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1 Introduction

Over the past decade, firms have invested heavily in technology and are in possession of volumes of data collected from legacy systems. As information has grown to be a strategic part of business, Business Intelligence (BI) and Data Warehousing have become major priorities for most enterprises. BI describes the process of turning raw data into useful information that aids decision-making. From the very beginning, Business Intelligence has been pitched as a savvy and evolutionary way to squeeze more out of existing technology investments, revitalize mature profit centers and obtain actionable insights that enable the emergence of new ones, all while paying for itself.

The explosion in data collection, growing ruthlessness and efficiency of competition, plummeting cost of both hardware and software technology and regulatory compliance are some of the driving forces behind adoption of an integrated BI solution. BI systems moved towards lead indicators such as customer satisfaction and loyalty, economic and politic landscapes and other factors which provide strategic information that can guide an enterprise in moving ahead. The focus of BI systems shifted from historic analysis to predictive analytics, thus, mainstream BI-analytics vendors scrambled to re-brand themselves as Business Performance Management (BPM) companies. The very character of BI is undergoing an interesting transformation, influenced deeply by the requirements of BPM and BI for the small and medium business.

In competitive telecommunication environments, customers choose their service providers. Today, this is a reality for long-distance, Internet Service Providers (ISP), wireless and some local markets. Internationally, competition exists in countries such as United Arab Emirates, United Kingdom, Australia and New Zealand. Under competitive conditions, the customer becomes the central focus of the carrier's activities. Customer requirements not only determine service offerings but also shape the network and impact the organizational structure of the carrier to focus on particular types of customers.

Telecommunications companies worldwide are exploring BI solutions to achieve competitive advantage. The key solutions for which telecommunications companies are looking involve marketing – such as customer retention, target marketing, campaign management, customer relationship management and network BI to streamline network assets.

This is a case study considering the challenges to be faced before, during and after the BI implementation in a leading satellite telecommunications company in the Gulf, ABC Satellite Telecommunications, where a lot of challenges hinder the implementation of BI.

The case study discusses in detail the reasons for implementing BI in the company and also the challenges before implementing, during and after the BI solution implementation. The help of a BI architect is vital in identifying the various challenges and success stories of the company since the implementation of BI. The need for implementing BI in a telecommunication company particularly in the ABC Telecom company is discussed. The challenges in implementing BI are analyzed and similar situations faced by companies which implemented BI are reviewed from the literature.

It is found that there are more managerial challenges than technical ones in companies as ABC Telecom. These situations and their proposed solutions from the literature helped in suggesting solutions to the present challenges in the ABC satellite telecommunications and similar companies.

2 Literature Review

2.1 Definition of BI (BI)

Bartner (Cited in Sujatha B, 2006), a renowned information technology research firm, defines the word BI as "the process of transforming raw data that the company collects from various operations into usable information". This process or definition seems to be simple at the first sight but in reality it is not. The flow presented in *Figure 1* depicts the transformation of data to information and then to knowledge. For an ordinary man, these terms seem no different; but they carry significant difference in the context of business and its needs.

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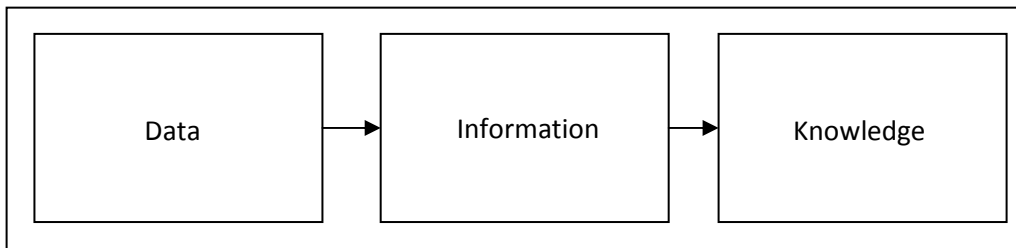
Figure 1 : Relation between "Data", "Information" and "Knowledge".

To start with, data is very simple in nature requiring less human intervention, yet to transform data to information; this would involve some human effort. Clearly, this shows that information is relatively complex compared to data, it may not have the level of redundancy that data carries, and may not be usable when time dimension is introduced.

Secondly, useful information today may not be as useful in the future and would just be some piece of data. Hence, further transforming it to knowledge would consider more human involvement and stretched time dimension.

Besides, knowing that knowledge is "well formed" information, it is clear that decision making is more effective only when one traverses from left end to the right end of the *Figure 1*. Though information is more legible and has some meaning when compared to data, it might not be the best choice for decision-making as knowledge does.

H P Luhn (1958) defines BI System as "an automatic system that is developed to disseminate information to the various sections of any industrial, scientific or government organization. This

intelligence system will utilize data-processing machines for auto-extracting and auto-encoding of documents and for creating interest profiles for each of the "action plans" in an organization. Both incoming and internally generated documents are automatically abstracted, characterized by a word pattern, and sent automatically to appropriate action points".

Information is now being generated and utilized at an ever-increasing rate because of accelerated pace and scope of human activities and the steady rise in the average level of education. There is also a growing need for more prompt decisions at levels of responsibility far below those customary in the past. Undoubtedly, the most formidable communications problem is the sheer bulk of information that has to be dealt with. In view of the present growth trends, automation appears to offer the most efficient methods for retrieval and dissemination of the information (H P Luhn, 1958).

The techniques proposed by H P Luhn (1958) are:

1. Auto-abstracting of documents;
2. Auto-encoding of documents;
3. Automatic creation and updating of action-point profiles.

All of these techniques are based on statistical procedures which can be performed on present-day processing machines. Together with proper communication facilities and input-output equipment, a comprehensive system may be assembled to accommodate all information problems of an organization (H P Luhn, 1958). This is called a BI System.

BI has been defined in many ways; some believe it is about the focus on the bottom line, or on using organizational data through data mining to find out what customers want; others think it is defined as the way of using technologies to help decision making, or centered on organizational direction and strategic planning; others consider BI as a subject of security and privacy.

BI moves away from the business's traditional concentration on purely using data for repetitive calculations, monitoring and control, to obtaining knowledge in a form that is suitable for supporting and enabling business decisions from marketing, sales, relationship formation, fraud detection through to major strategic decisions (Chang et al, 2006).

Some of the definitions given by some well known organizations to BI are listed below. These definitions were cited in "Trust and Reputation for Service-Oriented Environments – Technologies for building BI and Consumer Confidence" by Chang et al, 2006).

"BI is a concept of applying a set of technologies to turn data into meaningful information. With BI applications, large amounts of data originating in many different formats (spreadsheets, relationship databases, web logs) can be consolidated and presented to key business analysts, and armed with timely, intelligent information that is easily understood and the business analyst is enabled to affect change and develop strategies to drive higher profits." (IBM, 2005).

Bergerou (2005) citing Accuracast defines BI as: *"the process for increasing the competitive advantage of a company by intelligent use of available data in decision-making. BI consists of sourcing the data, filtering out unimportant information, analyzing the data, assessing the situation, developing solutions, analyzing risks and then supporting the decisions made"*.

Siebel (2005) defines BI as "a solution suite that integrates data from multiple enterprise sources and transforms it into key insights that enable executives, managers, and front-line employees to take actions that lead to dramatic improvements in business performance". Siebel further considers that the next generation of BI "comprises a mission-critical architecture that scales to handle the largest data volumes and delivers critical information to tens of thousands of concurrent users across the enterprise".

COGNOS is the BI tool to the ABC telecommunications company considered in this case study. COGNOS (2004) defined BI to be event driven.

"Event Drive BI monitors three classes of events in operational and BI content – notification, performance and operation events – looking for key changes. Having detected changes, event-driven BI then notifies and alerts decision-makers, keeping them informed and up-to-minute. This personalized information can be pushed to decision makers no matter where they, enabling them to make timely and effective decisions".

Based on definitions including the above, Chang et al (2006) gave an advanced definition to BI stating that "BI is accurate, timely, critical data, information and knowledge that supports strategies and operational decision making and risk assessment in uncertain and dynamic business environments. The source of data, information and knowledge are both internal organizationally collected as well as externally supplied by partners, customers or third parties as a result of their own choice". With reference to this definition: Data is defined as a set of facts about the corporation and its business; Information is said to be an abstraction of data which provides semantics about the data with defined meaning, context and value; and Knowledge is a high level of representations and ideas that permits

one to reason and carry out pattern recognition, classification, planning or other high level of intelligent tasks that might include representations of uncertainty.

2.2 History of BI

BI has evolved in 1970 and is expected to evolve further. *Figure 2* below briefs the BI technologies and applications over a 40 years span. Modern BI software originated with products catering to financial and sales planning. As these systems matured and information from other functions within the organization funneled into them, the term "data warehouse" began surfacing. Spread sheets became very popular from the 1980s on and these applications made the provision of both raw data and processed information more available (Deepak Pareek, 2007).

This resulted in the building of applications and solutions by the organizations that took advantage of this consolidated view of information. Transaction processing systems, for applications such as inventory management, order processing, costing and the like became widely available in the corporations, creating new databases as a byproduct. This transformed the noun data warehouse to a verb data warehousing to include both the physical structure and the applications sitting on top.

Today, the evolving definition for BI can best be described as a framework that encompasses both solutions and enabling technology components designed to enhance the decision-making process within an organization (Deepak Pareek, 2007). The important tools being used in the present day are Data Mining, Recommender systems and Knowledge Discovery systems. These are the most important aspects of BI. They are circumscribed by the feature that they conduct this search for knowledge within organizational databases that either represent useful;

(a) Information about different aspects & units and individuals within the organizations.
(b) Information that the organization itself has collected about transactions with other organizations and customers.

What they do not allow for is a collaborative notion of intelligence that utilizes;

(c) Knowledge from organizations outside of itself
(d) Data and information that are provided by customers and other organizations as a result of their own choice
(e) Information arising from the open nature of interactions and the Internet.

Figure 2 below describes how the technologies and applications of BI have changed with time since it has evolved. BI came to existence in 1970 with few technologies like Customer Service Management, Databases Inventory Control and then moved new applications like Business Modeling, DBMS, and UIMS etc in the early 1980s. After the 80s BI saw a change with the more effective tools like Data Warehousing, Supply Chain Management, Decision Support Systems, CRM, ERP, KPI etc. The recent developments in BI over a period of 8 years i.e. from 2000 are the Data Mining, Information Exchange, JIT services, OLAP (online analytical procurement) created BI through organization external data apart from the BI through organizational Internal Data. Once their new dimensions of interactions and knowledge is added, BI in the future will include amongst other things, Trust and Reputation systems, Knowledge sharing and Ontology based search engines and internal/external holistic risk management (Chang et al, 2006).
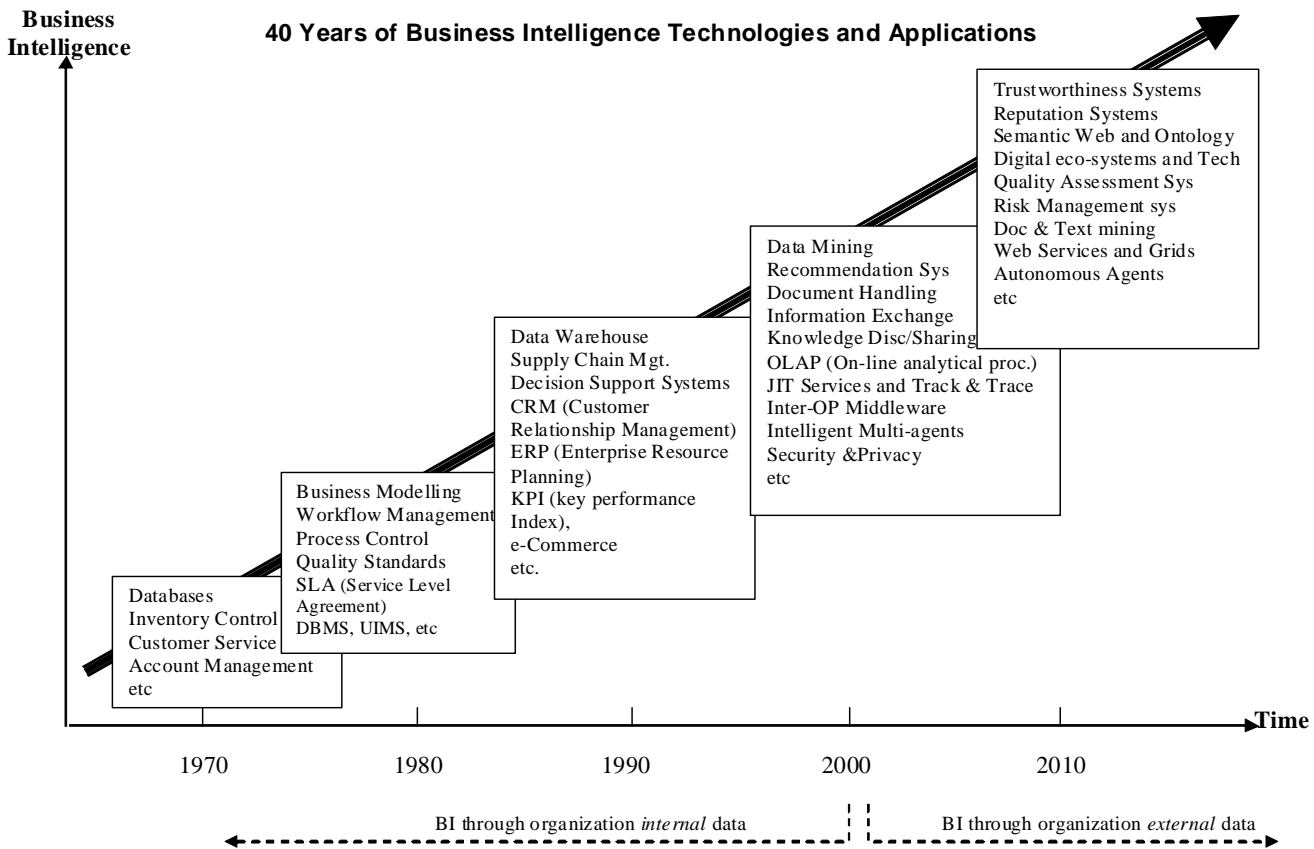

Figure 40 Years of Business Intelligence Development Paradigm

Figure 2 : (Cited in "Trust and Reputation for Service-Oriented Environments – Technologies for building BI and Consumer Confidence" by Chang et al, 2006).

2.3 Role of BI

Any business firm, be it small or large, needs data. But data alone is of no use. To analyze and observe data patterns, and hence for setting up long-term goals, a shift in approach is required to be competitive enough to stand in the market. This is possible if the firm has sophisticated methods for string data in the form of repositories and retrieving it and utilizing it for its business needs. It is very difficult to manage manually. When the data is large it is difficult to identify the bottlenecks in the process of transforming it into information. This difficulty increases with increase in the data. Hence, companies are in a dire requirement of those automated solutions using which efficient data management is very easy. The recent advances in technology have enabled in developing sophisticated tools that are used for data management. Some tools are used to conduct surveys and online researches to collect data using web interviews. There are also tools that help in homogeneity among the consumers and thus segment them into clusters. And there are tools for forecasting the trends that are obtained. Companies need these solutions using which they can automate their overall operations. This is called a business solution. Since this type of business solution offers intelligence, it can be called a BI solution. There is an increasing demand for such solutions in the corporate world.

