بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduate Studies

A proposed Application of Business Intelligence in Microfinance Sector in Sudan

(A Case Study of Agricultural Bank)

تطبيق مقترح لذكاء الأعمال في التمويل الأصغر في السودان:دراسة حالة البنك الزراعي

A thesis is submitted for partial fulfillment for the requirements of

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الآيـــــــــــة

بسم الله الرحمن الرحيم

{ لا يُكلِّفُ اللهُ نَفساً إلا وُسعَهَا لَهَا مَا كَسَبَتْ وَعَلَيْهَا مَا
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(سورة البقرة : آية 286)

المستخلص

نظراً للتطور السريع في حجم البنوك والتوسع الجغرافي وازدياد حجم المعاملات ومعلومات العملاء أصبح من الضروري لإدارة البنوك استخدام برنامج ذكاء الأعمال وهو من الأنظمة الحاسوبية لمساعدتهم على الإدارة الجيدة واكتساب ميزة تنافسية بين البنوك الأخرى.

الهدف الرئيسي من هذه الدراسة هو معرفة تأثير ذكاء الأعمال في قطاع التمويل الأصغرفي البنوك من خلال تطبيق برنامج Microsoft SQL Server software، وتأثير ذكاء الأعمال على جودة اتخاذ القرار.

ولتحقيق الغرض من هذه الدراسة، قام الباحث بتطوير استبانة استنادا إلى أحدث الدراسات التي تناولت الموضوع لجمع البيانات ذات الصلة لتحقيق هذا الهدف. وتألف مجتمع الدراسة من (50) عينة عشوائية وزعت على بعض مديري ورؤساء الأقسام و العاملين في البنوك داخل ولاية الخرطوم. بعد الانتهاء من توزيع عينة الدراسة، تم الاستعانة بالحاسوب باستخدام الحزم الإحصائية للعلوم الاجتماعية (SPSS) لتحليل البيانات واختبار الفرضيات.

توصل البحث الى العديد من النتائج اهمها، هناك تأثير مباشر في تطبيق ذكاء الأعمال في القطاع المصرفي وهذا يدل على ان القطاع المصرفي في السودان بحاجة الى حل ذكاء الأعمال.

Abstract

As the banks grew in size and expanded geographically, the volume of transactions and customer information became quite large, the banking industry need Business Intelligence (BI) computer software to help them gain competitive advantage.

The main objective of this study is to explore the impact of Business Intelligence in microfinance sector in banking industry using Microsoft SQL Server for building BI software, through exploring the impact of Business Intelligence on Quality of Decision Making.

In order to achieve the purpose of this study, the researcher developed a specific questionnaire based on the latest studies that are written in the subject to collect relevant data to achieve that object. The population of this research a random sample consists of (50) person managers and head of departments working at banks of Sudan. After distributing (50) questionnaires of the study sample, The Statistical Package for Social Sciences (SPSS) program was used for analysis and examine the hypothesis.

The research has reached several findings; there is appositive direct impact for implementation of BI application in banking industry which meant that the banking industry in Sudan needed Business Intelligence solution.

Acknowledgement

I would like to express my gratitude to all those who gave me the possibility to complete this thesis.

I had great fortune to study under supervision Dr.Osama Ahmed Ibrahim and I am very grateful for their guidance and encouragement. Their profound knowledge provided me with opportunity to broaden my knowledge and to make significant progress to do this wonderful project.

Last but not least, special thanks to my family for their ever present love and support. Without them, none of this would ever have happened. I hereby dedicate this piece of work to my beloved brother and friends.

List of Contents

List of Figures

List of Tables

Glossary

Business intelligence (BI): refers to the use of technology to collect and effectively use information to improve business effectiveness.

Business Intelligence Development Studio (BIDS): is Microsoft Visual Studio 2008 with additional project types that are specific to SQL Server business intelligence. Business Intelligence Development Studio is the primary environment that you will use to develop business solutions that include Analysis Services, Integration Services, and Reporting Services projects.

Credit information Bureau (CIB): is an organization that collects and collates credit data on borrowers from its member financial institutions.

Data warehouse (DW): is an analytical database use as the base for BI system, designed for large amount of data in a manure enabling simple and efficient data management for purpose of creating information required in the decision making process.

Data mining (DM): is the process of exploring and analyzing meaningful stacks and rules. Data mining used technology and algorithm from the area of statistic and artificial intelligent to find significant hidden stacks in large data set.

ETL (Extract, Transform and Load): is a process in data warehousing responsible for pulling data out of the source systems and placing it into a data warehouse.

Microsoft Business Intelligence (MSBI): This powerful suite is composed of tools, which help in providing best solutions for Business Intelligence and Data Mining Queries.

Online Analytical Processing or OLAP: provides multidimensional, summarized views of business data and used for reporting, analysis, modelling and planning for optimizing the business. OLAP techniques and tools used to work with data warehouses or data marts designed for sophisticated enterprise intelligence systems.

State Bank of Pakistan (SBP): a department responsible for maintaining the information related to borrowing related to any person, company, and/or group of companies.

SQL Server Integration Services (SSIS): A comprehensive platform for extract, transforms, and load (ETL) operations that enable the population and synchronization of your data warehouse with data from the disparate data sources that used by your business applications throughout the organization.

SQL Server Analytical Services (SSAS): is the technology from the Microsoft Business Intelligence stack, to develop Online Analytical Processing (OLAP) solutions.

SQL Server Reporting Services (SSRS): is a feature included in the SQL Server 2008 product. SSRS use to design, develop, test, and deploy reports.

Chapter 1 Introduction

1.1 Background

The banking industry is becoming increasingly competitive and facing ever-changing regulatory requirements, making it more and more challenging for banks to keep up with the changes and with the competition. With a vast range of customers and customer needs, ongoing regulatory changes, and increasing consolidation, banking enterprises need information management solutions that will allow them to make smart decisions. Banks need to use all the tools at their disposal to manage the many industry challenges and ensure their own financial stability through intelligent business solutions [4].

"Business intelligence is the process of gathering high-quality and meaningful information about the subject matter being researched that will help the individual(s) analysing the information, draws conclusions or make assumptions." [Jonathan, DMR 2000]

Business intelligence refers to the use of technology to collect and effectively use information to improve business effectiveness. BI system gives an organization's employees, partners, and supplier's easy access to the information they need to their jobs, ability to analyse and easily share this information with others [6].

Business intelligence (BI) software can be a transformational asset for organizations. It can eliminate much of the guesswork within organizations, enhance communication and joint planning across functions and lines of business, and enable organizations to respond much more quickly to changes in financial conditions, customer preferences and supply chain operations.

Deregulation in 1999 hastened the revolutionary changes in financial services that began to take hold around 1990 and defined four macro trends that directly affect this industry:

- Globalization and consolidation
- Complexity in go-to-market strategy
- Explosion in data availability
- More sophisticated customer understanding

With the globalization and consolidation of markets, customer needs and risk, banks and institutions serving the corporate banking requirements of their customers are dealing with a far broader set of needs and a far more complex environment. Today, insurance, investment banking, corporate banking and private debt placement can be offered fairly well by a single entity; As a result financial service providers are centralizing their information management platforms either on full data warehouses or on sophisticated data marts.

In order to face this growing set of challenges, financial organizations require a common BI platform that allows for shared, defined access to information as shown in figure 1.1[28].

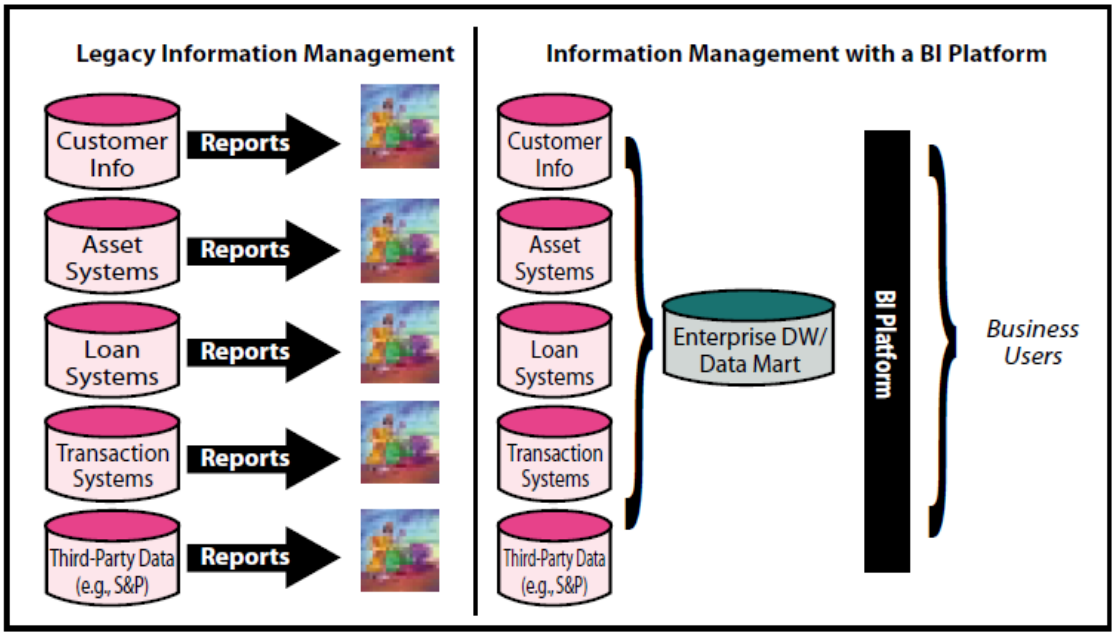


Figure 1.1 Business Challenges Global Banks Face [28]

Business intelligence covers many areas of the bank, and among the most important are: Customer Relationship Management (CRM), Performance Management (PM), Risk Management (RM), Asset and Liability Management (ALM), and Compliance. Data warehouse, online analytical processes (OLAP). The research explores application of Business Intelligence In Bank (microfinance Sector) [2].

Microfinance (MF) is a powerful poverty alleviation tool. It implies provision of financial services to poor and low-income people whose low economic standing excludes them from formal financial systems. Access to services such as, credit, venture capital, savings, insurance, remittance provided on a micro-scale enabling participation of those with severely limited financial means. The provision of provide financial services to the poor helps to increase household income and economic security, build assets and reduce vulnerability; creates demand for other goods and services (especially nutrition, education, and health care); and stimulates local economies[7].

1.2 Problem statement

Modern banks must respond to challenges such as process automation, increased client expectations, aggressive competition, mergers and acquisitions, new product development and market segmentation, At the same time, banks must also manage risks, understand consumer needs, track trends, identify profitable areas, identify their most profitable customers for targeted retention efforts, and monitor consumer credit.

In addition, a bank will have many people in different locations with varied skill levels that need to use information for varying purposes and creating report without depending on it department.

1.3 Motivation

Nowadays the bank and financial institutions record large amounts of data daily; data are recorded for all clients on their personal, psycho-social, property and financial features, This data is generated in the bank's basic information system and stored in transactional databases[2].

Due to the above mentioned facts about the availability of large amounts of data. Banking enterprises need information management solutions (BI) to make smart decisions.

1.4 Objectives

The research aims:

- To understand how banking industry use business intelligence software to report on, analyse, and monitor the vast corporate data.
- To give banking the capability to analyse the vast amounts of information they already have to make the best business decisions.
- To allow banking analyses profit and loss, including product sales analysis, campaign management, market segment analysis, and risk analysis. Banks can grow revenue by maximizing customer value over the long term and improving customer acquisition and retention.
- To help banks set financial performance goals and monitor their financial portfolios

1.5 Hypotheses

Based on the study problem and the literature review, the hypotheses are:

HA1: There is a positive direct impact for implementation of Business Intelligence in banking industry in Sudan deepened on:

- Familiarity and knowledge of business intelligent
- Use of business intelligent in banks

HA2: Microfinance sector in Sudan banking industry need a good solution positively related to BI to generate report for make smart decisions.

HA3: There is a relationship between business intelligence and the performance of Microfinance sector in banking.

HA4: There is a challenge for implementation of business intelligent in Sudan banking industry.

1.6 Methodology

The methodology of this study was developed based on the data base (a case study of agricultural bank of Sudan) that have huge amount of data stored in transactional databases, the banking need to Implement business intelligence software to analyse the vast amounts of information they already have to make the best business decisions,

In addition, the software will allow them to tap into their huge databases and deliver easy-to-comprehend insight to improve business performance and risk management. Also, describe in details the methodology used in this study (questionnaire), the study population and its sample.

1.7 Thesis outline

Chapter 1: Introduction:

This chapter describes the application of business intelligence in banking industry and the objective of working this project.

Chapter 2: Literature review:

This chapter describes the BI techniques and their role in banks, outlines the business intelligence and its main features, and describes the environment of banking operations also describe the role of BI technology in analysing key business factors in banking.

Chapter 3: Methodology and Procedures

This chapter focus on a case study of agricultural bank of Sudan, how to design business intelligence software, also describe in details the methodology used in this study, the study population and its sample.

Chapter 4: Implementation:

This chapter describes the implementation and tools that used.

Chapter 5: Analysis Results & Hypotheses Test

This chapter describes the results of the statistical analysis for the data collected according to the research questions and research hypotheses.

Chapter 6: Conclusion:

This chapter describes the findings results from application of business intelligent software, also represent the recommendation of business intelligence applications that to implement in the future at all levels of banking operations.

Chapter 2 Literature Review

2.1 Introduction

Business intelligent today plays an important role in banking and finical organization and other companies, as mention in chapter one Banking enterprises need to keep up with their constantly changing industry to stay viable and competitive.

Banks are looking for ways to differentiate themselves from the competition, and many are focusing on increasing customer revenue to maximize performance. Banks are trying to stand out from the competition by providing top-quality customer service as a way to retain customers and gain new ones. In addition, banks must handle more and varied customer information, making it more difficult for them to understand consumer needs, track trends, identify profitable areas, and monitor consumer credit. Increased customer diversity also means that these companies must keep up with growing consumer demands.

Moreover, banks handle immense amounts of information. It is hard to keep track of important information and even to know which information is valuable, and banking enterprises need the tools to take advantage of the myriad information at their disposal. The information technology available today allows these companies to make better business decisions and to better target performance goals.

Each of the challenges stated above require banks to be proactive in managing and utilizing corporate data if they want to keep up with or stay ahead of the competition. That is where business intelligence comes in. Business intelligence software gives banking enterprises the capability to analyse the vast amounts of information they already have to make the best business decisions [4].

This chapter is divided into three parts, first it's describe about the concepts of BI, its components, benefits of BI and Bi system architecture in banking industry. Second part it is describe about microfinance what its, targeted categories and how to apply for a microfinance. Finally, present the related studies form existing related literatures. Firstly, let us look at different perspectives of Business Intelligence definition.

2.2 Business Intelligence

Business intelligence, or BI for short, is an umbrella term that refers to competencies, processes, technologies, applications and practices used to support evidence-based decision making in organizations. In the widest sense, it defined as a collection of approaches for gathering, storing, analysing and providing access to data that helps users to gain insights and make better fact-based business decisions [8].

Stackowiak et al. (2007) define Business intelligence as the process of taking large amounts of data, analysing that data, and presenting a high-level set of reports that condense the essence of that data into the basis of business actions, enabling management to make fundamental daily business decisions.

(Cui et al, 2007) view BI as way and method of improving business performance by providing powerful assists for executive decision maker to enable them to have actionable information at hand. BI tools are seen as technology that enables the efficiency of business operation by providing an increased value to the enterprise information and hence the way this information is utilized.

Zeng et al. (2006) define BI as “The process of collection, treatment and diffusion of information that has an objective, the reduction of uncertainty in the making of all strategic decisions.” Experts describe Business intelligence as a “business management term used to describe applications

and technologies which are used to gather, provide access to analyse data and information about an enterprise, in order to help them make better informed business decisions."

(Tvrdíková, 2007) describes the basic characteristic for BI tool is that it is ability to collect data from heterogeneous source, to possess advance analytical methods, and the ability to support multi user's demands.

(Golfarelli et.al, 2004) defined BI that includes effective data warehouse and a reactive component capable of monitoring the time critical operational processes to allow tactical and operational decision-makers to tune their actions according to the company strategy.

(Gangadharan and Swamy, 2004) define BI as the result of in-depth analysis of detailed business data, including database and application technologies, as well as analysis practices [1].

2.2.1 Objectives of BI systems

BI systems may be analysed from different perspectives. Decision makers and organizations should predominantly associate BI with organizational implementation of specific philosophy and methodology that would refer to working with information and knowledge, open communication, knowledge sharing along with the holistic and analytic approach to business processes in organizations. BI systems are assumed solutions that are responsible for transcription of data into information and knowledge and they create some environment for effective decision making, strategic thinking and acting in organizations as shown in figure 2.1[26].

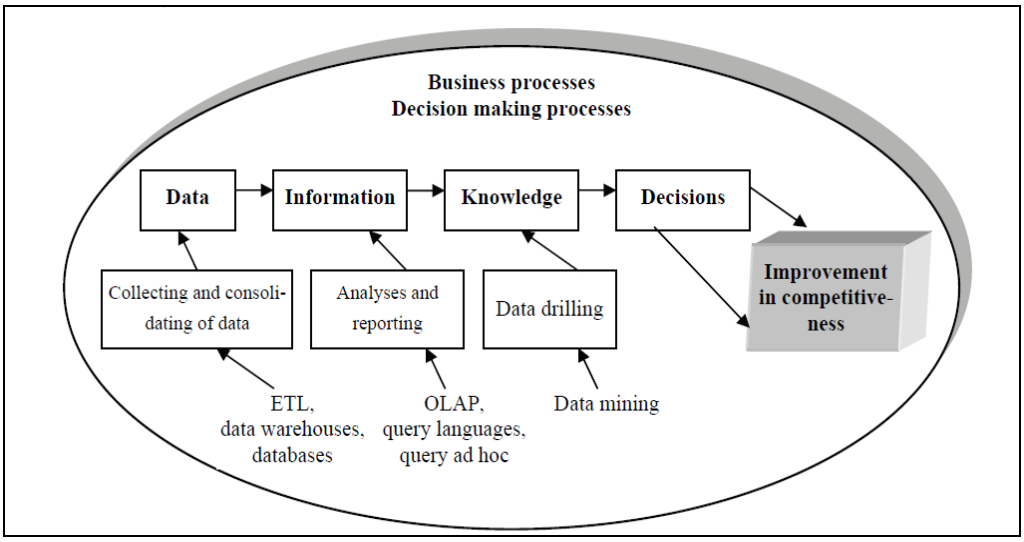


Figure2.2The role of BI systems in decision-making [26]

2.2.2 Benefits of BI

BI provides many benefits to companies utilizing it. It can eliminate a lot of the guesswork within an organization, enhance communication among departments while coordinating activities, and enable companies to respond quickly to changes in financial conditions, customer preferences, and supply chain operations. BI improves the overall performance of the company using it.

The firms have recognized the importance of business intelligence for the masses has arrived. Some of them listed below:

- With BI superior tools, now employees can also easily convert their business knowledge via the analytical intelligence to solve many business issues, like increase response rates from direct mail, telephone, e-mail, and Internet delivered marketing campaigns.
- With BI, firms can identify their most profitable customers and the underlying reasons for those customers' loyalty, as well as identify future customers.
- Analyze click-stream data to improve ecommerce strategies.
- Quickly detect warranty-reported problems to minimize the impact of product design deficiencies.

- Analyze potential growth customer profitability and reduce risk exposure through more accurate financial credit scoring of their customers.
- Determine what combinations of products and service lines customers are likely to purchase and when.
- Reduce equipment downtime by applying predictive maintenance.
- Decreased Costs, Because BI can quickly analyze the performance of front-line operations, it helps identify where productivity and cost improvements are possible. For example, by analyzing supply chain performance, managers can decide whether they should put their efforts into reducing procurement, warehousing or delivery costs. BI allows companies to priorities where their efforts are likely to achieve the greatest payoff [11].

2.2.3 Component of Business Intelligence

After understanding the definition of BI, it is time to discover more about its components and understand how these components work with each other [9].

Generally, the basic components of Business Intelligence are gathering, storing, analysing and providing access to data as shown in figure2.2 [8].

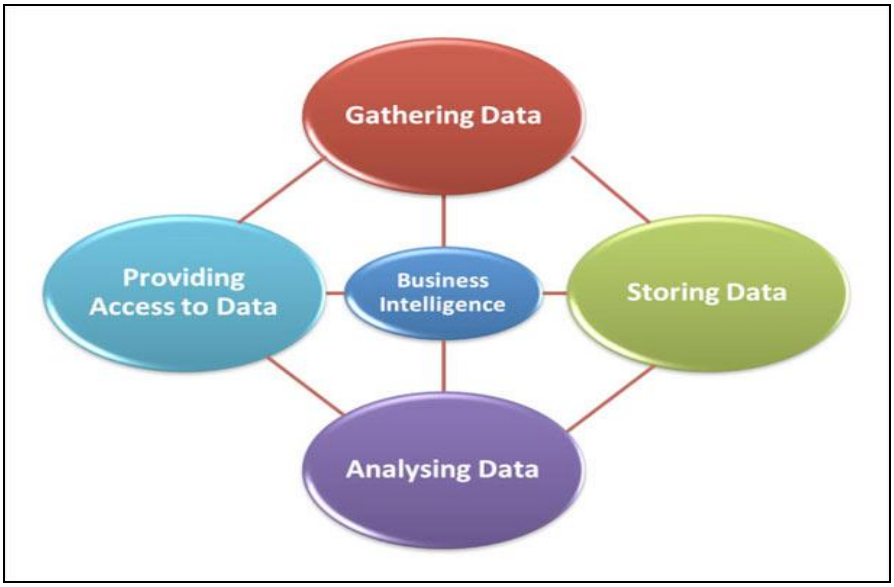


Figure2.3.2Basic components of Business Intelligence [8]

2.2.3.1 Gathering Data

Gathering data is concerned with collecting or accessing data, which used to inform decision-making.

2.2.3.2 Storing Data

Storing Data is concerned with making sure the data filed and stored in appropriate ways to ensure it can be found and used for analysis and reporting.

2.2.3.3 Analysing Data

The next component of BI is analysing the data, transform or model it in order to gain new insights that will support our business decision making.

2.2.3.4 Providing Access

In order to support decision making the decision makers need to have access to the data. Access needed to perform analysis or to view the results of the analysis [8].

