IMPACT OF BUSINESS INTELLIGENCE SYSTEMS IN INDIAN TELECOM INDUSTRY

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Abstract

Growth of Indian Telecom Industry is a major part these days. Different software systems are used for the benefit in different areas and segment of the industry. It is very important that the software used is really has ability to fulfill the various requirements of the industry. It is a very tough decision to take. Business Intelligence Systems are wisely used for decision-making problems. This research will investigate various business intelligence software selection decisions, awareness & benefits involved. The objective of this research is to analyze the impact of Business Intelligence Systems in Telecom Domain, rising requirements & management of different activities practiced by the Telecom Organizations in India. The aim of the research is to identify significant factors involved. The research will take both technical and managerial factors under consideration. It will also include different modes & possibilities for the growth of Telecom Industry in India using Business Intelligence Systems. This research will also check attraction of different software organizations using Business Intelligence Software’s for the growth of Indian Telecom Industry. Business intelligence technologies cover areas, like Data Warehousing & Data Mining, OLAP & Reporting, and Performance Management. Key words: Business Intelligence, Data Mining, Olap.

Business intelligence (BI) mainly refers to computer-based techniques used in identifying, extracting and analyzing business data, such as sales revenue by products and/or departments, or by associated costs and incomes. BI technologies provide historical, current and predictive views of business operations. Common functions of business intelligence technologies are reporting, online analytical processing, analytics, data mining, process mining, complex event processing, business performance management, benchmarking, text mining and predictive analytics. A Data Warehouse is one of the most valuable things for Business Intelligence System or Data warehouse rises and effective use can help decision-making intelligently that can improve the operations of Business Intelligence System or Data warehouse rises notably. It provides a collection of integrated data for on-line analytical processing (OLAP). A data warehouse is “a subject-oriented, integrated, nonvolatile, and time-variant collection of data in support of management’s decisions”.

Here Business Intelligence System or Data warehouse is:

• **‘Subject-oriented’** means the data are arranged and optimized to provide variety of analysis requirements from diverse functional departments within an organization.

• **‘Integrated’** means the data warehouse combines operational data derived from different departments & strategic business units of the organization. It is allowed to use consistent naming conventions, measurement standards, encoding structures and data attribution characteristics.

• **‘Time-variant’** means the data are periodically loaded to the data warehouse, all time-dependent aggregations need recomputed.

• **‘Non-volatile’** means Data warehouse are static. Data in the warehouse system are read-only generally; data in the database are rarely changed. Data in the warehouse database are updated or refreshed on a periodic, incremental or full refresh basis.
Information is one of the most valuable assets of Business Intelligence System or Data warehouse rises and when utilized properly can help Decision making intelligently that can improve the operations of Business Intelligence System or Data warehouse rises significantly. Data Warehousing is a technology that allows information to be easily, efficiently, timely and accurately accessed for decision-making purposes. A data warehouse can be viewed as a very large database that integrates the data stored in several different operational data sources. The operational data sources are usually maintained separately to support daily on-line transaction processing (OLTP).

**Data Warehouse**

With the huge potential of data warehouse applications, a large number of publications on data warehousing research have appeared in the past ten years. However, to the best of our knowledge, no systematic review and classification of these literatures have been done. In this study, two hundred and thirty-one articles were reviewed and classified based on Business Dimensional Life Cycle. This study provides a beginning for understanding of data warehouse research for readers interested in this area. For academics, it helps to review the historical trend of published data warehouse articles and to explore potential research areas for future study. For practitioners, it helps companies to understand the potentialities and possible issues need to be considered in data warehouse implementation projects.

The papers reviewed in the research are all published on academic journals. The reason is that academics and practitioners use journals to acquire and spread knowledge in general. Many journals have published electronic versions with the pervasive of on-line electronic databases; Researchers can find the latest publications with relative comprehensive searching mechanism from these databases which have now become important resources for education and research. As a result, the literature search performed by the project starts from placing full text search with the words of “data warehouse” and “data warehousing”. The research work is further extended with data warehouse related references listed in the collected papers.