The need for BI in the real-time business operations is significant. The demand for timely and reliable information is placing a major focus on corporate reporting and auditing practices. Data management is one of the most challenging and critical jobs in any organization. Summarizing financial information needs a lot of practice and expertise and a solution is needed in place. A small change in the financial data (because of its misinterpretation) may lead to wrong listing in the stocks and shares. And this would tremendously affect the positioning of the firm. One of the most crucial aspects of any organization is that of financial reporting. Companies use the traditional method of reporting using MS Excel. But if the data is very complex and is spread into pages and sheets, managing it might be impossibility. Organizations deliver financial closing statements using a detailed consolidation cycle. Data from throughout the organization must be consolidated to make it suitable for reporting. But MS Excel has its own limits. It is a fact that these processes are not only complex but also repeatable. No doubt, there are some specialized softwares for financial reporting, but these softwares are not user friendly and are targeted for power users who are trained to use multidimensional databases and online transaction processing systems. Reporting can be done with efficiency using the latest BI solutions. These solutions are compatible with any standard format of database from which data can be imported or exported.

The decision making gets more difficult as the complexity in reporting procedures, querying and transaction processing increase. Hence the only possible solution is to integrate them to form an enterprise BI solution so that users can access databases directly and produce reports for displaying and further analysis. Using Enterprise BI Solution, reporting will be easy both within and outside the enterprise.

BI means different things to different people, but essentially BI encapsulates everything from operational reporting to data mining. BI represents a broad category of applications and technologies for providing access to data to help enterprise users make better business decisions. BI includes:

- Decision Support Systems
- Forecasting
- Reporting data warehouse
- Data Mart
- Data Store
- Data Mining
- Statistical Analysis
- Extract, Transform, and Load (ETL)
- On-line Analytical Processing (OLAP)
- Reporting
- Portal
- Ad hoc query

The tools mentioned above that analyze data and information to help people acquire insight and knowledge are now much more accessible to a larger swath of employees, thanks to BI. These BI tools gather, mange, and analyze data to produce information that is distributed to people throughout the enterprise to improve strategic and tactical decisions, and at the same time condense the cycle between analysis and decision making as well as into real time (Deepak Pareek, 2007).

2.3.1 Importance of BI

There are four main areas of BI with which it is managed effectively in businesses. Viz.,

 (1) People (2) Process (3) Technology (4) Information.

The first area of BI deals with people who work in organizations and who have execute jobs collectively as a team and also governing and monitoring the people is also an important area in BI.

Aspects like Management, measurement, control, methodologies and communication in the domain of process are dealt with in the second area of BI. The Third area of BI deals tools, applications, architecture and information in the domain of technology. The fourth area of BI deals with plans, analysis, designs, models and tests in the domain of information.

In the execution of BI levels of project, there is required to be clear understanding of concepts, practices and capabilities. A complete BI-C (collaborative) program consists of multiple and interconnectivity levels of applications. For instance in BI-C when a program is executed in an organization, it is confined to a particular project only. When a project plan is made, requirements are developed, application is designed, after the process of building, testing, training and deployment of personnel is made, and it is a project that carries every detail at every step in working level. For instance internal businesses need a base for measuring, monitoring and controlling a process in sales.

It is important here to select people who carry expertise knowledge in development and designing of projects who possess efficient skills and who can solve problems and provide solutions in development of projects. Therefore people are the main source of BI.

In the domain of Process where management, measurement, methodologies and communications enabling the entire process to derive optimum results in the execution of BI; Process requires tested and proven methods, perfect standards of measurement and best principles of management apart from clear and cost-effective communication systems to perform BI. Duplication of work, inefficiency and redundancy would slow down the process of building of projects in BI and therefore a close check and inspection is required at every level until the entire process is completed.

In the third domain of BI Technology, there are many at the behest of BI viz., web technology, computer hardware and software technology and mobile communications technology which has been on rapid growth all through the world lately. Apple I phones, Samsung, Nokia and HTC touch-pads enable an advanced technology for promotion of BI. Choosing a particular technology, application of technology and implementation of technology carry an equal importance in execution the BI. A methodical and systematic approach to technology would further derive and maximize profits for the companies.

The fourth domain of BI, Information is available in vast volumes and all times; yet, it is difficult to assess which information is more important and whether the focus on that important information is correct and relevance to BI. For instance a telecommunication company is taking a survey about consumers. In the questionnaire, it is not important –to the company- which color is liked

by a customer as is it which mobile the customer is interested in or how best and use of touch the phone is for that customer. Therefore, the correct collection of important and useful information is what enables a company to perform and assess the business functioning in an efficient manner.

2.3.2 Stages of BI

The stages of BI can be broadly categorized into three parts. The three categories are Extract, Transform and Load (ETL). Extract, Transform and Load (ETL) is a process in data warehousing that involves extracting data from outside source, transforming it to fit business needs and ultimately loading it into the data warehouse.

ETL is important, as it is the way data actually gets loaded into the warehouse. The term ETL refers to a process that loads any database.

2.3.2.1 Extract: The first part of an ETL process is to extract the data from the source systems. Most data warehousing projects consolidate data from different source systems. Each separate system may also use a different data organization or format. Common data source formats are relational databases and flat files, but may include non-relational database structures such as IMS or other data structures such as VSAM or ISAM. Extraction converts the data into a format for transformation processing.

2.3.2.2 Transform: The transform phase applies a series of rules or functions to the extracted data to derive the data to be loaded. Some data sources will require very little manipulation of data. However, in other cases any combination of the following transformation types may be required:

- o Selecting only certain columns to load (or if you prefer, null columns not to load).
- o Translating coded values (e.g. if the source system stores M for male and F for female but the warehouse stores 1 for male and 2 for female).
- o Encoding free-form values (e.g. mapping "Male" and "M" and "Mr." onto 1).
- o Deriving a new calculated value (e.g. sale_amount_qty*unit_price).
- o Joining data from multiple sources (e.g. lookup, merge etc)
- o Summarizing multiple rows of data (e.g. total sales for each region).
- o Generating surrogate key values.
- o Transposing or pivoting (turning multiple columns into multiple rows or vice versa).

2.3.2.3 Load: The load phase loads the data into the data warehouse. Depending on the requirements of the organization, this process ranges widely. Some data warehouses merely overwrite old information with new data but more complex systems can maintain a history and audit trail of all changes to the data.

2.3.3 Challenges

ETL processes can be quite complex, and significant operational problems can occur with improperly designed ETL systems. The range of data values or data quality in an operational system may be outside the expectations of designers at the time of validation and transformation rules are specified. Data profiling of a source during data analysis is recommended to identify the data 6767 conditions that will need to be managed by transform rules specifications.

The scalability if an ETL system across the lifetime of its usage needs to be established during analysis. This includes understanding the volumes of data that will have to be processed within service level agreements. The time available to extract from source systems may change; this may imply that the same amount of data may have to be processed in less time. Some ETL systems have to scale to process terabytes of data to update warehouses with tens of terabytes of data. Increasing volumes of data may require designs that can scale from daily batch to intraday micro batch to integrate with message queues for continuous transformation and update.

And additional difficulty is making sure the data being uploaded is relatively consistent. Because multiple source databases all have different update cycles (some may be updated every few minutes, where as others may take days or weeks), an ETL system may be required to hold back certain data until all sources are synchronized. Likewise, where a warehouse may have to be reconciled to contents in a source system or with the general ledger, establishing synchronization and reconciliation points is necessary.

2.3.4 Tools

Although ETL processes can be created using almost any programming language, creating them from scratch is quite complex. Increasingly, enterprises are buying ETL tools to help in the creation of ETL processes. A good ETL tool must be able to communicate with the many different relational databases and read the various file formats used throughout an organization. ETL tools have started to migrate into enterprise application integration, or even enterprise service bus, systems that

now cover much more than just the extraction, transformation and loading of data. Many ETL vendors now have data profiling, data quality and metadata capabilities.

2.3.5 Store Data

Throughout the history of systems development, the primary emphasis had been given to the operational systems and the data they process. However, it is not practical to keep data in the operational systems indefinitely and only as an afterthought was a structure designed for achieving the data that the operational system has processed.
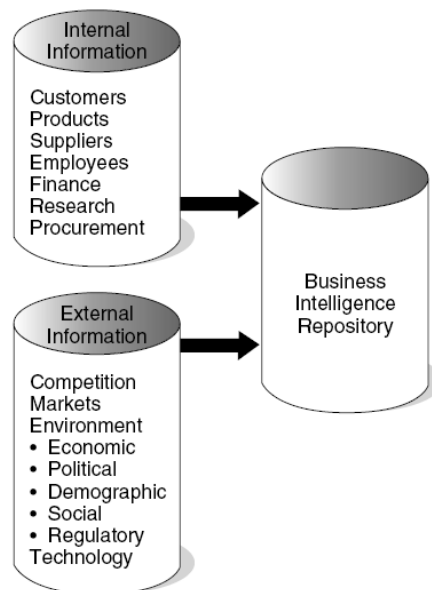
Figure 3 : BI repository (BI for Telecommunications by Deepak Pareek, 2007)

The primary concept of data storage is that the data stored for business analysis can most effectively be accessed by separating it from the data in the operational systems (see *Figure 3*). Many reasons for this separation have evolved over the years making the most important reason for separating data for business analysis from the operational data is the potential performance degradation on the operational system that can result from the analysis procedures. Undoubtedly, the goal of data storage systems such as the data warehouse is to free the information that is locked up in the operational databases and to mix it with information from other, often external, sources of data. Increasingly, large organizations are acquiring additional data from outside databases. This information includes demographic, econometric, competitive and purchasing trends. The so-called "Information Superhighway" is providing access to more data resources every day. (Deepak Pareek, 2007)

2.4 Need for BI

Why BI Now?

Good business performance analysis and planning are never out of style. Whether times are good or bad, whether it is the concern about the growth or just keeping doors open, understanding the business, planning effectively and taking profitable action are responsible to keeping the enterprise on track. Times are always not good. Economic growth has slowed to crawl. Corporate budgets have been locked down and the end is not right. And in this kind of situation no one can stop working and just wait for the economy to grow back to normal. Moving ahead during a slow economy is difficult. It requires vision and unconventional thinking. It requires speed, agility and economy. Most of all, it requires good information – information that will help the enterprise discover new opportunities and exploit them. BI is the key an enterprise needs to unlock those opportunities.

BI is the dynamic use of data and corporate knowledge to make decisions and identify actions. BI maintains the alignment of the enterprise's strategic objectives, tactical processes and operational efficiencies. It extracts value from the data the corporate systems gather as well as from the knowledge of people who understand the business and its markets. It streamlines business processes by automating routine analysis and reporting. It enlightens decision-makers by providing insight into the status of the business at any given time across its many "dimensions". It enables discovery of new opportunities for profit. It aligns all departments and levels in the organization with corporate goals. In spite of all the changes in the business world, some things remain constant. The enterprises operational data still comes from large systems (e.g. ERP, CRM) while other business-critical data are stored in spreadsheets. The enterprise's data comes from different sources in various levels of granularity. Perhaps they are not readily available or compatible. Moreover, they may be difficult to access by decision makers and analysts. Nevertheless, enterprise still needs to understand the intersections of these data to set direction and manage the business qualities like acuity, affordability, flexibility, leveragability and dimensionality.

Earlier information was given less emphasis, for they used to consider men, machines and other resources as the essentials in running a business. But as information is exploited as "strategic asset", it played a major role in putting high-level managers' work with it. Some of the issues that that really matter in a corporate firm are:

2.4.1 The Data Management Challenge

Business changes and increase in data repositories are the quite common in organizations. Managing these repositories is a challenge itself and analyzing for further reporting is even more complex. Managing issues like upgrading the existing legacy applications, or rewriting them from the scratch so that they can be integrated with BI solutions, etc., require a good decision-making. Data management challenges have been tackled through server consolidation in most of the cases.

Strategic decision making is one of the most important tasks of a CEO in an enterprise. Managing the data and data repositories and making efficient decisions go together. Either to take the decisions for server consolidations, or to upgrade the existing legacy applications or to adapt for new BI solutions or to integrate the existing ones to form an enterprise BI suite, all require a sufficient amount of analysis.

2.4.2 Business Activity Monitoring

Business Activity Monitoring is yet another component of the BI solution that has gained a lot of applause in the corporate world. It is one of the key roles of a CEO of an enterprise. It applies operational BI to automate processes to refine them based on the feedback a CEO gets from various operational units across the business. Processes can be streamlined and best of the strategic plans can be implemented.

BI is not just technology; it is the combination of data, knowledge, systems, processes and people that delivers improved corporate performance. Neither BI technology nor the BI process needs to be expensive. The technology is a fraction of the cost of an ERP or CRM systems and some platforms can be implemented for less than $10000. The BI process is an integral and ongoing part of any enterprise in which relevant information is delivered to enquiring minds. This means that BI can be fast and light-exactly what an enterprise needs when budgets are slim and time is short.

Some of the reasons for the need of BI are:

- BI increases revenue and margin.
- BI reduces costs in the enterprise.
- It reduces expenses.
- It improves accountability and budget ownership.

- It encourages collaboration across departments and business units, improving thoroughness and accuracy of the plans.

- It assures that everyone is connected into the planning process using the same business assumptions to build the budget.

- It aligns actions with corporate goals, which is especially necessary when a stormy economy dictates that the corporate ship must change direction.

- It connects business drivers to their impact on financial results, preparing management to better understand variances between actual results and plan at month-end and quarter-end.

- It enables anticipation of how financial results will be impacted by the changes in the business, providing an early warning to enable management to react faster and adjust tactics earlier to reduce the risk of earnings "surprises" (Dave Stark & Steven Humphrey, 2003).

To deliver correct (valid) information quickly, BI is a must.

2.5 Applications of BI

BI applications are decision support tools that enable real-time, interactive access, analysis and manipulation of mission-critical enterprise information. These applications provide users with valuable insight into key operating information to quickly identify business problems and opportunities. To support business decisions, users are able to access and leverage vast amounts of information for analyzing relationships. Hence, the potential loss of knowledge within the enterprise is prevented by these tools that results from massive information accumulation that is not readily accessible or in a usable form.

BI applications must allow businesses to leverage their information assets as a competitive advantage while they allow businesses to understand the demand side of the business and manage customer relationships. These applications must also be capable of allowing enterprises to monitor results of change, both positive and negative. The desired outcome of BI projects is the continuous improvement of the enterprise through timely information that enhances decision making. BI applications should enable the enterprise to become proactive and agile by delivering information used to:

- Support internal enterprise users in the assessment, enhancement and optimization of performance and operation.
- Deliver critical business information to end users about value chain constituencies such as customers and supply-chain partners.

There have been new managerial challenges due to the globalization of markets, technological developments and the increased importance of knowledge-based assets. BI is a tool that organizations can leverage to gain competitive advantage in this dynamic era of the performance oriented modern business environment.

Due to the latest developments, technology providers and vendors have devolved many applications and tools using exceptional features and flexibility offered by BI to solve different problems from different decision-making points of views. It can be stated that today BI can be applied in almost all industries and sectors. BI applications provide effective and efficient monitoring and control of operative processes while they assist in decision making and guide towards strategic direction. BI applications can be effective across most processes, functions and departments of an

organization from order processing to purchasing up to financial accounting and resource management. Few of them are briefed as below:

- Distribution and Customer Data Analysis: Increasing globalization is intensifying competition at such a rate making both; extensive individual analysis of customer relationships and the product mix an essential. Visualization of distribution data creates transparency and helps in correlating between marketing trends and distribution results which will be visible and give an enterprise a range of options. An enterprise can also get in depth understanding about its customers and can identify profitable customer relationships and extend them continuously.

- Cost Accounting and Controlling: The basic requirement for the operational management of an enterprise is cost transparency. An enterprise can identify cost drivers and can study historical emerging patterns by tracking the development of costs that can be used for cost minimization and optimization of the value chain.