The BI architecture and components differ based on the tools, environment, and so on. The following diagram 2.3 shows an illustration of the architecture and main components of the Business Intelligence system:

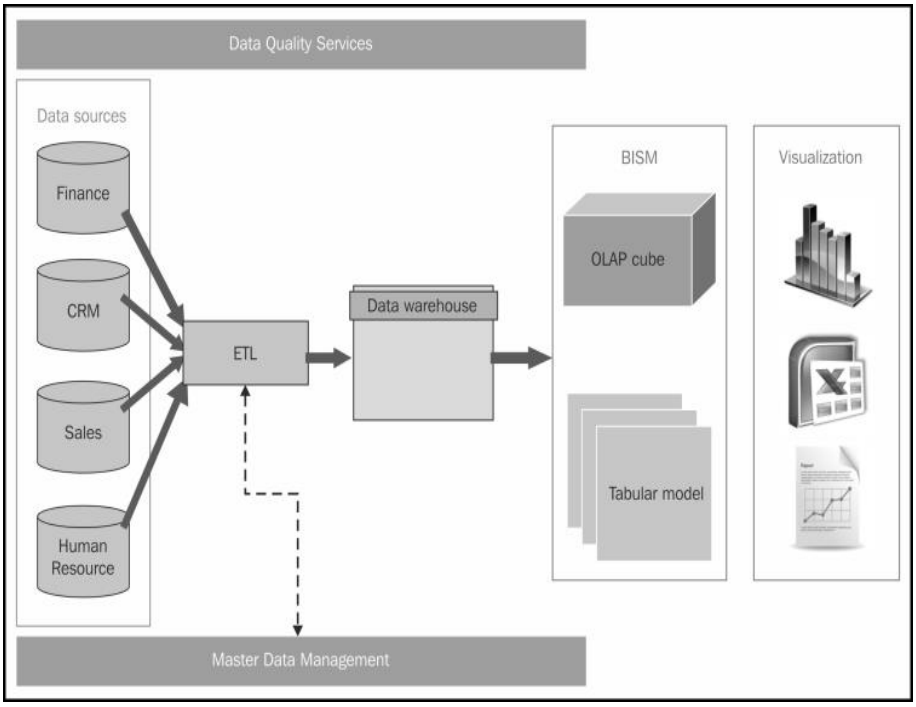


Figure2.4.3 Architecture and Components of the Business Intelligence system [9]

The architecture shown in the preceding diagram contains components that are common in most of the BI systems [9].

- **Data Sources:** can be operational databases, historical data, and external data for example, from market research companies or from the Interne, or information from the already existing data warehouse environment. The data sources can be relational databases or any other data structure that supports the line of business applications [1].
- **ETL (Extract, Transform and Load**): is a process in data warehousing responsible for pulling data out of the source systems and placing it into a data warehouse [10].
- **Online Analytical Processing or OLAP:** provides multidimensional, summarized views of business data and is used for reporting, analysis, modeling and planning for optimizing the business. OLAP techniques and tools can be used to work with data warehouses or data marts designed for sophisticated enterprise intelligence systems [1].
- **Data Warehouse and data marts:** The data warehouse is the significant component of business intelligence. It is subject oriented, integrated. The data warehouse supports the physical propagation of data by handling the numerous enterprise records for integration, cleansing, aggregation and query tasks [1].

2.2.4 BI framework

BI framework provides a broad overview of how different components of your BI strategy fit together to serve your entire BI vision. It brings together the forces that drive business operations: people, processes, and technology in a collaborative environment shown in figure2.4.

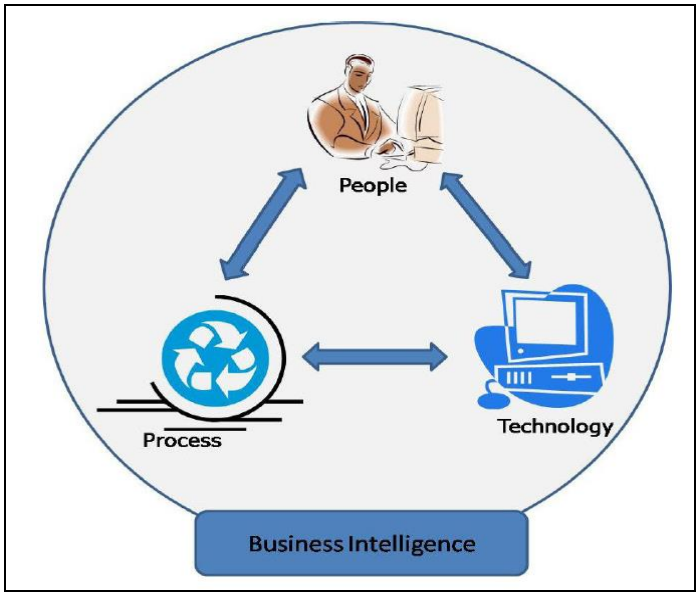


Figure2.5.4 BI using people, process, and technology to enable value [15]

BI framework involves connecting together BI, business processes, collaborative applications, and their underlying data stores. The framework further enhances the integration with business planning systems, supports knowledge management, business processes, performance management technologies, and users. BI strategy should have a comprehensive approach in describing the current and future behaviour of the processes, technology, people, and other components to ensure that they align with the goals and strategic direction of the enterprise. BI framework helps you in connecting these pieces together [15].

2.2.5 Areas Encompassed by business intelligent in banks

Business intelligent solution for banks should provide the decision makers from all business segments of the banks with the ability to manage and exploit the information potential of a multitude internal and external data source.

Business intelligent covers many areas of banking business the most important:

- Analytical customer relationship management.
- Bank performance management.
- Enterprise risk management.
- Asset and liability management and,
- Compliance as shown in figure 2.5 [2].

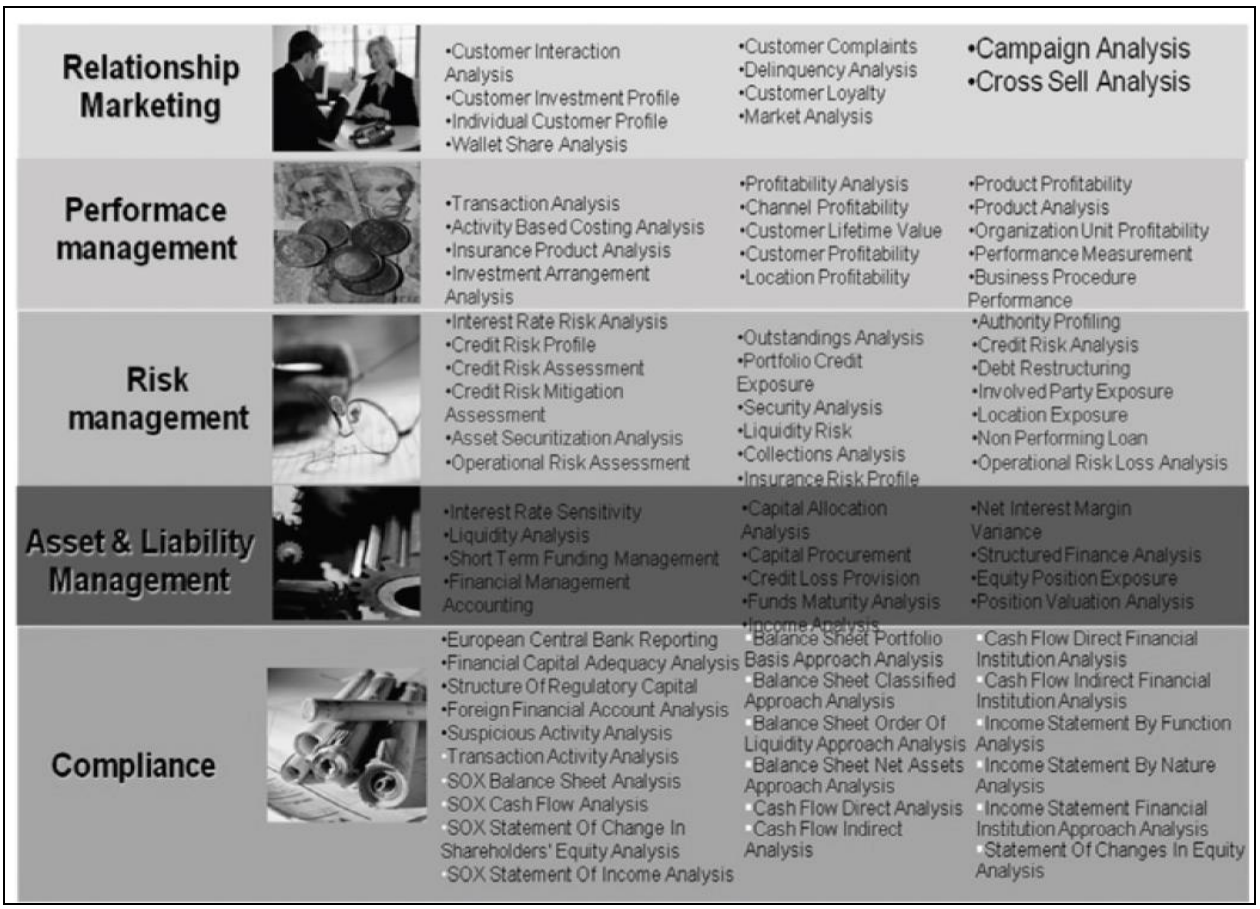


Figure2.6.5Areas Encompassed by business intelligent in banks [2]

2.2.6 Business intelligent system architecture in the banking industry

The architecture of a bank's business intelligence system is very heterogeneous and comprises several layers:

- Operational database and external data
- The data integration and transformation layer
- The data warehouse layer
- The data access layer (application, OLAP, data mining, etc.)and
- The front end (layer for access to information).

Operation (transaction) database are created to meet the need day-to-day operation. The bank's transactional data processing systems i.e. Online Transactional processing (OLTP) is the bank's basic information system.

The data integration and transformation layer include process transforming data from operational and external source into a form suitable for database storage they are referred to cumulatively as Extract Transform and Load (ETL) process.

The data warehouse (DW) is an analytical database use as the base for BI system, designed for large amount of data in a manure enabling simple and efficient data management for purpose of creating information required in the decision making process.

The terms OLAP (Online Analytical processing) refers to the category of software technology enabling users (such as analyst, managers, etc.) to gain insight into data in a quick, consistent and interactive. OLAP is the database interface and a form of data processing, which enable the user to extract data quickly and easily, and translate them into information in an almost unlimited number of ways.

Data mining (DM) is the process of exploring and analyzing meaningful stacks and rules. Data mining used technology and algorithm from the area of statistic and artificial intelligent to find significant hidden stacks in large data set. Data mining can be very useful in the banking industry and there are numerous instant of their application.

The layer for access information interacts directly with end users. In essence, this layer contains tools and applications used daily by end user [2].

2.3 Microfinance

Microfinance is known in the most countries of the world as the provision of a wide range of financial services in the domains of credit, saving, insurance, deposit and money transfer's but it can also be extended to the training and capacity building of low-income clients or the poor who are economically active. The Bank of Sudan strategy, has identified the microfinance client as a poor who is active economically with a monthly income of less than the official minimum limit of salaries approved by the GOVT or as a person who owns assets whose value is less than 10,000SDG and who doesn't benefit from funding via formal institutions and for whom the ceiling of finance is restricted to 10,000SDG as a maximum.

The targeted categories are Clients of microfinance of whole urban and rural sectors (small producers, technicians, households, small farmers, students, pensioners, employees and low-income workers).Microfinance is granted to the following sectors:

1) Individuals

Finance ceiling for individuals is identified according to the type of small scale projects implemented in the area. It's worth mentioning that maximum limit for an individual funding is 10000 SDG .i.e. origin of funding profit shouldn't exceed 10000 SDG.

2) Organizations and Societies

Requirements:

- Legal identity and valid registration certificate authenticated by concerned authority.
- Be informed by the society's financial commitments towards banking institution.
- Convenience of the society or organizations, administrative and organizational structure for running microfinance operations
- Previous experience of the society or organization in the field of provision of microfinance
- Operational plan for the society or organization.
- Size of savings shouldn't be less than 10% of the total required finance.

The required finance should equal total projects cost submitted for finance.

Duration of finance: It ranges from one year to two years.

- Sticking to gradual system: when providing finance. EX. The first package of finance shouldn't exceed 50000 SDG.
- Adopting gradual method when providing finance (started with small amounts then repeated and increased gradually).

3) Solidarity lending group

Members of the solidarity lending group range from 15-20 persons. Their formation is monitored by branch employees. Mostly, they are microfinance clients who belong to the same region (residence, work-place). They are always committed to their responsibilities collaboratively, and respond to loan's repayment individually, the thing which strengthens their guarantee .When providing funding through groups, flexibility should be displayed, according to the local circumstances of the group .It is worth noting that the work is guaranteed by the group according to the assessment of the group's administrative efficiency and its ability to enhance saving and repayment of loans. This type of funding contributes substantially to expanding the range of service and mitigating the cost of financing through groups.

2.3.1 Applying for microfinance

Three approach for applying microfinance:

- The individual approach.
- Through microfinance intermediaries (organizations, societies, unions, trade names, companies operating in the microfinance field, microfinance firms).
- Granting microfinance through business incubators within the framework of linking the bank with universities and other institutions.

2.3.1.1 Procedures for Granting Individual Financing

Each branch is free to select the appropriate individuals or activities according to the geographical region and markets it serves. The individual applicant should meet the financing conditions set by SSDB (saving and social development bank).

Procedures of granting the individual financing shall be approved in three steps as of the client reporting to the branch and up to takeover of the project subject of the financing (commodity or service), provided that this process does not exceed 21 days as of date of filling the data analysis form for the client's application.

First Step: Meeting the Client:

1) When the client reports to the branch for the first time, the branch's employee shall explain to him the services provided by the bank in detail as well as discuss his project, illustrate the risks of success and failure and underline two primary messages, as follows:

- The importance of repayment of debt in Islam
- The importance of linking the client with the bank to develop his work through his commitment to repayment

It stressed that the following are the basic requirements for granting the financing:

- The client's application specifying the type and cost of commodity or service subject of the financing
- Forma invoice for the goods to purchased, if any.
- Residence certificate

- Copy of nationality card
- Copy of I.D. (I.D., passport, driving license or valid military I.D., if any)

2) If the client displays wish for financing, his application will be received and a discussion will be held with him immediately to adopt an initial decision on the possibility of financing him.
3) Filling the client's individual financing application that includes sufficient and detailed information on the following: the client's character and place of residence, information on the project financed the client's commitment to the other institutions

Second Step:

1) Visiting the client to verify the information supplied in the form above. The visit made within three days as of filling the client's application analysis form in case of applications that require field visits such as the already existing projects.
2) Recommendation of the field official regarding the terms and conditions of financing (the amount, method of repayment, profit margin, period of allowance, period of financing and type of available guarantee.
3) The application discussed at the meeting of the financing committee in the branch, comprising the branch's manager with deputy manager and head of the financing section for approval or regret (the committee shall meet twice a week to decide on submitted applications).
4) The client informed of the committee's decision and he shall be required to finalize the documents in the case of approval within a period of not more than week as of date of the field visit.
5) The required documents submitted after approval for finalizing the following files:
    a. Lease contract, if necessary
    b. Approval from authorities, if necessary (from the state – locality – popular committee – medical party – artisan union – agricultural union….etc)

c. Guarantee:

- Transfer (pension, salary)
- Authenticated attestation
- Insurance of assets
- Microfinance insurance
- Mortgage of mobile assets
- Investment securities guarantee
- Savings guarantee
- Inquiring about the guarantor if the guarantee was by a check

Third Step:

1) Finalization of the encoding procedures and receiving the code (three days as of opening the private current account and issuing the repayment checks in three work days).
2) Execution, handing over the required items and receiving the goods
3) Signing the financing contract according to the specified mode (Murabaha, Musharaka, and Mugawala….etc)
4) Signing the repayment check

Time between the first and third steps should be as follows: 21 days for new clients and 5-7 days for old clients.

Fourth Step:

1) Visiting the client within a month as of execution of the project ensure exploitation of the financing for the required purpose. This will require a field employee for every 250 clients.
2) Repeated monthly field visits for following up the client's work and assisting him in resolving the problems that face him [12].

2.4 Business Intelligent Case study

2.4.1 Bangkok bank case study

Bangkok bank is the largest commercial banks in Thailand, Providing strong customer services have helped Bangkok bank become the largest commercial bank in Thailand. Always looking for new ways to enhance the services it provides, the bank wanted to study its customer data to help it better determine customer needs, but a reporting system based on manual report development in spreadsheet by using mainframe data (provided in text files) proved cumbersome.

The company created a business intelligence (BI) data mart using the Microsoft application platform including Microsoft SQL server 2008 enterprise database software. Reports are now generated automatically using SQL server 2008 reporting services.

As part of its ongoing focus on customer services the bank wanted to create a data mart to provide it executive, analysts, and branch managers with an efficient foundation for generating reports and to support business intelligent analytics.

Previously, a centralized team sent reports and analysis to managers using e-mail K.Sathita Uthaisri, project managers for Bangkok bank says, "This was a time consuming process, and when the mailbox of a user was full the teams had to resend the report. We knew that the right BI solution would help us deliver even better data with fewer problems"[13]

2.4.1.1 Solution:

Bangkok bank created and deployed a business intelligence (BI) data mart solution to support reporting and analytics using the Microsoft application.

Bangkok bank BI architecture has a multitier that includes:

- **ETL tier:**

The information from bank's mainframe core banking system and other sources validated and normalized before moved into the data mart using SQL server integration services.

- **Database tier:**

Relational data for Bangkok bank's BI data mart hosted on a single instance of SQL server 2008

- **Analytic tier:**

The bank use SQL analyses services to import information from its data mart to organize the information into multidimensional cubes with pre-calculated aggregation data to provide rapid answer to complex queries.

- **Reporting tier:**

Reporting is supported using SQL server 2008 reporting service for creating, managing, and delivering real time information to support daily operation and decision as shown in figure 2.6.

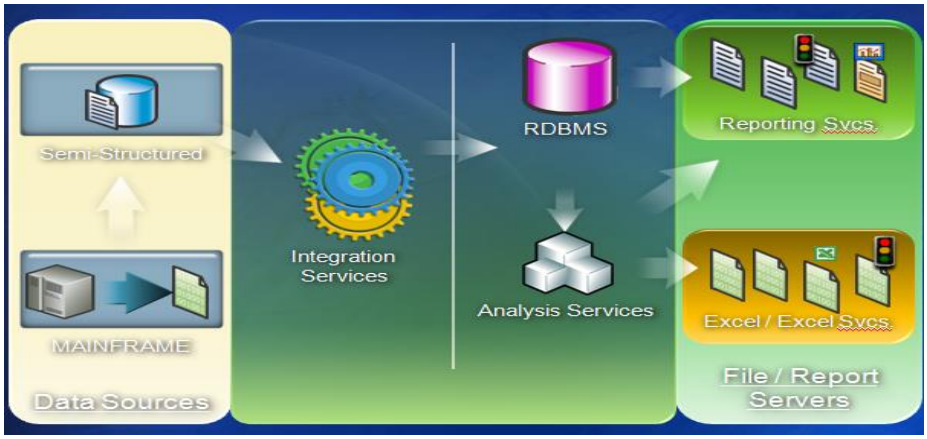


Figure2.7.6 Basic architecture of the Bangkok bank BI infrastructure [13]

2.4.1.2 Benefits

- Faster reporting.
- Better view of the business.
- Deeper customer knowledge.
- Flexible ad hoc reporting [13]

2.4.2 CIB – A BI IMPLEMENTATION:

CIB-Credit information Bureau, a State Bank of Pakistan's department responsible for maintaining the information related to borrowing related to any person, company, and/or group of companies.

CIB maintains this information by frequently fetching borrowing's related information from various banks and institutes throughout Pakistan.

This is a requirement imposed by SBP on all financial institution that they need to get the credit worthiness report before granting a loan above a certain amount to a customer. The current practice of obtaining a credit worthiness report is that the Financial Institution submits a form in SBP. Here the report is prepared manually by the SBP staff and handed over to the requesting institution on the following day.

The reason behind to maintain such an information is to track the net amount hold by any borrower, to eliminate the manual work at SBP end, and to provide quick and easy service to the Financial Institution[6].

2.4.2.1 CIB Problem Statement

To provide fast, accurate, and dynamic analysis on both individual borrower and group basis Currently, CIB gets borrowings information through fax and/or telephones and if any bank or institutes wants to inquire about the holding of a certain person it has to first contact CIB department and then after 15-20 days the information provided to the bank.

The process is quite complex. CIB provide information about borrowings of a particular borrower, also if the borrower belongs to a particular group of companies then the group's net borrowing also needs to be identified [6].

2.4.2.2 Existing Repository

Currently the database is running on Oracle 9i. The database contains information related to borrowings and application security [6].

2.4.2.3 CIB Solution

As with all business intelligence implementations, the solution is not just a software application. As discussed in previous sections a typical business intelligence solution consists of several layers. Starting from OLTP Data bases to Data extraction, transformation, loading, generation of multidimensional data store, and finally a very user friendly User Interface providing Drill-down and Roll-up facilities.

As specified in the previous sections currently Oracle 9i used as database of OLTP. In the following table the tools/technologies used in implementing each layer is specified [6].

Table2.1 Tool/Technologies Used [6]

Layer	Tool/Technology
Operational Database (OLTP)	Oracle 9i
Data Extraction/Transformation/Loading	Microsoft Data Transformation Service
Data Staging Area	MS SQL Server 7.0
User Interface	C#.Net, Pivot Table Service

2.4.2.4 CIB Schema Design

Star Schema used in data warehouse design. They have developed only one dimension for fulfilling all current analytical requirements.

They have only one fact table, for Borrowing detail information, and four dimension tables for Borrower, Institute, Director/Guarantor and Time related information [6].

2.4.2.5 The Interface

The User interface developed using Visual Studion.Net (C#.Net). By default, user interface for any analytical/Business Intelligence Application needs to be dynamic and very user friendly.

OLBA (Online Business Analysis) is a very user friendly and easy to use application. It is very secure, dynamic and analytically enriched tool. OLBA provides graphical as well as analytical analysis to user on subject areas according to its rights/permission. OLBA allows user to perform analysis on various basis. For example, through OLBA user can analyse net borrowings based on Borrower, Institute, Time, on director/guarantor as shown in figure 2.7 [6].

Figure2.8.7 OLBA – User Interface [6]

2.4.3 A Mortgage Banking Industry case study

The mortgage banking industry has seen significant growth and change in the last few years. Record low interest rates drove loan originations and refinancing volume to an all-time high in 2001 and 2002. This explosive growth taxed the existing legacy applications, which handled the loan origination process. To handle this increasing transaction volume, technology investments primarily consisted of new applications that enhanced the operational processes in loan origination.

Another major change was the increased competition and blind eye brought on by new Internet based mortgage banks and consumer mortgage shopping sites with automated tools for comparative shopping. This resulted in the commoditization of primary products and reduced margins in a traditionally lucrative business area. Customer acquisition campaigns lacked differentiation and were mostly ineffective [14].

