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1.1 INTRODUCTION TO BUSINESS INTELLIGENCE

1.1.1 MEANING OF BUSINESS INTELLIGENCE

Business Intelligence, or Business Intelligence, refers to the process by which business and companies gather data, analyze it, and re-apply it in order to make the best possible business and financial model for their particular instance. Many businesses devote entire divisions just to this process, in order to streamline their workflow and make more money for less effort. Those that succeed, succeed financially also. Those that fail cannot usually last for long.

Business performance management solutions like business intelligence might set up a monitoring system on sales - profits, amounts lost in small transaction fees, amounts paid originally - with enough data, it is possible for a good business intelligence system to pinpoint exactly where costs need to be cut or new systems put in place.

A good business intelligence system essentially manages the "value flow " of a business in an effort to find out where that flow hits its rapids or its deep, fast flowing strong points. Ideally, that data flow will be evened out into a single organic, powerful system capable of producing great results with a minimum of effort. This might include anything from adding jobs in an area, converting a process to automation, or even just changing an advertising strategy; regardless, these processes come about because of the results determined by business activity monitoring processes like business intelligence and related fields.

Business Intelligence is a process for increasing the competitive advantage of a business by intelligent use of available data in decision making.
1: Conceptual Framework of Business Intelligence

1.1 Introduction to Business Intelligence

1.1.2 Definition of Business Intelligence

‘Business Intelligence is a concept of applying a set of technologies to turn data into meaningful information. With Business Intelligence 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.’

‘Business Intelligence is 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 Business Intelligence ‘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.’

Business Intelligence is event driven. ‘Event Drive Business Intelligence monitors three classes of events in operational and Business Intelligence content – notification, performance and operation events – looking for key changes. Having detected changes, event-driven Business Intelligence 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 are, enabling them to make timely and effective decisions’.
1: Conceptual Framework of Business Intelligence

‘Business Intelligence is define as the processes, technologies, and tools needed to turn data into information, information into knowledge and knowledge into plans that drive profitable business action. Business Intelligence encompasses data warehousing, business analytics tools and content/knowledge management’.

‘…Collect data about your business, for analysis and prediction, ‘Business Intelligence is timely, easily and decision making capability for an organization at all levels, simplified administration, scalable, reliable and performance’

1.1.3 Advanced Definition of Business Intelligence

We see from the above definitions that Business Intelligence refers to the Business understanding its customers, knowing their needs and wants, studying their purchasing behaviour, identifying potential services that are in demand, understanding market conditions and reacting quickly, targeting new businesses, and it is also about learning what we do not know. The advanced definition of BUSINESS INTELLIGENCE are as followed.

‘Business intelligence is a way of exploring data to improve business performance, whether to drive profitability or to manage costs.’

‘Business Intelligence is accurate, timely, critical data, information and knowledge that supports strategic and operational development such as new initiatives, new revenue streams and risk assessment in uncertain and dynamic business environments. The source of the data, information and knowledge are both internal organizationally collected as well as
I: Conceptual Framework of Business Intelligence

1.1 Introduction to Business Intelligence

Data can be in the form of sell figures, buyers, suppliers, inventory and budgets, etc. Information can be in the form of customer demand, cooperation competition, feedbacks, best products, or sell patterns, etc. Knowledge can be considered as an abstraction of data and information. Knowledge can be obtained directly from experts or experiences and can also be derived from data mining of the corporate data sources that provides strategic advice on market trends, profit/loss projections, productivity measurements, quality of service and product reputation and bottom-line predictions, for which it enables an increase in consumer confidence and business value.

Using the BUSINESS INTELLIGENCE tools, the complex corporate level data can be presented to the top-level management for overall Business Performance Management (BPM) by different way of:

- Slicing & Dicing
- Drill Down reporting
- Comparison with Key Performance Matrices (KPM)
- Comparison with Key Performance Indicators (KPI)
- Performance Scorecard
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1.1 Introduction to Business Intelligence

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

Industry savvy and experience are increasingly critical variables to successful business intelligence sales and implementation cycles. These challenges and opportunities vary by industry, and the ability to meet industry- or business specific challenges that customers confront can be the deciding factor for organizations looking to implement business intelligence solutions.

Many industries are using Business Intelligence applications to reach beyond the enterprise and share insights off the platform with vendors and customers. For example, it is increasingly common for retailers to provide their vendors visibility into inventory levels, performance metrics and other supply chain data to collaborate in developing efficiency improvements. Business Intelligence technical requirements have to address such business imperatives as:

- Security and user/role-defined access to the warehouse
- Data freshness and common meta data definitions
- Benchmarks and performance targets

In many cases, business executives collaborate with IT executives to evaluate Business Intelligence investments. For a Business Intelligence vendor, industry knowledge is essential to establish credibility, and vendors and consultants must be able to walk between challenges in the client’s business environment and technical requirements and capabilities.
I: Conceptual Framework of Business Intelligence

1.1 Introduction to Business Intelligence

1.1.4 Researcher’s Definition of Business Intelligence

Business Intelligence is a Structured Approach towards Gathering Data, Validating & Transforming it to highly Meaningful Information and further Communicating the same to the Business Users in timely manner – enabling them to take Informed Decisions.