- Breakeven Analysis: The breakeven analysis offers an important tool for planning and controlling an organization. The organization can analyze fixed and variable costs as well as the profitability of clients and products. Thus, it can create a range of products more profitable and take profound make-or-buy decisions.

- Order and Production Data Analysis: The record and the specific analysis of the production process with the help of key data permit detailed capacity planning. An organization can identify disturbance variables at an early stage and be able to compensate for them in terms of an active quality management.

- Supply Chain Management Monitoring: Knowledge about correlations of the entire supply chain holds enormous potential. First, the organization can analyze customer requirements in detail. With the help of diverse key data (supplier assessment) transparency about the behavior of suppliers can be created. With the analysis of stock data the organization can optimize supply chain, turnover rate, purchase order quantity and delivery times and thus reduce costs and delivery items.

- Balanced Scorecard: The balanced scorecard is a management tool for the realization of strategy controlling. By means of Key Performance Indicators of the scorecard, management can monitor the development of the organization permanently. This early-warning system gives signals needed to control an organization in a fast and effective way.

- Process Performance Measurement Systems: Today, milestone- oriented process flows are established in many divisions of an organization. In the past, these work flows were increasingly optimized, so that a higher degree of effectiveness and efficiency could be reached. However, in many cases a centralized process control is still missing. In this case, the use of BI produces relief by definition of key performance indicators and a consistent appraisal and presentation of these KPIs by a central MIS system.

These are only some of the applications of BI. In the real world, there can be numerous areas where BI can play a vital role in improving or enhancing performance. BI allows organizations to make the right decisions on the basis of safe information in practically every organizational department (Deepak Pareek, 2007).

2.6   Tools of BI

In the past, organizations used to analyze data either by manual methods or semi-automated methods. Only periodic reports were sent to the headquarters usually once in a week, monthly or quarterly. This type of analysis was very narrow. For example, an accountant analyses the data from the accountant point of view and the sales manager from the sales point of view whereas actually this leaves behind a little integration between the two. Thus, the vital information that could help the company with rich dividends mostly went unnoticed. This type of analysis was mostly post-mortem rather than a planning tool. The results of such analysis, at best, could help operational planning but seldom the strategic planning Enterprise-wide solutions, like ERP and CRM, which replaced manual or semi automated systems, & helped in collecting data in a central place but offered very little in a way of data analysis capabilities. This is where BI tools came into play.

BI tools can help the companies with automated analytical capabilities, which help in developing effective strategies. Corporate knowledge and wisdom are the products of extensive analysis of the variable organizational data. The technology, software, systems and processes that facilitate the analysis form a part of the BI tools. The first requirement to develop any meaningful BI application is the capability on the part of an organization to collect all the data centrally. Islands of organizational data leave lot of gaps, and if central storage of data is not possible, then these islands must be effectively integrated. The set of BI tools comprises of extraction, Transformation, Loading Technologies, Data Marts, Data Warehouses, Date Mining tools and other complimentary analysis tools; like Online Analytical Processing (OLAP) systems and decision support systems.

2.6.1 Extraction, Transformation and Loading Tools

Extraction, cleansing and transformation are the rules to be observed for capturing the data from the sources. This makes the data accurate by cleaning and transforming and involves integrating similar data from different sources according to these rules. Extraction involves moving the data from a number of sources like mainframe-based order entry systems, flow control systems, payroll systems, and sales force automations systems and many others. Cleansing is the process of checking and validating the data that is coming from different sources. This can include simple things from format validation to range checks other than data integration. The data hygiene algorithms are also used in this process.

Transforming the data involves a number of actions which include activities like converting the data into a common format, realigning encoded values, restructuring, summarizing, conversion of keys, merging different record types, conversion to different operating systems, hardware, DBMS, editing the data and adding a time stamp on the cleaned and transformed data. Currently, there are a number of automated tools, which facilitate this process. The ETL software converts the application data into integrated organizational data. Loading is the process of delivering the data to the data warehouse. Audits and controls are used to ensure that only accurate data is entering the warehouse and all the rules are being followed.

2.6.2 Data Warehousing

Data warehouse is a centralized data repository of the organization, which stores all the data generated or collected in the organization. The data warehouse is defined as "a subject-oriented, integrated, time variant and non-volatile collection of data for strategic analysis". From the above definition, it is clear that data warehouses are organized around some major objects or processes of the organizations like the customer, products, vendors and transactions. Data pertaining to all the subject areas is stored in an integrated form. The data in the warehouse is non-volatile, which means this data is not subject to any change unlike in the online environment. This data cannot be updated. Whenever new updates are available, they are appended. Finally, time variance implies that data in the warehouse is accurate at that point of time or with reference to some point of time.

The data warehouse is created to support the decision-making process in the organization. The warehouse holds data at the atomic level and provides all the historical data that is needed for decision-making. One can think of the data warehouse as central storage of detailed, generic, static, historical data that is spanning the entire enterprise. Each unit of the data enters the data warehouse is time stamped. Putting some stamp indicates that the particular piece of data is accurate at the time of stamping. There are two ways of time stamping. In the first, the time stamping can be for one instant of time for which the record is accurate. In the second, the record is accurate for a continuous length of time. The first one is known as discreet time stamping and the later as continuous time stamping. For the variables that change very fast, discreet stamping is used and for those variables where changes are slow continuous time stamping is used.

2.6.3 Data Marts

Data Marts are a subset of the data warehouse that is meant for sue by a specific group of users. "Data mart is a customized or summarized data that is derived from the data warehouse and tailored to support specific analytical requirement of a given business unit or function." (sas.com) The three types of data marts that are available today are OLAP data marts, exploration warehouses and data mining warehouses. OLAP data marts consists of customized and reformatted data that support multidimensional requirements like 'drilling down', 'slice and dice' of a given business situation. Exploration data warehouses are data marts that provide the facilities for exploratory and ad hoc processing, through which analysts can quickly develop their hypotheses. Data mining data marts are used to prove and test the assumptions made in exploration data warehouses. Data marts are created for a variety of reasons. They sped up queries by reducing the volume of data to be scanned, structure the data in the form suitable for a user access tool, partition data in order to impose access control strategies and segment data into different hardware platforms. The operational cost of data mart is high and it is advisable not to go to data marts unless it is warranted and essential. In the development of warehouses, two methods could be followed. One is the 'bottom-up' approach of developing these subsets or data marts first, and then integrating them. The second approach is 'top-down' approach of creating the data warehouse that support the entire organization first and then the data marts that support a specific business area. Data marts are the most important analytical sources, which provide all the necessary data to the businesses about the customers, products and resources.

2.6.4 Data Mining – The Analysis Tool

Data warehouse by far is the most valuable corporate resource. However, to realize its true potential the data has to be retrieved, analyzed, transformed into information and made available to the people. Data mining helps in retrieval and analysis of data from the warehouse. Data mining is the process of selecting, exploring and modeling data to identify the previously unknown patterns. The volume of data generated also increasing day by day. The complexity of data needed efficient tools to analyze the data. As a result, data mining has come to the forefront. For example, in relation to the customer data analysis, customer churn analysis, customer segmentation, and customer propensity analysis which indicate the chances of the customer buying a given product offered by the company. Data mining helps in all the stages of customer life cycle, whereas it helps in acquiring new customers,

increasing the value of the customers and retaining the good customers by using information about customers.

2.6.5 Online Analytical Processing (OLAP)

OLAP is a complimentary tool to data mining. Typical OLAP applications are consolidation, 'drill down' and 'slice and dice'. Consolidation means aggregating the data. For example, the sales of all the retail outlets can be consolidated into regions and regions can be consolidated into sales areas. Drill down is the movement part of a consolidation. Slice and dice is the capability of looking at the same database from different angles providing information pertaining to different aspects. For example, a single sales database can show sales by product, sales by channel and also sales by region.

1. Analyze the relationships of business elements such as sales, products, regions and channels.
2. Compare aggregate data of different periods.
3. Present data in different perspectives.
4. Involve complex calculations.
5. Are able to respond quickly to user requests.
   (Col. R S Prasad, Cited in B Sujatha, 2007)

2.7   Role of IT in BI implementation

2.7.1 Corporate Performance Management (CPM)

Enterprise BI is also the key enabler for Corporate Performance Management (CPM). CPM allows enterprises to proactively monitor and eliminate impediments to performance before they affect financial results. CPM is a real time initiative that aligns everyone in the organization in support of a business strategy by proactively monitoring and measuring business performance and alerting key personnel at all levels when problems occur in time to take corrective action (Deepak Pareek, 2007).

Successful CPM initiatives require a flexible and reliable reporting environment that unifies everyone from the CEO to a mailroom clerk to quickly resolve performance problems. CPM applications create shared accountability throughout an organization by different levels of reports pertaining to a particular performance area with varying levels of detail. For example, a senior executive may receive an update on days of inventory as part of the dashboard of high-level key performance indicators she views daily; simultaneously, the inventory manager receives a report showing the exact status of each piece of inventory with the ability to drill down to determine what might have caused a sudden change in inventory (e.g. a large number of returns or cancelled orders). The manager can investigate and take corrective action to rectify the problem. However, what if the senior executive is particularly concerned and wants to check throughout the day to see if there is a change. She has the option of getting a just-in-time update by performing the query in real-time directly from the dashboard.

CPM exemplifies the power of BI in transforming an enterprise into a sense-and-respond environment based on improved information flow. Using BI to effectively measure overall business performance – as well as performance of specific functional areas or lines of business – will play an important role in creating a culture of measurement and accountability.

Methods of managing performance include the following:

- Visualize key performance data effectively in graph format.
- Convey performance results quickly with visuals.
- Use scorecards and dashboards as gateways to first-order and advanced analysis.
- Monitor red zones and define threshold levels to set indicators and trigger alert deliveries.
- Link individual KPIs (Key Performance Indicators) to corporate goals.

- Cascade scorecards and dashboards throughout the organization and across the value chain.

- Deliver scorecards and dashboards via e-mail, on a scheduled or alert basis.

- Reach all individuals, from executive mangers to new associates.

- Incorporate all enterprise data-financial and operational-from every business process worldwide.

- Access personalized secure scorecards and dashboards from any web browser, intranet/internet, or portal. (Deepak Pareek, 2007).

Brief functions of CPM in some of the companies are described as below.

Calumo CPM suite provides BI performance management is high through Microsoft SQL Server, and provides analytical services. KPI dashboards, reporting, budgeting, forecasting, financial consolidations and in modeling CalumoCPM suite delivers all the capabilities and comprehensive service based solutions.

Paul Voges, Director of Small and Mid Market Solutions and Partner Group, Microsoft Australia, says

> *"Our partners are the lifeblood of Microsoft's business and through the Awards we're able to highlight and recognize those who have gone above and beyond in delivering exceptional technological solutions and services to Australian customers."*

He also says

> *"It's an honor to acknowledge their dedication and success as part of the Microsoft partner community, and also to recognize the broader role that they play as leaders in Australia's IT sector."*

Corporate Performance Management is a set of process that enables and helps organizations to maximize business performance. CPM is a framework for organizing, automating and analyzing business methods, processes and systems that drive business performance.

The software of CPM provides a systematic and integrated approach for enterprise strategy core processes and activities. Many companies use software solutions as a powerful tool for customer performance management. The analysis provided by CPM software enables businesses to generate actionable and business oriented insight that are used to produce higher productivity, control costs and improve overall performance of businesses.

Corporate performance management and BI software provides assistance for companies in alignment of strategies with actionable checklists, compliance requirements in respect of financial and budgeting reporting needs, management and optimization of performance of organization through performance management solutions. In business process applications, usage of strategic management planning and budgeting, forecasting, financial consolidation, financial reporting will help to optimize financial management processes.

2.7.2 IT Management

IT Management is a combination of information technology and management. Information Technology Infrastructure Library (ITIL) and IT Portfolio Management provide information technology services. Information technology governance, management information systems and Microsoft server technology are all part of IT management which enable in management of information technology for development many BI solutions in-house as well in web technologies.

IT bridges the gap between business and technology and provides key information for running a successful business through IT and supply chain reports and there is a continuous supply of strategies. IT in BI deals with data governance, data integration, data quality, data warehouse appliances, DW basic, ETL and Master Data Management.

Carriers rely on analyses of their terabytes of customer, product, and traffic data to help them make business-critical decisions that will positively affect their bottom line. High end data warehouses and powerful BI solutions are essential tools to help carriers meet profit goals. To reduce the revenue leakage and churn, migrate fraud, optimize network usage and increase profits. Carriers should analyze and integrate in-depth data from multiple departments. Competition makes things more difficult for operators and the analysis they need for operations, to stay ahead, needs to be much more granular to allow for true assessment of the profit contribution of the customer and the services, especially when most of the business questions they want an answer for go across multiple operational systems as business processes flow across many departments.

Telecom companies are looking for ways to build IT flexibility and agility in their businesses, in an effort to lower the costs and risks involved in upgrading and evolving these OSS/BSS. The need to be flexible and nimble requires telecom companies to migrate to more open technology environments and to adopt an architectural approach to integration challenges. Many telecommunications companies are organized first by customer segment – be it consumer or business –

then by product or service, such as customer long distance, business or local. Managing data within these silos and across these silos can be a challenge, and data warehousing is an essential lynchpin in maintaining a profitable business model.

A robust BI solution can help telecommunications companies manage the complexities involved in this calculation. Telecommunications companies worldwide are exploring BI solutions to achieve competitive advantage. The key solutions for which telecommunication companies are looking involve marketing, such as customer retention, target marketing, and campaign management, customer-relationship management and network BI, to streamline network assets. Additional systems are needed with capabilities to deliver best-of-breed BI and business management. These capabilities enable the companies to accomplish the following:

- o Understand the needs of their business (BI)
- o Manage actions based on those needs (business management)
- o Effectively run day-to-day operations (business operations)

These capabilities will enable the companies to realize the opportunity of a business landscape characterized by customer relationships, customized product delivery and opportunity driven profit. One of the key enabling technologies to this evolution is the data warehouse.

A critical BI platform empowers IT professionals with the ability to quickly deploy integration, analysis, reporting solutions and to effectively manage these solutions over time with the utmost availability, reliability and security. After application developers complete their data integrations, analysis and reporting solutions, IT professionals are responsible for preparing the solutions for information worker access. IT professionals must not only ensure that all necessary components are successfully migrated to the production environment, but they must also ensure that all required software is installed on information worker computers. The more efficient the deployment process, the quicker the turnaround time for new BI solutions and the easier to roll out periodic solution upgrades.

2.7.3 Team Work

Modern manager is required to possess qualifications and abilities to lead with expertise. Team leadership, an essential quality in managers, enables the entire team to work in good spirit. A good manager manages self as well manages the team ahead in completing the tasks and projects with a collective team spirit. Managers interacts with each and every team member, outlines the strengths and skills of each team member and delegates tasks according to the strengths and skills of team member.

Especially in BI, where there would be development of many business models according to the requirement of customer, team members are assigned the project works with a time schedule to complete the projects. At this level of working team must cooperate, coordinate and work collectively with enthusiasm by maintaining organizational behavior and etiquette. Further managers must motivate and energies team members towards progress oriented tasks and must also be sincere, honest and openly communicate in disclosing the facts while working on the projects.

Demoralizing the spirit of team members would not do any good and instead, conducting discussion forums, meetings, committees and conducting workshops would motivate team members to stay self-motivated and stay-ahead in working keeping the objective towards efficiency in execution of projects.

