Literature Review of Business Intelligence

Shubhi Jain[1], Anu Sharma[2]

M. Tech Student, Assistant Professor

Teerthanker Mahaveer University, Moradabad

ABSTRACT:-Business Intelligence (BI) is a term that refers to the set of technologies, architectures, practices, applications and processes for the collection, integration, analysis, and presentation of business information that drives profitable business actions. BI is considered to have a significant impact on businesses. The primary purpose of the Business Intelligence is to enhance decision making capability. BI tools help us to perform data analysis and create summaries, dashboards, maps, graphs, charts and reports to provide users with detailed intelligence about the nature of the business. A critical part of BI systems is a properly performing implementation of the Extract, Transform, and Load (ETL) process. In this paper, I will do the literature review that how Business Intelligence System helps in enhancing decision-making capability, readiness in meeting new business challenges, and identifying every hidden cost.

KEYWORD:- Business Intelligence, BI, Extract, transform, and Load, ETL, data mining, DSS(Decision Support System)

INTRODUCTION:-In today's challenging business environment, it is vital for the organization to access useful information and knowledge. Business intelligence (BI) has received wide popularity in the last few years. It is an umbrella term that includes the applications, infrastructure and tools, techniques and best practices that enable the user to access to and analysis of information to improve and optimize decisions and performance and also helps managers to understand business situation. Business Intelligence is descriptive in nature. It tells us about what's happening now and what happened in the past to get us in that state. BI solutions today deal with enormous and increasing amounts of data known as Big Data and can rely on substantially increasing processing capacities (incl. in-memory technologies), which have created new opportunities for knowledge discovery that is known as data mining. It is a discipline that is made up of various activities that include gathering, storing, analyzing, sharing, querying and reporting of data in order to make better decisions. It is used in several sectors such as finance, food industry, pharmaceutical industry, travel and transport industry

etc. Also, we will analyze what is the requirement of Business Intelligence, how Business Intelligence helps in enhancing decision making capability. Business intelligence technologies use predictive analytics and advanced statistics to help businesses in order to draw the conclusions from data analysis, discover patterns, and forecast future events in the business operations. BI reporting is not a linear practice; and rather, it is a continuous, multifaceted cycle of data access, exploration, and information sharing. In this paper, we are going to perform the study on the Business Intelligence System architecture and its essential components, what are the requirements of Business Intelligence and its benefits, also how it helps in enhancing decision making capability.

LITERATURE REVIEW:- In this paper, I will use secondary information from the previous literature review of Business Intelligence with the help of some articles and secondary sources of data collection. The paper is concluded with the literature review of Business Intelligence Architecture and its components. Following are some definitions of Business Intelligence collected from different sources:-

S.No.	Research Paper Name	Author & Journal	Definition
1.	BUSINESS INTELLIGENCE: State of the Art, Trends, and Open Issues	Ana Azevedo and Manuel Filipe Santos, KMIS 2009 - International Conference on Knowledge Management and Information Sharing	BI refers to information systems aimed at integrating structured and unstructured data in order to convert it into useful information and knowledge, upon which business managers can make more informed and consequently better decisions.
2.	Essential Components and Success Factors of Business Intelligence and Performance Management. Cannes, France	Gartner Reports – Essential Components and Success Factors of Business Intelligence and Performance Management. Cannes, France: Gartner Symposium IT Expo 2006	An umbrella term that includes applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance.
3.	Business Intelligence Systems	Bodgan NEDELCU, Database Systems Journal vol. IV, no. 4/2013	Business intelligence is based on an aggregate of concepts and technologies which cooperate for helping companies and their decisional activities. In the current environment, everything is based on information; companies provide informational activities needs, and the internet makes the information transfer without having distances barriers.