In contemporary Business Scenario – where each player in the Marketplace faces acute competitions – the Importance of Competitive Intelligence (CI) has assumed a great significance, within the broad scope of Business Intelligence.

Here Competitive Intelligence can be termed as:
A systematic and ethical program for gathering, analyzing, and managing external information that can affect your company’s plans, decisions, and operations.⁶
Business intelligence has been around a lot longer than the technology used today. If you look back into the ancient mists of history, we will find a small book written by a brilliant Chinese general. The general’s name was Sun Tzu, and his famous little book is the celebrated The Art of War. The Art of War emphasizes the importance of intelligence and information in war - but the book isn’t useful for only war. Even today, high level executives and managers read that book, precisely because it is useful in situations of any sort of conflict - and Sun Tzu’s advice about information is particularly applicable in the business world.

The term “business intelligence” itself was coined in 1989 by Howard Dresner, a Research Fellow at the Gartner Group, an information and technology research group headquartered in Stamford, Connecticut. It was essentially an umbrella term to cover a number of methodologies and ideas designed for the increase of efficiency and profitability in the corporate workplace.

**Business Intelligence Today**

Today, business intelligence relies heavily on data and data processing. The computer is foremost in this process, and any business intelligence analyst can’t afford to ignore the use and practicality offered by computer technology. Software, as we’ve said, collects data and interprets it for the CEO or other managers of a company, making sure that company outdoes its competitors and knows exactly how its own internal affairs are being run. A human can improve him or herself by introspection; the same goes doubly for a company or corporation.

**Business Intelligence Tomorrow**

The world is changing, whether we want it to or not. Computers are getting faster, as are cars, planes, and nearly everything else in this world. The
human race is speeding up - your customers will want more for their money, and they'll want it faster than ever before. If you can't make a product fast and exciting, you’re going to fall in second place to someone who can.

Business intelligence can help predict the trends of the customer base even as they shift, faster and faster every day. It’s that fast shift, as fast as lightning sometimes, which makes business intelligence vital. Business intelligence itself is shifting as a process and an ideology to conform to the faster, more demanding rigors of the modern and future economy.

On the cutting edge of the business intelligence of tomorrow is a new type of process, suggested by information analyst Andy Hayler - Business Intelligence 2.0. This new sort of business intelligence wouldn’t just gather and analyze data, but would also do it in real time - in other words, you’d be able to see a shift in profits or customer dynamics as it happened.
1: Conceptual Framework of Business Intelligence

1.3 Scope of Business Intelligence

Successful Business Intelligence Implementation and application spans over multiple Techno-Functional Processes and Delivery Channels of the organization. The Scope of Business Intelligence can be defined on two from two different perspectives:

1.3.1 Implementation Scope of Business Intelligence

1.3.2 Application Scope of Business Intelligence

1.3.1 Implementation Scope of Business Intelligence

- Requirement gathering
- Data warehouse schema designing
- Identifying Data Silos
- Extracting and Transforming Data From data silos
- Auditing and documenting transformation process
- Aggregating data across dimensions
- Designing User interface for reports and dashboards
- Defining and scheduling delivery channels

1.3.2 Application Scope of Business Intelligence

- Providing Information to Business users at different levels of organization:
- Providing Information in different formats to different Business Users on right time:
- Providing information across functional domains using different Analytic applications:
- Delivering information by using Corporate Performance Management, Interactive Dashboards.
- Providing Web based Enterprise reporting.
- Providing Information to Business users at different levels of organization.
1.3 Scope of Business Intelligence

As shown in the figure 1.1, Business Intelligence satisfies information needs of Business users at different levels of the organization like strategic, Analytical and operational level. It also provides information to the external users who are critically associated to the organization like Customers and partners as per their Profile needs.
1: Conceptual Framework of Business Intelligence

1.3 Scope of Business Intelligence

Providing Information in different formats to different Business Users on right time:

As shown in the figure 1.2 Business Intelligence Provides right information to the right business users, in the right format on right time to make them enable to take informed decisions. The business users are like Senior Executive, Executive Manger, Senior Manger, Business Analyst, Partners and customers.

Figure: 1.2 Information Channel
1.3 Scope of Business Intelligence

Providing information across functional domains using different Analytic applications:

Figure: 1.3 Analytical Applications

As we have seen in the beginning, first step of scope of Business Intelligence is Data Integration. Data is identified from different data sources like OLAP, ERP, CRM, SCM, Legacy Data, other Applications, Local data and data from Web. We can see the same is above figure.

After Analysis of the integrated data, derived information is broadcasted in the form of standard Reports, Interactive analysis, dashboards, scorecard etc… related to different functional domains like Customer Intelligence, Product and service Intelligence, Supply chain intelligence, HR intelligence and Finance intelligence.
1.3 Scope of Business Intelligence

Delivering information by using Corporate Performance Management and Interactive Dashboards:

Business Intelligence Aggregates the information from the data transactional systems like: Supply Chain Management module, Finance Management Module, Customer Relationship Management, Enterprise Resource Planning Solution and other legacy System if there is present any in the organization.