Managers must also enable team members to be open in communication and put forth if there are any grievances at the place of work. Therefore team managers are performing a multi-role that of a HR manager, business executive and leader in execution of projects through leadership qualities. (Robert Heller, 2006)

2.7.4 Information Technology

Information technology (IT) includes software development, Internet and hardware technology of computers. Technology is defined by Julian Simon as follows:

Technology is the know-how to convert what we have into what we want.

(Julian Simon; Cited in Technology, BI, Knowledge and Change by Dr. Ramon 2008).

BI through Information Technology (IT) provides economic and financial structure, scope for education, scope for innovation and infrastructure for information. Operational vs. Decision Support Systems in IT consist of decision support processes, transactional processes, linkages with partners, suppliers and customers.

In Operational Systems there is a good deal of work on day-to-day transactions, current and up-to-date data, e.g. customer orders, inventory levels and bank and cash balances. Decision support systems consists of strategic decision making, contains historical and summarized data e.g. performance summary, periodical summary, customer profitability, market segmentation.

Data Mining is a combination of Artificial Intelligence (AI) and Statistical Analysis to find information that is hidden in the data in respect of associations, sequences and classifications and also

forecasting. Some of the samples of data mining applications are direct marketing; detailing which prospects are included in a mailing list, market segmentation; detailing the common characteristics of customers who purchase similar products, customer analysis as to which customers are leaving to buy competitor's brand, market basket analysis as to which products are likely to be purchased together, and insurance claims analysis which detail fraudulent transactions.

In business use of data mining there are essentially six tasks viz., classification which deals with credit applicants low, medium, high risk, classification of insurance claims such as normal and to be verified, estimations about value of customer, predictions as to which customer would leave within next six months.

The architecture of data warehousing consists of viz., business rules to learn from data, meta data – which enables logical model and mappings to physical layout, data base schema – physical layout of data, tables, fields, index types, summary data – summary of who what where and when and finally operational data which details who, want, where and when. Often data warehousing considerations are: What data to include? How to reconcile inconsistencies? And, How often updating has to be made?

Trends in BI include text mining patterns and software agent technologies that includes BI, searching of web and recommend products, comparison of prices, negotiations and uses to vendors.

2.7.4.1 Resource description Framework

Resource Description Framework (RDF) is a family member of World Wide Web Consortium (W3C) specifications, originally designed under metadata model carrying various syntax formats. This metadata model is based on making statements on web resources in the form of subject-predicate .e.g. "the dress color is red", in this the subject "dress" and predicate is "color" and object as "red". RDF considers triple pattern such as subject, predicate and object. There are several serialization formats in RDF while there were several ancestors to RDF.

2.7.4.2 Web ontology

Web ontology is endorsed by World Wide Web consortium. The Web Ontology Language (OWL) is most commonly used in RDF.XML syntax. OWL language consists of a set of axioms which provide semantics. OWL language is a revised work of DAML+OIL web ontology language which

was developed by a group called as "US/UK ad hoc Joint Working Group on Agent Markup Languages" which was found by Defense Advanced Research Projects Agency (DARPA)

2.7.4.3 SPARQL

Pronounced as "sparkle" SPARQL is also similar to SQL query RDF language standardized by RDF Data Access Working Group of the World Wide Web Consortium. This language was recently announced as official language of W3C recommendation on 15th January 2008 and prior to this, SPARQL was under recommendation for working draft status. SPARQL permits queries in triple patterns and in optional patterns. According to Tim Berners-Lee, several implementations for multiple programming languages exist. SPARQL will make a huge difference. (Tim Berners-Lee, May 2006)

2.7.4.4 Ontology alignment

Ontology is a process of determination of concepts and correspondences. Computer scientists express concepts as labels for data. The need for ontology arose for integration of diverse databases. Ontology alignment tools have been developed to operate on database schemas, XML, taxonomies, dictionaries and other frameworks. BI is an important area wherein semantic technology helps to solve real application areas of BI. The modalities of data viz., Textual, Numerical and multimedia enable BI in various statistical approaches and semantic technology transforms BI in producing higher quality and analysis in application areas such as eDiscovery, customer relationship management, enterprise performance management, financial risk management and every analysis of company performance.

2.7.4.5 Semantic integration

Semantic integration is a process that uses business semantics to automatically convert to communication through computer systems. Semantic integration relies on metadata publishing in order to allow ontologies to be linked or to be mapped. Further semantic integration also relies on semantics to facilitate the activities of interface designing and mapping. Semantic integration promises a richer understanding of metadata and clearer context, but to embrace this emerging approach, we'll have to revise some cherished data warehousing concepts (Neil Raden, 2005).

2.7.4.6 Semantic link

Semantic link is a typed link which would connect the link as any expression of syntax. These links are the basis of semantic network. Semantic web as described by Tim Berners-Lee is one

example of the many attempts over many decades of to define standards for semantics of links (Tim Berners-Lee, 2006).

The sources of links which are of great importance in functioning in World Wide Web enable internet browsers to open a specific link on clicking the HTML links.

2.7.4.7 DSS and MIS

Decision Support Systems and Management Information Systems are important from the view of BI in management of data as well in data warehousing.

After much research and constant working, the decision support systems were categorized in generic operations in the year 1980 and the following are seven types of DSS.

1. File drawer systems that provide access to items of data.
2. Data analysis systems that enable manipulation of data by computerized tools and by setting more general tools and operators.
3. Analysis information systems that provide access to decision-oriented databases and small models.
4. Accounting and financial models that enable calculation of the consequences of possible actions.
5. Representational models that produce consequences of actions on the basis of simulation models.
6. Optimization models that produce guidelines for actions generating solutions.
7. Suggestion models that perform logical processing and producing a specific decision.

Management Information System (MIS) is about internal controls of a business, viz., documents, accounts, employee management and about costing of products and services. The term MIS is also used academically in decision support systems, expert systems and executive information system.

> *Research in the information systems field examines more than the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact.* (Professor Allen S.Lee).

MIS is also termed as system of collecting, processing, and storing and distributes data in the form of information needed to carry out various functions of management.

2.7.4.8 Software packages

A software package is in-built and generally based on object-oriented programming language which is used in various segments of industries, commercial services and for management of resources.

Software package is also referred as a module that is integrated into main program. An example of software package is java.io which contains groups of classes in Java programming language that aids input and output of data with the interaction of user. This is the first kind of software package which is a programming software package. The second kind of software package is installation software which is available in an archive format and which can be installed by a method of self-installation or by a package management system.

2.7.5 Web Technologies

Web technology has many segments in development and application areas viz., HTML, XML, http://, dhtml, CGI and server technology.

BI and web technologies that work together are viz., RSS and ATOM feeds, web services, Java script and AJAX, PHP/Perl/Python scripting, JSON, Folksonomies, Mashups, programming frameworks, Adobe, Blogs and Wikis. Each kind of web technology has a different execution of job in BI.

SAS BI integrates the data from the enterprise and delivers reporting and analysis. IT takes very little time in responding to requests, business users spend less time in looking for information.

Therefore, web technologies are the fastest means of finding information or in sending information at a fast pace and also with less cost. Every BI solution offered by web technologies are much advanced and easily accessible while working as well for data analysis purposes.

There are many companies which provide BI solutions with the use of web technologies and especially in these days of Internet technology, wherein every small, medium and big enterprise is working with BI solutions, efficient web technologies have been developed which save lot of time of user, customer and which also lead to a fast paced business on the Internet. Data management and

corporate performance management are the two key areas for maintaining the efficiency of web technologies.

2.7.6 BI 2.0

BI 2.0 is the latest development in BI. The new era of BI, which is already available, goes far beyond data and reporting. BI is becoming proactive, real-time, operational, integrated with business processes and extending beyond the boundaries of the organization. To become pervasive and grow out of its reporting niche, BI has to provide simple, personal analytical tools on an as-needed basis with a minimal foot print and cost (Neil Raden, 2007). BI needs a 2.0 initiative too but it won't replace BI. It can only extend BI. BI capabilities are appropriate for individualized dashboards overnight data or providing a rich environment for interactive exploring of data, by people and by algorithms. With the new BI 2.0, the data is available from ever-widening sources, generates down the demand. There are variable views from the experts about the new BI 2.0. Although it has simpler and more accessible, it is said that BI is inevitable.

2.8 BI in Telecommunication Industry

Telecom was among the first industry verticals to experience the benefits that BI brings to the corporate table. Telecom was also the first to experiment with how BI, or rather analytical capabilities in conjunction with Customer Relationship Management (CRM) solutions, can improve customer experience and thereby the business. The telecom industry's BI initiatives to reduce customer churn were among the first applications in this area. The use of BI connected to operational CRM systems helped identify customers who were most likely to shift to another service provider, by analyzing the number and nature of grievances registered by users.
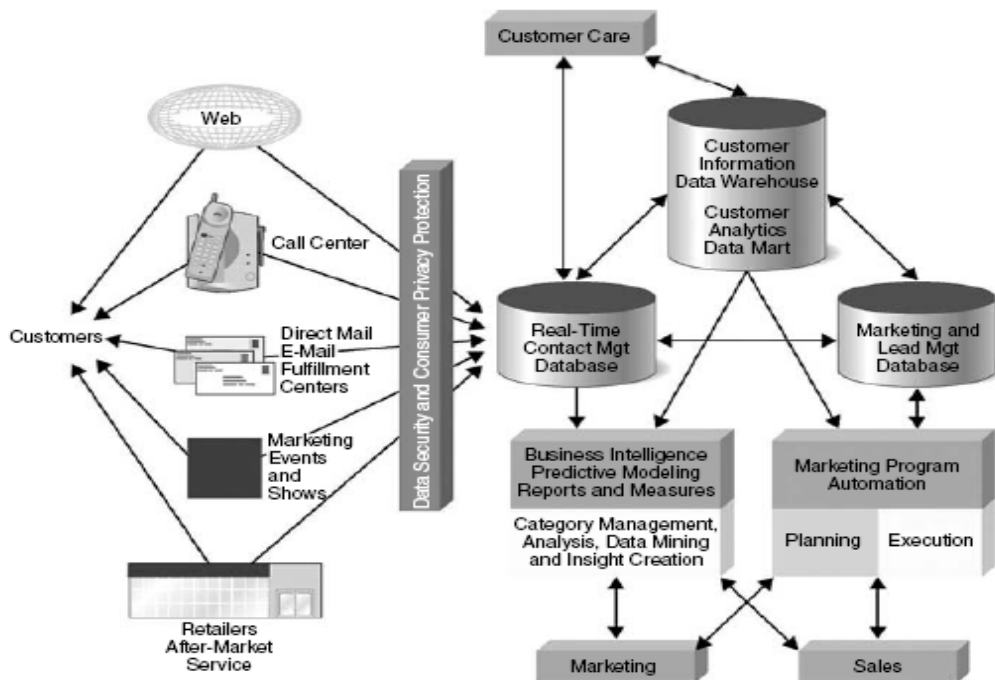
Figure 4 : Strategic BI Architecture (Deepak Pareek 2007, p185).

Although the success of these initiatives has resulted in CRM products with analytical capabilities, the case is still strong for a dedicated BI system connected to an operational CRM system, provided the linking is done optimally. The reason for this is because the new CRM products still do not match up to a full-fledged BI system's analytical capabilities, not so far at least. Telecommunication companies have basic answers but the complex questions they need to answer go beyond one operational system.

For example, today they know who their customers are and are marginally effective in marketing new services to them. However, if they want to know who their profitable customers are, which services the customers use that make them profitable, and which marketing campaigns should be targeted to this segment, they find themselves having to extract data from multiple systems and manipulate complex spreadsheets.

This is a time consuming process and is not at all error free. If one parameter changes in the equation, they find themselves at square one, without the ability to construct what – if scenarios and respond effectively to the changing market conditions. The analysis must be in depth to allow for true assessment of the profit contribution of the customer and the services. Most of the answers they try to answer go across multiple operational systems as business processes flow across many departments.

It is a tedious process to activate a customer as it has to go through different departments from customer and service support to accounting, credit approval, billing, network planning, network support, inventory management, scheduling a service person to configure and install the customer premises equipment, and turning the service on. Most operators have disparate systems managing the provisioning and customer activation process and there is very little visibility of the bottlenecks and disconnects. The activation of new customer has revenue implications and therefore, affects the share price and market evaluation of the carrier. This is a Key Business Performance parameter with visibility in the office of the CEO and to the board.

There are software solutions that are helping service Providers Bridge this gap. The BI applications extracts and connect disjointed systems and data from disparate sources and enable the business user and decision maker to make an informed decision. Generally, the IT organization at a service provider will consolidate data from the multiple sources into large area warehouses or smaller data marts. The analytical applications and reporting tools are utilized to query the database and provide regularly scheduled production reports to the business users. Solutions have very easy to user interfaces so the users can also create their own reports and make ad hoc queries as required by business conditions. The user can set alerts based on predetermined business rules and thresholds.

It is important for service operators to be able to segment their customers more precisely than they have in the past. Not all services are attractive and useful to all customers, and it is very costly to run outbound marketing campaign that result in response rates. Not only they tax the resources of already overburdened call centers, but they also result in customer irritation or often time's acquisition of customers who do not add any value to the bottom line. Service operators are using BI tools to obtain a better understanding of their customers.

Data warehousing or data mart is a collection of data that is organized, supported and used for strategic and analytical functions in the operational working of an organization. Routing database management system facilitates customer acquisition, customer care and prevention of fraud in businesses. Data warehousing contains a large amount of data under one single umbrella system which is collected from a variety of sources. There are many areas that are covered by data warehousing.

With the rapid globalization, global customer and global investor have become much popular and in rendering good services to customers have become priority for all companies in telecommunication industry. There is an emerging of new markets, new services which gave rise to stiff competition in the market. Every customer checks what the ISP (Internet service provider) is offering and how lucrative and feasible the benefits are and from the view of companies there are many options for companies to withstand the competition. One of the option is being merger and acquisition and the other being convergence which is the integration of multiple services of voice, data and video. Telecommunication industry focuses on marketing, customer retention, target marketing, campaign management, customer relation management, network BI and streamlining of network assets. There is a growing competition in United State, United Kingdom, New Zealand and deregulation of is taking place in Europe, Latin America and Asia. Under these circumstances, customer is the main focus for all companies to retain the market and stay ahead in business. Therefore BI in telecommunications puts forth many challenges to innovate new technology, customer satisfaction, and cost effective, profit-oriented, business-oriented, capability to deliver benefits and offer many advantages to the global customer or investor. Therefore, BI indicates some of the latest challenges for telecommunications industry. These are firstly, to understand the needs of business which is BI, secondly manage actions based on the needs identified through BI which is business management and thirdly effectively run day-to-day operations which is business operations.

OLAP (Online Analytical Processing) is the most widely used product which is highly functioning in data warehousing especially in statistical functionality, multidimensional analysis, with a view to focus on processing of queries to the database whereas OLTP focuses on the transactions which information is entered into the database. OLAP engines deliver high performance or custom executive information systems. OLTP (On line transaction processing) engines are seldom used whereas OLAP is widely used in data warehousing.

Data warehousing is used in BI to support sophisticated operational functions and for the purpose of fraud detection. Data mining which is another integrated process for data warehousing

which is broadly defined in the industry. Data mining software can vary in terms of its functionality and in scope. (BI for the telecommunication industry)

Presently there are multinational telecommunication companies, in UK, US and Asia which are successful in targeting a good proportionate of market of consumers, by providing good customer service, reasonable tariffs and in maintaining the data warehousing of customers and the services rendered (Deepak Pareek, 2007).

2.8.1 BI requirements of the Telecommunication Industry

Telecommunications service providers should pursue an integrated information strategy from a single platform without comprising security, user requirements or future flexibility. There are several strategic benefits to this type of "define once, deploy everywhere" solution. This type of solution enables detailed analyses within business units while allowing cross-divisional analyses by enterprise users. Once the enterprise data warehouse is built, organizations can the define data marts that meet multiple business unit needs.