- **Larger challenges**

The larger challenge facing lending institutions today is the lack of systems and processes that track, alert, and analyse data effectively. The loan origination process generates massive amounts of data that needs to manage by the asset management, finance, and servicing functions. Key management reporting and data analysis capabilities are critical in dealing with issues such as risk management, portfolio analysis, identifying and quantifying trends in delinquency rates.

Another major challenge in large financial institutions and mortgage banks with multiple lines of business (LOB) is the lack of a cross-LOB view of the customer to determine total customer value. In this scenario, each LOB handles the customer as a new entity, resulting in redundancies and wasted motion. In addition, with the lack of cross-LOB customer value analysis, every customer is treated the same.

- **Solution**

The solution to the problems identified above lies in implementing business intelligence (BI) solution. BI is the technology that unites disparate corporate data into one resource, harnesses it as a single source of company truth, and leverages it to achieve the strategic goals of the organization.

BI used to analyse the geographic distribution of mortgaged properties to understand concentration of credit and pre-payment risk based on differences in regional economies, and to analyse loan portfolios to determine customer buy zones.

BI can also be a critical tool to help mortgage bankers obtain high credit ratings from the rating agencies. The goal of a rating agency is to assess a mortgage banker's ability to meet its debt obligations in the future and prevent or mitigate losses as shown in figure 2.8.

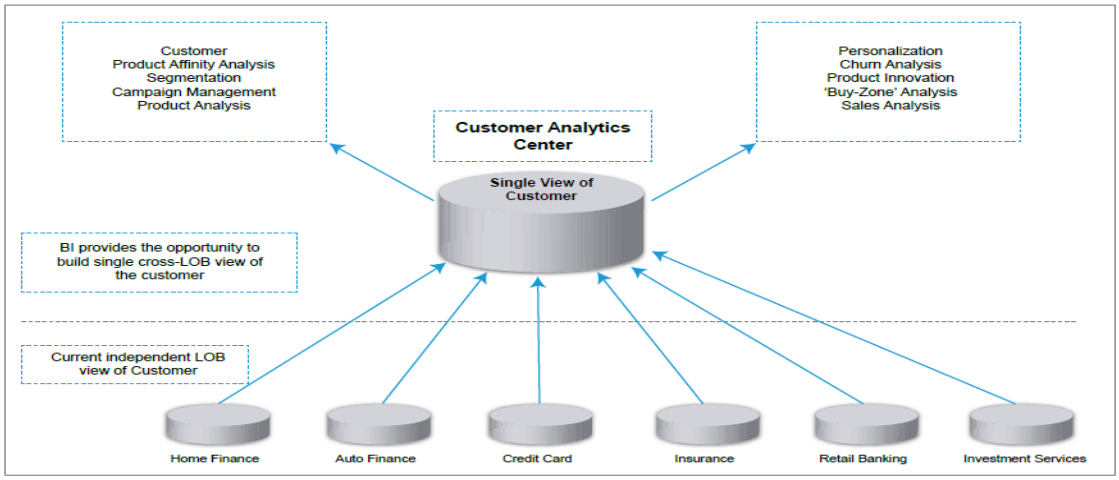


Figure2.9.8 Integrated customer view [14]

- **Strategic benefit**

In the case of large financial institution and bank with multiple LOBs, BI cans provide strategic benefits to manage customer relationship. In most case each LOBs maintains a unique view of customer, which is not accessible by the other LOBs.in addition, there is no enterprise wide quantification of customer value, resulting in standard approach to managing all customer relationship. In this case, BI used to build a single view of customer across all LOBs and make it available for sharing with all the LOBs [14].

2.5 Chapter summary

This chapter discusses the literature review of business intelligent in the banking industry. Also it describes first the definition of business intelligent, benefits of BI and architecture of BI in banking industry. Second part it is describe about microfinance what its, targeted categories and how to apply for a microfinance. Finally, present the related studies form existing related literatures some of them are summarized below:

- **Bangkok bank case study**

Bangkok bank is the largest commercial banks in Thailand, Providing strong customer services have helped Bangkok bank become the largest commercial bank in Thailand. Always looking for new ways to enhance the services it provides. The company created a business intelligence (BI) data mart using the Microsoft application platform including Microsoft SQL server 2008 enterprise database software. Reports are now generated automatically using SQL server 2008 reporting services.

- **CIB-Credit information Bureau**

A State Bank of Pakistan's department responsible for maintaining the information related to borrowing related to any person, company, and/or group of companies. To provide fast, accurate, and dynamic analysis on both individual borrower and group basis Currently, CIB gets borrowings information through fax and/or telephones and if any bank or institutes wants to inquire about the holding of a certain person it has to first contact CIB department and then after 15-20 days the information provided to the bank.

Chapter 3 Methodology and Procedures

3.1 Introduction

The methodology of this study developed based on the database (a case study of agricultural bank of Sudan) that have huge amount of data stored in transactional databases. As mention in chapter one and two banks need information management solutions that allow them to make smart decisions. This chapter presents the methodology and implementation of building a business intelligent system using Microsoft SQL Business Intelligence software

Moreover, describes in detail the study population and its sample; explain the study tools and the way of data collections to achieve the objective of the study. Also, address the description of questionnaire and the validity and reliability tools and finally determine the appropriate statistical method to analyse data and examine hypotheses.

3.2 Research Methodology

Use descriptive method qualitative and quantitative descriptive approach known as "quantitative and qualitative", also designed a questionnaire to collect data from members of population in order to determine the status the actual reality needs of business intelligence systems in banking industry.

3.2.1 Study Population and Sample

To increase credibility, it is important to choose the sample that will represent the population under investigation. The population of the study is the banking industry in Khartoum. On the other hand, the study sample selected from a random sample which consists of (50) managers and employees was chosen from the top and middle management in the banking industry in Khartoum.

3.2.2 Study Tools and Data Collection

The current study is of two folds, theoretical and practical. In the theoretical aspect, it relied on the scientific studies that related to the current study. Whereas in the practical aspect, it relied on descriptive and analytical methods using the practical manner to collect, analyse data and test hypotheses.

The data collection, used in the current study based on two sources:

1) Secondary sources: books, journals, and theses to write the theoretical framework of the study

2. Primary source: a questionnaire designed to reflect the study objectives and hypotheses.

3.2.3 Questionnaire

The questionnaire is define as a series of questions or situations that include some of the psychological, social, educational or personal data applied to individuals or groups in order to obtain specific data or some of the problems they face. The questionnaire instrumental sections are as follows:

- **Section One: Demographic variables.** The demographic information was collected with closed-ended questions, through (6) factors (Age; Gender; Education level; Experience; Years of Service in Banks and Job Title).
- **Section Two: Familiarity and knowledge of business intelligent.** This section was measured through (6) items on a Likert-type scale.
- **Section Three: The role of banking industry to implement Business Intelligence.** This section was measured through (9) items on a Likert-type scale.

- **Section Four: Challenges of implementing Business Intelligence systems.** This section was measured through (6) items on a Likert-type scale. Table 3.1 represent Likert-type scale as follow:

Table3.2 Likert-type scale

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	2	3	4	5

3.2.3.1 Statistical Treatment

The data collected from the responses of the study questionnaire used through Statistical Package for Social Sciences (SPSS) for analysis and test hypotheses, and adopted the significance of 5%, which offset the 95% confidence level to explain the results. Also used a Likert-type scale as follows:

(Strongly Agree), (Agree), (Neutral), (Disagree), (Strongly Disagree) and tested as follows:

•given the number 1 (Strongly Agree)

•given the number 2 (Agree)

•given the number 3 (neutral)

•given the number 4 (Disagree)

•give the number 5 (Strongly Disagree)

$$\textbf{Mean} = \frac{5+4+3+2+1}{5} = \mathbf{3}$$

The questionnaire instrumental tested through the creation of community-weighted calculations and standard deviations.moreover, used the suitable statistical methods that consist of:

- Percentage and Frequency
- Cronbach Alpha reliability (α) to measure strength of the correlation and coherence between questionnaire items
- Arithmetic Mean to identify the level of response of study sample individuals to the study variables
- Standard Deviation to Measure the responses spacing degree about Arithmetic Mean

3.2.3.2 Demographic Variables of Study Sample

The demographic variables of the study sample consist of (Age; Gender; Educational level; Experience; Years of Service in Hotels and Job Title).

- **Age:**

Table3.3.2 Age Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	30 years or less	23	46.0	46.0
	From 31 -40 years	10	20.0	66.0
	From 41 - 50 years	7	14.0	80.0
	51 years More	10	20.0	100.0
	Total	**50**	**100.0**	

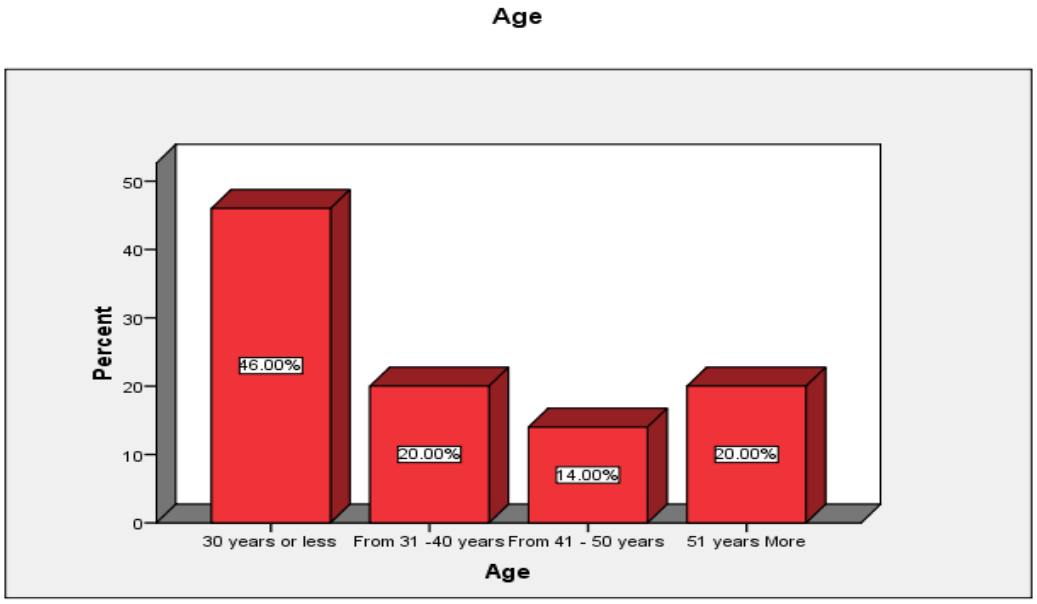


Figure3.10 Age Demographic Variables

Note from the table and figure above the proportion of 30 years or less represented (46%), From 31 -40 years (20%),and From 41 - 50 years represented (14%).finally 16 years more represented (20 %) of the respondents.

- **Gender**

Table3.4.3 Gender Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	Male	32	64.0	64.0
	Female	18	36.0	100.0
	Total	**50**	**100.0**	

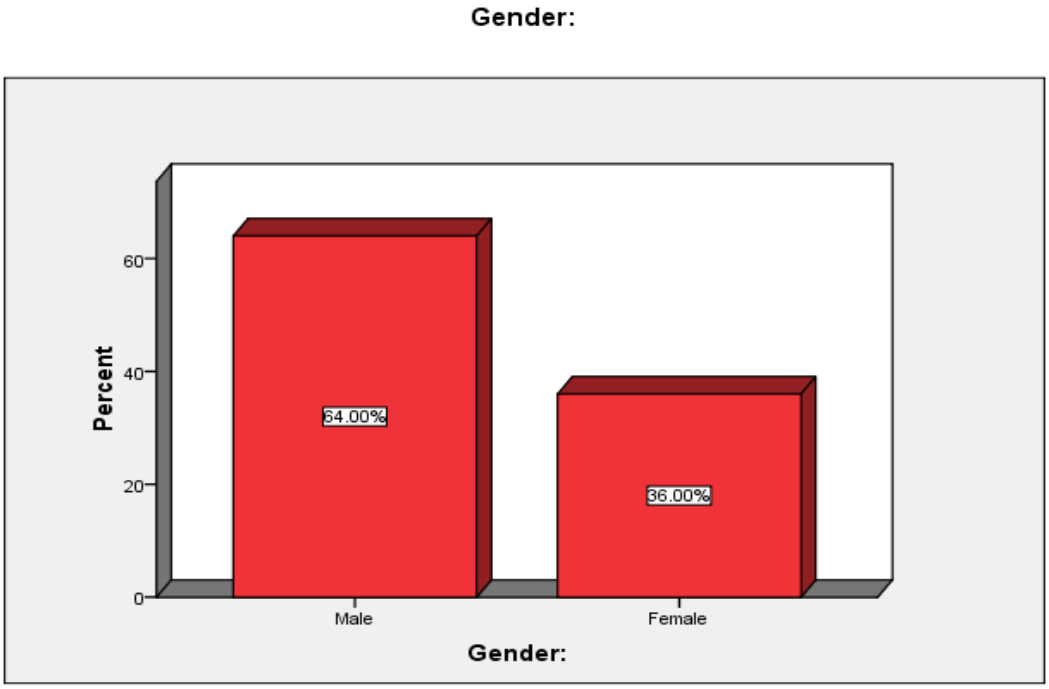


Figure3.11.2 Gender Demographic Variables

Note from the table and figure above the proportion of males 64% of respondents, while the proportion of females (36%) of the study sample.

- **Educate Level**

Table3.5.4 Educate Level Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	BSc	25	50.0	50.0
	High Diploma	6	12.0	62.0
	Master	18	36.0	98.0
	PhD	1	2.0	100.0
	Total	**50**	**100.0**	

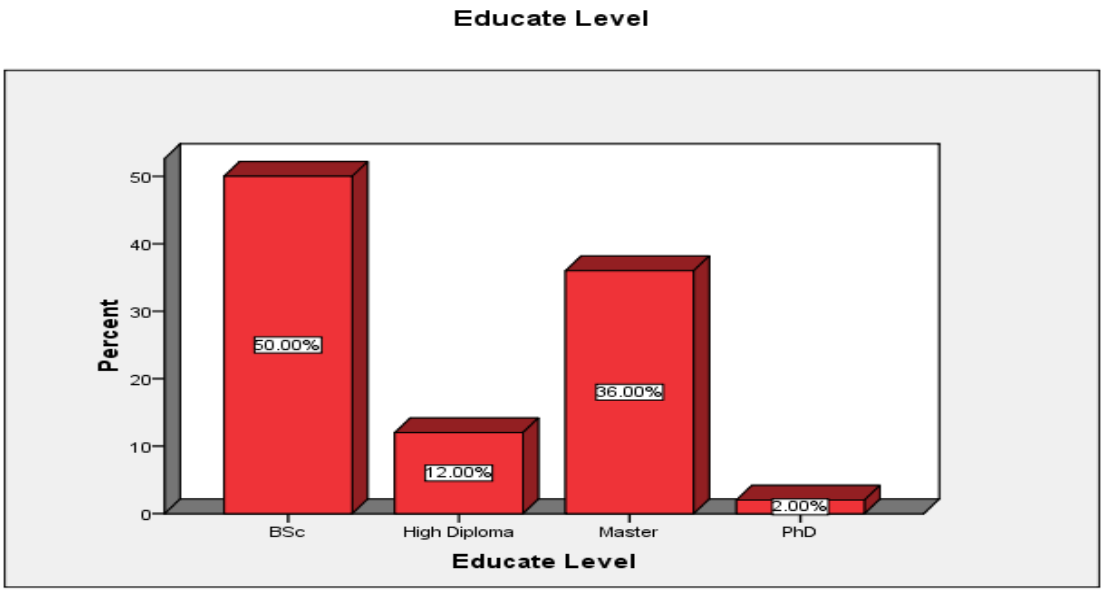


Figure3.12.3 Educate Level Demographic Variables

Note from the table and figure above the BSc drive ratio (50%), the proportion of High Diploma represents (12%), and the proportion of Master represents (36%).finally the proportion of PhD represents (2%) of the study sample.

- **Experience**

Table3.6.5 Experience Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	5 years or less	12	24.0	24.0
	From 6 -10 years	15	30.0	54.0
	From 11-15 years	14	28.0	82.0
	16 years More	9	18.0	100.0
	Total	**50**	**100.0**	

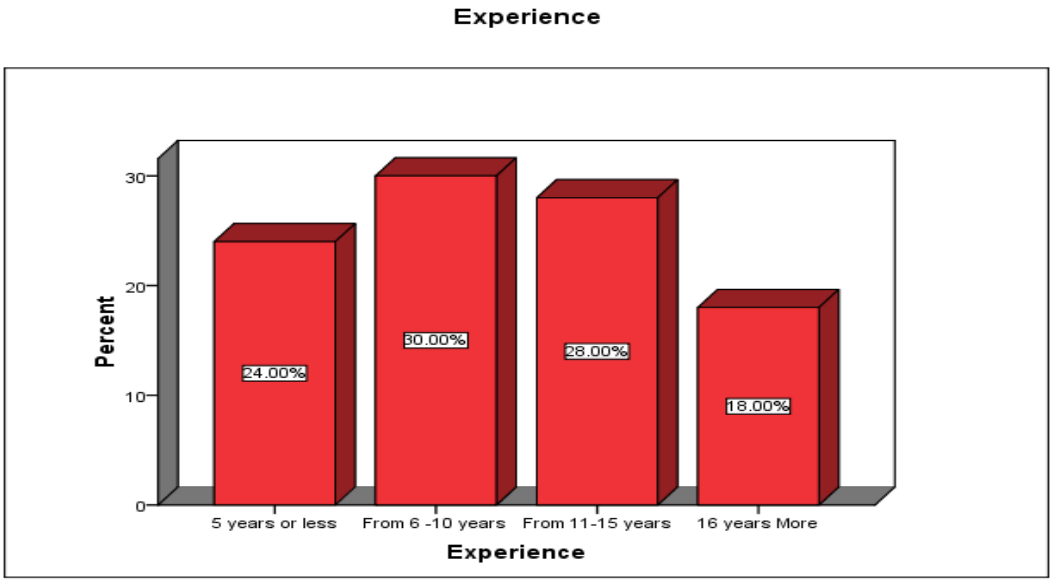


Figure3.13.4 Experience Demographic Variables

Note from the table and figure above the percentage of the experience of 5 years or less represented (24%), from 6 years From 10 represents (30%), From 11-15 years represent (28%).finally the percentage of experience16 years More represent(18%) of the study sample.

- **Years of Service in Banks**

Table3.7.6 Years of Service in banks Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	5 years or less	19	38.0	38.0
	From 6 -10 years	13	26.0	64.0
	From 11-15 years	11	22.0	86.0
	16 years More	7	14.0	100.0
	Total	**50**	**100.0**	

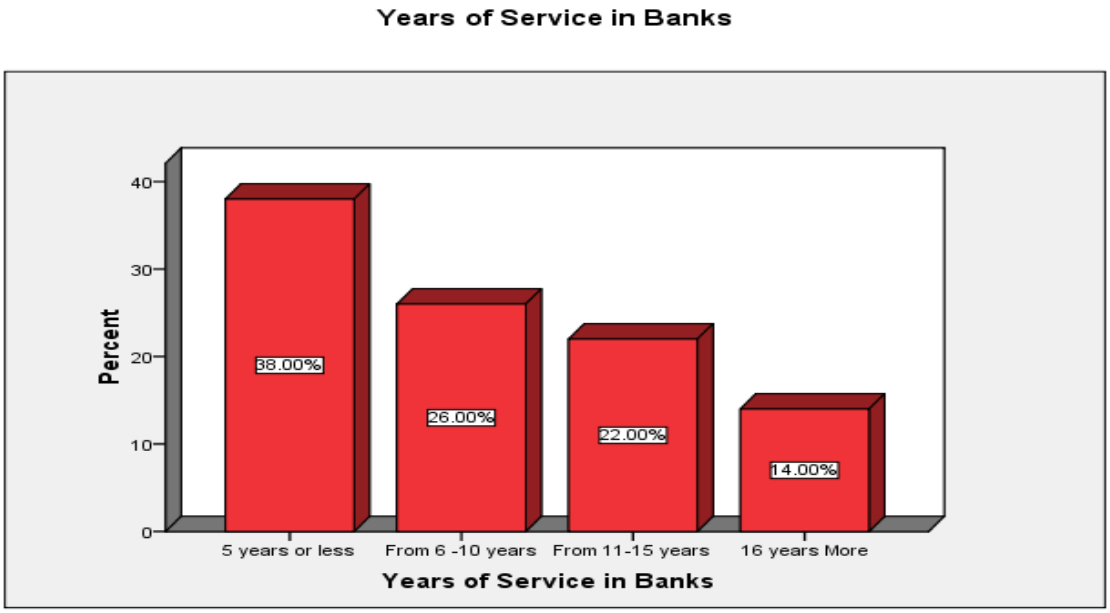


Figure3.14.5 Years of Service in banks Demographic Variables

Note from the table and figure above the percentage of the experience of 5 years or less represented (38%), from 6-10 years represents(26%), from 11-15 years represent (22%). finally percentage of experience16 years More represent (14%) of the study sample.

- **Job Title**

Table3.8.7 Job Title Demographic Variables

		Frequency	Percent	Cumulative Percent
Valid	Top Management	2	4.0	4.0
	Middle Management	48	96.0	100.0
	Total	**50**	**100.0**	

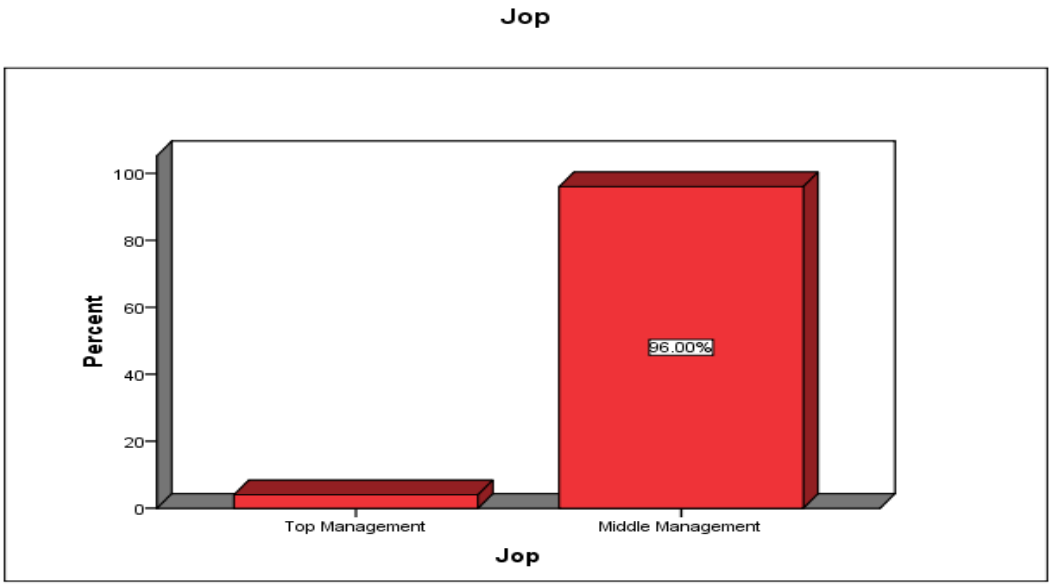


Figure3.15.6 Job Title Demographic Variables

Note from the table and figure that represents the percentage of Top Management (4%), and represent the proportion of Middle Management represents (96%) of the study sample.