**The Research Issues in Various Categories**

**Project Management**

This category includes project planning, business requirement taking, and project control.

- **Project planning**: The subject describes the definition and scope of data warehouse project including accessing organization’s readiness for the project, building business justification such as combining investments
and returns to calculate ROI, and focusing on resources and capable staff requirements.

- **Project control:** The subject focuses on keeping the data warehouse project on track by status monitoring, scope managing and ongoing communication strategy.

- **Business requirement:** It impacts virtually every phase of the data warehouse project lifecycle. Business requirements decide what data must be resided in data warehouse, how to organize the data, and when to update data frequently.

### Data Design

The data design phase design multidimensional models to hold aggregated data for queries which is defended with the company in customize way.

### Architecture

The category is dedicated to the architect design of data warehouses. It consists of five subcategories: novel architecture, DW software, the design of Meta data, security of data warehouses, and guideline of product selection.

- **Novel architecture:** The subject includes the topics of advanced architecture design that different from traditional data warehouse architecture such as moving the data warehouse to the Internet architecture.

- **Data warehouse software:** It includes commercial data warehouse systems for companies to implement and some developing systems for academic research.

- **Metadata:** Metadata is like an index for the warehouse contents that tracking of what data is where in the warehouse (Inmon, 2002). Metadata maintenance is an important issue, because it has influence on the entire warehouse from initial model through data extraction and load processes to the exploration and access of users.

- **Security of data warehouses:** The security issues are important to the data warehouse since many important data are collected in the system. The data warehouse must provide a mechanism to help user access data. The issues include data encryption, authentication, authorizations, etc.

- **Product selection:** Given various design and architect on the market, the subject discusses a formal procedure to decide which product fits company need better. The factors needed to be considered including price, training, and maintenance services, etc.

### Realization

The realization phase transforms the logical design of a data warehouse project into physical implementation. The details of physical implementation vary according to different applications and size of projects. This phase includes five subcategories: physical design of data, data staging, query processing, data quality and applications.

- **Physical design:** The phase converts logical data design into physical database. One of the techniques used to improve data warehouse performance is the creation of set of materialized view. A data warehouse stores integrated information from multiple data sources in materialized views over the source data. Materialized views are used to pre-compute and store aggregated data such as sum of product sales, or are used to pre-compute joins with or without aggregations. They are employed to reduce the overhead associated with expensive joins or aggregations for complex and time-consuming queries. The research topics of materialized views include view selection, view maintenance and view synchronization.

- **View selection:** Normally, the data warehouse system cannot materialize all possible views due to the constraints of some resource such as disk space, computation time and maintenance cost. Accordingly, how to select an appropriate set of views to materialize under limited resources has significant effect on query processing performance.

- **View maintenance:** When the data in any data source changes, the materialized views in the data warehouse need to be updated consistently.

- **Data staging:** The process collects operational source data and integrates the data into data warehouse. It consists of three major steps: extraction, transformation and load (ETL). Extraction is the process of retrieving data from a variety of sources. By modifications, validations and conversions of the source data, transformation makes sure the data is in a consistent state. Loading data is the final step of the ETL process; it loads quality data into the warehouse.

- **Query processing:** Data warehouse typically involves the execution of complex queries with join, group-by, and sort operations for a large volume of data. To support these kinds of queries, a large variety of query processing techniques are used to increase the query performance.

- **Data quality:** Since data quality will impact on the credibility of data warehouse. To ensure quality data
in the warehouse, the data gathering process and full lifecycle of data warehouse must be well designed.

• **Applications:** Data warehouse can be applied to many areas and industries for better decision making. The applications cover health care management, construction management, marketing and web data, etc. The applications of a data warehousing are seen to have considerable potential for different usage in the future.