A good quality of decision making in business is totally dependent upon high-quality business information. This is a fact in today's competitive business environment that requires agile access to a data storage warehouse, organized in such a manner that will enhance business performance, deliver fast, accurate, and relevant data insights. Business Intelligence architecture has emerged to meet those requirements, with data warehousing as the backbone of these processes [1]. According to Valuates Report, Major factors driving the growth of Business Intelligence market size are:

1. Rapid Increase in unstructured data generated by IoT devices, smart cities, sensors, cameras, etc.

2. Growing demand for dashboards for data visualization to make informed decisions that dramatically impact business performance.

3. Rising investments in analytics and increase in adoption of cloud-based BI tools[2]

BUSINESS INTELLIGENCE ARCHITECTURE:- Business intelligence architecture is a term that is used to explain standards and guidelines for organizing information with the help of computer-primarily based techniques and technologies that create commercial enterprise intelligence systems used for online facts visualization, reporting, and analysis. A general Business Intelligence architecture generally consists of various components and layers. Business Intelligence applied to any field needs three basic things to be performed on data, i.e. ETL (Extraction, Transformation, Loading). For these processes to be performed, we need to dump our massive data somewhere that it could be retrieved, processed and again stored[3]. Creating a sustainable architecture depends on understanding the different components that are involved with developing successful business intelligence tools. Each component has its own predefined purpose, which we will discuss in the later section of this paper.

Due to different understanding of business intelligence, different architectures for business intelligence systems are presented in the theories. About the broad knowledge of the term used in the present work, and above all, various logical processes are given in references, which forms the basis for a BI architecture.

A robust BI architecture framework consists of the following components :

1. Data Gathering
2. Data Integration
3. Data Storage
4. Data Analysis
5. Data Distribution
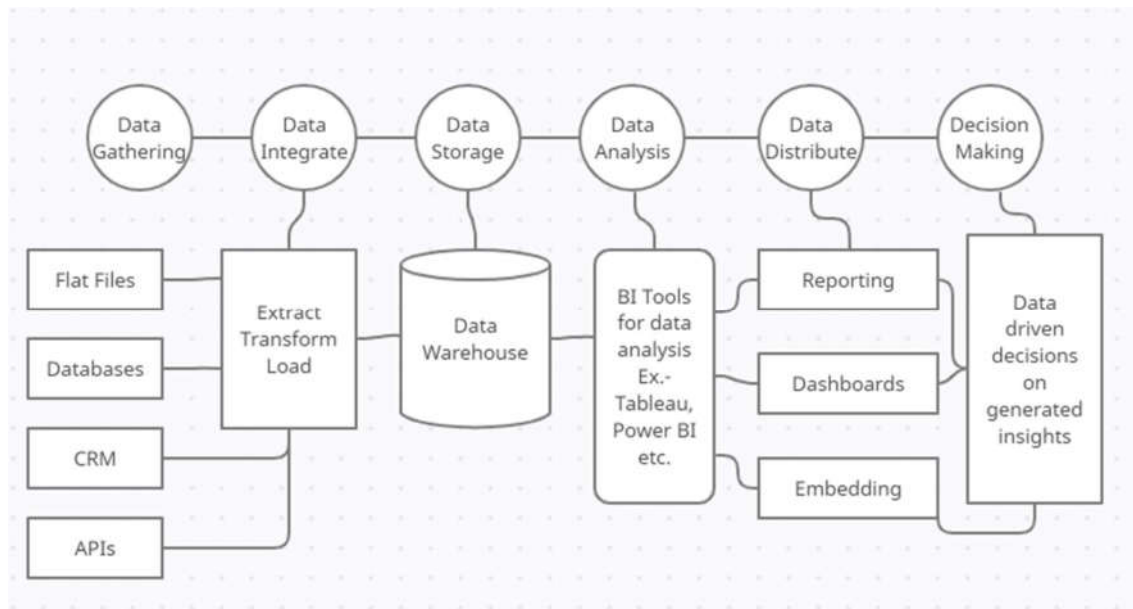6. Data-driven decisions on generated insights

Fig1.1 Business Intelligence Architecture Framework

Data Gathering:- The first step of creating a stable BI architecture starts from gathering the information from the various data sources such as databases, flat files, API's, CRM and ERP etc., depending on the requirements of a company. All these data sources capture and hold the transactional and operational data identified as essential for the enterprise BI program. They can also include secondary sources, such as market data and customer databases from outside information providers. As a result of which, both internal and external data sources are often incorporated into a BI architecture. The main criteria in the data source selection process include data relevancy, data currency, data quality and level of detail in the available data sets. A combination of structured, semi-structured and unstructured data types may be required to meet the data analysis and decision-making needs of the executives and other business users [4].

