2. Click the plus sign next to the Databases folder. An entry for the RedOnionCooking DM database should be present.
3. Right-click the entry for the RedOnionCookingDM database and select **Tasks | Restore | Database** from the context menu. The Restore Database - RedOnionCookingDM dialog box will appear.
4. Select the **From device** radio button.
5. Click the ellipsis button (...) across from the From device radio button. The Specify Backup dialog box will appear.
6. Select "File" from the **Backup media** dropdown list, if it is not already selected.
7. Click **Add**. The Locate Backup File dialog box will appear.
8. Navigate to the folder where you unzipped the RedOnionCookingDM Database Install and select the "RedOnionCookingDM Database Backup.BAK" file.
9. Click **OK** to exit the Locate Backup File dialog box.
10. Click **OK** to exit the Specify Backup dialog box.
11. Check the box in the Restore column for the RedOnionCookingDM backup entry you just created in the **Select the backup sets to restore** grid.
12. Select the **Options** page in the upper-left corner of the dialog box.
13. Check the **Overwrite the existing database** check box.
14. Change the paths in the Restore As column of the **Restore the database file as** grid, if the RedOnionCookingDM database was not created in the default location.
15. Click **OK** to restore the database.
16. Wait for the database restore to complete.
17. Click **OK** to exit the restore completed message.

Note: If the database restore is not successful, check the Files page of the RedOnionCookingDM Database Properties dialog box to insure that the database is being restored in the proper location in step 13.

Installing the RedOnionSalesDM Database for use with Delivering Business Intelligence with Microsoft SQL Server 2008

The RedOnionSalesDMLoad project will populate this database. If you do not wish to go through this process, you may use the following steps to create a fully populated version of the database.

Create an Empty RedOnionSalesDM Database in SQL Server

5. Open SQL Server Management Studio.
6. Use **File | Open | File** from the main menu to open the "Create RedOnionSalesDM Database.sql" file. When prompted, connect to the SQL Server database server that will host the RedOnionSalesDM database. Be sure to use credentials that have rights to create a database on this server.
7. Execute this script to create the database.
8. Close the query window containing the "Create RedOnionSalesDM Database.sql" script.

Restore the RedOnionSalesDM Database Backup

18. In the SQL Server Management Studio, right-click the Databases folder in the Object Explorer window and select "Refresh" from the context menu.
19. Click the plus sign next to the Databases folder. An entry for the RedOnionSalesDM database should be present.
20. Right-click the entry for the RedOnionSalesDM database and select **Tasks | Restore | Database** from the context menu. The Restore Database - RedOnionSalesDM dialog box will appear.
21. Select the **From device** radio button.
22. Click the ellipsis button (...) across from the From device radio button. The Specify Backup dialog box will appear.
23. Select "File" from the **Backup media** dropdown list, if it is not already selected.
24. Click **Add**. The Locate Backup File dialog box will appear.
25. Navigate to the folder where you unzipped the RedOnionSalesDM Database Install and select the "RedOnionSalesDM Database Backup.BAK" file.
26. Click **OK** to exit the Locate Backup File dialog box.
27. Click **OK** to exit the Specify Backup dialog box.
28. Check the box in the Restore column for the RedOnionSalesDM backup entry you just created in the **Select the backup sets to restore** grid.
29. Select the **Options** page in the upper-left corner of the dialog box.
30. Check the **Overwrite the existing database** check box.
31. Change the paths in the Restore As column of the **Restore the database file as** grid, if the RedOnionSalesDM database was not created in the default location.
32. Click **OK** to restore the database.
33. Wait for the database restore to complete.
34. Click **OK** to exit the restore completed message.

Note: If the database restore is not successful, check the Files page of the RedOnionSalesDM Database Properties dialog box to insure that the database is being restored in the proper location in step 13.

Installing the Order Processing System Database for use with Delivering Business Intelligence with Microsoft SQL Server 2008

NOTE: The Order Processing System Database is used by the RedOnionCookingDMFactLoad Integration Services project.

Create an Empty Order Processing System Database in SQL Server

9. Open SQL Server Management Studio.
10. Use **File | Open | File** from the main menu to open the "Create OrderProcessingSystem Database.sql" file. When prompted, connect to the SQL Server database server that will host the OrderProcessingSystem database. Be sure to use credentials that have rights to create a database on this server.
11. Execute this script to create the database.
12. Close the query window containing the "Create OrderProcessingSystem Database.sql" script.

Restore the Order Processing System Database Backup

35. In the SQL Server Management Studio, right-click the Databases folder in the Object Explorer window and select "Refresh" from the context menu.
36. Click the plus sign next to the Databases folder. An entry for the OrderProcessingSystem database should be present.
37. Right-click the entry for the OrderProcessingSystem database and select **Tasks | Restore | Database** from the context menu. The Restore Database - OrderProcessingSystem dialog box will appear.
38. Select the **From device** radio button.
39. Click the ellipsis button (...) across from the From device radio button. The Specify Backup dialog box will appear.
40. Select "File" from the **Backup media** dropdown list, if it is not already selected.
41. Click **Add**. The Locate Backup File dialog box will appear.
42. Navigate to the folder where you unzipped the OrderProcessingSystem Database Install and select the "OrderProcessingSystem Database Backup.BAK" file.
43. Click **OK** to exit the Locate Backup File dialog box.
44. Click **OK** to exit the Specify Backup dialog box.
45. Check the box in the Restore column for the OrderProcessingSystem backup entry you just created in the **Select the backup sets to restore** grid.
46. Select the **Options** page in the upper-left corner of the dialog box.
47. Check the **Overwrite the existing database** check box.
48. Change the paths in the Restore As column of the **Restore the database file as** grid, if the OrderProcessingSystem database was not created in the default location.
49. Click **OK** to restore the database.
50. Wait for the database restore to complete.
51. Click **OK** to exit the restore completed message.

Note: If the database restore is not successful, check the Files page of the OrderProcessingSystem Database Properties dialog box to insure that the database is being restored in the proper location in step 13.

Appendix H: DVD