Further solutions should include a multilayer security model that authenticates and authorizes access to data, protects data transmission and controls application functionality by associated privileges. This ensures that users see only the data intended for them as access in each user against project, row and object.

Finally, the solution's integrated and flexible platform allows enterprise analysts to survey the entire enterprise to measure ROI, cost of capital, IRR and additional financial analyses across units, campaigns and customer segments (Deepak Pareek, 2007).

2.9　Challenges before implementation of BI

The basic challenge of BI is that dividing line of business and technology with the application of intelligence. There need to be a combined effort in BI projects from all factors viz., data management, data quality, data warehousing, team management, time management and project management and above all clear and analytical approach towards BI project. The challenges of BI project pertain to the positions of a software engineer, BI manager, business executive, database engineer, BI team member, chief information officer, and those participate in the development of BI programs or working on BI programs and endeavoring towards repair work or in regularizing BI projects. Data is a major challenge as the source of BI project is data. In every perspective, data has to be clean, informative and useful for decision making.

Information stored is another challenge that it has to be kept confidential wherever required and made ready for public disclosure and access for daily working. Huge volumes of data are another challenge that it has to be sorted and make scrutinizes to delete whichever data is not useful. Adoption of data model, business model are another challenge for selection of data model depending on business model which varies from business to business as the emerging trend of e-commerce has enabled expansion of businesses at a fast pace and quick business service through Internet technology. Information is the result of organized data that establishes a relationship between data items, which in the context of business provide meaning. Knowledge is the concept of data which leads to the understanding and an insight about information. Data when organized is converted into information and is used as knowledge.

Therefore, data, information and knowledge are interlinked which takes various forms of working in many aspects of BI projects, as data is converted into information, information to knowledge and knowledge into actionable plans which is finally actionable knowledge delivers successful BI projects. Further BI increases profitability, decreases costs, decreases risk and improves the customer relation management (CRM).

Information is an asset for BI and information passes through several stages beginning from proper collection of data, aggregation of data, analyzing data and enables discovery of knowledge and operational processing. BI develops successful relation between technical developers and business clients. So managing Information is another important challenge for BI. Managing good relations between the business personnel and the IT personnel is another major challenge.

The motive behind BI is to turn knowledge into actionable plans. These actionable plans of BI improve business efficiency, increase sales, more emphasis on targeting of customer, reducing customer service costs, identification of fraud, increase profits while reducing costs and provide over all benefits for the business.

When any of the above benefits are not being derived from BI projects, it indicates that projects are either poorly performing or require necessary corrective measures which proper implication of BI methods. The challenges of BI can easily be achieved when there is a perfect order of working and planning along with timely execution of schedules or tasks.

2.9.1 Technical Challenges

The first and foremost challenge for the telecommunication industry is the management of large volumes of data. In the telecommunication industry data consists of call records, contract details, usage details, renewal details etc. Linda L. Briggs (2008) says "Your client needs to query 100 billion call records in a highly complex environment, and the legacy data warehouse system needs a complete reengineering to put the new system in place. The sheer volume of data could be a prescription for trouble." in a case study about the challenges that implementation of BI should overcome. The case study is about the management of massive data volumes call for appliance solution in British Telecom. Reliability and accuracy of the call records constantly coming in from British Telecom's many suppliers and customers were to be ensured. This is the basic challenge that every telecommunication company faces that leads to find perfect BI tools for implementation. The reliability and speed of access to huge numbers of call detail records in British Telecom were lacking which made them opt for Dataupia Satori Server. It was able to handle the capture of 400 million records and to run analytics on more than 100 billion records in storage in a few hours which previously used to take few weeks. The legacy tape-based system limited the number of queries that could be executed simultaneously; with the new system, numerous concurrent queries can be run (Linda Biggs, 2008).

Other technical challenges include the selection of BI interface which might be different from the old legacy tape based system; making users aware of the capabilities of the new system. The BI interface challenge in the case of British Telecom was overcome by using the same database language that was previously used viz. Oracle, to connect the backend systems to the Dataupia appliances interface. The challenge of improving awareness among the users about the capabilities of the new system can be dealt with only by regular increments rather than a phenomenal improvement.

The awareness among the users was improved by apprising them of the legacy system of the scope and capabilities offered by the new setup. As the users start to learn more about the new system, they themselves start developing new ideas about what they could do with the data and the analytic capabilities it offers (Linda Briggs, 2008).

2.9.2 Organizational challenges

Being successful technically alone doesn't help a company in achieving successful BI implementation. There are a lot of managerial/organizational challenges in companies which implements BI. One such example is the Ferrari North America's case. Though it is not a telecommunication industry but the organization's problem is similar in any company that implements BI. When BI tools are proposed in the company instead of the old decision support systems being followed, the employees or the end users react in multiple ways. Some users understand the value of BI solution whereas some are resistant to change. In Ferrari NA, similar situation arose, where some understood the value behind the new BI technology that was introduced whereas some were very resistant to change initially. Some users assumed that they would no longer be able to quickly peruse the spreadsheets they were accustomed to and find the few data points of interest to form decisions (The path toward pervasive BI at Ferrari North America, 2008).

To deal with this challenge, Ferrari NA's IT group sought to build support among a small group of users who interacted with data on a daily basis. Some of these power users had been responsible for generating the spreadsheets that are so widely used across the organization. Then the IT group realized that it had to employ an iterative approach to new BI solution deployment (The path toward pervasive BI at Ferrari North America, 2008). To achieve this goal, the IT group of Ferrari NA started with BI applications for sales data analysis and initially deployed most of the familiar metrics that existed in spreadsheet reports within the new BI solution from Tableau software. The IT group of Ferrari NA began involving more end users in the design of the new application which created a sense of ownership among these power users; they began to extol the benefits of the new solution to the doubters around them. After creating training videos for the end users, they could observe the initial acceptance of the new BI interface and the IT group developed more BI applications. And in this course, some of the power users came up with new ideas of looking at data which were later incorporated into the new BI applications.

2.9.3 Business – IT personnel relations

This is a common challenge faced by any industry that implements BI. There has always been a difference in perspective and behavior between the business personnel and the IT personnel in BI implemented company. It was in 1959; a British novelist and physicist C. P. Snow delivered a lecture, "The Two Cultures", and later wrote two books on the same topic (Snow, 1959; Snow, 1964). The two cultures are the IT and Business cultures. It can be understood from this that there has been a difference between Business and IT cultures since long. It is common to hear phrases like "IT doesn't understand our business, they can't help us solve our problems, and all they care about is the technology" and "Business people have no knowledge of technology, they don't care about technology, and they have no understanding or appreciation of what is require to build and maintain systems." (Hugh J Watson, 2009)

The main reason behind this difference between them is the difference in their respective backgrounds; the kind of work they like to do, their college educations, work experiences and loyalties etc. The chasm that can exist between IT and business people is damaging when it comes to BI. For BI to be truly effective, the people who deliver BI (a group that includes many people with IT backgrounds) must understand the business, strive to align BI with business strategies, understand business processes, discover information requirements, build and maintain a decision support infrastructure, and train and support users. Some of these activities are technical, but many of them require business and organizational skills (Hugh J Watson, 2009).

Hugh J Watson (2009) also recollects an interview with a data warehouse manager; when he asked about the applications that use warehouse data, she said that she doesn't really know and that the decision support staff would know in depth about it. This is the case with many data warehouse mangers. This brings to light the need for bridging the chasm. The idea of BI centers of excellence was well appreciated by many BI authorities but implementing them is not always simple. There are issues like strong vision for the use of BI in the company, sponsorship, funding for the center, placement of the center in the organization's structure, building relationships with business units and many more which are to be considered in setting up a BI center of excellence. But BI centers of excellence are not the only solution for this problem as there are many successful companies that don't have these centers but are doing an excellent job of ensuring that BI is supporting the business. Hugh J Watson (2009) says "While a BI center of excellence is a good way of organizing for BI, it is possible to parse out some of the elements associated with a center and implement them without actually having one."

Specific solutions developed by companies like Continental Airlines, Overstock.com etc are successful in bridging chasm between their IT and business cultures.

There are a couple of approaches to bridge the chasm that separates the business and IT cultures. As mentioned earlier, setting up a center of excellence is one potential way to accomplish this, but it requires considerable organizational buy-in.

Another approach is to focus on things that can be done easily. A strong BI governance program like that which was introduced in BCBSNC is a very good idea. Overstock.com physically takes its decision support specialists in the business units. At continental airlines, the business and data warehousing analysts have both strong technical and business skills and are, to some extent, interchangeable (Hugh J Watson, 2009). These are the approaches that can be incorporated in the companies that implement BI to avoid the difference in Business and IT cultures.

2.9.4 Maintain business value of BI

There is always an internal battle that can force cost overruns and deployment delays, and possibly doom the BI project altogether in a company. Mark Kromer (2008), a senior product manager and Daniel Yu (2008), a product manager, at Microsoft had conversations with customers regarding implementing BI solutions where they met highly talented technical professionals from the data warehouse groups. It takes considerable time for the enormous efforts that the database administrators, developers, business analysts and data warehouse experts put in collecting data from numerous, disparate data sources.

When these product managers asked the business units which are responsible for driving the performance and lines of business about the value they receive from these data warehouses, it was found that in most cases the value is not being realized by the business (Mark Kromer & Daniel Yu, 2008). This is due to the cost overruns and the deployment delays. Another important challenge is the extent of access that users have in a typical organization. Generally, in a typical organization, only selected users have access to the knowledge mined from business data that BI brings to a business. Meanwhile, the vast majority of knowledge workers must rely on discrete sources of data (commonly spreadsheets stored at local PCs), experience, or gut feeling to make key business decisions (Mark Kromer & Daniel Yu, 2008).

Kromer and Yu suggested proof of concept techniques to overcome this challenge. They suggested a pre-implementation business value tool that is a pared down business productivity tool in the form of Excel spreadsheets. A pre-implementation phase of such projects can be scoped for gathering sample data from data sources required for a customer segmentation solution. A small scale data mart and analysis cube can be created based on this data (Mark Kromer & Daniel Yu, 2008). This phase is referred to as a proof of concept or a pilot.

Mark Kromer and Daniel Yu (2008) says "Though the technology and software that make BI possible have existed for decades, the enterprise wide adoption (and benefit) of BI has yet to materialize for many IT shops." So they identified the resources needed and the key stakeholders for this customer segmentation project and spent weeks gathering and analyzing the campaign data and purchase logs. Upon analysis a couple of problems were identified; the company lacked the tools for campaigns to target the "VIP" customer cluster, their analysis distribution curve of the lifecycle value of the products was misleading. So they created new mathematical models as an instrument of optimization for a future campaign. To implement this campaign and customer segmentation solutions, they utilized the BI products from the Microsoft BI suite: SQL Server 2005, ProClarity 6.3, Performance Point Server 2007, Excel Web Services and Microsoft Office Sharepoint Server 2007.

Finally they found that a quick implementation of a BI solution idea on a small scale – a well bounded pilot or proof of concept – enabled them to show results in tangible business value that could be easily explained and demonstrated. This will leave a substantive baseline system from which one can scale out and build the production version of one's BI vision.

2.9.5 Project Management of BI

Project management is a key area for BI which involves project team who can understand the needs of business and integration of business solutions with software and hardware technologies. For this purpose, BI project team is required to have interaction with broader aspects beginning from IT professionals who are responsible for information systems and business analysts and executives who access have access to complete information in building BI projects. In-depth knowledge in a specific area viz., finance or supply chain requires data integration, availability of information, essential technologies that enable in building of project and leading to its successful implementation. Skills, project plans and management of project plans are special areas which require unique knowledge and experience in project management.

People behind project management are the drivers of success. It is necessary for project team to possess a wide range of skills in communication, organizational skills, expert knowledge area, and leadership skills and in personal conduct. A clear analysis and understanding about risks, knowledge about business and technical aspects of architecture, designing a solution which must meet the needs of businesses are some of the essential criteria for a BI project manager. Further BI project manager must seek the support of only those who possess ability to provide guidance in the area of project and must have ability to contribute to the success of project in researching the business requirements through BI technology. A clear understanding of what one is really good and what is not good at enables project team to make a collective effort in building models of project for building a successful project.

Experience of a project manager is of great worth with the fact that practical knowledge apart from theoretical knowledge on project management. An effect project manager manages the project giving a practical exposure to the BI project and studies the entire scope along with project budget. There is an active monitoring of tasks, deliverables and an assessment of each project team member's time and expenses.

Leadership skills are the most important in project team as decision making is made by leader of project team. Project manager must be able to build the team towards more responsibility, honesty and dedication towards project as project management cannot be performed by a single individual and the contribution of each team member leads to the development and completion of projects. Supervisors, team members, executives must provide a good rapport with project manager and detail about the progress in project. Therefore, project manager must be able to lead project team with motivation and by boosting the energies of each team member. Further the team chosen must be from different areas in different disciplines for the purpose of cross-functioning and to handle multi-tasking models. Leader must also be able to solve conflicts, disputes and must possess an art of negotiation to manage the team efficiently (Jonathan Wu, 2005)

Another important fact in project management is that an outstanding BI project manager possesses excellent organization skills in adhering to the principles of project management by submitting a project plan, seeking approval for the plan and also produces a time line along with budget. Only after the project plan is approved, project manager begins to work towards project plan and also takes the guidance from project committees, project team members and project sponsors by conducting regular meetings and discussions.

2.10   Challenges during and after implementation of BI

2.10.1 Critical Challenges for BI Success

More than half of all BI projects are either never completed or fail to deliver the features and benefits that is optimistically agreed on at their outset. Although there are many reasons for this high failure rate, the biggest is that companies treat BI projects as just another IT project.

The reality is that BI is neither a product nor a system. It is, rather, a constantly evolving strategy, vision and architecture that continuously seek to align an organization's operations and direction with its strategic business goals. BI definitely complex, but the returns it provides make it worth the effort. Successful BI brings greater profitability, the true indicator of business success.

Organizations must understand and address challenges critical for BI success. BI projects fail because of:

- Failure to recognize BI projects as cross-organizational business initiatives, and to understand that as such they differ from typical standalone situations.
- Unengaged business sponsors (or sponsors who enjoy little or no authority in the enterprise).
- Unavailable or unwilling business representatives.
- Lack of skilled and available staff, or suboptimal staff utilization.
- No software release concept (no iterative development method).
- No work breakdown structure (no methodology).
- No business analysis or standardization activities.
- No appreciation of the impact of dirty data on business profitability.
- No understanding of the necessity for and the use of metadata.
- Too much reliance on disparate methods and tools (the dreaded quick pill syndrome).

(Deepak Pareek, 2007).

Some pitfalls in the BI Projects according to Claudia Imhoff (2006) are as follows:

1. No Business Involvement: This occurs throughout the life of the project and is lower than the executive level. If an enterprise cannot get access to the actual users of its application, it is headed

for failure. The users are the people that who will use the enterprise's applications daily. They are the business analysts of the company. They must also believe in the project by contributing to its requirements. Otherwise, they will not accept it. No amount of training will overcome this obstacle.

2. No Audit Controls: If the enterprise cannot guarantee that its numbers match those in the original sources, it can be observed that the audience will disappear. There is a misconception in the BI project leaders that their projects are not operational in nature so they need not bother about audits and controls. This idea is not only naïve but also downright silly. One must demonstrate his environment as good as an operational one. If the numbers do not match, then audit trails and statistics must be produced to explain why they did not match.