3.2.3.3 Familiarity and knowledge of business intelligent

- Do you have any knowledge about the concept of business intelligence?

Table3.9.8 Frequency, Percent, and Cumulative Percent of item one section two

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	21	42.0	42.0
	Agree	20	40.0	82.0
	Neutral	3	6.0	88.0
	Disagree	4	8.0	96.0
	Strongly disagree	2	4.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion Strongly Agree represents (42%), the proportion Agree represents (40%), the proportion of Neutral represent (6%), the proportion of Disagree represent (8%), and the proportion strongly disagree represent (4%) of the study sample.

- How often do you use Business Intelligence System?

Table3.10.9 Frequency, Percent, and Cumulative Percent of item two section two

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	10	20.0	20.0
	Agree	26	52.0	72.0
	Neutral	6	12.0	84.0
	Disagree	2	4.0	88.0
	Strongly disagree	6	12.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (20%), the proportion Agree represent (52%), the proportion of Neutral represent (12%), the proportion of Disagree represent (4%), and the proportion strongly disagree represent (12%) of the study sample.

- Do you normally use reports provided by Business Intelligence System when making decisions?

Table3.11.10 Frequency, Percent, and Cumulative Percent of item three section two

		Frequency	Percent	Cumulative Percent
valid	Strongly Agree	11	22.0	22.0
	Agree	14	28.0	50.0
	Neutral	16	32.0	82.0
	Disagree	1	2.0	84.0
	Strongly disagree	8	16.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (22%), the proportion Agree represent (25%), the proportion of Neutral represent (32%), the proportion of Disagree represent (2%), and the proportion strongly disagree represent (16%) of the study sample.

- Is there is a difference between the business intelligence reports and the reports using by the existing application in the bank?

Table3.12.11 Frequency, Percent, and Cumulative Percent of item four section two

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	22	44.0	44.0
	Agree	12	24.0	68.0
	Neutral	12	24.0	92.0
	Disagree	2	4.0	96.0
	Strongly disagree	2	4.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion Strongly Agree represents (44%), the proportion Agree represent (24%), the proportion of Neutral represent (24%), the proportion of Disagree represent (4%), and the proportion strongly disagree represent (4%) of the study sample.

- Do you think Business Intelligence application helps you reach to the largest number of customers?

Table3.13.12 Frequency, Percent, and Cumulative Percent of item five section two

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	26	52.0	52.0
	Agree	9	18.0	70.0
	Neutral	11	22.0	92.0
	Strongly disagree	4	8.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (52%), the proportion Agree represent (18%), the proportion of Neutral represent (22%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (8%) of the study sample.

- Do you think after the implementation of Business Intelligence application in the bank is good for making the appropriate decisions?

Table3.14.13 Frequency, Percent, and Cumulative Percent of item six section two

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	29	58.0	58.0
	Agree	15	30.0	88.0
	Neutral	6	12.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (58%), the proportion Agree represent (30%), the proportion of Neutral represent (12%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

3.2.3.4 The role of banking industry to implement Business intelligent

- Bank plans to increase its efforts to implement business intelligence systems for analysis

Table3.15.14 Frequency, Percent, and Cumulative Percent of item one section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	23	46.0	46.0
	Agree	15	30.0	76.0
	Neutral	11	22.0	98.0
	Disagree	1	2.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (46%), the proportion Agree represent (30%) the proportion of Neutral represent (22%), the proportion of Disagree represent (2%), and the proportion strongly disagree represent (0%) of the study sample.

- The Bank maintains an organized effort to collect, analyse data and generate reports for Business Intelligence

Table3.16.15 Frequency, Percent, and Cumulative Percent of item two section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	18	36.0	36.0
	Agree	13	26.0	62.0
	Neutral	16	32.0	94.0
	Disagree	3	6.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (36%), the proportion Agree represent (26%), the proportion of Neutral represent (32%), the proportion of Disagree represent (6%), and the proportion strongly disagree represent (0%) of the study sample.

- The Bank uses business intelligence to collection, analysis of data and generation of the reports

Table3.17.16 Frequency, Percent, and Cumulative Percent of item three section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	13	26.0	26.0
	Agree	21	42.0	68.0
	Neutral	9	18.0	86.0
	Disagree	7	14.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (26%), the proportion Agree represent (42%), the proportion of Neutral represent (18%), the proportion of Disagree represent (14%), and the proportion strongly disagree represent (0%) of the study sample.

- The Bank uses business intelligence systems for structuring unstructured collected information

Table3.18.17 Frequency, Percent, and Cumulative Percent of item four section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	12	24.0	24.0
	Agree	16	32.0	56.0
	Neutral	13	26.0	82.0
	Disagree	9	18.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (24%), the proportion Agree represent (32%), the proportion of Neutral represent (26%), the proportion of Disagree represent (18%), and the proportion strongly disagree represent (0%) of the study sample.

- Business intelligence will improve operational and strategic decisions for better and timely information

Table3.19.18 Frequency, Percent, and Cumulative Percent of item five section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	17	34.0	34.0
	Agree	20	40.0	74.0
	Neutral	12	24.0	98.0
	Disagree	1	2.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (34%), the proportion Agree represent(40%), the proportion of Neutral represent (24%), the proportion of Disagree represent (2%), and the proportion strongly disagree represent (0%) of the study sample.

- The business intelligence systems sufficient to achieve the fundamental objectives of our business

Table3.20.19 Frequency, Percent, and Cumulative Percent of item six section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	23	46.0	46.0
	Agree	19	38.0	84.0
	Neutral	8	16.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (46%), the proportion Agree represent (38%), the proportion of Neutral represent (16%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

- Business intelligence allows the bank to predict many of the tools in the work systems.

Table3.21.20 Frequency, Percent, and Cumulative Percent of item seven section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	23	46.0	46.0
	Agree	17	34.0	80.0
	Neutral	10	20.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (46%), the proportion Agree represent (34%), the proportion of Neutral represent (20%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

- BI will helps to increase the competitive advantage of the banks

Table3.22.21 Frequency, Percent, and Cumulative Percent of item eight section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	23	46.0	46.0
	Agree	17	34.0	80.0
	Neutral	10	20.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (46%), the proportion Agree represent (34%), the proportion of Neutral represent (20%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

- BI reports are suitable for reach to the largest number of customers

Table3.23.22 Frequency, Percent, and Cumulative Percent of item nine section three

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	24	48.0	48.0
	Agree	17	34.0	82.0
	Neutral	9	18.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (48%), the proportion Agree represent (34%), the proportion of Neutral represent (18%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

3.2.3.5 Challenges of implementing Business Intelligence System

- Business Intelligence is relatively new concept and not any banks are interested in implementing it on a large scale

Table3.24.23 Frequency, Percent, and Cumulative Percent of item one section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	6	12.0	12.0
	Agree	16	32.0	44.0
	Neutral	15	30.0	74.0
	Disagree	10	20.0	94.0
	Strongly disagree	3	6.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (12%), the proportion Agree represent (32%), the proportion of Neutral represent (30%), the proportion of Disagree represent (20%), and the proportion strongly disagree represent (6%) of the study sample.

- Knowledge and Training of Business Intelligence System

Table3.25.24 Frequency, Percent, and Cumulative Percent of item two section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	14	28.0	28.0
	Agree	15	30.0	58.0
	Neutral	21	42.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (28%), the proportion Agree represent (30%), the proportion of Neutral represent (42%), the proportion of Disagree represent (0%), and the proportion strongly disagree represent (0%) of the study sample.

- Difficulty use BI application by staff.

Table3.26.25 Frequency, Percent, and Cumulative Percent of item three section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	6	12.0	12.0
	Agree	7	14.0	26.0
	Neutral	23	46.0	72.0
	Disagree	14	28.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (12%), the proportion Agree represent (14%), the proportion of Neutral represent (46%), the proportion of Disagree represent (28%), and the proportion strongly disagree represent (0%) of the study sample.

- Lack of technical support (Technological Changes)

Table3.27.26 Frequency, Percent, and Cumulative Percent of item four section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	7	14.0	14.0
	Agree	16	32.0	46.0
	Neutral	18	36.0	82.0
	Disagree	9	18.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (14%), the proportion Agree represent (32%), the proportion of Neutral represent (36%), the proportion of Disagree represent (18%), and the proportion strongly disagree represent (0%) of the study sample.

- The absence of managerial Support for using business intelligence software

Table3.28.27 Frequency, Percent, and Cumulative Percent of item five section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	10	20.0	20.0
	Agree	9	18.0	38.0
	Neutral	22	44.0	82.0
	Disagree	7	14.0	96.0
	Strongly disagree	2	4.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (20%), the proportion Agree represent (18%), the proportion of Neutral represent (44%), the proportion of Disagree represent (14%), and the proportion strongly disagree represent (4%) of the study sample.

- High upfront set up costs and running costs.

Table3.29.28 Frequency, Percent, and Cumulative Percent of item six section four

		Frequency	Percent	Cumulative Percent
Valid	Strongly Agree	11	22.0	22.0
	Agree	7	14.0	36.0
	Neutral	21	42.0	78.0
	Disagree	11	22.0	100.0
	Total	**50**	**100.0**	

Note from the table the proportion strongly Agree represent (22%), the proportion Agree represent (14%), the proportion of Neutral represent (42%), the proportion of Disagree represent (22%), and the proportion strongly disagree represent (0%) of the study sample.

3.3 BI system

Business Intelligence (BI) solutions come in all shapes and sizes. Some emphasize architecture, while others tout their flashy interface. Some cost hundreds of thousands of dollars, while others cost hundreds. Every good Business Intelligence solution must include certain essential features.

1) Open architecture:

Business intelligence software built on open architecture integrates better with other platforms and software. It also comes with less limitation, as it does not tie your company to any single platform or vendor.

2) Wide database support:

Some solutions only support a single database or platform; modern BI software must support any database or platform.

Why is this so important? As new databases crop up at an increasing rate, database support only becomes more important. Even if your company only uses one database now, BI software with broad database support will not limit your database options as shown in future3.7.

Figure3.16.7 A few popular databases that modern BI software must support [19]

3) Real-time data:

Some BI software delivers day-old or even week-old data. Good Business Intelligence software creates applications that deliver real-time data directly from your database.

Why is this so important? Business Intelligence helps you make quick, informed decisions based on the most current data possible.

4) Self-service capabilities:

In the past, the IT department controlled reporting and BI capabilities within the organization. These days, good BI software includes self-service capabilities that let end users create their own BI and reporting applications.

5) Mobile support:

Modern Business Intelligence software must span all devices and platforms. As illustrated in the figure 3.8, a single BI application must provide a different, yet native, experience for every device.

Why is this so important? According to a report published by MIT, mobile computers (smartphones/tablets) will saturate markets in the U.S. and the developing worlds in record time faster than any other technology in history. Because of this growing mobile trend, modern BI solutions must create applications that instantly adapt to any platform [19].

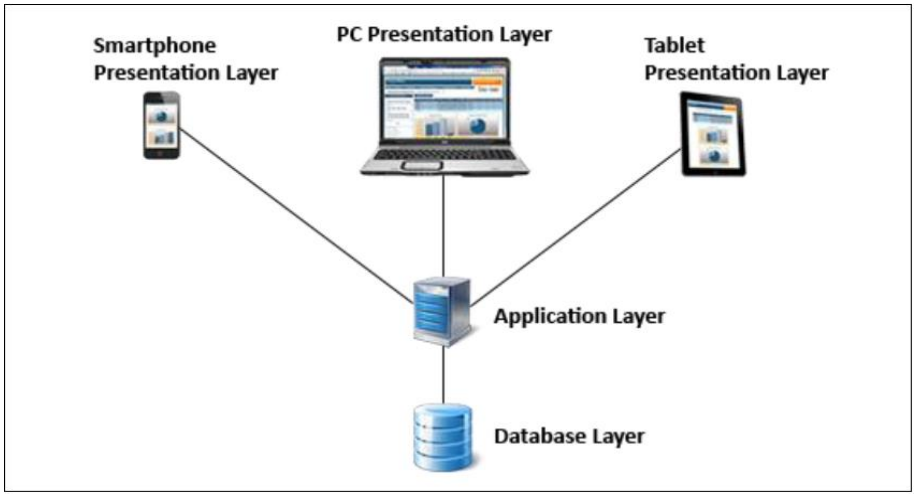


Figure3.17.8 Architecture of a cross-platform BI application [19]

3.4 Business intelligent software tools

Today's increasingly competitive marketplace requires that companies make targeted, data-driven business decisions to secure their standing in the industry. Business intelligence software enables companies to efficiently detect and evaluate structural patterns, anticipate industry trends and offer greater operational visibility. Business intelligence solutions are valuable regardless of company size [15].

Some big companies will drive business Intelligence market. There are seven major players in the Business Intelligence solution provider industry (Business Objects), IBM (Cognos), Oracle (Hyperion), Microsoft, Information Builders (IBI), MicroStrategy, and SAS [17].

In this study, business intelligent system built upon Microsoft® SQL Server® 2008. A typical Business Intelligence System Architecture based on it.

Microsoft® SQL Server® 2008 provides a scalable BI platform optimized for data integration, reporting, and analysis enabling organizations to deliver intelligence where users want it [21].

3.5 Microsoft SQL Business Intelligence software

MSBI stands for Microsoft Business Intelligence. This powerful suite is composed of tools, which help in providing best solutions for Business Intelligence and Data Mining Queries. This tool uses Visual studio (BIDS) along with SQL server. It empowers users to gain access to accurate and up-to-date information for better decision making in an organization. It offers different tools for different processes, which are required in Business Intelligence (BI) solutions.

MSBI divided into 3 categories:-

1) SSIS – SQL Server Integration Services – Integration tool
2) SSAS – SQL Server Analytical Services -Analysis tool
3) SSRS – SQL Server Reporting Services – Reporting tool. The diagram 3.9 below broadly defines "Microsoft Business Intelligence (MSBI)" [18].

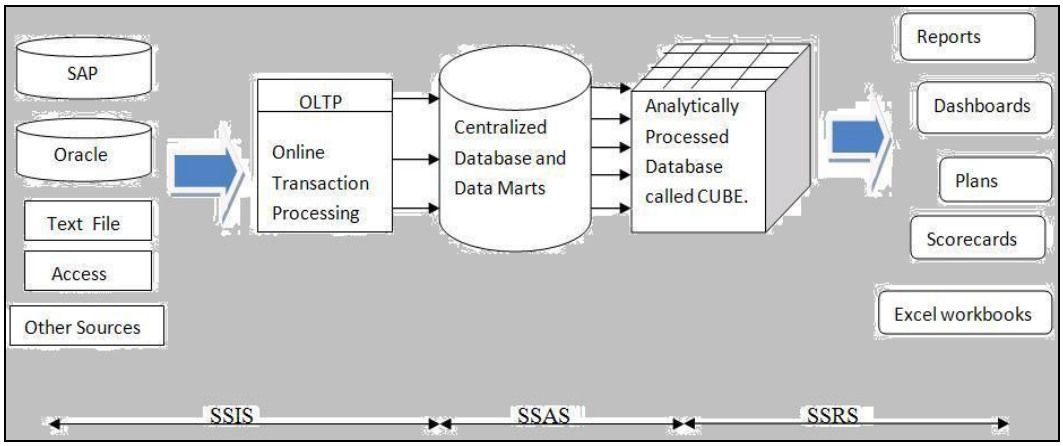


Figure3.18.9 Microsoft Business Intelligence categories [18]

3.6 Why Microsoft SQL Server Business Intelligence

SQL Server 2008 makes business intelligence available to everyone through deep integration with Microsoft Office, providing the right tool, to the right user, at the right price. Employees at all levels of an organization can see and help to influence the performance of the business by working with tools that are both easy to use and powerful [29].

Microsoft SQL Server includes several features that make it easy and inexpensive to implement business intelligence (BI) and data warehousing. These features include reporting, data management, analytic data storage and [20].

- Create high-performance Analysis Services solutions with improved cube designers.
- Implement more responsive Reporting Services solutions through enhancements to on-demand processing and instance-based rendering.

- Build flexible and effective reports with the new Tables data structure and rich formatting capabilities.
- Enable business users to build ad hoc reports and create reports with any structure by using the powerful report designer [21].
- Provides customers with user-friendly tools whose complexity remains on the cutting edge [20].
- Deliver reports in the format preferred by most end users by using the new and enhanced Reporting Services (example: you can used Microsoft Office Word as a format for reports)[29].

3.7 BI how it works

Business Intelligence is more than Software Tools and Technology it refers to software applications used to analyze an organization's raw data. Terms often associated with BI in an IT sense are data mining, online analytical processing, querying and reporting [8]. The methodology of building BI system in this project is applying into the following steps:

1) Designing the data base first
2) Design the tables
3) Designing Analysis Service project and
4) Build required reports.

3.7.1 Designing a database

This is a first step of building successful business intelligent system; create a new database (Microfinance-db).

Before implement, this steps it first install Microsoft SQL server 2008 and then open SQL server management studio to create the database (Microfinance) as first steps the database schema as shown in figure 3.10.

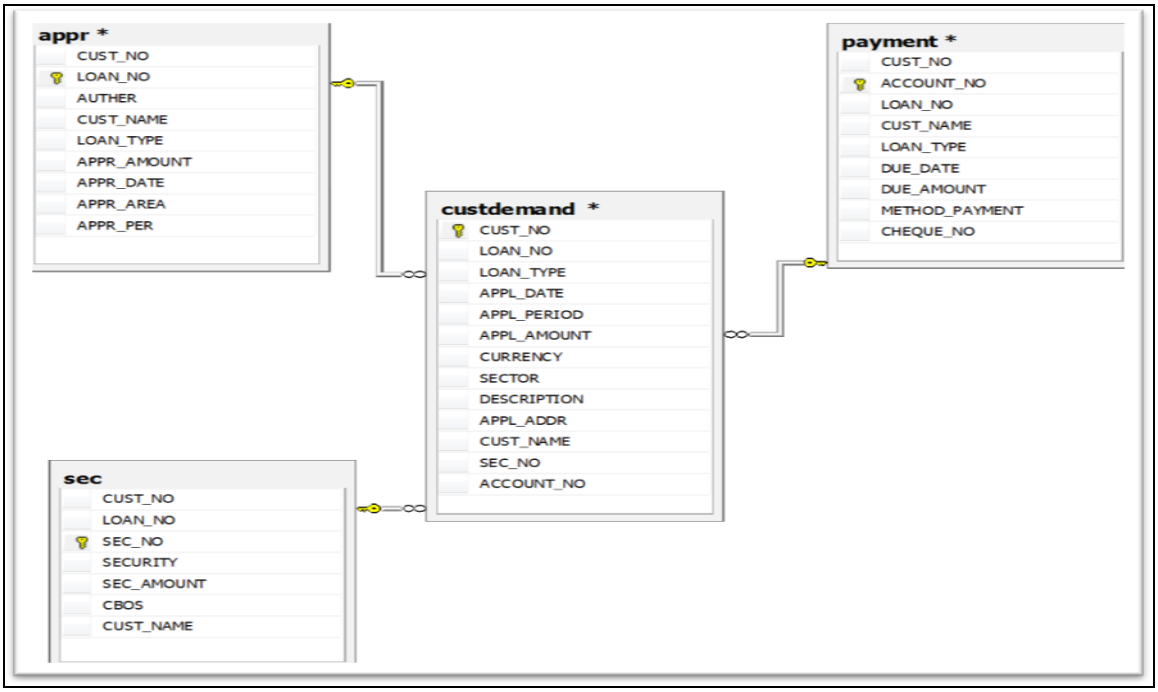


Figure3.19.10 The Microfinance database schema

3.7.2 Designing a tables

After creating database the second step is to create tables that are needed as part of the database. A table holds the information that enters into a database. The table is consisting of:

- Customer demand table.
- Approval table.
- Customer Guarantee table.
- Customer Payment table as shown in figures3.11, 3.12, 3.13and 3.14.