**Deployment and Maintenance**

Deployment is to deliver the data warehouse related technology, data and application to end-users along with necessary education and support. End user education must match the role the users play. After successfully deploying a data warehouse, the attention should be focus on the ongoing support and education for operation of the warehouse and future growth. As data warehouse is a type of IS, the user satisfaction is applicable to measure the success of data warehouse.

**Others**

This category contains articles that discuss others aspects of data warehouse research. Three subcategories are related to these issues: DW implementation, introduction/overview and integration.

• **DW Implementation:** This includes the methodology, strategy, considered factors, critical implementation factors and organizational culture changing when implementing data warehouse.

• **DW Overview:** General introduction to data warehouse concepts and an overview of data warehouse related technologies, etc.

• **DW Integration:** As advancements are made in decision support technologies and computer based information systems, there have more opportunities to integrate data warehouse systems with others systems or technologies such as AI (artificial intelligence), KM (knowledge management) and data mining, etc.

**Need of Business Intelligence for the Telecommunications Industry**

This data says that till end of 2011 global cellular phone service subscribers will be doubled. Competition in the telecommunications industry is intense and several factors are forcing major changes. A continual effect worldwide on Internet and wireless technologies will continue to advance rapidly quickly changing customer preferences, disrupting traditional communication methods and forcing prices downward. The telecommunications industry encompasses many technology-related business sectors including:

• local and long-distance telephone services
• wireless communications
• Internet
• fiber-optic
• satellites
• cable TV systems

**About Customer satisfaction:** customers are the first step in that direction. To arrive at the overall profitability of a customer, vendors must quantify the costs associated in serving the customer over a period of time and the revenues realized from them during that period. The results of customer profitability analysis can help identify why some customers are not as profitable as others. For example, a customer might be unprofitable because the products used by them do not match their risk profile. Customer profitability analysis can significantly help in developing new offerings, customizing existing offerings and helping to target market segments for future growth.

**Product Development:** Under Forecasting to plan their networks, telecommunications service providers perform forecasting that helps operators to make key investment decisions. These decisions affect all aspects of the business including product development, launch, advertising, and pricing. Effective forecasting helps to ensure that the company will make a profit and that capital is invested wisely. BI solutions that use forecast data can help network planners decide how much equipment to purchase and where to place it to ensure optimum management of traffic loads.

**Service Design and Delivery:** In response to fierce competition, telecom service providers must develop new products in order to offer a wide range of new value-added services faster and more cost efficiently. Design of effective services is enhanced through the use of BI solutions that provide information regarding the adoption and profitability of existing products and services. Business Intelligence solutions can help telecommunications service providers improve customer retention and satisfaction through the effective analysis of service fulfillment systems. Information regarding installation, upgrades and repairs to customer’s service can help the business reduce the cost associated with service fulfillment.

**Finance & Budgeting:** The role of financial reporting has undergone a paradigm shift during the last decade.
It is no longer restricted to just financial statements required by law. Increasingly, it is being used to help in strategic decision making. Many companies, in an attempt to improve financial reporting and decision making, have integrated their financial data in a data mart or data warehouse. Data warehousing facilitates analysis of budgeted versus actual expenditure for various cost heads like promotion campaigns, product development, infrastructure maintenance, investments, commissions, etc. BI tools can provide drill down capabilities whereby the reasons for cost overruns can be analyzed in more detail. It can also be used to allocate budgets for the next financial period.

**Human Resource:** Business Intelligence can significantly help in aligning the HR strategy to the overall business strategy. It can present an integrated view of the workforce and help in designing retention schemes, improve productivity, and curtail costs.

**Challenges**

Data Management is the Business Challenge for telecom organizations. New players are seen emerging in the market. A high potential market and very less time to attract customers are forcing the players to accelerate their offerings.