As next step Business Intelligence analyses this aggregated information with most powerful logic and generates critical information for which influences Business users for making their strategic level, tactical level and production level decision to improve their overall performance.
1.3 Scope of Business Intelligence

Delivering information using Web-Based Enterprise Reporting:

As shown in the above figure 1.5 web enterprise reporting is broadcasted on web to cater power users, Business Analysts, Nontechnical Business Users and unknown users in different forms like Geographic, Visual, enterprise, financial, scorecard, forecast and Ad Hoc / OLA. This kind of Analytic Applications falls under the scope of Business Intelligence.
In today’s corporate scenario the dynamic business conditions are in a constant state of flux. For example:

- Sales patterns change from place to place and from time to time.
- Currency valuations shift and alter profit margins.
- Suppliers change their delivery schedules and their prices.
- Customers become more educated and therefore more demanding.
- Supply chain aligning with consumer demand
- Handling Impact of price changes/fluctuation on buying behavior

Balancing on this shifting terrain, business managers are expected to deliver steady earnings growth. Somehow, they must smooth out the bumps and anticipate the changes.

The key reason for utilizing business intelligence is to be able to make, as the top management of the company, informed and intelligent decisions regarding the way the company or business is run; informed decisions like these lead to better, more efficient processes in the actual work environment and will certainly lend the corporation that competitive edge it needs to succeed in today’s highly competitive environment.

The promise of Business Intelligence is to enable organizations to understand change, to identify causal factors through analysis of data by region, currency, customer or other relevant dimensions.

As the CIO of a large chemical company said recently, “If you rely on averages, it’s easy to be misled, but if you slice through the data, it’s possible to see exactly what’s affecting costs.”
Retailers like WalMart uses its data warehouse to relentlessly hone its operations and it captures point-of-sale transactions from over 2,500 stores in six countries in its tera-scale data warehouse. It uses this information to ask questions like “For which stores and for which months was Flex Shampoo in high demand but short supply?” With the answer, it can optimize inventory and capitalize on pricing opportunities that exist transiently at a local store.

The importance of Business Intelligence is not limited to retailers. Telecommunications carriers use Business Intelligence to identify and mitigate fraud. A delivery service might predict which vehicles are most likely to break down and where. A bank might use Business Intelligence to identify customers who, based on their recent activity, are likely to transfer their account to another institution. The possibilities are limitless.

Business Intelligence makes enterprise data actionable. It uncovers trends and patterns that might otherwise go undetected. Managing a business on intuition, educated guesses or averages isn’t good enough anymore. To be successful, a company needs a foundation of accurate, current and complete information.

Organizations are becoming Data rich and Information poor. Business intelligence is today’s tech priority for a reason: Information is growing at an exponential rate. Information contained in enterprises worldwide is expected to reach 120,000 peta bytes by 2012, according to a new survey by IDC (a sister company to CIO’s publisher).  

As information grows, the need for organizations to manage it and make it actionable grows as well. Getting that information in a timely manner—and
1. Conceptual framework of Business Intelligence

1.4 Importance of Business Intelligence

to the right people in the right places, throughout an organization—is an important means to enterprise success.

Here’s a snapshot of today’s information management needs, according to the survey:

- **The amount of information is growing rapidly.** Eighty-one percent of respondents say the amount of information available with which to make decisions has "grown significantly" or "increased a lot."

- **We’ve reached information overload.** Seventy-five percent report feeling overloaded with information, and 40 percent rated their degree of being overwhelmed at 4 on a 5 point scale.

- **The need for timely information is more pressing.** A third of respondents said access to up-to-date information within seconds or hours is critical to their companies.

- **Accessing unstructured information is difficult but increasingly necessary to decision making.** Fifty-five percent of the information dealt with in decision making is unstructured—for example, e-mails, documents, or images—yet two-thirds of respondents use mostly manual methods to search and access such data.

- **To manage the avalanches of information, business intelligence tools are becoming more widespread.** No longer the sole domain of analytical experts in headquarters, single departments or applications, business analytics are used by front-line workers, multiple departments and by users outside the
1: Conceptual Framework of Business Intelligence

1.4 Importance of Business Intelligence

organization. Forty-eight percent of respondents said their front-line staff—call centre, bank tellers, and so on—are making more decisions than last year, and 54 percent said front-line staff had business intelligence solutions to support them. And 24 percent of respondents allow customers to access their business intelligence applications, 21 percent allow suppliers, and 20 percent distributors.

Timely business intelligence has become mission critical to many enterprises. Sixty-four percent of respondents said that if a business intelligence system was down one day or less, they expected a materially negative impact to business operations. Twenty-one percent said negative results would come from a downtime of one hours or less.

Simply put, Management needs information in order to run an effective and profitable company, and information can only come through one way - business activity monitoring. Business performance management, when it is successful, may be exactly the trimming and streamlining touch is needed to make the corporation or small business a driving force in today's information driven economy.