3. No Data Quality Processes: Much like the previous pitfall, the business community must be assured that their decision-making data is of the highest quality possible. In fact, it should be better than the data in the operational environment. To give the users confidence, the enterprise must have metrics to measure the quality of the data going into its data warehouse and marts.

4. No Program Mentality: It is quite obvious that one never builds only once BI application. An environment should be created which users can utilize to make appropriate business decisions. This means that an enterprise must build the first application, then the second, third, fourth, etc. Each project should build upon the value created by the previous projects. The projects must be coordinated and have to reuse mentality. Hence, there must be some form of program management function that prioritizes and funds these project plans and data models, while ensuring compliance with program standards and procedures.

5. No Technological Roadmap: Since the environment is created from multiple projects, enterprise must possess an architecture that acts the roadmap determining how each project will contribute and fit into the overall BI strategy. Without such an architecture, the enterprise is likely to build just another set o chaotic reporting databases.

These pitfalls can forewarn an enterprise of potential problems within the BI project (Claudia Imhoff, Cited in B Sujatha, 2006).

2.10.2 Technical Challenges

One of the most common challenges in any telecommunication industry using BI solutions is the management of the Call Detail Record (CDR). It is difficult and expensive to analyze large volumes of records at the CDR level within a fixed time frame using the traditional technology. As a

result, millions or even billions of CDRs must first be sampled and summarized to reduce the data being analyzed (Transforming Telecommunications BI, 2004). Even then it takes many hours to process in today's general platforms. The effectiveness of CRM, revenue assurance, fraud detection is limited due to the above said reason. The key activities in a telecommunications company that are affected by the present traditional systems are reducing churn, process optimization, ensuring complete and accurate billing and modeling call behavior etc. The present RDBMS systems and the legacy servers take lengthy time to analyze the CDRs. Performing a single complex BI query against billions of records using traditional systems takes hours or days. Summarizing or filtering the CDRs will result in incomplete information for decision making and also time consuming system development.

The Netezza Performance Server (NPS) system is the first enterprise-class data warehouse appliance to solve the tera-scale data warehouse challenge without compromising on performance, ease of use or on the level of data being analyzed This system is a fully integrated data warehouse appliance that consists of a host computer and arrays of hot swappable mirrored storage, custom chips and network switches that act as a powerful unit to manage data flows and process queries at the disk level. A BI query in this system will respond in a few seconds as it works at the disk level (*Transforming Telecommunications BI*, 2004). This is one new trend in the market that is especially created for the Telecommunications companies that implement BI.

2.10.3 Soft Skills

Implementation of BI in any company requires a good investment of finance, intellectual resources and time. For a successful BI implementation, a regular follow-up through the project leaders and the employees is a must. Here comes the issue of "soft skills" which hinders the project to drive for a successful BI solution implementation. This is a non-technical or managerial challenge that is faced in the implementation of BI in a company. This can act as a critical factor in the failure of a project.

Implementation of a BI solution is one of the most costly, complex, time-consuming, and resource intensive information technology ventures an organization can pursue (Zangaglia, 2006 cited in Robert Hobek et al, 2009).

Robert Hobek et al, 2009 in their paper found out five major non-technical factors for the successful implementations: strategic alignment, support from upper management, change management, employee buy-in and training.

If the companies do not understand how to utilize the technology for business applications, then minimum requirement that the BI should support business is not fulfilled. The organization must have a strategy in implementing its BI solution with respect to the vision, mission, values, goals and objectives of the company. There should be strategy in aligning the technology implementation to serve the business purposes. Lack of strategic alignment can cause a serious trouble in the success of BI implementation.

Many case studies and articles tie the failures of BI implementations to a lack of support from key members of the upper management (Robert Hobek et al, 2009). If active participation of a top level executive in the project is lacking, then it can be viewed as a "showstopper". So influential organizational leaders must be on board along with the employees throughout the project to overcome the hurdles when required and also encourage the achievements of the employees. This helps in the continuous project movement.

Change management is another non technical factor that affects the implementation of BI. In the present day situation, the growth of technology results in changes to processes, information gathering requirements and reporting relationships. Companies must be in a position to accept such changes. This issue must be handled carefully as it is the employees who will be uncomfortable and reluctant towards change. Mukherjee and D'Souza (2003) note that "it is not unusual for a [data warehouse] implementation to take a year or two to reach fruition. During that period, the firm could have experienced various internal and external changes. Therefore, at project completion, the firm may face a vastly altered environment." The companies must be in a position to predict the possible changes in processes, assignments and environment and communicate these predictions to the end users.

Employee buy-in is another factor which affects a successful BI implementation. If the end user doesn't understand how to use the BI solution what is the use of improvement in the technical view of BI. Employees are well versed with the regular interfaces and processes, so the implementation of a new process or procedure makes them uncomfortable. It is critical to ensure employees understand the system, its capabilities and how it can be used to improve business (Robert Hobek et al, 2004).

Training is important to all the employees in a company. Training is required for both top executives who use information for strategic purposes and end users who make critical tactical decisions under right timelines. User must learn the value of the BI system and how it can improve the way they do their jobs (Robert Hobek et al, 2004).

Considering these factors seriously, Robert Hubek et al (2004) arrived at few action plans to overcome the challenges due to soft skills. To deal with the strategic alignment he suggested an action plan which says "Project sponsors must effectively tie the project to overall business strategy by making a business case for the BI implementation". It means that the BI implementation should be a project that binds with the business strategy of the company. There must be continuous monitoring by officials from the upper management throughout the project which will increase the seriousness among the employees towards the project. Change management has to be planned and executed carefully right from the beginning by predicting the changes that may occur due to a BI project in the company. The employees or the end users should be made aware of the importance of change that occurs during the implementation of a BI project. Communication among the personnel in the company regarding the advantages of the new processes and the new interfaces to be used makes them more comfortable once the change actually occurs. This will keep the same enthusiasm and will increase interest towards the new processes instead of reluctance towards change.

Employees at all levels (BI system's end users) should be engaged early in the design and implementation process. The organization must engender in employees the mindset that they are going to make a difference to the company; that their specific detailed contribution will be recognized (Maddock et al, 2004). The employees must be offered training workshops or sessions that focus on one subject area at a time frequently through the implementation and post implementation phases (Robert Hobek et al, 2009).

2.10.4 Fate of BI

BI will only become profitable if IT managers and business leaders come together and share data, according to a panel of analysts at Information Builders Summit 2001 (Jennifer Brown, 2001). The main theme of the summit was that "the fate of BI lies in smarts of leaders". Gerald Cohen (2001) in the meeting said that only a small portion of the data gleaned from various sources is actually used though millions are spent on IT and massive amounts of data were collected. Statistically speaking, though the growth of data storage increased by 30 percent per year, only 7 percent of the organization's data is actually available for use.

Corporate information sharing has been hampered by a combination of technology that is not user friendly and different segments of an organization are reluctant to share what they have accumulated, said Henry Morris, vice-president of research with Framigham, Mass based International

Data Corp. (Jennifer Brown, 2001). He also said that people don't want to share what they have, which is creating problems in utilization of the stored data for actual use. Dresner (2001) says "departments within a company tend to be parochial and rarely step outside their own domain. Smaller organizations have no choice but to align with the business goal, but in large organizations, IT often becomes a bureaucracy."

To overcome this challenge, the organization should set up programs that will create awareness among the employees about how sharing of information can create a difference. Also meetings among the technical and business departments in the company should be made regular to increase rapport with one another that will help in avoiding the problem of information sharing.

2.11 Conclusions

- Storage of data and retrieval of information in a company that implements BI must be ready to face any kind of data management problems. The latest alternatives which provide more facilities than the existing softwares and servers must be implemented instead of the legacy traditional systems. So the company must be welcoming change whenever required.

- In most of the cases, the end users are reluctant to change in the processes, softwares and the interfaces of the BI solution implemented in the company. This challenge is to be overcome within a span of time only. To minimize the reluctance of the end users, methods like involving a few power end users right from the beginning in the design of the application and later making them explain the users and advantages of the same to their colleagues have to be implemented. This will make the employees respond positively towards change, if not at a go but surely in a short span of time.

- The managerial problems in any company impede the technological performance. The relations between business and IT personnel in a BI implemented company will always be rough and coarse. Successful methods of removing the barriers between the business and IT cultures/men have to be employed. For example, the methods employed by overstock.com and Continental Airlines are both very simple but still effective.

- BI solution projects are extremely expensive. In companies that are new to the implementation of BI, the initial expenditure may not serve the purpose perfectly. Also in cases where huge amounts of finance and resources are an input to the BI implementation, certain techniques may help in developing a model and analyze the performance and later install the BI solution in a large scale. The proof-of-concept techniques described by the product managers of Microsoft are excellent ideas for initiating a BI solution implementation in any company.

- Analysis of large volumes of records at the Call Detail Record (CDR) level within a very short time is another task that exists even after a successful BI implementation. Only alternative to this can be a search for new technology based servers that have high capacities like the Netezza Performance Server (NPS) which is a fully integrated data warehouse appliance that consists of host computer and arrays of hot-swappable mirrored storage, custom chips and network switches that act as a powerful unit to manage data flows and process queries at the disk level.

- If the appropriate funding and technical know-how are in place, attention to "soft" issues is of equal importance and value to a BI implementation. The effect of the soft skill factors like strategic alignment, support from top management, change management, employee buy-in and training are to

be dealt with utmost care to avoid the failure of an implemented BI solution. These are the challenges that can be easily handled once identified, but if ignored they may result in the failure of the whole project.

- It is quite certain that the fate of BI lies in smarts of the leaders. Good leadership is a must and should for any successful project. Similarly, in the implementation of BI also the leadership qualities of the personnel matter the most. It is found that in general business and IT departments won't maintain smooth relations. Some departments don't want to share the knowledge that they have gathered. Regular meetings between the business analysts and the IT personnel, frequent visits of one department personnel to the other to identify the requirements and training sessions which motivate the employees in developing a good environment to work will help the company overcome such challenges.

2.12 Benefits of BI

Every BI company offers its own benefits with a unique style of database structure and working. Software giant Microsoft BI offers benefits viz., connects people to information efficiency and effectively, empowers employees, simplifies collaborations and enables sharing, analyzes and provides insight, improves alignment, enhances the power of Microsoft office systems, delivers BI to the entire organization, reduces training needs, delivers sophisticated analysis and reporting and delivers enterprise-grade BI. (Microsoft BI Top 10 benefits.)

Applications of industries which benefit from BI are viz.., consumer goods, retailing industry, financial reserves, and transport. Departments that benefit from BI are database (marketing) sales, finance, Information Technology (Web world) and higher management.

The difference between decision support systems and BI is that decision support systems (DSS) is a computer program application that provides an analysis about business data and presents its users to enable its users to make business decisions more easily whereas BI is a wide and broad category that deals with both applications and technologies for gathering, storing, analyzing and providing access to data to enable enterprise users to make better deals in decision making process. Therefore although DSS and BI are slightly different, DSS carries the general characteristics of BI in its application which are support decision making and data warehousing.

Information access tools are of two categories (1) specific systems (Decision support systems), (2) Executive Information Systems (3) Management Information Systems and Generic systems such as OSAP (Online Analytical Processing (OLAP) and DM (Data mining)

The end users of BI include all levels of expertise who apply different levels of knowledge. The BI tools enable to carry out analysis and reports on every aspect of systems as long as the data about business is in large amounts and is also stored in data warehouse. Further BI offers lot of benefits to business environment in increasing the speed of business, rapid globalization, technological changes and a dynamic change in internal processes and environment. The benefits of data warehousing includes management decision making, cost-effective IT resources, linking of other sources, reliable, consistent and high quality information, improvement in information and availability of data access and enables different views on business working. Therefore, the information and data handled through BI enables organizations to turn the volumes of businesses in a greater strengths and with fast pace working in all sectors of businesses. (R. F. Baraams, 2004).

3 Case Study

ABC Telecommunications is a multinational company having its shareholders in the Middle East, North Africa and other investment companies. The company is a regional satellite phone provider covering most of the areas in Europe, Middle East, North, Central and East Africa, Asia and Australia. The current number of subscribers as of March 2006 is 250,000 and the handsets around 360,000 launched in 2001 as the company continues to maintain a net profit of US $ 80 million on revenues out of US $ 323 million in 2005 as compared to US $ 26 million profit in 2004. The services rendered by ABC Telecom are voice communications with ABC SO-2510, SG-2520 and value-added services like news, call back, call waiting, missed calls, voicemail, WAP and other services such as short message service, 9.6kbits data and fax service, 60kbits and 15kbits mobile data services. Besides, they offer prayer service to notify users about incoming call marine and emergency services.

The company operates on three communication satellites built by Boeing. The first satellite named ABC 1 launched in 2000, but recently, it is no longer in use and has been moved to junk orbit.

The second satellite, ABC 2, launched in 2003, is located in geosynchronous orbit and can handle 13,750 simultaneous voice calls. This satellite currently serves most of Europe, Middle East and parts of Asia.

The third satellite, ABC 3, launched in 2007, has been a failure when launched. But later, it was re-launched successfully in 2008 and now functioning similar to satellite ABC 2.

3.1 Methodology

The focal aim of this dissertation/research is to identify, analyze and discuss overall BI (BI) tool(s) implementation challenges in the telecommunication industry where high technological applications applied with complex business requirements and operations in different global markets, focusing on the managerial challenges prior, within and post the project lifecycle.

Starting by conducting interviews with the BI Architect, BI Project Manager, and Head of PMO in order to vision the current status, identify the role of the BI tool used within ABC Telecom and evaluate the different reviews about what was the vision and expectations and how could they align with it now.

The context and outcome(s) from the conducted interviews are as follows:

1. **When was BI introduced in ABC Telecom? What led them to look for BI in a telecommunications industry?**

   - BI was implemented in ABC Telecom by WIPRO on January 2006.
   - There was a DWH department, which grew into BI department due to need of information.
   - ABC Telecom was losing customers after Iraq war and management was in need of information and knowledge.

2. **What were the expectations before implementing BI?**

   - Certain set of KPIs required by the management.
   - Answer several market research concerns.
   - Support the marketing/commercial team which was not doing well.

3. **How did they implement BI?**

   - Project manager from ABC Telecom and a technical team from WIPRO implemented the BI system. It is a web based application using COGNOS BI tools, backend is SQL Server 2000.

4. **What are the technical and statistical details of BI operations in ABC Telecom?**

   - Monthly trends like:
     - Customers per rate plan per service provider.
     - Activation dates per contract.

- Usage (minutes), number of calls and retail amount per contract or per service provider.
- Non-used amount (postpaid) per month.
- Renewal and refill per contract.
- Fraud reports.
- ARPU and AMPU per product.
- Product sales on a yearly basis.
- Top 5 service providers / top 5 calling countries.

5. **Would you brief me with the success stories of "implementing BI in ABC Telecom"?**

- BI is used in most departments now for decision making.
- ABC Telecom is the first to implement a complex BI system in the gulf region.
- More investments are done on BI to further use its capabilities.

6. **Did BI implementation in ABC Telecom help the management reach their expectations?**

- No, most users are not trained in BI; that is due to high retention rate and complexity of satellite telecommunications it was very hard to train everyone.
- Users don't understand the industry well and they tend to use BI tools for wrong analysis.

7. **What in future does the ABC Telecom expect from BI to increase profits further?**

- Timeless, accuracy of data.
- To automatically send alerts for unusual trends without having the user to check daily.
- Frontend/presentation needs to be improved.
- ABC Telecom is thinking of using MS SharePoint instead of COGNOS!!