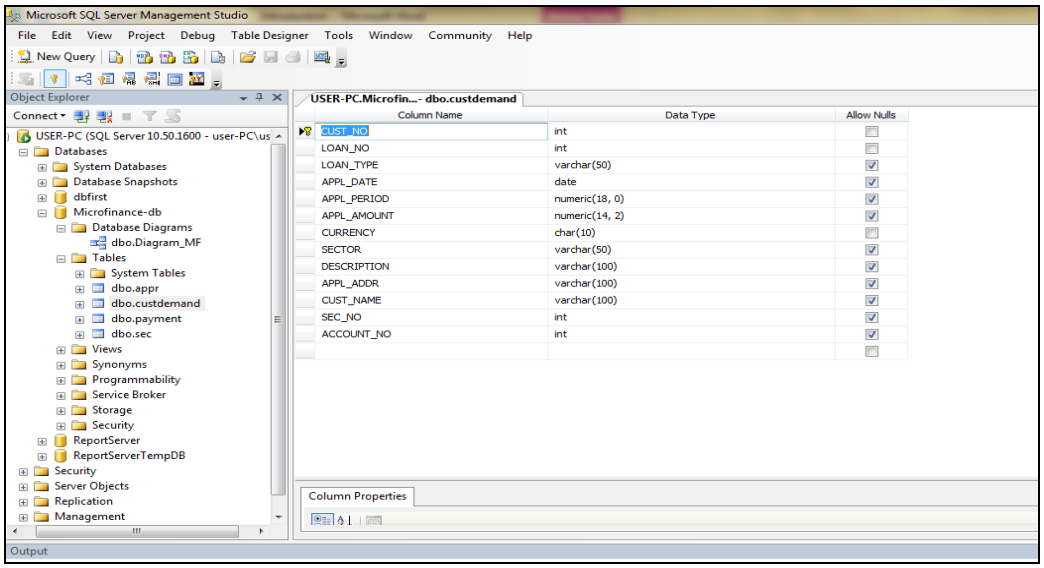


Figure3.20.11 Customer demand table

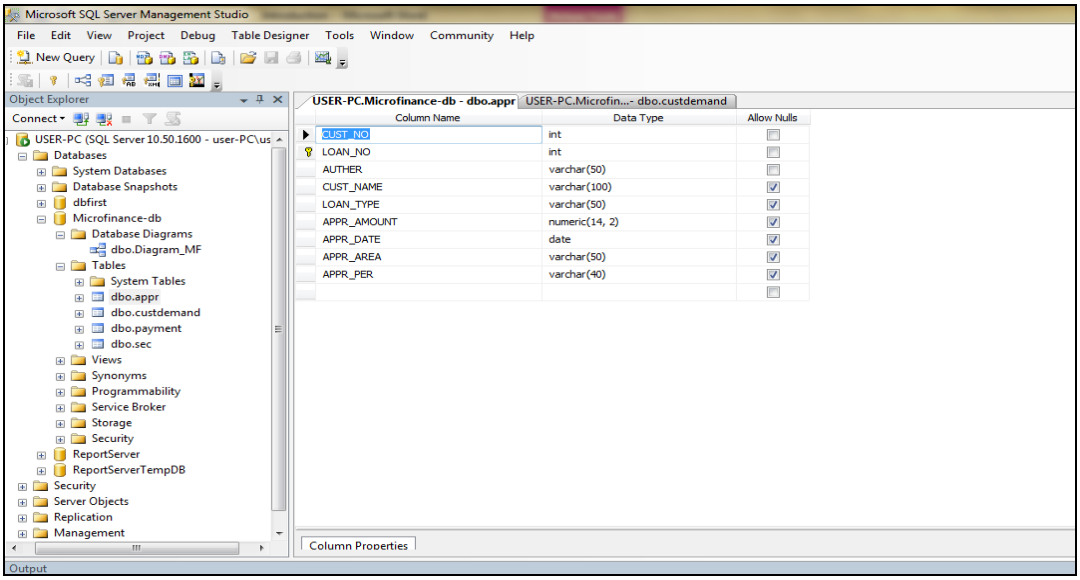


Figure3.21.12 Approval table

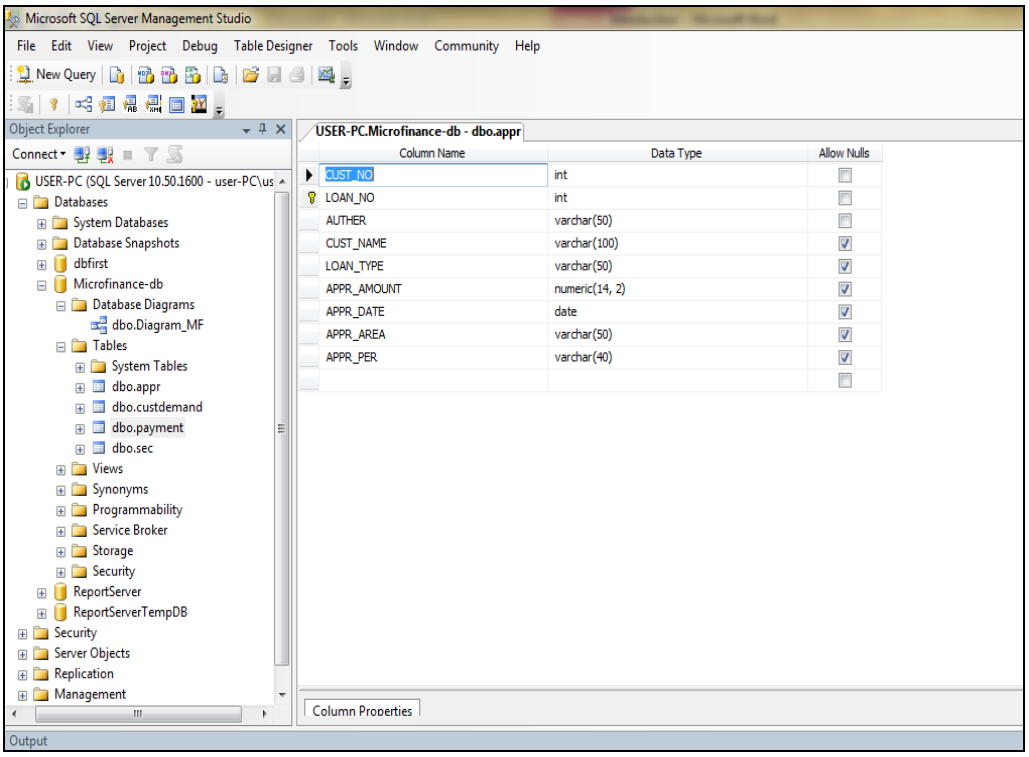


Figure3.22.13 Customer Payment table

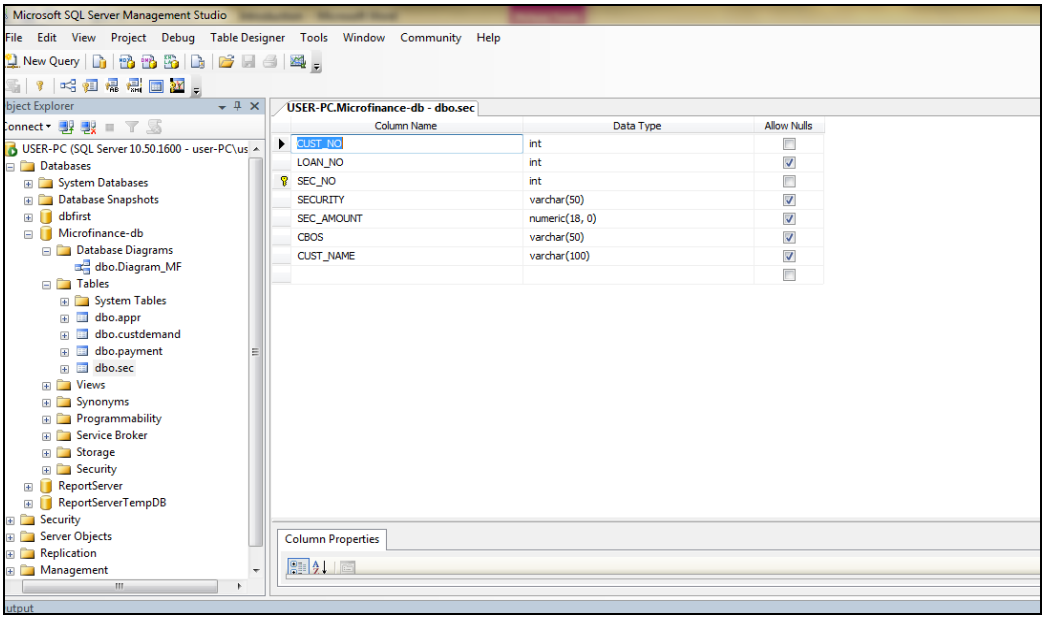


Figure3.23.14 Customer Guarantee table

The description of each table summarized below in table 3.29.

Table3.30.29Table name and description

Table name	Description
Customer demand (custdemand)	Contain attribute about the customer name, No, application date, application amount and loan type.
Approval (appr)	Contains attribute about the approval from authorities, date, and period time for applying financing.
Customer Guarantee (sec)	Contains attribute about the guarantee type, guarantee amount, and the guarantor.
Customer Payment (payment)	Contains attribute about the method payment, date of payment, amount of payment.

After creating tables, the third steps use Business Intelligence Development Studio (BIDS) to analysis and develop reports. It provides an intuitive interface based on Microsoft's Visual Studio product, which used by developers for many years. The SQL Server 2008 version of BIDS has some nice enhancements to the user interface for designing, developing and testing reports [22].

3.7.3 Designing Analysis Service project (SSAS – SQL Server Analytical Services)

SQL Server Analysis Services (SSAS) is the technology from the Microsoft Business Intelligence stack, to develop Online Analytical Processing (OLAP) solutions [23].

This step contains the following step:

- Create Data Source.
- Create Data Source View.

To create a new Analysis Services project, follow these steps:

1) Select Microsoft SQL Server 2008 > SQL Server Business Intelligence Development Studio from the Programs menu to launch Business Intelligence Development Studio.
2) Select File > New > Project.
3) In the New Project dialog box, select the Business Intelligence Projects project type.
4) Select the Analysis Services Project template.
5) Name the new project (microfinance) and select a convenient location to save it.
6) Click OK to create the new project as shown in figure3.15.

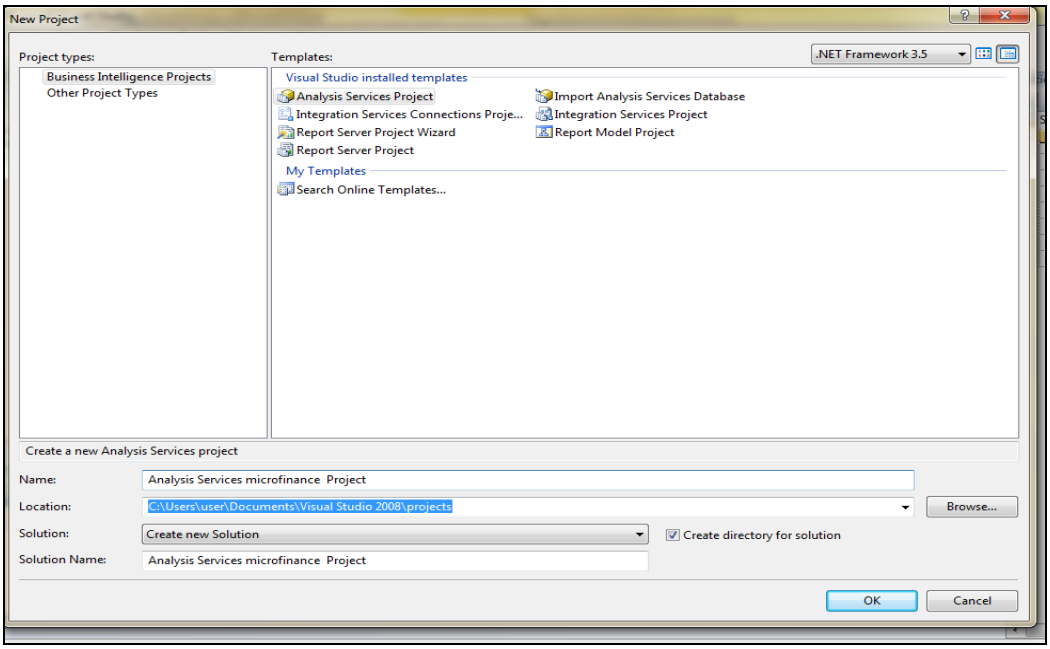


Figure3.24.15 New Analysis Services project

3.7.3.1 Defining a Data Source

After create an Analysis Services project, it generally start working with the project by defining data sources that the project will use.

To define a data source, follow these steps:

1) Right-click on the Data Sources folder in Solution Explorer and select New Data Source

2) Read the first page of the Data Source Wizard and click next as shown in figure 3.16.

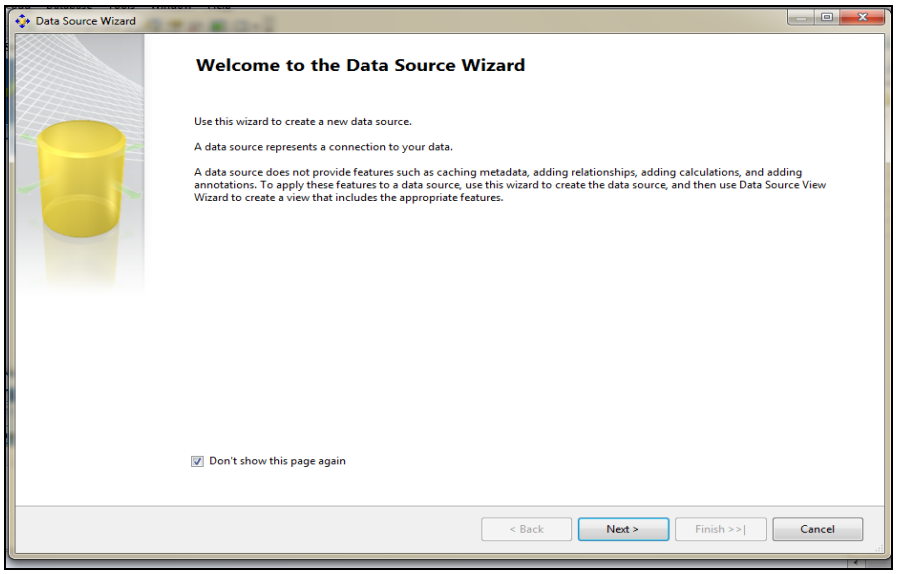


Figure3.25.16 Data Source Wizard

3) You can base a data source on a new or an existing connection. Because you do not have any existing connections, click New.

4) In the Connection Manager Dialog box, select the server containing your analysis services sample database from the Server Name combo box.

5) Fill in your authentication information.

6) Select the Native OLE DB\SQL Native Client provider (this is the default provider).

7) Select the (Microfinance-db) database. Figure 3.17 shows the filled-in Connection Manager Dialog box.

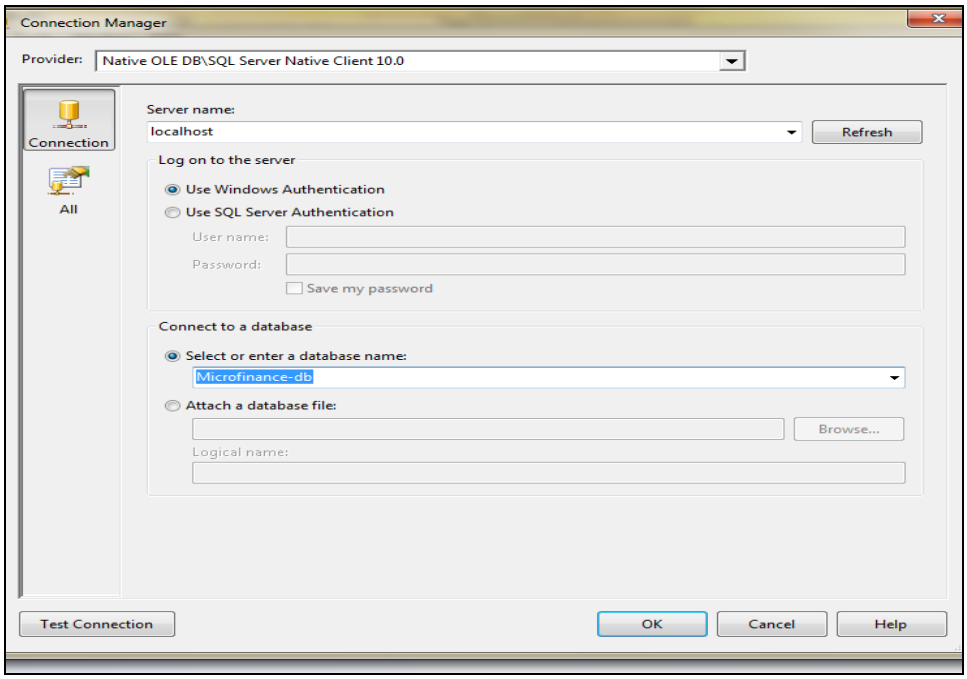


Figure3.26.17 Setting up a connection

8) Click OK to dismiss the Connection Manager Dialog box.

9) Click Next.

10) Select Use the Service Account impersonation information and click next.

11) Accept the data source name and click Finish see figure 3.18.

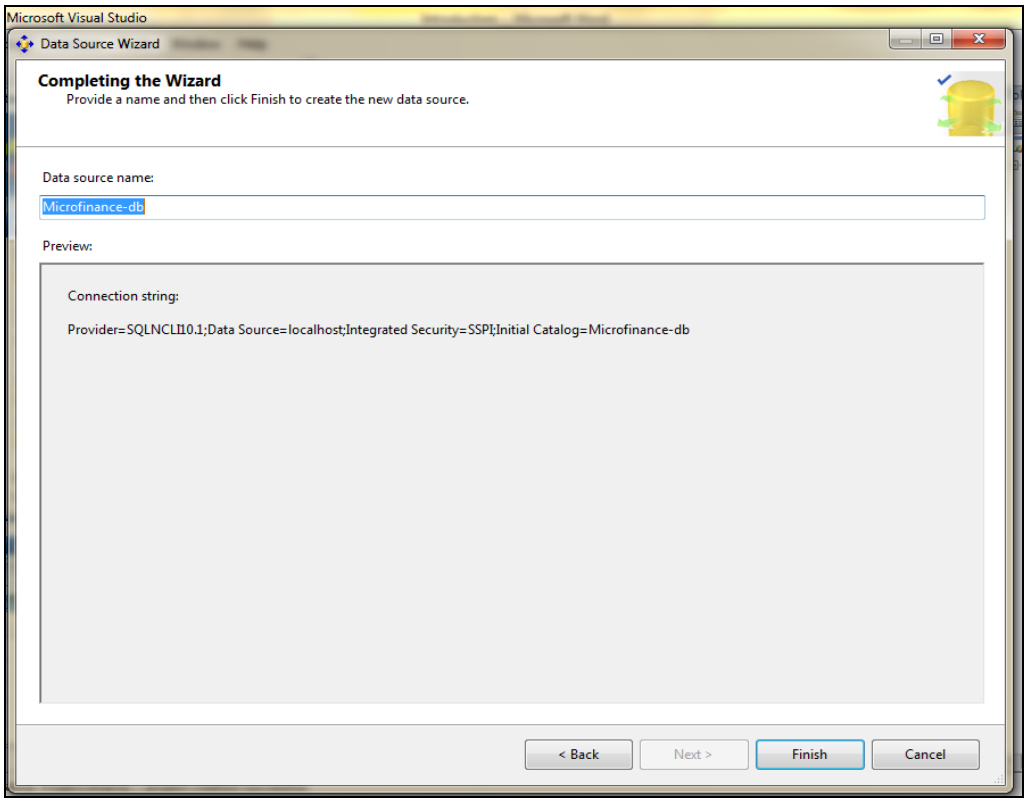


Figure3.27.18 Data source name

3.7.3.2 Defining a Data Source View

A data source view is a persistent set of tables from a data source that supply the data for a particular cube. It lets you combine tables from as many data sources as necessary to pull together the data your cube needs. BIDS also includes a wizard for creating data source views, which you can invoke by right clicking on the Data Source Views folder in Solution Explorer [24]. To create a new data source view, follow these steps:

1) Right-click on the Data Source Views folder in Solution Explorer and select New Data Source View as shown in figure 3.19.

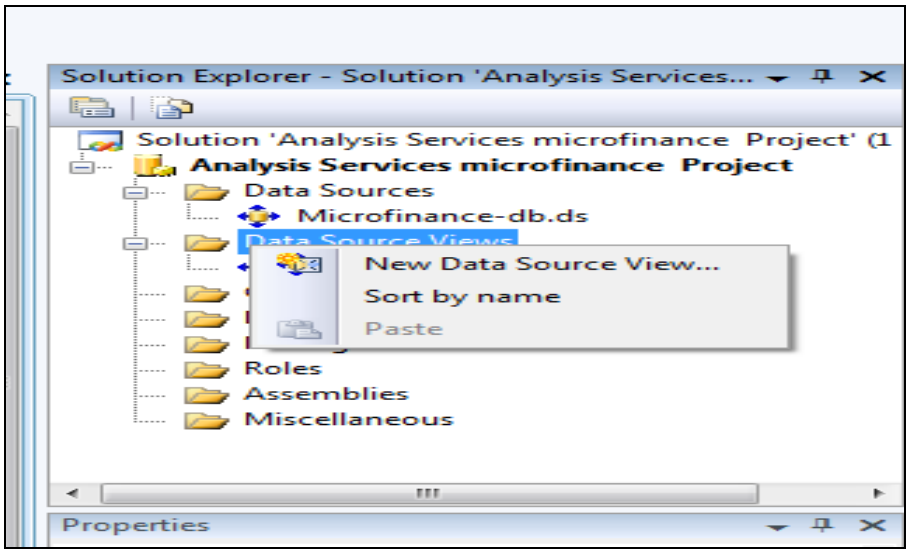


Figure3.28.19 Data Source Views

2) Read the first page of the Data Source View Wizard as shown in figure 3.20 and click Next.

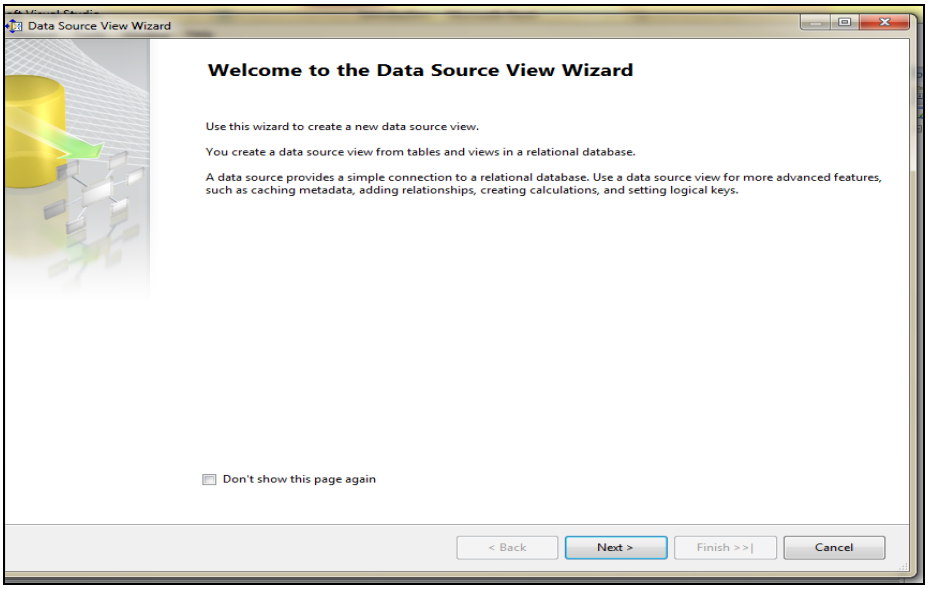


Figure3.29.20 Data Source View Wizard

3) Select the Microfinance-db data source as shown in figure 3.21 and click Next. Note that you could also launch the Data Source Wizard from here by clicking New Data Source.

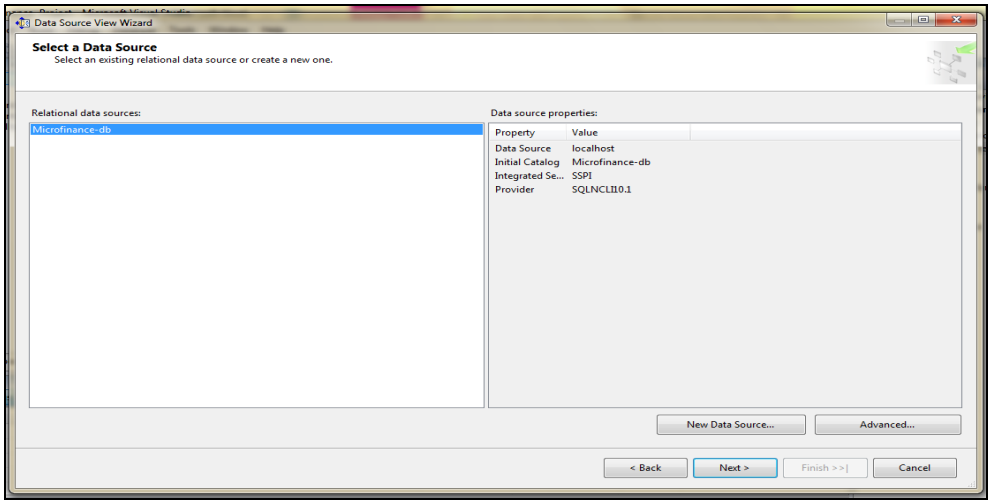


Figure3.30.21 Select database name

4) Select the tables in the Available Objects list and click the > button to move it to the Included Object list.