Right information lets Management know what types of changes will shift things in the company toward a more profitable end product, and helps them better know how their competition compares - and, through that information, how to make sure their companies are better than the competition. If the company has good business performance management, it can get a leg up on the competition and deal out the best product for the lowest price - and still get more actual profit than the opponent across the street.
I: Conceptual Framework of Business Intelligence

1.5 Challenges Related to Business Intelligence

Traditional business intelligence projects are costly, complex and risky endeavor. Projects intended to improve management decision making, are most of the time going over budget. There are different types of challenges related to Business Intelligence which are as follows:

A. Business Intelligence Functional Challenges
B. Business Intelligence Technological Challenges

A. Business Intelligence Functional Challenges:

- Management of the company does not have Clarity on Needs & Specifications of Business Intelligence
- Traditional Work Culture of the organization
- Resistance to Change
- Clear understanding on Varied User Needs
- Dependency of Managers on Information Technology

B. Business Intelligence Technological Challenges:

- Information Silos / Varied Format
- Heterogeneous Platforms
- Geographically Dispersed Data
- Single Version of Truth – Missing
- Entity Identity Problem – Master Data (eg.; Banking Services)
- Unstructured Data Source – Possible (eg.: E-mail, Text files etc…)
- Highly Normalized Data from Transactions (Dataware house Demoralized)
- Huge Data Volumes piled over years
I: Conceptual Framework of Business Intelligence

1.6 Ideal Implementation Methodology For Business Intelligence

Business Intelligence Implementation Process Flow:

![Diagram of Business Intelligence Implementation Process Flow]

Figure: 1.6 Business Intelligence implementation Process Flow

Any Business Intelligence Implementation revolve around these tasks:

1.6.1 Requirement Gathering
1.6.2 Need Analysis & Design Phase
1.6.3 Development
1.6.4 Deployment

Project Management is essential to coordinate and orchestrates all the above tasks. As a recommended practice, Business Intelligence Competency Center (Business Intelligence CC) is established within the organization to ensure the overall success of the Business Intelligence Initiatives.
1.6 Ideal Implementation Methodology

For Business Intelligence

1.6.1 Requirement Gathering

This is – probably – the most crucial phase, where the Business Users are involved in a group discussion and interview process. Here, small groups are made based on the functional domain they represent. Many Business Intelligence Initiatives fails – because of the faulty and/or incomplete Requirement Gathering.

Further – this helps is building up a sense of ownership in the Business Users, who are ultimately going to use the Business Intelligence for their informed decision making.

1.6.2 Need Analysis & Design Phase

This phase is based on the Requirement Gathering Process. The noted interviews and storylines narrated by the Business Users are converted into a structured form. The Analytical Themes are derived from the Interviewed Information and the same is mapped to the Business Processes within the Organization. The right set of tools and/or Products are decided based on POC exercise done with the possible vendors in the Business Intelligence Marketplace.

Further in this phase – the Business Processes are mapped with the available Source System Data and various dimensions and measures available within it. Here, the Application is also designed – which will communicate the analyzed information to the Business Users.

1.6.3 Development Phase

Once the design is in place – actual development of the application and the data models starts here. Preselected tools and/or products are used as the platform for this Development Phase.
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1.6 Ideal Implementation Methodology for Business Intelligence

1.6.4 Need Analysis & Design Phase

This is – again – an important phase, where the developed application is deployed across the enterprise. Business User Training plays a major role to ensure that they use the deployed system effectively and efficiently.

It is important to note here – Business Intelligence Initiative is a Continuous Process. Depending upon the changing Market Dynamics and feedback from Business Users, it requires Maintenance and/or Enhancements to the deployed landscape of the application.
1. Conceptual Framework of Business Intelligence

There are two types of approaches to Business Intelligence:

1.7.1 Data Centric Approach to Business Intelligence
1.7.2 Process centric approach to Business Intelligence

### 1.7.1 Data Centric Approach to BI

Data-centric Business Intelligence approach – Issues:

- Business Intelligence creates an artificial barrier between transactional data and historical data, and it does nothing to prevent a tight coupling between applications and data.

- People analyze events and make decisions based on what happened in the past, what is happening right now and what is likely to happen in the future. In the normal decision-making process, people do not put up artificial barriers between these time domains.
I: CONCEPTUAL FRAMEWORK OF BUSINESS INTELLIGENCE

1.7 Approaches of Business Intelligence

Instead of analyzing the past, the present and the future in a seamless way, users are forced to move between tools, processes and methodologies.

Business Intelligence solution providers limit themselves by asking users what they want, rather than asking them what they want it for.

Dealing predominantly with the past, Business Intelligence is relegated to the role of a fancy aggregator of historical data rather than a provider of true, comprehensive intelligence.

Enterprise Data Management (EDM) - a common response to data governance issues, is a heavy-handed solution that may not be sustainable for most companies.

Data-centric Business Intelligence approach – Analytical Landscape:

Figure: 1.8 The Landscape for Analytical Tools
1: Conceptual Framework of Business Intelligence

1.7 Approaches of Business Intelligence

1.7.2 Process Centric Approach to BI

Business Intelligence includes data, rules, documents, organizational structures, roles, key performance indicators, metrics and process models. Originating or linked to business processes, these Business Intelligence units, can provide a common base for Business Process Management (BPM) and Business Intelligence.