Data Integration:- Data Integration is the process of integrating data from different sources into a unified view. Integration begins with the ingestion process and includes steps such as cleansing, ETL mapping, and transformation. Data integration ultimately enables analytics tools to produce effective, actionable business intelligence [5]. By using an established ETL framework, one way increase one's chances of ending up with better scalability and proper connectivity. The main problem that one can resolve by using any ETL tool is that we can quickly import the large data sets to database architects. It is challenging to handle the large datasets manually, but ETL tools are very effective. These tools reduce the chances of error and incorrectness to a vast extent. The ETL process seems quite straight forward. Instead of writing big SQL queries for any operation, one can use this tool. It enhances users performance and efficiency.
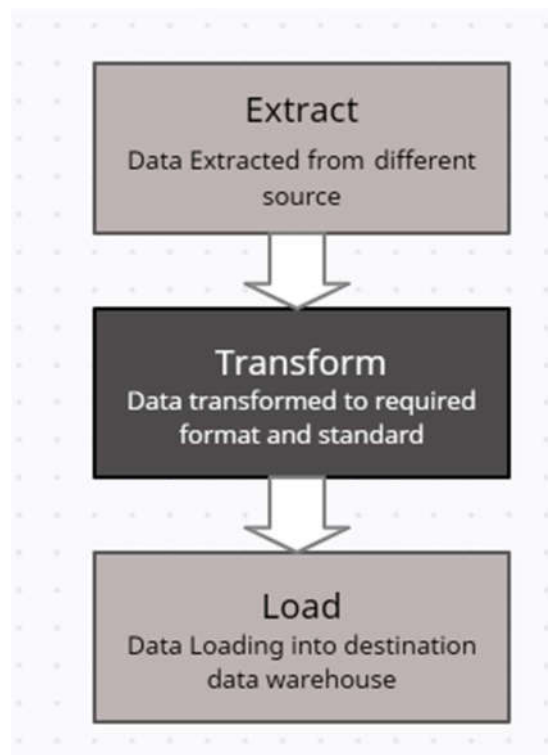
Fig 1.2 Flowchart of working of an ETL Tool

Data Storage:- BI Systems and tools make use of a data warehouse, typically an online analytical processing (OLAP) system. OLAP helps us to perform multidimensional analysis of business data and provides the capability for complex calculations, trend analysis, and sophisticated data modelling. OLAP technology is defined as the ability to achieve "fast access to the shared multidimensional information." It is the foundation for many business applications for Business Performance Management, Planning, Budgeting, Forecasting, Financial Reporting, Analysis, Simulation Models, Knowledge Discovery, and Data Warehouse Reporting. OLAP enables end-users to perform ad hoc analysis of data in multiple dimensions, thereby providing the insight and understanding they need for better decision making [6].

Data Analysis:- In this step, we will focus on the data analysis. It is the process of cleaning, analyzing, interpreting, and visualizing data to discover valuable insights that drive smarter and more effective business decisions. Data analysis tools are used to extract useful information from business data and help make the data analysis process easier. It also focuses on the process of turning raw data into useful statistics, information, and explanations[7]. Below is the list of some tools that are widely used for data analysis:-

- Tableau
- Power BI
- QlikView
- Business Objects

- Cognos
- Jaspersoft
- Microsoft BI
- OBIEE

Data Distribution:- Data distribution is one of the most crucial processes when it comes to sharing information and providing stakeholders with indispensable insights to obtain sustainable business development. Data distribution is generally performed in 3 ways, which are as follows:-

1. Reporting via automated e-mails:- Created reports can be shared with selected recipients on a defined schedule. The dashboards will be automatically updated based on some defined time-frequency which eliminates the manual work and enables up to date information.