5) Click the Add Related Tables button to automatically add all of the tables Figure 3.22 shows the wizard with all of the tables selected.

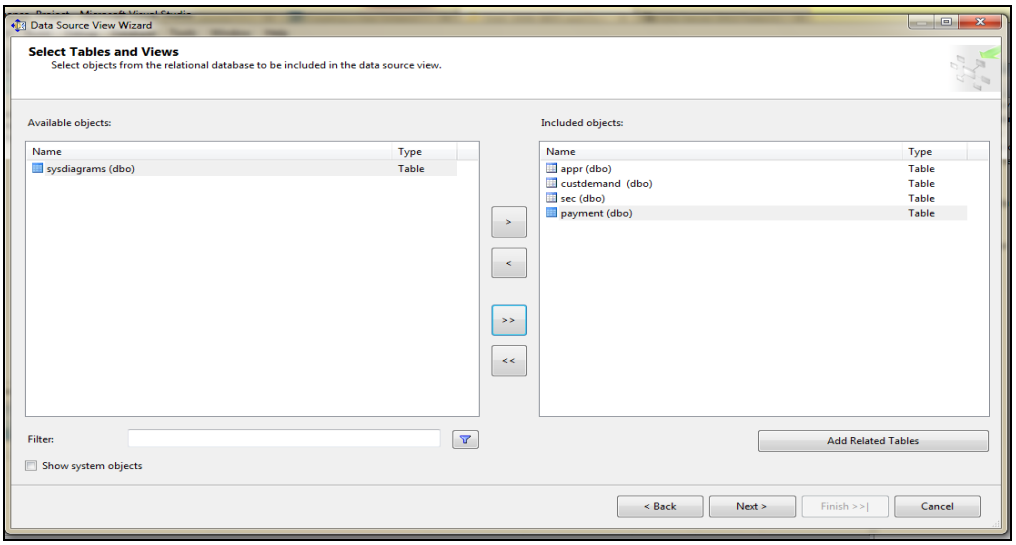


Figure3.31.22 Select table

6) Click Next.

7) Name the new view as shown in figure 4.23 and click Finish. BIDS will automatically display the schema of the new data source view, as shown in Figure 3.24.

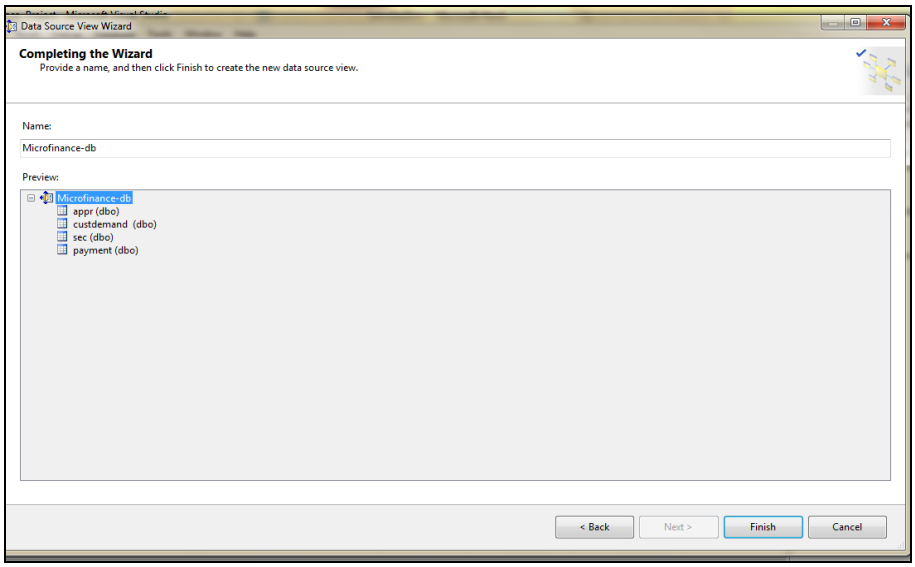


Figure3.32.23 Completing the wizard

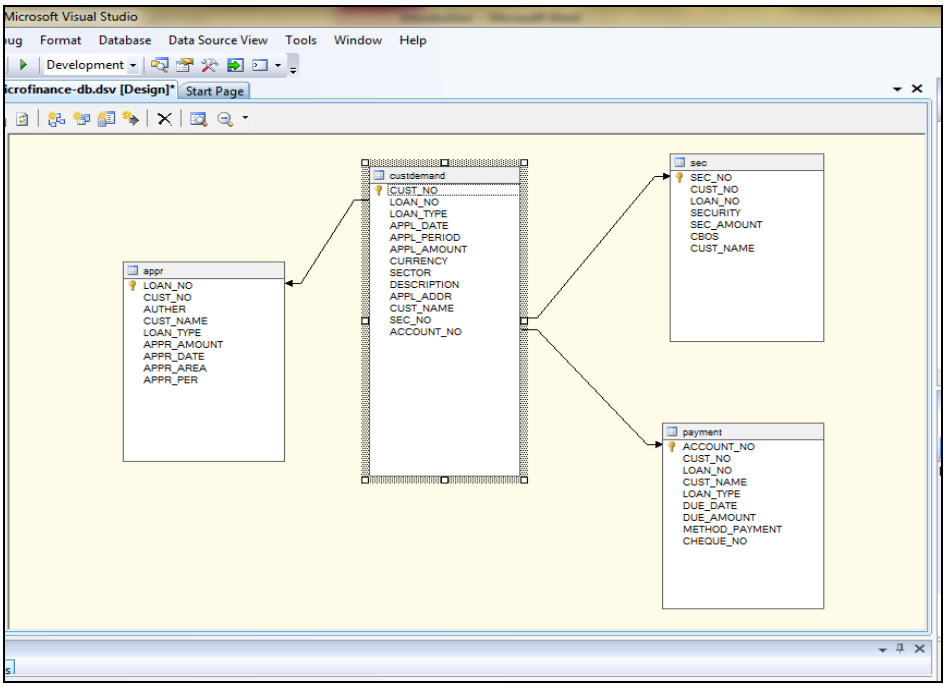


Figure3.33.24 The schema of the new data source view

3.7.4 Build a required reports (SSRS – SQL Server Reporting Services)

SQL Server Reporting Services 2008 (SSRS) is a feature included in the SQL Server 2008 product. SSRS use to design, develop, test, and deploy reports. It originally slated to release with SQL Server 2005. SSRS leverages the Business Intelligence Development Studio (BIDS) developer tool for all aspects of authoring and deploying reports. BIDS is included with SQL Server 2008[25].

Finally, this step used to design, develop, test, and deploy reports through the following steps:

1) Launch the report wizard.

2) Create a shared data source.

3) Design a query.

4) Select a report type.

5) Design a table.

6) Choose the table layout.

7) Complete the wizard [25].

3.7.4.1 Create a Simple Report with the Wizard

The earlier section covered Business Intelligence Development Studio (BIDS), the tool that developers use to create reports. BIDS provides a Report Designer that allows you to define every aspect of your report. In addition, BIDS provides a Report Wizard that will guide you through the steps to build a simple report. With the Report Designer, you start out with an empty canvas; you define every aspect of the report yourself. When you are getting started with Reporting Services, the Report Wizard should be your first choice. To build a report, follow these steps:

1) Open Business Intelligence Development Studio (BIDS) — Go to Start – All Programs – MS SQL Server 2008 R2 – Business Intelligence Development Studio.

2) Open a Start page. Go to create project and choose Report Server Project Wizard, select Name, Location and Solution name for the project as shown in figure 3.25.

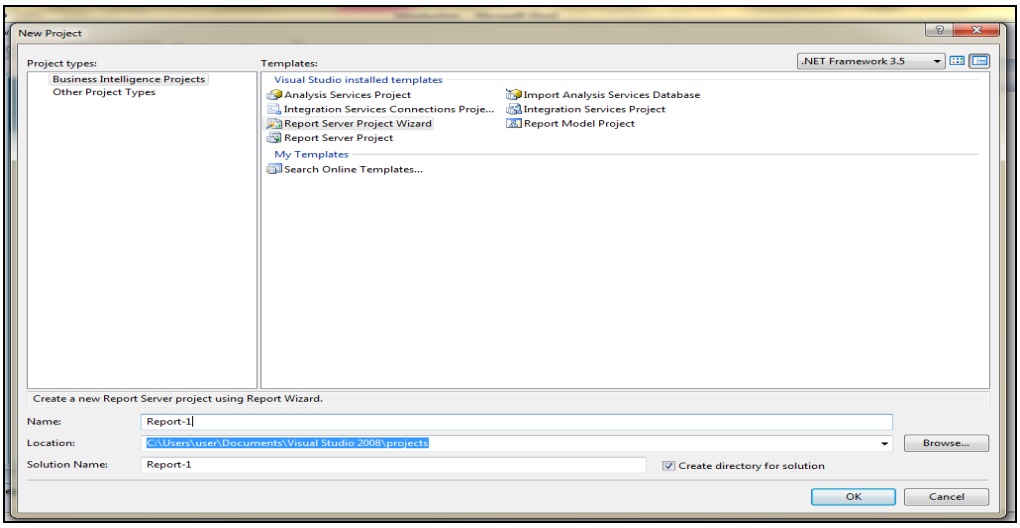


Figure3.34.25 Report Server Project Wizard

3) Clicking OK button will pop up Welcome Report wizard screen. You can tick the check box if you do not prefer to see this screen next time as shown in figure 3.26.

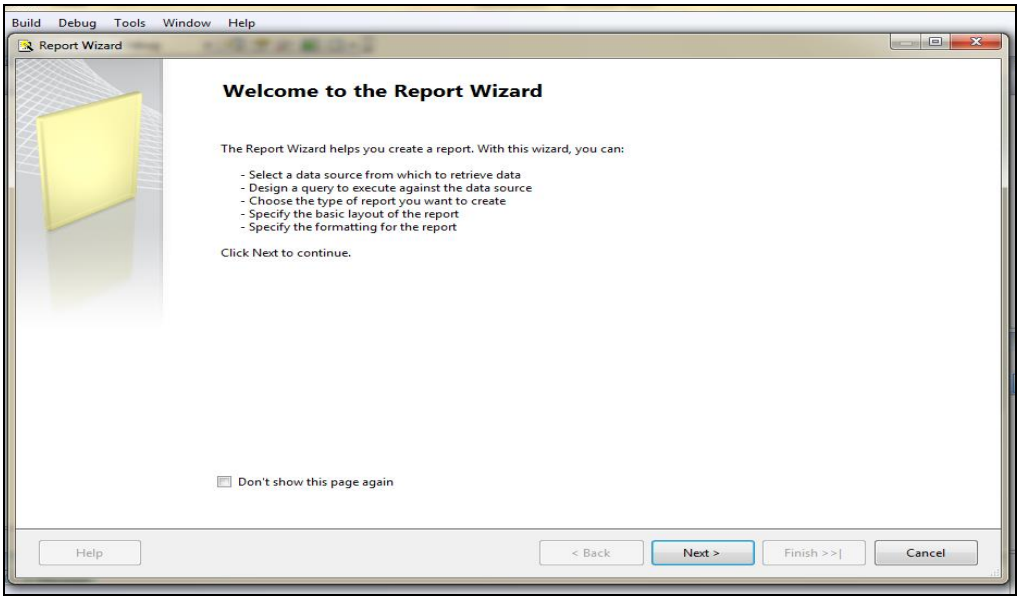


Figure3.35.26 Welcome Report wizard screen

4) Select a data source from which we will obtain data for creating this report. Either we can choose Shared Data Source (If data source is already been present) or can create a new Data source as shown in figure 3.27.

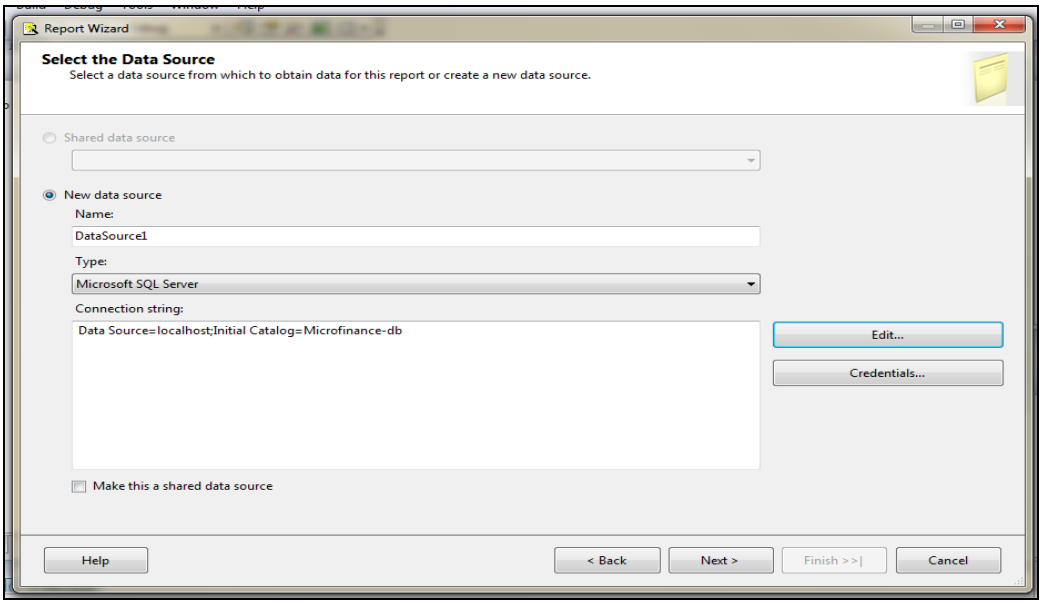


Figure3.36.27 Select a data source

5) Design our query to fetch the desired data from the chosen table as shown in figure 3.28. Click on Query Builder button to build your query or you can type your query directly into the Query string textbox. Click NEXT to Add Table button present at the extreme right on top and choose the tables whose report you want to generate and click OK to move on to the Select the Report Type dialog as shown in figure3.29, 3.30,3.31.

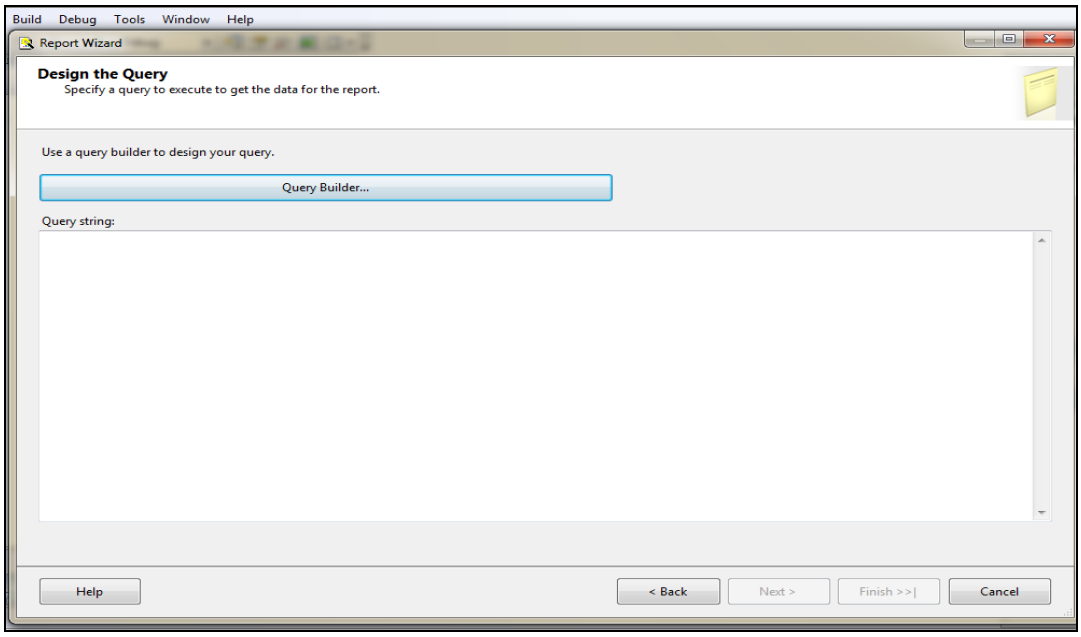


Figure3.37.28Design the query

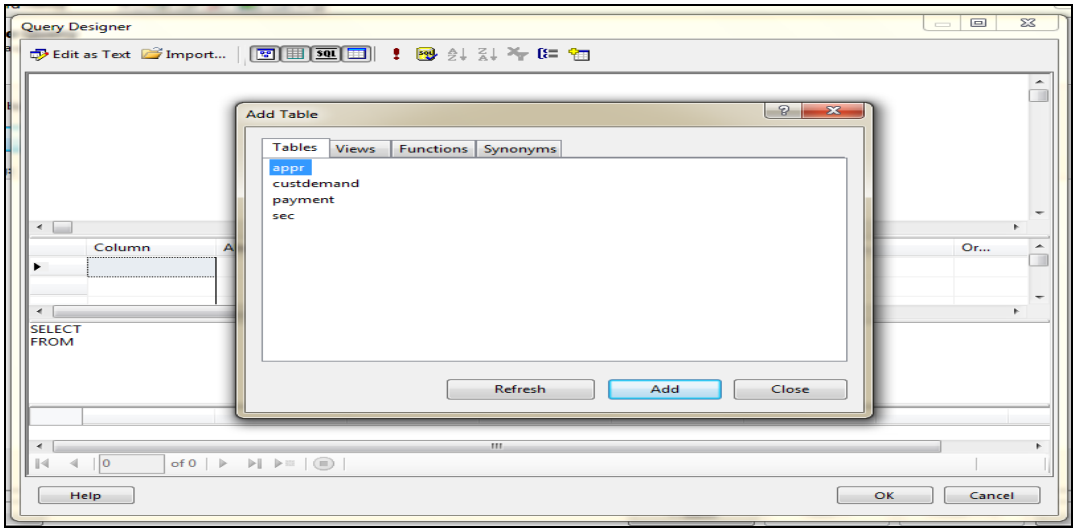


Figure3.38.29 Select table

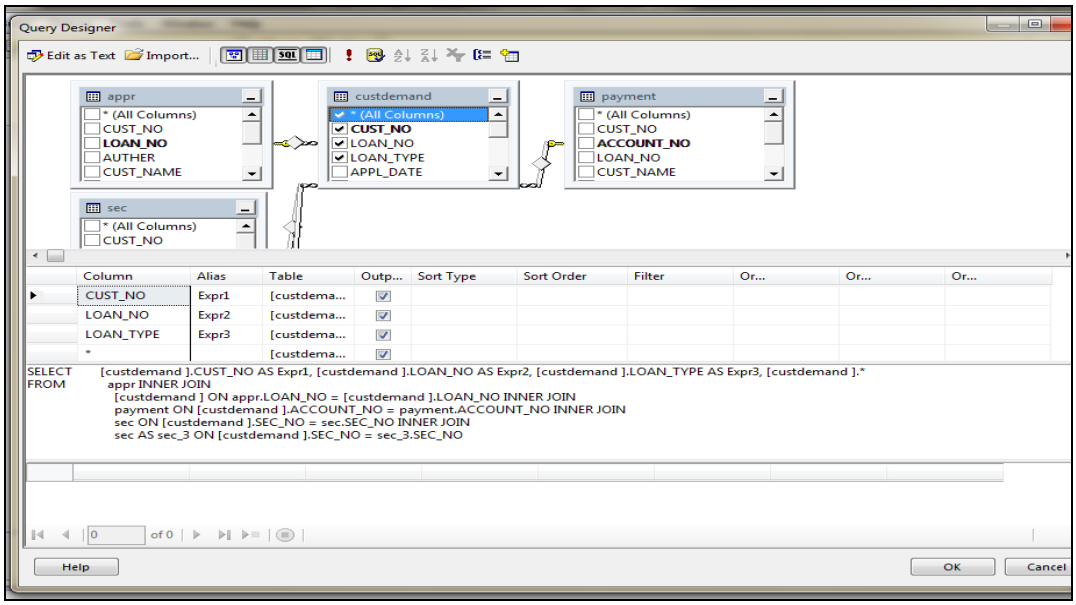


Figure3.39.30 Select column from table

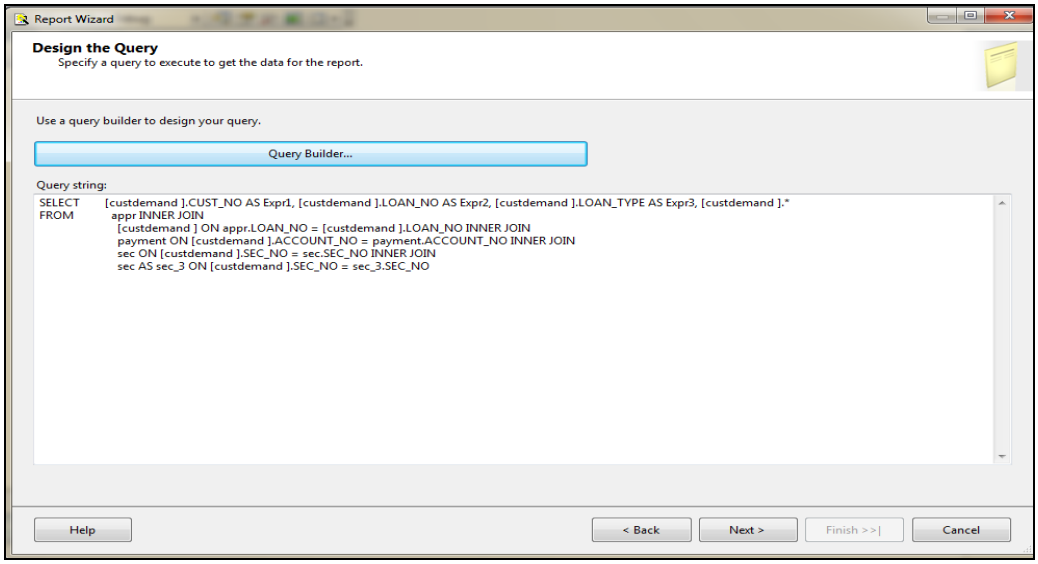


Figure3.40.31 Complete design query

6) Clicking Next button will lead to Report type screen as shown in figure 3.32. Select the desired Report type (tabular or matrix)The tabular report type is the traditional report with page headings, column headings, subtotals and totals running down the page. The matrix report type is one where we define the fields that go on the columns and rows and click Next.