By using a integration of BPM and Business Intelligence:
(a) Users will be able to relate Business Intelligence to business processes.
(b) IT architects will be able to relationally link data islands together and offer seamless, end-to-end process visibility to business users.
(c) Business analysts will be able to investigate and document analytical needs as part of the project’s requirements-gathering phase, being empowered to ask their business customers what they want the information for.
(d) Business users will be able to convey their decision-making and analytic needs to IT rather than just requesting a compilation of data.

The systemic collaboration between Business Intelligence and BPM can ensure unparalleled support for focused decision-making:
(a) Users have trust in the quality of data.
(b) Reported metrics are aligned to business priorities.
(c) Information exposes clear courses of action and visibility into the business processes.

This implementation can provide stable foundation for integrating both internal and external data sources into the relevant business process and thus allow full scale:
(a) Corporate Performance Management
(b) Competitive Intelligence
Critical Success Factors (CSF’s) are the critical factors or activities required for ensuring the success of the business. While Implementing Business Intelligence in any organization there are few critical factors which influences success of Business Intelligence.

**Critical Success Factors** have been used significantly to present or identify a few key factors that organizations should focus on to be successful. As a definition, critical success factors refer to “the limited number of areas in which satisfactory results are dependent.”

The CSFs framework outlines how a set of critical factors contributes to the success of a Business Intelligence system implementation. Following implementation success criteria of this research take into account two key dimensions:

- Process performance (i.e. how well the process of a Business Intelligence system implementation went), and
- Infrastructure performance (i.e. the quality of the system and the standard of output).

There are three dimensions of Critical success factors of Business Intelligence implementation as shown in figure 1.9:

- 1.9.1 Organisation dimension
- 1.9.2 Process dimension
- 1.9.3 Technology dimension
1: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

Figure: 1.9 CSFs Framework for Implementation of Business Intelligence System

Note: * denotes the emerging finding from stage 2 multiple case studies
Committed management support and sponsorship has been widely acknowledged as the most important factor for Business Intelligence system implementation. All Delphi participants agreed that consistent support and sponsorship from business executives make it easier to secure the necessary operating resources such as funding, human skills, and other requirements. One interviewee stated firmly, “If you don’t have top level sponsorship — it is doomed!”

Another participant explained the situation this way, “Project Sponsorship has been shown to be the single most important determinant of IT project success or failure.

A Business Intelligence project is no different to any other IT project in this respect . . . Maintaining the commitment and support of the projects sponsor throughout the project — because Circumstances can change over the life of the project.” Many participants also asserted that it is more beneficial if the sponsor is from the business side of the enterprise rather than from the IT sector. Similarly, a study by Watson et al. indicates that the ideal Business Intelligence sponsor should come from a business function. Such a sponsor often has a strong stake in the success of the Business Intelligence initiative. Most importantly, some interviewees highlighted the point that the sponsor should be in serious need of the Business Intelligence capabilities for a specific business purpose.

A Business Intelligence system implementation is an adaptive information improvement initiative for decision support. Some Delphi interviewees further indicated that the typical application-based funding model for implementation of transactional systems does
I: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

not apply to Business Intelligence systems that are evolutionary in nature. That is, a Business Intelligence system evolves through an iterative process of development in accordance with dynamic business requirements.

Therefore the Business Intelligence initiative, especially for the enterprise-wide scale, requires consistent funding and resource allocation directly from senior management to overcome continual organizational issues. Contrary to conventional OLTP-based systems, these organizational challenges arise during the course of the cross functional implementation, as it often uncovers many issues in such areas as business processing, data ownership, data quality and stewardship, and organizational structure. Many functional units tend to focus on tactical gains, ignoring the rippling effects imposed on other business units, and one participating expert observed that, “The whole Business Intelligence effort cut across many areas in the Organization that’s making it very difficult, it hits a lot of political barriers. For instance, for a system owner, they are only interested in delivering day to day transaction, as long as all that done . . . that’s what they care about.”

Therefore the commitment and involvement of senior management is imperative, particularly in breaking down the barriers to change and the ‘states of mind’ within the organisation.

Clear vision and well-established business case:
As a Business Intelligence initiative is driven by business, so a strategic business vision is needed to direct the implementation. Many Delphi participants indicated that a long-term vision, primarily in strategic and organizational terms, is needed to establish a solid business case.
1: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

The business case must be aligned to the strategic vision, thereby meeting the business objectives and needs. If the business vision is not thoroughly understood, it would eventually impact the adoption and outcome of the Business Intelligence system. Speaking to this point, an interviewee emphasized that,

“"In order for Business Intelligence initiatives to be taken seriously and to be supported by corporate leadership, they need to be integrated with the overall strategy. Otherwise they will not receive the leadership support that is required to make them successful. The vision is the tool that leadership can quickly understand and identify the linkages to the corporate strategy.”

Many participants argued that the overriding reason some Business Intelligence projects fail is not due to technical challenges, because many of the technological issues have proven answers. Rather, the most common cause for failure is that the Business Intelligence initiative does not align with the business vision and so fails to meet the core objectives of the business. As a result, the Business Intelligence system will not satisfy the business needs and neither will it satisfy the customers. The possession of a well established business case is important for sustaining organizational commitment to a new Business Intelligence system.