2. Dashboarding:- Another reporting option is to directly share a dashboard in a secure viewer environment.

3. Embedding:- This form of data distribution is enabled through embedded BI. Your application can use dashboards as a mean of analytics and reporting without the need for labelling the BI tool in external applications or intranets [1].

Data-Driven Decisions on generated insights:- This is the final stage of any BI Architecture that supports a better decision-making approach. Managers, CEOs and all the higher authorities can make a better decision from the generated insight. Business Intelligence helps companies to make informed decisions on strategic issues by providing crucial information on the current and historical performance of the company along with future trends, expected demands, customer behaviour etc. [8]. The dashboard is the final product of any BI operation, which improves the following factors:-

 1. Operational Efficiency
 2. Improves Business Productivity
 3. Crucial Information Easily accessed
 4. Good Return On Investment (ROI)
 5. Informed Decision Making

REQUIREMENT OF BUSINESS INTELLIGENCE:- Almost every business can benefit from the use of business intelligence, but there are not always the appopriate conditions to successfully implement business intelligence. It's not just about technical prerequisites to be able to access the relevant databases, but also the questions of corporate culture and the way in which business intelligence is approached. Essentially, the three basic requirements for BI can be represented as follows:

 1. Willingness to make things in question: Business Intelligence offers the opportunity to challenge the things that have been in the business for a long time. It is possible to

analyze the changed structures, create new information combinations and to simply look at changes on suspicion. If the basic design of the information is well-structured, regarding both the technical conditions and the organization of the data, this offers a wide field of confirmation.

2. Willingness to think unconventionally: BI creates entirely new insights. These must be explicitly allowed to consider into account the things that might at first glance be considered nonsensical or unrelated.

3. Management Attention: From the first two points, realize that BI projects have to take one or the other way to be successful. However, this also means that the management also accepts this. It is very administrable for BI projects if they are provided with the appropriate support from the responsible management. This significantly increases the acceptance and willingness to participate in such processes[9].

BENEFITS OF BUSINESS INTELLIGENCE:- They typically involve systematic integration, aggregation and management of structured and unstructured data in – increasingly 'real-time' – data warehouses, which enable new forms of fact-based DSS(Decision Support System). Second, BI solutions today deal with enormous and increasing amounts of data ('Big Data') and can rely on exponentially increasing processing capacities (incl. in-memory technologies), which have created new opportunities for knowledge discovery (e.g. data mining). Third, BI solutions benefit from new ways of data interrogation and information delivery (automatic distribution to or self-service from pervasive computing devices)[10]. Today's organizations are driving more value from BI by extending actionable information to many types of employees. A potential trend involving BI is its possible merger with Artificial Intelligence (AI). The better can be understood by the following benefits of BI:-

1. Cohesion between the various components for a better overview.

2. High scalability in terms of data volume and user growth.

3. Flexible reporting and analyzing, using BI to its full potential.

4. Easier to manage thanks to its clear structure: satisfied users.

5. Higher data quality and guaranteed response times[11].

6. Business intelligence provides a facility for assessing an organization's readiness in meeting new business challenges.

7. Business intelligence supports the usage of best practices and identifies every hidden cost.

CONCLUSION:- The purpose of this paper was to provide the new insights into how aspects of BI directly or indirectly influence the standard of managerial decision making. Also, provide a better understanding of Business Intelligence Architecture and its components and what

are the right conditions to successfully implement business intelligence. It also focuses on how Business Intelligence benefits many organizations by improving flexible reporting and analyzing via maintaining higher data quality, better decision making. It also explains the whole ETL lifecycle in BI architecture, which further helps us in systematic integration, aggregation and management of structured and unstructured data. Business Intelligence is the need of today's time.

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