8. **From the previous interview, we knew that ABC Telecom is not satisfied with the present BI applications/implementation. Can the reasons be more specific and detailed?**

- BI in ABC Telecom didn't fail. On the contrary it is used by most of managers, finance and commercial team. However, some few drawbacks are:

    1) Some users feel it is not delivering all requirements from reports.

    2) Some users want reports per customer number which is not available in the portal for confidentiality reasons. Data per customer number can be retrieved form the backend only (database) and not front end (BI portal).

    3) Some users don't know what the report is actually showing and will wrongly start comparing between different reports.

9. Why preferring MS SharePoint? And what are the expectations from MS SharePoint?

- We have a major project coming up and we are still experiencing with MS SharePoint.

- We might migrate to MS SharePoint mainly because of the cost of ownership of SharePoint is less than COGNOS.

- Another reason is that learning curve for MS products will be much less than specific BI tools such as COGNOS.

10. What further immediate changes and improvements are to be done for the rapid growth??

- Upgrade the database from MS SQL 2000 to MS SQL 2008 to help improve the database performance.

- New employees who may benefit from BI should have immediate training on BI portal.

11. What are the challenges faced before you started the implementation of BI the first time? And, what percent of those challenges have been met after implementation?

- Lack of cooperation between commercial team and technical team; commercial team would wait for a long period when they ask for reports. Now it is easier and faster to get reports.

- Knowledge sharing was very limited before BI implementation.

- Around 70% of challenges were met after BI implementation delivery.

12. What are the non-technical challenges you faced during the BI project implementation?

- Collecting the correct requirements from BI users.

- Users must spend time to study and deliver what they really need from BI portal and not just random reports.

- It was hard to collect data and logic to implement from different data sources.

- Lack of knowledge in specific ABC Telecom products in different teams; it is hard to collect knowledge from the data source if he/she is not sure how the product is rated or how the system will generate the file.

- Lack of cooperation from other teams to improve the accuracy of BI logic.

Following the interviews, a detailed survey was prepared aimed to evaluate the current BI tool (COGNOS) implemented in ABC Telecom. Evaluation took into consideration the current usage and utilization of this tool, how it is recognized and used, what are the technical and business employees' feedback about it, the awareness of BI among the organization, what employees' perception about it and how it is used in day to day operations. The survey had been prepared and sent to selected employees due to the company's privacy policy:

Employee / User	# of Employees	Type	% Responses from Total
BI architect	1	Technical User	1 / 100%
BI Support Engineer	2	Technical User	2 / 100%
BI Project Manager	1	Technical User	1 / 100%
Head of PMO	1	Technical/Business User	1 / 0%
Head of Billing	1	Technical/Business User	1 / 100%
Head of Customer Service	1	Business User	1 / 100%
Customer Service Representative	16	Business User	4 / 100%
Head of Commercial & Sales	1	Business User	1 / 100%
Products Manager	3	Business User	1 / 33%
Marketing Manager	1	Business User	1 / 0%
Head of Planning and Strategy Division	1	Business User	1 / 100%

Response rate was close to 52%; that is considered to be high compared to other questionnaires. That is due to the selected type of employees who already were accessible and showed interest to participate – upon their direct manager advice/confirmation. Below is a Survey feedback brief:

#	Question	Mean (Scale 1 – 10)
1	Did you join ABC Telecom before the BI project initiative?	9.1
2	Where you assignment as a stakeholder/steering committee member?	9.0
3	Where you involved in day to day project life cycle decisions?	6.3
4	Is the BI formally used as your departmental reporting tool?	6.0
5	Are you using the BI portal as your primary report(s) generator?	4.8
6	Is the BI portal easy for use?	3.7
7	Is the BI available and accessible always (accessible any time)	9.5
8	Is the BI fulfills your business needs and expectations?	6.3
9	Did you get enough training on how to use the BI portal?	6.1
10	Do you feel that BI portal contains many things that you don't know how to use it?	7.2
11	How frequent you send support tickets to BI support team? (1: Never Sent – 10: Every Day)	3.1
12	How you rate BI support team response?	7.2
13	How you rate BI support team by understanding your business understanding?	6.6
14	Do you believe that current BI has technological problems more than business? (i.e. choosing the right tool, interface …etc)	5.0
15	Do you believe that current BI has business problems more than technological? (i.e. understanding business requirements, gap between IT and business …etc)	6.3
16	Is your management committed to utilize the BI portal along the department/organization?	5.1
17	How is your overall satisfaction/experience with the current BI portal?	5.9

An aggregative analysis for the above questionnaire and survey had been conducted within the context of the research discussion where it is mainly quantitative.

3.2 ABC Satellite Telecommunications

3.2.1 History

ABC Telecom is a satellite-based mobile telephone company extending its services nearly to one-third of the globe. The company is based in UAE distributing its products in most of the Europe, the Middle East, East Africa, Asia and Australia. The company is a regional satellite phone provider having a successful network as indicated by the growth in its subscriber network. Presently, the company is showcasing its products in Gitex 2008 in the areas of solutions, services, application development, broadcasting for media and connecting communication networks with the medium of net communication. Furthermore, the company is also displaying its diversified products such as latest broadband and maritime solutions.

In order to expand its promotion of products and services, ABC Telecom has to exercise more efforts at all levels to be more successful in the mobile and telecommunications business. At present, the company is marginally successful with its satellite network in performing the business in communications industry. The company's CEO states

> *"Our presence at GITEX is an opportunity to display our latest products and services and promote our newly-launched solutions. We look forward to welcoming and interacting with our customers, SPs and partners at this event and enhancing partnerships and business relations".*

It can be stated here that the competition in mobile communication industry is more advanced with the development of emerging new technologies; subscribers are interested in purchasing cost-efficient handsets and also networks that extend services even in remote areas. Therefore, in this aspect, the company faces a great challenge ahead for increasing its technology, launching of new BI projects and marketing its products with more advanced features.

The company has posted a net profit of US $ 80 million in 2005 against the revenues of $ 323 million in 2005 and as compared with US $ 26 million profit for the year 2004.

3.2.2 Products

The products of the company provide the ability to stay connected in more than 110 countries covering many parts of Asia, Africa and Middle East. Whether residing in a village or near a mountain, GSM satellite handheld phones extend powerful technologies viz., satellite, GSM and GPS giving the flexibility to avail seamless connectivity. Smart phones provide satellite service with a complete range of advanced features. Beside, DSL phone provides internet connectivity through a small and mobile terminal with the size of a notebook, offering speed of 144kbps connectivity at any time which makes a feature of great interest to subscribers. This facility is ideal for corporate customers, government agencies and news-gathering agencies. This DSL is a cost effective solution for high speed data requirements. PCO and payphone are other powerful and cost effective solutions for thousands of people who are residing in remote and rural areas with either no connectivity for communication or having an access to low-efficient network connectivity.

3.2.3 Services

Satellite services provide seamless and superior quality performance with affordable connectivity in marine outposts and remote industrial areas. With this high performing service, subscribers are satisfied with the connectivity. GSM networks are designed broadly for a range of offered services giving uninterrupted and stable connectivity for subscribers. Communication in rural areas is extended in a reliable and cost effective manner providing access to telecommunications in both low populated and scattered areas. Some of the diverse services include Tracking Solution, Aeronautical and Satellite Capacity Leasing used in various segments covering vast areas.

3.2.4 Technology

The technology used by the company is much advanced and quite benefiting for the subscribers. In this era of globalization, with rising customer demands and changing in life style, and electronic and communication gadgets becoming necessity; the company uses GSM technology embedded in smallest handset easy to carry and use for the purpose of voice, data, fax and sending short messaging service. The phones are enabled with fastest software operating systems viz., Windows XP, Windows 2000 and Windows NT.Satellite-1 was built by US satellite manufacturer Boeing Satellite Systems, formerly named Hughes, and was launched in the Pacific Ocean on 21st

October, 2000. This successful launch of first satellite led to another satellite launching in the year 2003 which was deployed into geosynchronous transfer orbit by Sea Launch. This satellite-2 was predicted with a lifespan of 12-15 years and was positioned at 35,786 km above the Earth at 44° East Longitude and 6.3°. The Primary Gateway in Sharjah, UAE serves the entire coverage area and there are future plans to establish additional Gateways at other locations.

3.3 Need for BI in ABC Telecom

The ABC Telecom previously had a Data Warehouse department (DWH) that is used to manage the data gathered for storage and for future retrieval of information. But due to the increasing need for information, the DWH department has grown to the BI department. Hence the company was losing customers badly after the Iraq war; they needed an alternative for the DWH department that can enhance the data management processes and methods helping in retaining the lost customers.

Once the customers started leaving ABC Telecom, the management needed more information to find the faults/reasons and fix them. ABC Telecom had then positioned to implement BI to set up a standard platform for the data management in the company from there onwards.

3.4 Implementation of BI in ABC Telecom

BI was introduced in ABC Telecom in January 2006 by WIPRO technologies. Project manager from the ABC Telecom and a technical team from WIPRO implemented the BI System. The BI solution was a web based application using COGNOS BI tools with SQL Server 2000 as the backend. COGNOS is a BI tool developed by IBM.

The BI of the company has proved to be good so far from the indication of present subscribers and its growth every year. The management, network around the world, customer service through products and services has been good so far whereas there are many challenges before the company to compete with other mobile communication companies. The products and solutions of the company include viz., European Antennas, GSMK Cryptophone in Secure Communications, Danisat, Teknobil in Vehicular Tracking, Digital Force Technologies, VisionTek (Linkwell) in Remote Telemetry, Sattrans, Teknobil in Vehicle Docking Adapter and Selcom in Personal Security Solutions.

ABC Telecom's web site has been developed to foster growth and expand business in many parts of the world as well as to invite new subscribers within the medium of Internet business. The company maintains sponsorship and collaboration with other technologies in order to develop more advanced features in mobile phones offering customized solutions or applications such as encryption and Indoor Enablers that are also ensured by ABC Telecom.

The company has opened Developers Program for offering solutions in the areas of fleet management, SCADA applications, Encryption, maritime antennas and maritime applications. Its Module is a compact (satellite) model which supports switched voice, data/fax, SMS, GPS and GmPRS upto 60/15 kbps. The Module has two RF connectors and board-to-board interfaces.

There are many advantages with this Module such as in its compact size, its optimized design, its size (72x52x9.5mm) (h x w x d) and weight of 60gms while being cost effective. This adds to the value end users worth, allowing developers the freedom to offer customized products with the integration of modem. Data services extended can integrate GmPRS at 60/15 kbps giving a way for greater communication possibilities to end users and in distant and isolated areas.

The benefits of the Developer Program are:

1. Providing assistance in identifying key requirements in commercial and technical areas.
2. Ensuring support from Technical Division on all technical matters.

3. Providing SIM card test on limited basis.

4. Providing modules subject to availability.

5. Providing configuration, optimization for every solution over its module.

6. Monitoring the development activities of each partner.

7. Monitoring to see that development programs that take place at a fast pace.

8. The partners of development program shall share every development and updates and progress made on the development front.

3.5 BI Operations in ABC

The major task of the BI solution that is implemented in ABC Telecom is to analyze the Call Detail Record (CDR) where most of the analysis done on a monthly basis. Trends that are analyzed monthly are:

- Customers per rate plan per service provider
- Activation dates per contract
- Usage (minutes), number of calls, retail amount per contract or per service provider
- Non usage amount (post paid) per month
- Renewal, refill per contract
- Fraud reports
- ARPU, AMPU per product
- Product sales on a yearly basis
- Top 5 service providers
- Top 5 calling countries

3.6 Expectations before Implementation of BI

- Certain set of Key Performance Indicators (KPIs) were required by the management.
- After the Iraq war, the company badly needed information for taking any further steps. So implementation of BI has to answer several market research issues.
- The marketing/commercial team was under performing before the implementation of BI. To improve the performance of the commercial team in taking successful decision for the growth of the company, BI has to be implemented in the ABC Telecom Company.

3.7 Challenges before BI implementation

3.7.1 Business – IT personnel cooperation

Upon interviewing a BI Architect in the ABC Telecom, it was found that lack of cooperation between the commercial/business personnel and the technical/IT teams exists as a major challenge being faced by the company.

The relations between the commercial and the technical team in a BI implemented company are to be taken care of to the fullest extent. Though both the teams finish their tasks with perfection; if the relations between them are not good, it is of no use. The barriers between these two departments have to be broken by certain techniques that were successfully employed by some other companies.

From the interview with the BI Architect in the ABC Telecom, the cycle time was an important factor that caused trouble between the business and technical departments; the commercial team had to wait for a long time after asking specific reports required for decision making. They also complained that the technical team is never in time when reports were required. The technical team counters the commercial personnel's claims saying that the business people do not understand the reason nor the work that technical team has to undergo before submitting a report.

This coarse and rough relationship between the commercial and technical teams was always a hurdle in achieving a successful BI Solution implementation in the ABC Telecom.

3.7.2 Knowledge Sharing

Another important challenge being faced by ABC Telecom is the limitation in Knowledge sharing. The unsettled relation between the business and IT teams has also affected the knowledge sharing between various departments in the company. But this alone is not the reason for limitations in knowledge sharing; technical difficulties in knowledge sharing are also to be considered.

As discussed in 3.6.1, the perspectives and behaviors of the business and IT people in the company vary, generally creating problems in the knowledge sharing between different departments. Lack of information at the right time hampers the decision making capabilities of the commercial team. Probably, this is due to the old and traditional processes used in the company.

3.7.3 Customer Retention

Though ABC Telecom is well established and has a large market, it never concentrated on the aspects like customer retention, customer satisfaction and customer relationship management (CRM) etc. ABC Telecom concentrated only on its technological development underestimating the value of meeting its customer satisfaction at all time. This was the main reason which resulted in more number of customers switching to other networks. If ABC Telecom took certain measures to implement BI strategies to overcome this problem of customer retention, a vast difference could have been seen in the profits and market share of ABC Telecom.

Performance management is really poor in the ABC Telecom, thus, business performance management became a real big issue considering that it gives preference to its products and services rather than customer satisfaction and customer retention. There is no proper action plan to bring back the lost customers which obviously will lead to a break in the development. The reason customers were leaving ABC Telecom's services in unknown due to the fact that the company does not concentrate on the lost customers. Knowing that the faults which resulted in the loss of customers if not were taken care of, ABC Telecom will get affected badly in future.

Customer satisfaction is the life for any products and services company. But in the case of ABC Telecom, customer service is comparatively below the required standards. Proper strategies and plans are to be put in action to overcome these issues. Apart from these particular problems in the ABC Telecom, there are also some critical challenges for the success of BI in telecommunications companies.

Therefore, the company has to face many major challenges in maintaining the present technology, performance in telecom business and in staying ahead with the environment and technological challenges apart from maintaining the human resource management for the company under corporate view. The ABC Telecom's main motto has to improve customer satisfaction and also develop plans for customer retention.

3.8 Challenges during and after BI implementation

- Collecting the relevant requirements of the BI users is an important challenge. Though the BI portal has some reports, it is not sure that these available reports are the exact requirements of the BI users. They may need some extra reports that are not currently available in the BI portal.

  After spending millions and millions on the implementation of BI, if the final reports were not delivered as required by the end user/BI user; the whole expenditure was a mere waste of time, money and resources. This will badly effect the growth of the ABC Telecom. The BI users must spend some time in evaluating the reports that are available in the BI portal and then create a report of the extent to which the BI portal reports serve the purpose. Neither the BI users nor the technical team which designs the BI portal concentrated on this issue. If this issue was rectified in due course of time, a great difference in the decision making capabilities of the BI users would have been witnessed.

- From the interview with the BI Architect, it was found that it was hard to collect data and logic to implement from different data sources. This is the major issue for any BI implementing company; gathering information from a wide range of sources is a tiresome process. Having softwares to collect data from different sources and making it available to the whole database system would solve this problem.