Most interviewees rejected the notion that if an excellent system was established then people would want to use it. In fact, one interviewee claimed that,

“A Business Intelligence system that is not business driven is a failed system!”
I: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

Business Intelligence is a business-centric concept. Sending IT off to solve a problem rarely results in a positive outcome. There must be a business problem to solve.”

Many participants stressed that a solid business case that was derived from a detailed analysis of business needs would increase the chances of winning support from top management. As stated firmly by one expert, “In order for the leadership to support, they must understand; when they understand and can easily explain and provide the support needed. Of course, the business case is an extremely important tool for both leadership and the implementation team.”

Thus, a substantial business case should identify the proposed strategic benefits, resources, risks, costs, and timeline. More significantly, it is important to understand that a Business Intelligence system implementation is not a project, it is a process [4]. That is, Business Intelligence systems are organic in nature. They evolve dynamically and in directions that are not necessarily finite and predictable. For instance, the warehouse data size of most Business Intelligence systems doubles during the first year of operation, and the number of users also increases markedly.

Business-centric championship and balanced team composition:
Most participants believed that having the right champion from the business side of the organization is critical for implementation success. They expressed the view that a champion who has excellent business acumen is always important since he/she will be able to foresee the organizational challenges and change course accordingly. More importantly, this business centric champion would view the Business Intelligence system primarily in strategic and organizational perspectives,
1: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

as opposed to one who might over-focus on the technical issues. For example, one interviewee commented that, “The team needs a champion. By a champion, I do not mean someone who knows the tools.

It means someone who understands the business and the technology and is able to translate the business requirements into a (high-level) Business Intelligence architecture for the system.” In fact, a Business Intelligence initiative often spans multiple functional units and demands extensive data and resources from these business units. In this respect, the champion is critical to ensure the careful management of the organizational challenges that arise during the course of the project. Unlike operational system projects, such challenges include getting system owners to recognize the strategic value of their data and to reflect on how their data interacts with data from other transactional systems. Therefore, the champion needs to ensure collaboration between business units and between the business and the Business Intelligence project team.

Organizations tend to rely on their IT staff to be solely responsible for most system implementation projects. However, Business Intelligence projects are fundamentally different from OLTP projects. The project team must design a robust and maintainable architecture that can accommodate the emerging and changing requirements, this work requiring highly competent team members. Not surprisingly, all interviewees agreed that the composition and skills of a Business Intelligence team have a major influence on the success of the systems implementation. They indicated that the Business Intelligence team should be cross-functional and composed of technical and business personnel, so-called “best of both worlds”.
1: Conceptual Framework of Business Intelligence

1.8 Critical Success Factors in Business Intelligence Implementation

1.8.2 Process Dimension

A Business Intelligence initiative is essentially a business-driven project and is critical for the making of strategic decisions. From a technical perspective, a Business Intelligence project is comparable to a systems integration project and requires the active involvement of the business side of the enterprise.

Typically, the project team has to deal with diverse platforms, multiple interfaces, connection to legacy systems, an array of tools, and so forth. All these tasks call for people with different skills and competencies, and so a suitable mix of technical and business expertise is a key to success. Most experts recommended that a Business Intelligence team should identify and include business domain experts, especially for such activities as data standardization, requirement engineering, data quality analysis, and testing. This enables the system design to be driven by the business and ensures that the Business Intelligence needs derived from business are a driver of the logical data architecture. To enable business users to navigate and manipulate the data model, the structure and model of the data warehouse must be closely related to their perception of the business objectives and processes.

Business-driven and iterative development approach:

The next factor to be considered is the business-driven and iterative development approach. According to most Delphi participants, adequate business-oriented project scoping and planning allow the Business Intelligence team to concentrate on the best opportunities for improvement. Scoping helps in the selection of clear parameters and develops a common understanding among all business stakeholders as to what is in scope and what is excluded. For instance, a Delphi participant
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1.8 Critical Success Factors in Business Intelligence Implementation

gave an in-sight into his experience, “The success of 90 percent of our project is determined prior to the first day. This success is based on having a very clear and well-communicated scope, having realistic expectations and timelines, and having the appropriate budget set aside.”

Most interviewees agreed that thorough scoping and planning facilitate flexibility and adaptability to changing requirements within the time frame and resources. Moreover, adequate scoping enables the project team to focus on crucial milestones and pertinent issues while shielding them from becoming trapped in unnecessary events. As one participant remarked,

“The scope needs to be controlled because ‘scope creep’ can cause a project to not meet its targeted conclusion. That does not mean that you cannot have a change control procedure or practice in place; this is a form of control. I have seen many projects miss their delivery and cost goals because of scope creep.”

Many experts stated that it is advisable to start with small changes and developments and then to adopt an incremental delivery, a so-called ‘iterative’ approach. Large-scale change efforts are always fraught with greater risks given the substantial variables to be managed simultaneously. Moreover, modern businesses are changing very quickly anyway and are always seeking to identify the immediate impacts of those changes, and so an incremental delivery approach is more cautious and provides the tools for delivery of short, measurable steps.