Data Management has taken a back seat and is not a priority. This has led to a lot of chaos and dissatisfaction among the customers. Customers often complain about inaccurate billing, unavailability of network and frequent disruption of their service. As we can see Analysis of the problem results in 'poor data in the operational systems'. Data management has become difficult due to its volume, rapidly changing business and quick implementation of the IT systems to support business in the market place.

Business Intelligence (BI) solution is not a mere data warehousing solution that encapsulates data to provide analytics, derived intelligence and easy access to information. It is a process that extracts, collates, validates, reconciles and integrates the data to provide intelligence to the business as well as to the operations. It is the intelligence of the process that can help in providing guidance to mitigate the challenges within an organization.
BI process comprising of data capture, data quality check and integration can provide continuous feedback to the source systems. Data quality check performed in ETL provides data quality reports that indicate where the source systems are deviating from the set standards. This helps in making immediate corrective actions at the source. Data Integration process defines the standards across the organization. The feedback at this stage should be tapped to achieve standardization of data elements across the business. Data quality and integration reports on reconciliation provide data correction methodologies. Reconciliation process collates all the reports and validates against the business rules to provide data correction recommendations. BI program, built on proper methodology, feeds back the data acquisition requirements to the source systems. Additional attributes and metrics required to be captured are passed back to the source systems to ensure data completeness in the organization.

**Business Intelligence for Sustainable Competitive Advantage**

The model is unique in the sense that it has been developed based on the data obtained from 10 interviews in 4 different Telco organizations. Although no formal propositions are developed in this paper, the model can still be taken as a research model for further investigation. A causal modeling approach such as structural equation modeling (SEM) can be undertaken to test the model. The combined model has 9 factors and 34 variables. It is observed that the basic determinants, which are obtained from the literature, apply quite effectively in the successful BI deployment. Its determinants are Quality BI Information, Quality BI Users, Quality BI Systems and BI Governance, which falls under firm’s unique resources. Organization Culture, Business Strategy and Use of BI Tools are considered moderators between successful BI deployment and the use of BI-based knowledge for sustainable competitive advantage. Organizations especially in telecommunication related industries which are planning to embark on BI can consider these variables as criteria of successful deployment. However, these criteria may not be applicable to all industries as careful analysis is first needed to select the appropriate criteria for the company. A multiple criteria modeling approach can then be undertaken to access the suitability of the company for BI deployment.
Transforming Telecommunications Business Intelligence

This research paper talks that many critical telecommunications functions rely on fast, complex analysis of CDR data. Key initiatives include analyzing behavioral data using CRM programs to optimally target services and reduce churn, ensuring complete and accurate billing and modeling call behavior with revenue assurance programs, and optimizing network operations using operations management programs. These initiatives all benefit from improved access to CDR-level data, access to large quantities of historical information for trend analysis and from the ability to quickly run complex BI queries.

The Data Summarization Compromise

1. Telecom networks and associated switches, billing systems and service departments typically generate from 100M to a half-billion CDRs per day. Carriers must use this data to gauge service offering traction, to monitor service and billing activity and to drive sales and marketing initiatives.

2. Complex analysis of the combined historical data from these sources drives CRM, revenue assurance, fraud prevention and operational reporting programs. Storing and accessing all of this data is highly valuable but technically challenging.

3. On the other hand, sampling and summarizing CDRs may hide changes in calling patterns and the relationships between data.
Consolidated Warehouses: Scale, Depth and Flexibility at High Cost. Rather than sample and store the data, many Tier 1 carriers have chosen to create consolidated warehouses because it is faster and more accurate to store all the CDR data and much easier to maintain. Although this approach is cumbersome and costly to implement, the benefits are compelling.