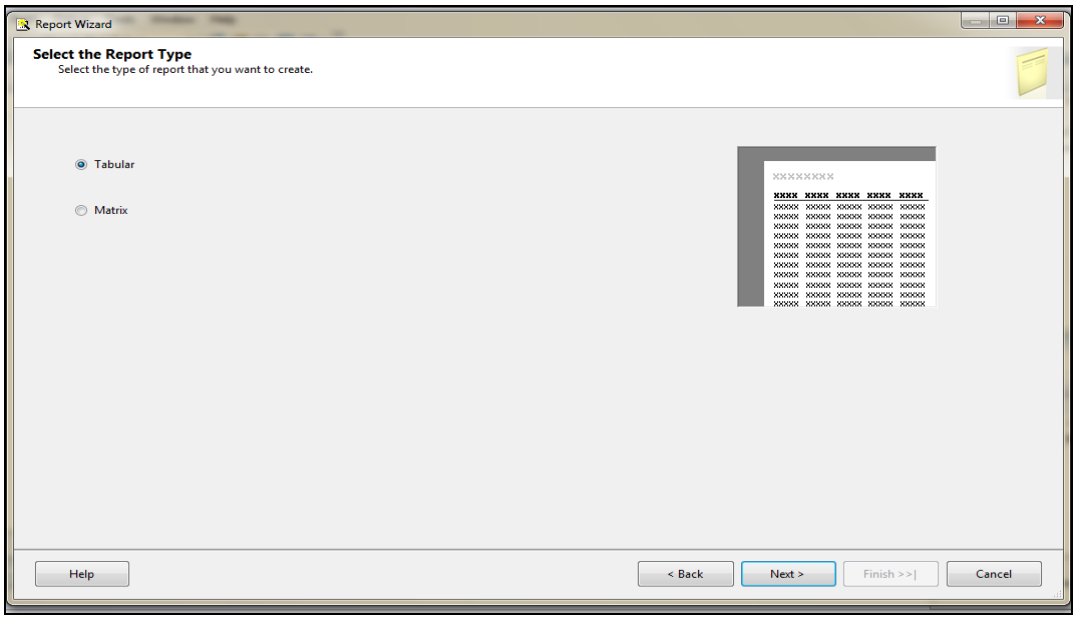


Figure3.41.32 Report type screen

7) Choose how you want to see your data in the report format according to your need. This is the screen where you can design the layout for your data as shown in figure 3.33. Click Next button.

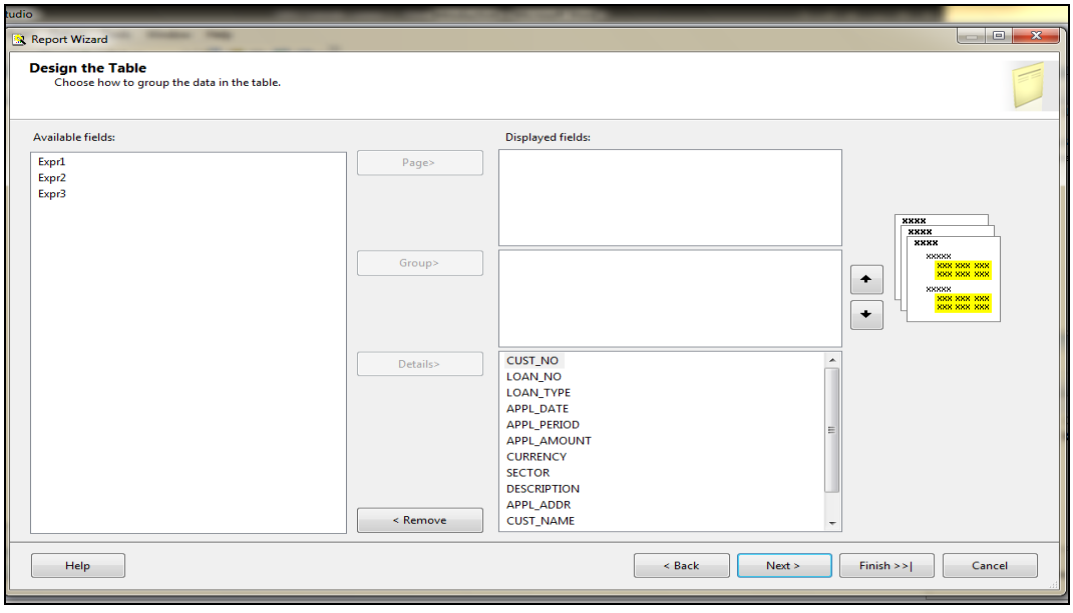


Figure3.42.33 Design the layout

8) Choose the type of Layout for the table, Include subtotals and Enable drill down features and click Next.

9) Choose a style for the table as shown in figure 3.34 allows us to choose from a number of different styles. Each selection provides a different color scheme. And click Next. Choose the Deployment location as shown in figure 3.35 for the report and click Next button.

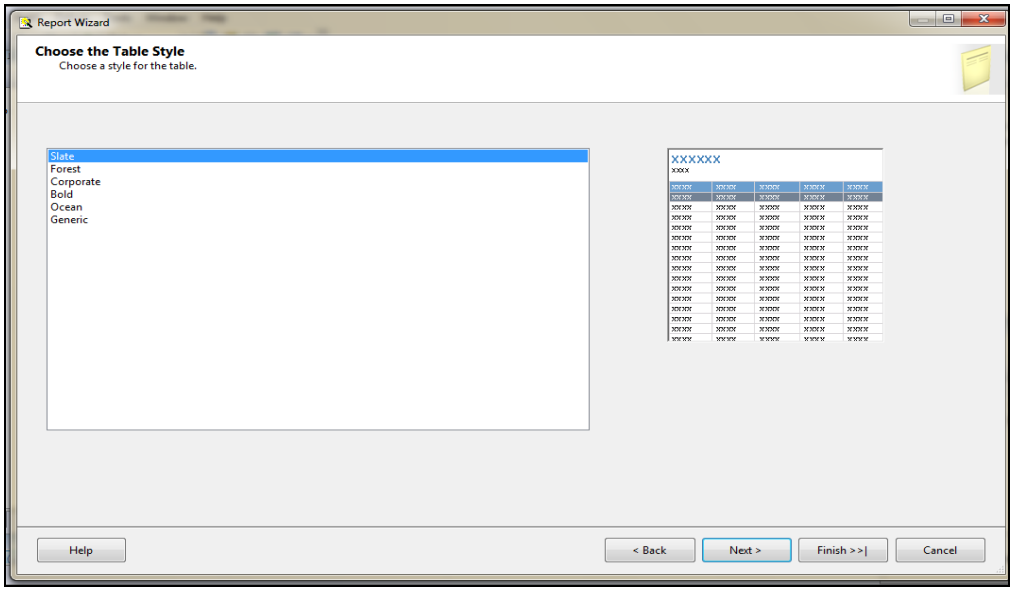


Figure3.43.34 Style for the table

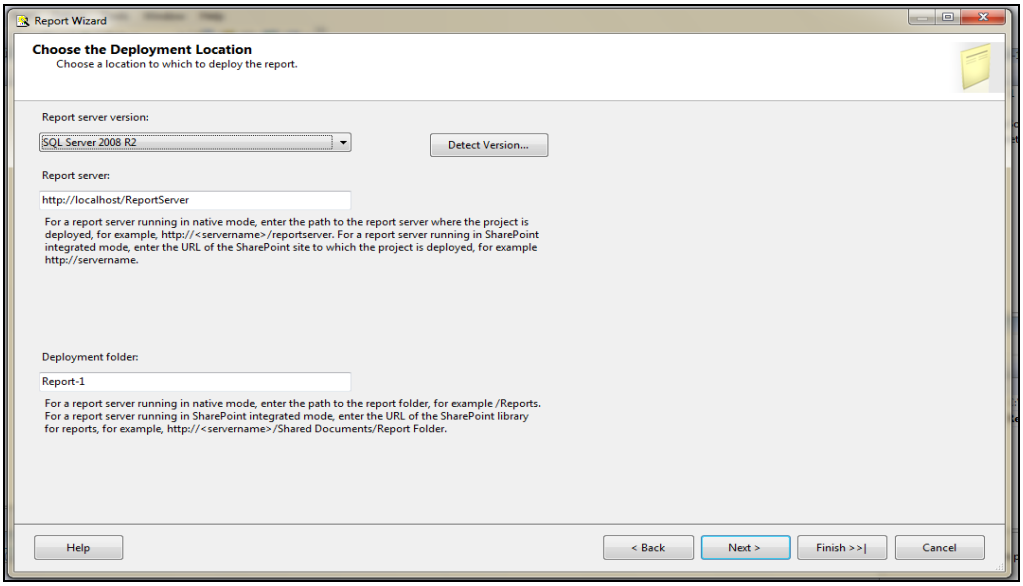


Figure3.44.35 Deployment location

10) Select the name for the report and click Finish button to create a new report using Report wizard as shown in figure 3.36.

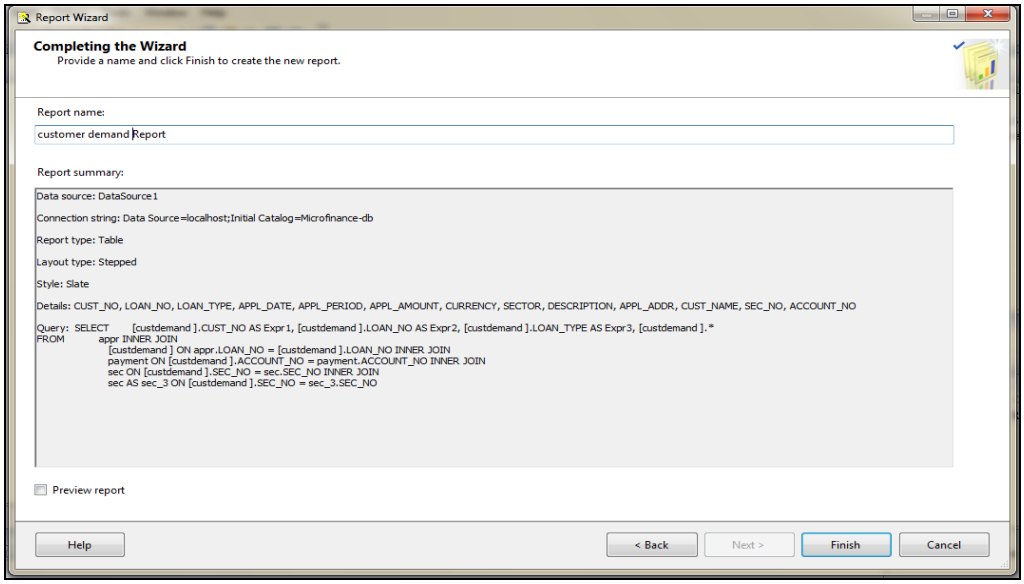


Figure3.45.36 Completing the wizard

11) Finally, Click the Finish button to have the wizard generate your report. You will now see your report in the Solution Explorer as shown in figure 3.37.

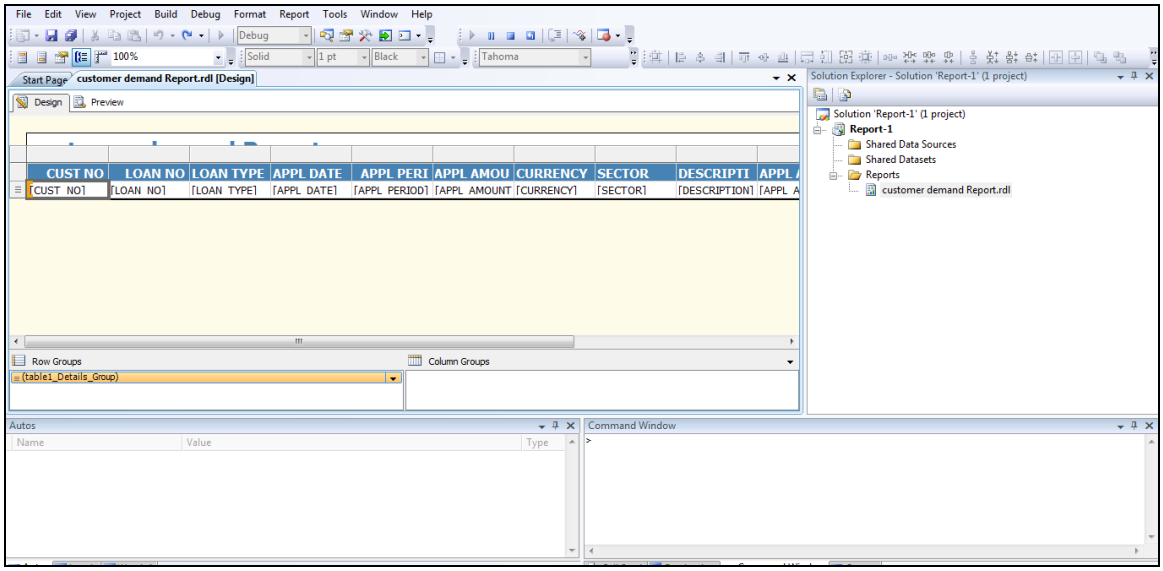


Figure3.46.37 Report generated

3.8 Chapter summary:

This chapter is describing about the general architectural approaches of BI and building successful BI system using Microsoft business intelligent development studio to create database and tables that are need in the project. Also, describes the general features of business intelligent that composed of Open architecture, Wide database support**,** and Real-time data.

The BI methodology contains the following step that summarized below:

1) Designing the data base first.
2) Design the tables.
3) Designing Analysis Service project and
4) Build required reports.

Moreover, the chapter describe in detail the study population and its sample; explain the study tools and the way of data collections using questionnaire to achieve the objective of the study. The questionnaire instrumental sections are as follows:

- Section One: Demographic variables
- Section Two: Familiarity and knowledge of business intelligent
- Section Three: The role of banking industry to implement Business Intelligence
- Section Four: Challenges of implementing Business Intelligence systems

Finally, this chapter describes the results of the statistical analysis for the data collected according to the research questions and research hypotheses. The data analysis includes a description of the Frequency and Percent for the questionnaire instrumental and snapshot samples from the business intelligent software system.

Chapter 4 Analysis Results & Hypotheses Test

4.1 Introduction

According to the purpose of the research and the research framework presented in the previous chapter, this chapter describes the results of the statistical analysis for the data collected according to the research questions and research hypotheses. The data analysis includes a description of the Means and Standard Deviations for the questions of the study use a chi-squared tested to test hypotheses.

4.2 Descriptive analysis of study variables

- Familiarity and knowledge of business intelligent

To analysis this variable, use the arithmetic mean, standard deviation, as shown in Table (4-1).The standard deviation values ranged between (.70595-1.30759).This indicates the homogeneity views of respondents.

In general, the arithmetic mean of each axis is less than default arithmetic mean (3) which proves the validity of this axis.

Table4.31Familiarity and knowledge of business intelligent arithmetic mean and standard deviation

No	Item	Mean	Std. Deviation	Weight closer to	
				weight	Class
1	Do you have any knowledge about the concept of business intelligence?	1.9200	1.08496	1	Strongly Agree
2	How often do you use Business Intelligence System?	2.3600	1.20814	2	Agree
3	Do you normally use reports Provided Business Intelligence System when making decisions?	2.6200	1.30759	2	Agree
4	Is `there is difference between the business intelligence reports and the report using by the existing application in the bank?	2.0000	1.10657	2	Agree
5	Do you think application helps you reach to the largest number of customers?	1.9400	1.21907	1	Strongly Agree
6	Do you think after the implementation of Business Intelligence application in the bank is good for making the appropriate decisions?	1.5400	.70595	1	Strongly Agree
Midfield General		**2.22**			
General Weight		**Agree**			

- role of banking industry to implement Business intelligent:

To analysis this variable, use the arithmetic mean, standard deviation, as shown in Table (4-2). The standard deviation values ranged between (.73540-1.04764) this indicates the homogeneity views of respondents.

In general, the arithmetic mean of each axis is less than default arithmetic mean (3) which proves the validity of this axis.

Table4.32.2 role of banking industry to implement Business intelligent arithmetic mean & standard deviation

No	Item	Mean	Std. Deviation	Weight closer to	
				weight	Class
1	Bank plans to increase its efforts to implement business intelligence systems for analysis.	1.8000	.85714	1	Strongly Agree
2	The Bank maintains as organized effort to collect, analyse data and generate reports for Business Intelligence.	2.0800	.96553	2	Agree
3	The Bank uses business intelligencer to collection analysis of data and generation of the reports	2.2000	.98974	2	Agree
4	The Bank uses business intelligence Systems for structuring unstructured collected information	2.3800	1.04764	2	Agree
5	Business intelligence will improve operational and strategic decisions for better and timely information.	1.9400	.81841	1	Strongly Agree

6	The business intelligence systems sufficient to achieve the fundamental objectives of our business	1.7000	.73540	1	Strongly Agree
7	Business intelligence allows to the bank to predict many of the tools in the work systems.	1.7400	.77749	1	Strongly Agree
8	BI will helps to increase the combative advantage of the banks	1.7400	.77749	1	Strongly Agree
9	BI reports are suitable to reach to the largest number of customers	1.7000	.76265	1	Strongly Agree
Midfield General		1.96			
General Weight		Strongly Agree			

- Challenges of implementing Business Intelligence System:

To analysis this variable, use the arithmetic mean, standard deviation, as shown in Table (4-3). The standard deviation values ranged between (.83324-1.09842) this indicates the homogeneity views of respondents.

In general, the arithmetic mean of each axis is less than default arithmetic mean (3) which proves the validity of this axis.

Table4.33.3 Challenges of implementing Business Intelligence System arithmetic mean & standard deviation

No	Item	Mean	Std. Deviation	Weight closer to	
				weight	Class
1	Business Intelligence is relatively new concept and not any banks are interested in implementing it on large scale.	2.7600	1.09842	2	Agree
2	Knowledge and Training of Business Intelligence System	2.1400	.83324	2	Agree
3	Difficulty to use BI application by staff	2.9000	.95298	2	Agree
4	Lack of technical support (Technological Changes)	2.5800	.94954	2	Agree
5	The absence of managerial Support for using business intelligence software	2.6400	1.08346	2	Agree
6	High upfront set up costs and running costs.	2.6400	1.06445	2	Agree
Midfield General		**2.35**			
General Weight		**Agree**			

4.3 Hypotheses Test

In this part tested the main hypotheses through a chi-squared test, also referred to as x^2 test (or chi-square test) as follows:

HA1: There is a positive direct impact for implementation of Business Intelligence in banking industry in Sudan. To test this hypothesis, use a chi-squared test, as shown in Table (4-4).

Table4.34.4 Chi-squared test for first Hypotheses

No		Chi-Square	df	Asymp. Sig.
1	Do you have any knowledge about the concept of business intelligence?	37.000a	4	.000
2	How often do you use Business Intelligence System?	35.200a	4	.000
3	Do you normally use reports Provided Business Intelligence System when making decisions?	13.800a	4	.008
4	Is `there is difference between the business intelligence reports and the report using by the existing application in the bank?	28.000a	4	.000
5	Do you think application helps you reach to the largest number of customers?	21.520b	3	.000
6	Do you think after the implementation of Business Intelligence application in the bank is good for making the appropriate decisions?	16.120c	2	.000

From the table the value of chi-squared was ranging from (37.000a-13.800a) with degree of freedom 2, 3, 4, and this indicate the homogeneity views of respondents about the questionnaire axes. Also observe that all questionnaire axes with level of significance are less than 5%, which confirms the validation of the first hypotheses, and thus, accept the hypothesis.

HA2 Microfinance sector in Sudan banking industry need a good solution positively related to BI to generate report for make smart decisions. To test this hypothesis, use a chi-squared test, as shown in Table (4-5).

Table4.35.5 Chi-squared test for second Hypotheses

No	item	Chi-Square	df	Asymp. Sig.
1	Bank plans to increase its efforts to implement business intelligence systems for analysis.	20.080a	3	.000
2	The Bank maintains as organized effort to collect, analyse data and generate reports for Business Intelligence.	10.640a	3	.014
3	The Bank uses business intelligencer to collection analysis of data and generation of the reports.	9.200a	3	.027
4	The Bank uses business intelligence Systems for structuring unstructured collected information.	2.000a	3	.572

From the table the value of chi-squared was ranging from (20.080a -2.000a) with degree of freedom 3, and this indicate the homogeneity views of respondents about the questionnaire axes. Also, observe that all questionnaire axes with level of significance are less than 5%, except number4 is greater than 5%.Which confirms the validation of the second hypotheses, and thus, accept the hypothesis.

HA3: There is a relationship between business intelligence and the performance of Microfinance sector in banking. To test this hypothesis, use a chi-squared test, as shown in Table (4-6).

Table4.36.6 Chi-squared test for third Hypotheses

No	Item	Chi-Square	df	Asymp. Sig.
5	Business intelligence will improve operational and strategic decisions for better and timely information.	16.720a	3	.001
6	The business intelligence systems sufficient to achieve the fundamental objective of our business	7.240b	2	.027
7	Business intelligence allows to the bank to predict many of the tools in the work systems.	5.080b	2	.079
8	BI will helps to increase the combative advantage of the banks	5.080b	2	.079
9	BI reports are suitable to reach to the largest number of customers	6.760b	2	.034

From the table the value of chi-squared was ranging from (16.720a -6.760b) with degree of freedom 2, 3, and this indicate the homogeneity views of respondents about the questionnaire axes. Also, observe that all questionnaire axes with level of significance are less than 5%, except number 3, 4 is greater than 5%.Which confirms the validation of the third hypotheses, and thus, accept the hypothesis.

HA4: There is a challenge for implementation of business intelligent in Sudan banking industry. To test this hypothesis, use a chi-squared test, as shown in Table (4-7).

Table4.37.7 Chi-squared test for four Hypotheses

No	Item	Chi-Square	df	Asymp. Sig.
1	Business Intelligence is relatively new concept and not any banks are interested in implementing it on large scale.	12.600a	4	.013
2	Knowledge and Training of Business Intelligence System	1.720b	2	.423
3	Difficulty to use BI application by staff	14.800c	3	.002
4	Lack of technical support (Technological Changes)	6.800c	3	.079
5	The absence of managerial Support for using business intelligence software	21.800a	4	.000
6	High upfront set up costs and running costs.	8.560c	3	.036

From the table the value of chi-squared was ranging from (21.800a -1.720b) with degree of freedom 2, 3, 4, and this indicate the homogeneity views of respondents about the questionnaire axes. Also, observe that all questionnaire axes with level of significance are less than 5%, except number 2, 4 is greater than 5%.Which confirms the validation of the fourth hypotheses, and thus, accept the hypothesis.