Furthermore, an incremental delivery approach allows for building a long-term solution as opposed to a short term one [1, 4]. As explained by this interviewee, “Adopting incremental delivery manages risks, provides tangible results visible to the client, improves the client’s ability to take
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ownership, eases knowledge transfer, supports effective change management, and allows for long-term solution.”

Therefore, the scope of a Business Intelligence initiative should be selected in such a way that a complete system for a specific business sector can be delivered within a reasonable time, rather than one ‘massive and complete big bang’ solution later on. Once the users start working with the Business Intelligence system, they will fully realize the potential reporting and analysis possibilities. The preliminary Business Intelligence system is then further enhanced and developed in an evolutionary and iterative approach. One interviewee elaborated that, “You cannot roll out the whole Business Intelligence system at once but people want to see some key areas. You need to do data marts for a couple of key areas and then maybe a small number of other key reports in an attempt to keep all stakeholders happy.

Then when the first release is done and you get some feedback, you can work on other data mart areas and enhance existing subject areas over time.”

Therefore, an incremental delivery approach allows an organization to concentrate on crucial issues, so enabling teams to prove that the system implementation is feasible and productive for the enterprise.

User-oriented change management:

Having an adequate user oriented change management effort was deemed critical by most comprised multiple case studies for the purpose of further validating the CSFs findings. The case studies examined whether these critical factors — and/or any other factors — influence the implementation success of Business Intelligence systems participants. They reported that better user participation in the process of change can
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lead to better communication of their needs, which in turn can help ensure successful introduction of the system. Many Delphi participants shared the view that formal user participation can help meet the demands and expectations of various end users. No doubt, users know what they need better than an architect or developer who lacks direct experience of the product.

This is mainly because business users will directly work with the data models without an application layer that conceals the complexity of the model (as is the case in conventional OLTP systems). One Delphi participant commented that, “Users should be an important partner in building and delivering the right system. Without their consistent input, we technicians cannot deliver the right system.”

This view was supported by another participant expert who asked, “How can the project team design and implement a Business Intelligence system to meet the users’ needs without their involvement?” It is evident that key users must be involved throughout the implementation cycle because they can provide valuable input that the Business Intelligence team may otherwise overlook. The data dimensions, business rules, metadata, and data context that are needed by business users should be incorporated into the system and validated against the definition of deliverables. Consequently, user support will constantly evolve in response to organic business requirement and supplementary Business Intelligence applications.

1.8.3 Technological Dimension

Business-driven, scalable and flexible technical framework.

Turning now to technological issues, a key factor emphasized by many Delphi respondents was that the technical framework of a Business
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Intelligence system must be able to accommodate scalability and flexibility requirements in line with dynamic business needs. That is, flexible and scalable infrastructure design allows for easy expansion of the system to align it with evolving information needs. So with a strategic view embedded in the system design, this scalable system framework could include additional data sources, attributes, and dimensional areas for fact-based analysis, and it could incorporate external data from suppliers, contractors, regulatory bodies, and industrial benchmarks. It would then allow for the building of a long-term solution to meet the incremental needs of business, as explained by an interviewee, “Scalability is always concerns to me. It seems that most Business Intelligence applications and systems always seem to grow to be larger than expected or their throughput is greater than anticipated. If the design is not scalable and flexible, it is more difficult to make changes to accommodate the increase in size.”

In fact, a Business Intelligence infrastructure involves all the tasks substantive to path the technical layer for the entire Business Intelligence environment. This includes the implementation of new software and hardware, the interoperability between the legacy systems and the new Business Intelligence environment on a network, as well as on a database level, an administration subsystem and so on. Establishing the technical infrastructure for the initial Business Intelligence solution is always time consuming, but with the proper selection of scalable and flexible hardware and software components, the effort would be minimized for the next delivery cycle. As a consequence, the system will be able to adapt to the emerging and ever-changing business requirements.
Sustainable data quality and integrity.
In regard to the important factor of sustainable data quality and integrity, the Delphi findings indicate that the quality of data, particularly in the source systems, is crucial if a Business Intelligence system is to be implemented successfully. According to most interviewees, a primary purpose of a Business Intelligence system is to integrate ‘silos’ of data for advanced analysis so as to improve the decision-making process. Often, many data related issues within the back-end systems are not discovered until that data are populated and queried within the Business Intelligence system.

Thus data quality at sources will affect the quality of management reports, which in turn influence the decision outcomes. Corporate data can only be fully integrated and exploited for greater business value once their quality and integrity are assured.

Speaking to this point, a Business Intelligence expert asked, “If the data is corrupt then what is the point?” Another interviewee further exclaimed that, “Without quality data the Business Intelligence is not intelligence!” These comments were echoed by another participant, who asserted, “Garbage in garbage out. The user community doesn’t care to understand why the information is wrong and once you have a data integrity issue you are in trouble.”