**Inclusive Growth and Various Impact Facts in India**

The trend toward evidence-based decision-making is taking root in commercial, non-profit and public sector organizations. Driven by increased competition due to changing business models, deregulation or, in some cases, increased regulation in the form of new compliance requirements, organizations in all industries and of all sizes are turning to business intelligence (BI) and data warehousing (DW) technologies and services to either automate or support decision-making processes. An increasing number of organizations are making BI functionality more pervasively available to all decision makers, be they executives or customer-facing employees, line-of-business managers or suppliers. Pervasive BI results when organizational culture, business processes and technologies are designed and implemented with the goal of improving the strategic and operational decision-making capabilities of a wide range of internal and external stakeholders. Despite the fact that the term Business Intelligence was first coined in 1958 and the first BI software tools emerged in the 1970’s, BI is not truly pervasive in any organization. As organizations identify more stakeholders who can benefit from improved decision-making capabilities, they are choosing to deploy BI and thus come increasingly closer to achieving pervasive BI. For organizations struggling with changing organizational structure and culture, business and IT processes and technologies, several lessons can be learned by examining the best practices organizations employ on their path toward achieving pervasive BI. It includes various benefits like time & cost. Knowledge is becoming more and more synonymous to wealth creation and as a strategy plan for competing in the market, place can be no better than the information on which it is based, the importance of knowledge and information in today’s business can never be seen as an exogenous factor to the business. Organizations and individuals having access to the right information at the right moment, have greater chances of being successful in the epoch of globalization and cut-throat competition. Currently, huge electronic data repositories are being maintained by businesses across the globe. Valuable bits of information are embedded in these data repositories. The huge size of these data sources make it impossible for a human analyst to come up with interesting information that will help in the decision making process. Commercial enterprises have been quick to recognize the value of this concept, as a consequence of which the software market itself for data mining is expected to be in excess of 10 billion USD. Business Intelligence focuses on discovering knowledge from various electronic data repositories, both internal and external, to support better decision making. Data mining techniques become important for this knowledge discovery from databases. In recent years, business intelligence systems have played pivotal roles in helping organizations to fine tune business goals such as improving customer retention, market penetration, profitability and efficiency. In most cases, these insights are driven by analyses of historical data.

**Conclusion**

Business Intelligence (BI) is a business management tool, which consists of applications and technologies that are used to gather and analyze information about business. Business Intelligence systems are used by telecom companies to analyze the factors (or data from inside and outside the organization) affecting the telecom industry; from technology to customers, there has been an increasing demand for customization of Business
Intelligence software. These Business Intelligence solutions revolve more around customer relationship. Also, the metrics for customer satisfaction and marketing intelligence keeps on changing with the personalization of offerings. Thus, such software is marked by its flexibility to accommodate changes. Moreover, data management is the primary focus of the telecom players, which makes integration with BI applications vital for the telecom industry. The Telecommunications industry is extremely varied in its adoption of business intelligence solutions. Few companies are in the advanced stages of their business intelligence initiatives; yet there are many that are oblivious of the benefits of BI. Some companies are hesitating due to anticipated high cost and long implementation cycles that many Business intelligence solutions require. Some telecommunications service providers have gone for non scalable temporary solutions which often fail to leverage the ever-increasing volumes of data. The real challenge is to make the BI environment an integral part of the decision making process. Efficiently gathering the information requirements of all the user-groups is extremely critical for the success of any BI implementation.

References


Brief Bio-Data

Dr. Poonam Kumar is a PhD and MBA in (Information and Technology and Marketing). A Science graduate from Delhi University and Higher Diploma in Aptech she has over eleven years of extensive experience in corporate and teaching. Previously at Amity University Noida for four years, Dr. Poonam has taught across a wide range of subjects and courses in IT and Marketing. She has worked with Jaipuria Institute of management, BLS Institute of Management and OKS span tech (IT Company). Her research interests are in Information and communication Technology, quantitative methods, branding and e-commerce. She has published over dozen of research papers in International Journals in the area of Information Technology and Marketing. Her published papers are in many esteemed International and National journals and book chapters. She has conducted Management development Programme and various workshops on marketing theme and research areas at various organizations. She has been awarded as employee excellence award in OKS Span tech software Company for her best contribution in client handling and as a Project leader.