- Lack of knowledge about specific ABC Telecom' products and services in different teams among the employees of the company is a great hurdle in the implementation of a successful BI solution. Some of the BI users and the technical team members don't have knowledge about the products of the ABC Telecom. This will disable them from working efficiently in gathering data and retrieving information as they are completely unaware of how the products are rated or how and on what basis the system generates the report with respect to these products. The lack of knowledge about the products of the company results in a deteriorating performance of the BI users as the decisions taken may not be relevant to the situation since the reports are misinterpreted.

- Lack of cooperation between teams to improve the accuracy of the BI logic in the company. This is again a managerial issue related to the knowledge transfer and the relations between different departments in the ABC Telecom Company.

3.9 BI implementation Review

- BI implementation in ABC Telecom was successful to only 70% (interview with a BI Architect of ABC). This does not mean that BI failed in ABC Telecom; on the contrary, it was used by most of the managers and finance and commercial teams. Yet, there were few negative comments when the overall implementation of BI was evaluated.

    1. Some of the BI users feel that the BI portal was not delivering all the requirements from the reports. They feel that more reports have to be made available on the BI portal to make effective decisions.
    2. Some users want reports per customer number which was not available in the portal for confidential reasons. But still the user can have access to that information from the backend (database) but not in the frontend (BI portal).
    3. Some users did not know what the report was actually about and wrongly interpreted the reports and compared between different irrelevant reports. This can be avoided by conducting frequent training sessions to the employees about interpreting the reports that are available on the BI portal.

- BI was successful being the best aid that recent commercial teams have came across making their decision making simpler to an extent, as it was used in most of the departments for decision making.
- Most investments are done on BI to further use its capabilities.
- ABC Telecom is the first to implement a complex BI system in the Gulf.

3.10   Future steps

- New employees who may be benefited by BI should have immediate training on BI portal.
- The data retrieval should be timeless and the accuracy of the data should be maintained.
- There is a need to upgrade database from MS SQL Server 2000 to MS SQL Server 2008 to improve the database performance. The latest features of the MS SQL Server 2008 will help the technical team in presenting the information more easily than in the older version.
- There is a need to automatically send alerts for unusual trends without having the user to check the status daily.
- Frontend presentation can be more attractive and improved. So immediate action on the improvement of the frontend is to be done.
- ABC Telecom prefers Microsoft Sharepoint over COGNOS of IBM for the future project. It is likely to move to MS Sharepoint mainly because of the cost of ownership of MS Sharepoint. The cost of ownership of Sharepoint is very less compared to the IBM's COGNOS. Another reason for the change is that learning curve for Microsoft products is much less than specific BI tools such as COGNOS. So implementation of MS Sharepoint will not take more time as any other BI tool.

3.11   Conclusions and Recommendations

3.11.1 Conclusions

- BI department in ABC Telecom was set up after the Iraq war, as there was a need for more information. The basic purpose of the BI implementation in the company was to gather more data and use the information for better decision making. This purpose was fulfilled but still there are a lot of challenges to cross before achieving the final result. Some challenges still trouble in the routine working of the ABC Telecom. Certain methods which were proved successful in similar situations in other companies can be implemented after few adjustments making ABC Telecom face its challenges easily.

- From the interview with the BI Architect in ABC Telecom, the implementation of BI was successful up to 70%. It could meet up to the expectations of the management up to an extent but went through many challenges from the beginning of the implementation.

- Another important reason to implement BI was the poor performance of the marketing/commercial team in the company. It was expected that the BI implementation would improve the performance of the commercial team in taking decisions. Moreover the competition growth is exponential for the past few years to match with the pace of the competition and development in the market; the commercial team's decisions play a major role. This reason for implementation of BI was also fulfilled and the commercial team is now completely dependent on the BI for making decisions.

- BI was so influential in ABC Telecom since implemented as most departments in ABC Telecom use BI for decision making. ABC Telecom is the first company to implement a complex BI solution in the Gulf region successfully over a broad scale but have to sort out some internal problems to achieve overall success.

- The positive effect of implementation of BI in ABC Telecom can be observed from the increasing investments in BI to extract more and more advantages from it in the future (interview with BI architect in ABC) as it was implemented in almost all the departments of ABC Telecom.

3.11.2 Recommendations

- The challenges faced by the company are either technical or managerial. Most of them being managerial challenges, the techniques and methods implemented by various successful companies can help ABC Telecom solve the challenges. Tailoring the methods according to its requirements

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and then implementing them to overcome these challenges will be a perfect action against these challenges.

- ABC Telecom needs to concentrate more on the retrieval of data rather than gathering data as the major problem is managerial but not technical. The technical team is doing its duty of gathering information and maintaining them safely in the database but the process of retrieval is causing trouble. The relations between the business/commercial team and the technical/IT personnel have to be improved by introducing new techniques like regular meetings, appraisal of work etc.

- The soft skill improvement among the employees of ABC Telecom will also help in improving the overall working performance. It was found that most of the employees do not have a good idea of the products of ABC Telecom making them handicapped in evaluating information related to the specific products. The decision making capabilities of the end users will also improve upon training them about how to interpret the reports that are available in the BI portal.

- Since the main problem is in the understanding between the commercial and the technical teams, seminars are to be conducted to give each individual to present their problems with respect to the reports that are available in the BI portal. Some employees need specific data with respect customer which are available in the database only but cannot be furnished in the frontend (BI portal). Alternatives like giving limited access to the database for the power users of the BI portal would enhance the scope of the decision maker.

- The challenges of the ABC Telecom have to be considered in a broad perspective and then the literature has to be reviewed for white papers, journals etc., where similar situations overcame by other companies in the past can be encountered. This will give a chance to understand the direction in dealing such situations. The present paper's literature review is an extract from white papers which explain solutions to similar problems in the telecommunications industry and few other field related companies. Their solutions give a perspective to the management in dealing with the present challenges being faced.

4 Discussion

The challenges faced by ABC Telecom can be classified into two categories: managerial and technical challenges. Most of the challenges that were found upon interview with business personnel of ABC Telecom were management related, yet, there were some technical challenges. The literature review provides similar situations and proposed solutions dealt by other companies over time. These solutions can be tailored to find solutions to the challenges that are hampering the chance of a successful BI implementation in the ABC Telecom. The detailed approach of using the solutions of the past to the present situation is described as follows.

4.1 Technical Challenges and Solutions

- The first and foremost challenge that ABC Telecom faced was the poor performance of the commercial/marketing team. In fact, improving the performance of the commercial/marketing team was one of the expectations of the company before the implementation of BI. To achieve that task, the technical team of ABC Telecom needs to gather and store more data and create a user friendly interface to the business/commercial team to help them in taking right decisions. ABC Telecom also needed a severe market research after the Iraq war as it was losing customers.

This is a basic challenge faced by any company, but based on the range to which the data storage depends on, a proper server has to be selected helping in utilizing the BI tools after implementation. The access to the Call Detail Records (CDRs) should be fast as well as reliable. For example, British Telecom selected Dataupia Satori Server which is proved to be a reliable and speedy server. Selection of server based on the specific requirements will overcome this challenge and since the case of British Telecom is exactly similar to that of the ABC Telecom; if the present server capability is less than that of the Dataupia Satori Server, then immediate action of replacing the present server with the Dataupia Satori Server will help in increasing the technical capabilities of the ABC Telecom. This gives the technical team an advantage to work more efficiently and produce more efficient reports to the commercial team. The Netezza Power Server (NPS) is also a very good alternative as it has fully integrated technology and is supposed to be the most efficient among the servers that are used in telecommunication companies. The technical challenges section in the

literature review explains the advantages of the NPS. This can always be a good alternative to the present server as well as the Dataupia Safori Server.

- The BI portal which was formed after the implementation of BI in ABC Telecom has complaints against it from the commercial team every now and then. This is a present challenge which was not yet met effectively. Some of the end users or the commercial team members needed reports per customer number which were not available on the BI portal. This restriction was due to confidential reasons but still the end users were disappointed even after knowing the reason. At the same time, the technical team has to understand the importance of the specific information requested by the end user though it was not possible to disclose such reports in the frontend (BI Portal).

A possible solution for this challenge is to provide a limited access to the backend or the database to a few number of selected power end-users. This can be implemented by giving a unique id/password to these few power commercial team members to access the database. The access provided should not have all the facilities the technical personnel has. It should be only a read only access. Another alternative is to create an internal query system in which the commercial personnel can send a request to the technical team requesting information which is not present in the BI portal. The technical person then analyzes the rules of confidentiality related to the specific information requested and if there is no problem in disclosing that information, he/she replies to the query accordingly.

4.2 Managerial challenges and Solutions

Most of the challenges faced in ABC Telecom are organizational challenges. These are due to the lack of understanding between departments or lack of soft skills among the employees. All the managerial challenges being faced by ABC Telecom have solutions from the cases considered in the literature review. The information about the challenges faced by the company is obtained from a BI Architect who is presently working for ABC Telecom.

- Some of the users feel that the BI solutions implemented in ABC Telecom doesn't deliver all the reports required. Some of these users are also reluctant towards change from the original Decision Support System or the traditional Data Ware House system. This happens in each and every company that installs a new system of data warehousing as one can never expect a hundred percent approval from all the members in any committee. It is as simple as that, the employees' agreement or welcoming nature towards a new BI system; they are not even interested in knowing or understanding the reason for this change, the advantages and benefits of the new system. This is an orthodox reluctance towards change. This particular challenge can be overcome easily by changing the employee's perspective towards things without even identifying the change in his/her perspective. Certain successful methods implemented by various companies in the past when they introduced a new BI solution are mentioned in the literature review. Those solutions can be implemented too in the ABC Telecom to overcome this challenge.

Consider the case of Ferrari NA, though it is not a telecommunications company, the challenge is the same. They dealt with this very easily and the result was successful. This same method can be employed in the case of ABC Telecom too. The end users have been used to operating in a traditional culture and they feel uncomfortable to even think of using a new system. To overcome this end-user skepticism, Ferrari NA's IT team thought of building a small group among the end-users and implement the change in perspective towards new system implementation. They selected users who interact with data daily on a regular basis. Some of these power end users are responsible for generating the spreadsheets in the organization. An iterative approach to the new BI solution deployment was selected. To achieve this goal, the IT group of Ferrari NA started involving the power end users in the design of the specific applications leading to the emergence of a sense of ownership among these users. This made them explore and also explain the benefits of the new solutions to the doubters. After creating a training video for end users and initial acceptance of the new BI interface,

the IT group organized seminars where these power users educated the fellow employees with new ways of looking at the data. This finally turned out successfully for the IT group to incorporate the new content into the BI applications.

- Lack of cooperation between the commercial and the technical personnel in the ABC Telecom is another major challenge. This is a challenge that is to be dealt with very carefully. The difference between the Business and IT cultures exists since long time that a novelist once wrote books on this topic "The Two Cultures" in 1950s itself. The difference between the perspectives of these two department personnel is due to the background from which they have come from: their education, their work experience, etc.

Some of the companies introduced certain methods which are simple yet effective. At BCBSNC, a strong BI governance program was introduced to help bridge the chasm. Overstock.com physically places its decision support specialists in the business units to prevent any relational problems. At continental airlines, the business and data warehousing analysts both have strong technical and business skills and are, to some extent, interchangeable. These type of methods when incorporated in ABC Telecom, can help them bridge the Business/IT culture chasm.

- Other important managerial challenges include the lack of knowledge about ABC Telecom's products among the employees, lack of cooperation between departments to improve the BI logic etc. The lack of knowledge about products has to be compensated by implementing training sessions to the end users at regular intervals of time so that they would not be in trouble while understanding the reports related to those products and also to take decisions pertaining to those products. If the employee lacks knowledge about the product, the interpretation of reports and the decision based on them will surely be wrong. The cooperation between various departments in ABC Telecom can be dealt with by improving the soft skill factors.

There are set of 5 soft skills defined by Robert Hobek et al (2009) that are important in the BI implementations. The five soft skill factors are strategic alignment, upper management support, change management, employee buy-in and training. Out of these five factors, the support from upper management is relevant to the present problem of lack of cooperation between departments. If there is no good support or vigilance of the upper management, the employees tend to take the project as a casual one losing the seriousness right from implementation stage. When it comes to the execution stage the situation becomes worst. So, constant monitoring and support of the upper management

personnel to the employees working on the project both in success as well as failure times gives the employees a feel of responsibility to maintain seriousness throughout the project. This helps in achieving a successful BI implementation. To deal with the lack of knowledge among employees regarding the products of the company, the training factor will provide the solution. Training the employees regularly, especially these decision making personnel, about products at regular intervals of time will help in overcoming the challenge. There are some users who do not know how to use the technical available facilities. For these users, the employee buy-in factor of the five soft skills is appreciated. It is critical to ensure employees understand the system, its capabilities and how it can be used to improve the business. It is critical to engage employees early and often to ensure proper post implementation usage. These are the ways in which challenges like lack of knowledge about products, lack of cooperation and lack of idea of resource utilization can be overcome.

- Knowledge sharing is another challenge that hinders the successful implementation of BI. It is clear that the fate of BI lies in smarts of leaders. Some departments don't want to share what they have; this is a childish act by the departments. This can be overcome by creating awareness among the employees of the departments by conducting workshops and seminars. These seminars or workshops should enlighten the uses of knowledge sharing and how a small act of an individual can bring about a great profit to the organization. The employees should be boosted and should be feeling that their contribution is very much needed for the growth of the organization as a whole.

5 Conclusions and Recommendations

Visioning any BI as a tool to enhance overall organizational, performance, productivity and efficiency is not a simple task. But, it requires a synergy, full commitment and collaborative efforts from all management and operational levels within the organization.

Yes, BI is an Information System tool where IT Departments are included directly in the evaluation, scoping, implementation, installation, support and maintenance. But, that is not enough. All organizational levels should be participating and adopting such projects and change to reach goals and objectives; Top management should be aggressively supporting and sponsoring the project to assure success, head of departments must support the change, push their employees for an effective engagement and eliminate stakeholders' resistance, project managers must work on proper planning, sizing, scoping and adopting the right change management plan and methodologies to reduce the failures' impact of all previous project outcomes. Another factor for success is the solid partnership between IT and business communities, where inputs are coming from business and outputs are introduced from IT. Furthermore, BI project owners should buy the responsibility of ensuring that all system users are involved in the processes and usages of these components. Last factor for success, is the ability and flexibility to accept and adopt the change. Entire organization should be flexible to accept new business processes, re-engineered business processes and any other outcomes from the project. All in all, both, IT people and business staff should be working closely once the BI initiatives take a place, they should work to bridge all the gaps that are or might occur in order to achieve the project objectives.

ABC Telecom has crossed many milestones through its technological improvements and also through its products and services. The smallest satellite phone is the greatest achievement. But upon the study of the ABC Telecom's BI implementation, various challenges came to light. Unless these challenges are met with efficient solutions, any expenditure in the BI implementation would result in vain. Performance management is also an issue to be taken care of. Managerial challenges faced in ABC Telecom Company were more critical than the technical challenges, as they were difficult to be identified in the first place and it wasn't easy to find their proper resolution plan. All above were justified by ABC Telecom's first experience in such project implementation and lack of resources (personnel, and practices) for the BI in the telecommunication industry. But most of the challenges being faced by the satellite telecommunications companies at present were the same and once experienced by some other companies. Thus, before approaching at a solution to the present problems,

the management needs to look back and review the literature for cases relative to the present challenges. Once similar case situations are determined, the solutions available can be modified accordingly to the present challenges.

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