4.4 Chapter Summary

This chapter describes the results of the statistical analysis for the data collected according to the research questions and research hypotheses. Moreover, the study proved that:

- There is a positive direct impact for implementation of Business Intelligence in banking industry in Sudan.
- Microfinance sector in Sudan banking industry need a good solution positively related to BI to generate report for make smart decisions.
- There is a relationship between business intelligence and the performance of Microfinance sector in banking.
- There is a challenge for implementation of business intelligent in Sudan banking industry.

Chapter 5 Conclusion

The manual system before used business intelligent system the operation in banking industry solved manually according to the banking branch. As the banks grew in size and expanded geographically, the volume of transactions became quite large. Manual systems became both time consuming and error prone.

From the concept of Business intelligence, The BI software described in this thesis solves both of these problems. Banks today collect enormous amounts of data from numerous sources. The use of BI to collect, organize, and analysed this data can add great value to a business.

After study the literature related to the business intelligence, BI define as the process of taking large amounts of data, analysing that data, and presenting a high-level set of reports that condense the essence of that data into the basis of business actions, enabling management to make fundamental daily business decisions.

Moreover, it does this by Microsoft SQL Business Intelligence software that is composed of tools, which help in providing best solutions for Business Intelligence and Data Mining Queries.

As mentions in chapter 4, this tool uses Visual studio (BIDS) along with SQL server to analysis data using SSAS and used SSRS to create reports.

In conclusion, According to the literature review, there are at least three major benefits of business Intelligence:

- **Increased profitability** BI can help companies identify their most profitable customers and build relationship-based marketing efforts to grow high net-worth customers. At the same time, BI analysis will enable companies to identify and shift their low-net worth customers to more efficient and profitable channels.

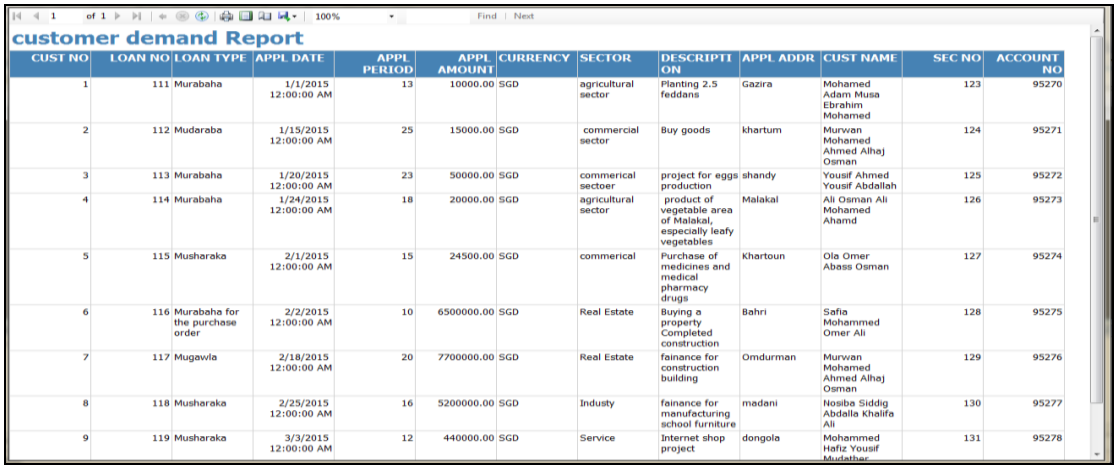
- **Decreased Costs**. Because BI cans quickly analysis the performance of front-line operations, it helps identify where productivity and cost improvements are possible.
- **Improved Customer Management.** Aggregated customer information that is provided through BI analysis will help companies identify cross-selling and up-selling opportunities. By providing more of what the customer wants, these opportunities will increase customer and brand loyalty [11].

5.1 Result

As mentioned in chapter 3, the last step of BI solution to prepare required reports through SQL Server 2008.it enables users to build the reports using Business Intelligence Development Studio (BIDS).

After implementing the BI solution different types of report generated, Some of them are illustrated in 5.1, 5.2 and 5.3:

- Customer demand report as shown in figure 5.1

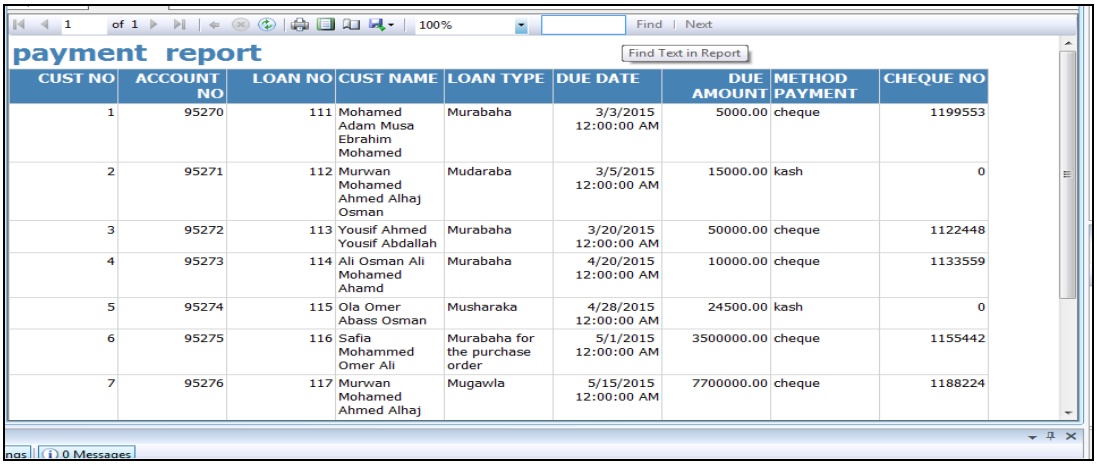


customer demand Report

CUST NO	LOAN NO	LOAN TYPE	APPL DATE	APPL PERIOD	APPL AMOUNT	CURRENCY	SECTOR	DESCRIPTION	APPL ADDR	CUST NAME	SEC NO	ACCOUNT NO
1	111	Murabaha	1/1/2015 12:00:00 AM	13	10000.00	SGD	agricultural sector	Planting 2.5 feddans	Gazira	Mohamed Adam Musa Ebrahim Mohamed	123	95270
2	112	Mudaraba	1/15/2015 12:00:00 AM	25	15000.00	SGD	commercial sector	Buy goods	khartum	Murwan Mohamed Ahmed Alhaj Osman	124	95271
3	113	Murabaha	1/20/2015 12:00:00 AM	23	50000.00	SGD	commerical sectoer	project for eggs production	shandy	Yousif Ahmed Yousif Abdallah	125	95272
4	114	Murabaha	1/24/2015 12:00:00 AM	18	20000.00	SGD	agricultural sector	product of vegetable area of Malakal, especially leafy vegetables	Malakal	Ali Osman Ali Mohamed Ahamd	126	95273
5	115	Musharaka	2/1/2015 12:00:00 AM	15	24500.00	SGD	commerical	Purchase of medicines and medical pharmacy drugs	Khartoun	Ola Omer Abass Osman	127	95274
6	116	Murabaha for the purchase order	2/2/2015 12:00:00 AM	10	6500000.00	SGD	Real Estate	Buying a property Completed construction	Bahri	Safia Mohammed Omer Ali	128	95275
7	117	Mugawla	2/18/2015 12:00:00 AM	20	7700000.00	SGD	Real Estate	fainance for construction building	Omdurman	Murwan Mohamed Ahmed Alhaj Osman	129	95276
8	118	Musharaka	2/25/2015 12:00:00 AM	16	5200000.00	SGD	Industy	fainance for manufacturing school furniture	madani	Nosiba Siddig Abdalla Khalifa Ali	130	95277
9	119	Musharaka	3/3/2015 12:00:00 AM	12	440000.00	SGD	Service	Internet shop project	dongola	Mohammed Hafiz Yousif Mudather	131	95278

Figure5.47 Customer demand report

- Customer payment report as shown in figure 5.2

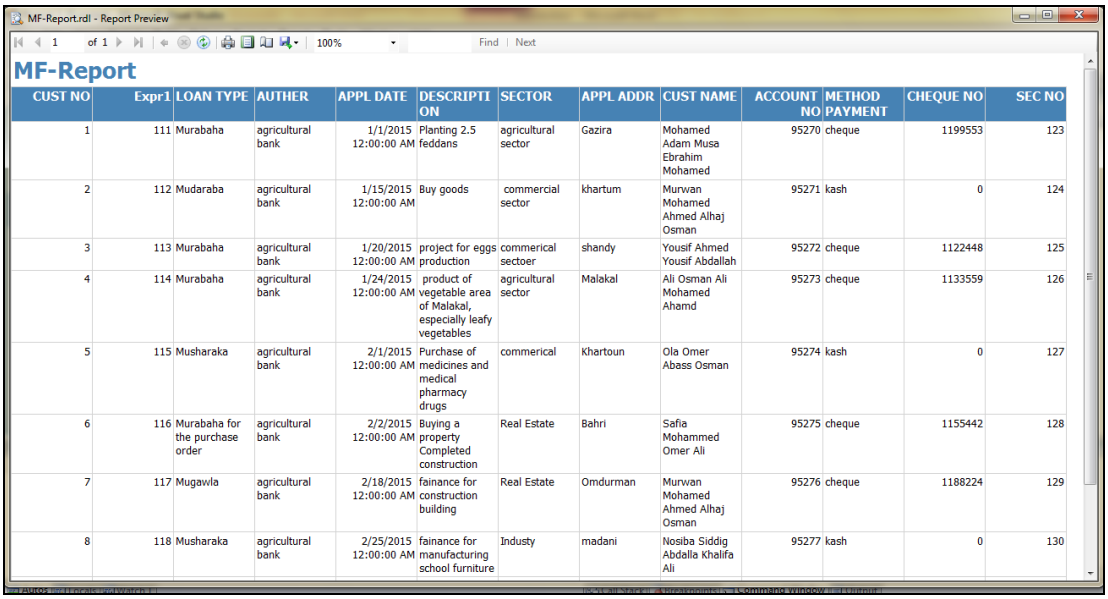


payment report

CUST NO	ACCOUNT NO	LOAN NO	CUST NAME	LOAN TYPE	DUE DATE	DUE AMOUNT	METHOD PAYMENT	CHEQUE NO
1	95270	111	Mohamed Adam Musa Ebrahim Mohamed	Murabaha	3/3/2015 12:00:00 AM	5000.00	cheque	1199553
2	95271	112	Murwan Mohamed Ahmed Alhaj Osman	Mudaraba	3/5/2015 12:00:00 AM	15000.00	kash	0
3	95272	113	Yousif Ahmed Yousif Abdallah	Murabaha	3/20/2015 12:00:00 AM	50000.00	cheque	1122448
4	95273	114	Ali Osman Ali Mohamed Ahamd	Murabaha	4/20/2015 12:00:00 AM	10000.00	cheque	1133559
5	95274	115	Ola Omer Abass Osman	Musharaka	4/28/2015 12:00:00 AM	24500.00	kash	0
6	95275	116	Safia Mohammed Omer Ali	Murabaha for the purchase order	5/1/2015 12:00:00 AM	3500000.00	cheque	1155442
7	95276	117	Murwan Mohamed Ahmed Alhaj	Mugawla	5/15/2015 12:00:00 AM	7700000.00	cheque	1188224

Figure5.48.2 Customer payment report

- Microfinance report as shown in figure 5.3



MF-Report

CUST NO	Expr1	LOAN TYPE	AUTHER	APPL DATE	DESCRIPTION	SECTOR	APPL ADDR	CUST NAME	ACCOUNT NO	METHOD PAYMENT	CHEQUE NO	SEC NO
1	111	Murabaha	agricultural bank	1/1/2015 12:00:00 AM	Planting 2.5 feddans	agricultural sector	Gazira	Mohamed Adam Musa Ebrahim Mohamed	95270	cheque	1199553	123
2	112	Mudaraba	agricultural bank	1/15/2015 12:00:00 AM	Buy goods	commercial sector	khartum	Murwan Mohamed Ahmed Alhaj Osman	95271	kash	0	124
3	113	Murabaha	agricultural bank	1/20/2015 12:00:00 AM	project for eggs production	commerical sectoer	shandy	Yousif Ahmed Yousif Abdallah	95272	cheque	1122448	125
4	114	Murabaha	agricultural bank	1/24/2015 12:00:00 AM	product of vegetable area of Malakal, especially leafy vegetables	agricultural sector	Malakal	Ali Osman Ali Mohamed Ahamd	95273	cheque	1133559	126
5	115	Musharaka	agricultural bank	2/1/2015 12:00:00 AM	Purchase of medicines and medical pharmacy drugs	commerical	Khartoun	Ola Omer Abass Osman	95274	kash	0	127
6	116	Murabaha for the purchase order	agricultural bank	2/2/2015 12:00:00 AM	Buying a property Completed construction	Real Estate	Bahri	Safia Mohammed Omer Ali	95275	cheque	1155442	128
7	117	Mugawla	agricultural bank	2/18/2015 12:00:00 AM	fainance for construction building	Real Estate	Omdurman	Murwan Mohamed Ahmed Alhaj Osman	95276	cheque	1188224	129
8	118	Musharaka	agricultural bank	2/25/2015 12:00:00 AM	fainance for manufacturing school furniture	Industy	madani	Nosiba Siddig Abdalla Khalifa Ali	95277	kash	0	130

Figure5.49.3 Microfinance report

Additionally, Microsoft SQL Server 2008 provides the following features:

- **Developer Productivity**

SQL Server 2008 simplifies the development of business intelligence solutions. BI developers benefit from easy-to-use utilities and tools that increase control and automate routine, time-consuming tasks, and can use the productivity features of SQL Server 2008 to create effective analysis and reporting solutions more quickly than ever.

- **Increase Reporting Flexibility**

Reporting is a significant element of any BI solution, and business users are demanding increasingly complex reports. SQL Server Reporting Services provides the following features to make it easy to build reporting solutions:

1) Visual Studio-based report development interface in Business Intelligence Development Studio that developers can use to build, debugs, and deploy reports.
2) Business-focused report development tool named Report Builder that business users can use to create and deploy reports.
3) Wide range of data display structures, including tables, matrices, lists, and charts.

Also, SQL Server 2008 includes extensive enhancements to Reporting Services that improve reporting performance and provide increased flexibility for formatting and publishing reports. One of the enhancements made to Reporting Services in SQL Server 2008 is support for a new layout structure that combines table and matrix data regions [29].

Finally, the research examined number of hypotheses uses a chi-squared tested and the research found that:

- There is appositive direct impact for implementation of BI application in banking industry which meant that the banking industry in Sudan needed Business Intelligence solution.
- The homogeneity views of respondents about the questionnaire axes, also, observe that all questionnaire axes with level of significance are less than 5%.Which confirms the validation of all hypotheses, and thus, accept the hypothesis.

5.2 Further work and recommendation

This work aimed to implement business intelligent solution into banking industry (microfinance sector) using BIDS software.

BI software gives banking enterprises the capability to analyse the vast amounts of information they already have to make the best business decisions. The software allows banks to tap into their huge databases and deliver easy-to-comprehend insight to improve business performance and maintain regulatory compliance.

Although, the implementation of BI brings several benefit it brings certain challenges:

- **Lack of trained staff:** Simply installing BI software is not enough; staff should be trained to handle it probably.
- **High investment:** BI is a relatively new concept and not many banks are interested in implementing it. Banks need to recognize that the long-term business benefits of BI [5].

Finally, after study the literature related to the business intelligence the recommendation of this project summarized as below:

- Implementation of Business intelligent software in banking using real data rather than random data.
- The staff should be aware of the advanced technology, but the most important is that the people using these BI tools need to understand and know how to use the tools to achieve their goals.

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Appendix A: Questionnaire

Mr/Mrs ……. Greeting

The researcher prepares a study to complete the requirements for obtaining a master's degree in Information Technology in Sudan University Faculty of Computer Science and Information Technology, The project is entitled about "Application of Business Intelligence systems in banking industry (A case study of agricultural bank of Sudan)".

This Questionnaire designed to collect information about your organization. I would be very grateful if you could answer ALL questions as completely and accurately as possible.

The purpose of this questionnaire is to obtain your views and opinions for significant impact in getting positive results, note that everything that is contained in your answer used only for the purposes of scientific research, and therefore no need to write your name.

Thanks for answer all the items in the Questionnaire.

Section one: Demographics Information

الجزء الاول :الخصائص الديموغرافية

(1)Age	(1) العمر
30 years or less □ From 31– 40 Years □ From 41– 50Years □ 51 Years More □	30 سنة فأقل □ من 31-40 سنة □ من 41-50 سنة □ 51 سنة فأكثر □

(2) Gender:	(2) الجنس
Male □ Female □	ذكر □ انثى □

(3) Educate Level:	(1) المستوى التعليمي
BSc □ High Diploma □ Master □ PhD □	بكالوريوس □ دبلوم عالي □ ماجستير □ دكتوراه □

(4) Experience:	(4) الخبرة العملية:
5 years or less □ From 6- 10 Years □ From 11 – 15 Years □ 16 Years More□	5 سنوات فأقل □ من 6-10 سنة □ من 11-15 سنة □ 16 سنة فاكثر □

(5) Years of Service in Banks:	(5) سنوات الخبرة في البنك:
5 years or less □ From 6-10 Years □ From 11 – 15 Years □ 16 Years More □	5 سنوات فأقل □ من 6-10 سنة □ من 11-15 سنة □ 16 سنة فاكثر □

(6) Job Title:	(6)المنصب الوظيفي:
Top Management□ Middle Management □	إدارة عليا □ إدارة وسطى □

الجزء الثاني: الالمام والمعرفة بذكاء الاعمال :

section tow: Familiarity and knowledge of business intelligent

No	Item	بدائل الإجابة Answer alternatives					الفقرة	ت
		لااتفق اطلاقا Strongly disagree	لااتفق Disagree	محايد Neutral	اتفق Agree	اتفق كليا Strongly Agree		
1	Do you have any knowledge about the concept of business intelligence?						هل لديك أي معرفة حول مفهوم ذكاء الأعمال؟	1
2	How often do you use Business Intelligence system?						هل تستخدم ذكاء الاعمال احيانا ؟	2
3	Do you normally use reports provided by Business Intelligence system when making decisions?						هل تستخدم برنامج ذكاء الاعمال لإعداد التقارير واتخاذ القرار ؟	3
4	Is there is a difference between the business intelligence reports and the reports using by the existing application in the bank?						هل هناك فرق في اعداد التقارير باستخدام البرامج الحالية في البنك و استخدام ذكاء الاعمال في اعدار التقارير ؟	4
5	Do you think Business Intelligence application helps you reach to the largest number of customers?						هل يساعدك برنامج ذكاء الاعمال في الوصول الى اكبر عدد من العملاء ؟	5
6	Do you think after the implementation of Business Intelligence application in the bank is good for making the appropriate decisions?						هل تعتقد بعد تطبيق ذكاء الاعمال في البنك انه يساعد على اتخاذ القرارات المناسبة ؟	6

الجزء الثالث :دور البنك في تطبيق ذكاء الاعمال:

Section three: The role of banking industry to implement Business Intelligence

No	Item	بدائل الإجابة Answer alternatives					الفقرة	ت
		لاتفق اطلاقا Strongly disagree	لاتفق Disagree	محايد Neutral	اتفق Agree	اتفق كليا **Strongly Agree**		
1	Bank plans to increase its efforts to implement business intelligence systems for analysis						يخطط البنك لزيادة جهوده في تطبيق تكنولوجيا المعلومات بمجال تحليل بيانات الأعمال باستخدام انظمة ذكاء الأعمال.	1
2	The Bank maintains an organized effort to collect, analyze data and generate reports for Business Intelligence						يحافظ البنك على جهد منظم لجمع وتحليل البيانات وتوليد التقارير عن ذكاء الأعمال.	2
3	The Bank uses business intelligence to collection, analysis of data and generation of the reports						يستخدم البنك تكنولوجيا ذكاء الأعمال للمساعدة في جمع وتحليل البيانات وتوليد التقارير الخاصة بها	3
4	The Bank uses business intelligence systems for structuring unstructured collected information						يستخدم البنك انظمة ذكاء الأعمال لهيكلة المعلومات غير المهيكلة التي تم جمعها.	4

No	Item	بدائل الإجابة Answer alternatives					الفقرة	
		لاتفق اطلاقا Strongly disagree	لاتفق Disagree	محايد Neutral	اتفق Agree	اتفق كليا Strongly Agree		
5	Business intelligence will improve operational and strategic decisions from better and timely information.						تعد جهود انظمة ذكاء الأعمال في البنك هامة في جانب القدرة على الحصول على المعلومات التشغيلية في الوقت الفعلي المطلوب	5
6	The business intelligence systems sufficient to achieve the fundamental objectives of our business						تعد امكانيات انظمة ذكاء الأعمال كافية لتحقيق الاهداف الاساسية المرتبطة باداء اعمالنا.	6
7	Business intelligence allows the bank to predict many of the tools in the work systems.						يتيح استخدام انظمة ذكاء الأعمال للبنك العديد من ادوات التنبؤ في العمل.	7
8	BI will helps to increase the competitive advantage of the banks						تطبيق ذكاء الاعمال يساعد على زيادة الميزة التنافسية للبنك	8
9	BI reports are suitable to reach to the largest number of customers						تساعد تقارير ذكاء الاعمال في الوصول الى اكبر عدد ممكن من العملاء	9

Section four : Challenges of implementing Business Intelligence systems

الجزء الرابع:مشاكل ومعوقات تطبيق ذكاء الاعمال

No	Item	بدائل الإجابة Answer alternatives					الفقرة	ت
		لااتفق اطلاقا Strongly disagree	لااتفق Disagree	محايد Neutral	اتفق Agree	اتفق كليا Strongly Agree		
1	Business Intelligence is relatively new concept and not any banks are interested in implementing it on a large scale						يعتبر ذكاء الاعمال من البرامج الحديثة ولم يتم تطبيقه في البنك	1
2	Knowledge and Training of Business Intelligence System						المعرفة والتدريب بنظام ذكاء الاعمال	2
3	Difficulty to use BI application by staff						صعوبة استخدام وتطبيق ذكاء الاعمال من قبل الموظف	3
4	Lack of technical support(Technological Changes)						عدم وجود الدعم الفني (التغييرات التكنولوجية)	4
5	The absence of managerial Support for using business intelligence software						غياب الدعم الاداري في استخدام برامج ذكاء الاعمال	5
6	High upfront set up costs and running costs						التكلفة الاولية وتكلفة التشغيل	6

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