Many participants believed that common measures and definitions address the data quality dimensions of representational consistency, interpretability and ease of understanding. This allows all stakeholders to know that a term has a specific meaning no matter where it is used across the source systems. It is typical for a large organisation to have many terms with slightly different meanings, because different business units
tend to define terms in ways that best serve their purposes. Often, accurate data may have been captured at the source level, but the record cannot be used with other data sources due to inconsistent data identifiers.

This is because data values that should uniquely describe entities are varied in different business units. A typical Business Intelligence system tends to be cross-functional and cross-departmental, so if only one specific business section is scoped in the initial phase, the business definitions and business rules must later be standardized in order to be understood consistently on an enterprise level.

This characteristic could have an impact on how the business data are interpreted among different units. Once an organisation has accumulated a large number of reports it becomes more difficult to re-architect these areas. As a result, a cross-system analysis is important to help profile a uniform master data set which is in compliance with business rules. There needs to be an organizational agreement on the definitions and measurements that are part of the deliverables. Hence, the development of a master data set on which to base the logical data warehouse construction for Business Intelligence system will ease terminology problems. As a result, the Business Intelligence team would use common definitions to develop an enterprise-wide dimensional model that is business orientated.

In short, this Delphi study was the first step in exploring the CSFs which can influence the implementation of Business Intelligence systems. The results show that there is a combination of multi-dimensional CSFs peculiar to successful Business Intelligence system implementation. More importantly, the study has narrowed the research focus through the identification of a set of CSFs as presented.
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1.9 Variables Affecting Business Intelligence

Organizations embarking on or continuing on their path toward Business Intelligence need to decide how to allocate their scarce human, capital, and IT resources to tasks and projects that have the biggest impact on increasing the diffusion of Business Intelligence throughout their organizations and to their external stakeholders.

Internal Factors – Organizational Behavior & Business Processes:

It is identified that there are five key factors as having the strongest influence on Business Intelligence that have positively influenced Business Intelligence at some of the leading organizations in the world. These factors, which are shown on the vertical axis of Figure 1, are as follows:

1. **Degree of training** is a factor that is based on responses to questions about the satisfaction level with training on the meaning of data, the use of Business Intelligence tools, the use of analytics to improve decision making, and other related enabling indicators of training.

2. **Design quality** refers to the extent to which end users’ expectations about the speed of adding various Business Intelligence solution components by the IT group are met.

3. **Prominence of governance** refers to the existence of and the importance of a data governance group and associated data governance policies to Business Intelligence system design or enhancement initiatives.

4. **Nonexecutive involvement** consists of the level of nonexecutive management’s involvement in promoting and encouraging the design and use of the Business Intelligence solution at the organization.

5. **Prominence of performance management** methodology or predisposition to analytical orientation is based on the existence of and the level of importance within the organization of a formal performance management methodology.
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1.9 Variables affecting Business Intelligence

1.9.1 Internal Factors - Technical

1. **Availability of Source System Data** is an important factor, where the available & qualified data forms the very base of the Analytics being generated. The Data Gathering Process should ensure that the required data is fully gathered within the acceptable latency and the degree of accuracy.

2. **Technology Platform & Tools** selection has to be carefully done after considering the end-to-end need of the organization. It is a recommended practice to build a POC using the possible tools – before the organization decides to invest in the technology / platform.

3. **Networking and Hardware** makes the backbone for the Business Intelligence Implementation. Such Infrastructure Component can actually decide the success or failure of the Business Intelligence Initiatives. We need to make sure; the Business Intelligence Applications are effectively & efficiently used across the Organization Structure and Locations – by providing right Infrastructure.

1.9.2 External Factors

1. **External Data** plays an important role – where traditional Business Intelligence (Business Intelligence) Initiative can expand its footprint to Competitive Intelligence (CI). Availability of business data from external sources like published industry reports, published performance reports of the competitors, Government Policy Decisions & shifts etc can play a vital role in achieving effective CI. This CI can help the organization to be more agile and prepare her for strategic decision making process to gain an edge over the competitors.

2. **External Consultant & Vendor** plays equally important role in the overall success of Business Intelligence. The support provided by them as well as the skill set they posses can have a huge positive impact on the Business Intelligence Initiative.
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1.10 Tools and Techniques used in Business Intelligence Implementation

Business Intelligence Implementation usually involves these Tasks:

1.10.1 Building Data Warehouse
1.10.2 Building Multi Dimensional Analytical Data – Ready to Slice & Dice
1.10.3 Building Data Mining Models – for Extracting Meaningful Patterns
1.10.4 Exception Reporting – Push Based Reporting
1.10.5 Reporting & Dashboard Presentation – with Drilldown Capability

1.10.1 Building Data Warehouse
This Process involves obtaining Operational Data from different Data Silos across the Organization and varied technology platforms. Usually – ETL (Extract Transformation & Load) Tools are used for this process e.g. Microsoft SQL Server Integration Services (SSIS)

1.10.2 Building Multi Dimensional Analytical Data – Ready to Slice & Dice
This facilitates the Business User to look at the Data as Summarized values across multiple faces (Dimension) of the Business. For example, one may be interested in seeing the Sales Figure across a Product Line, Time Line & Geography. Such – Ready to Analyze – Multi Dimensional Data can be built using OLAP Cube Building Tools like Microsoft SQL Server Analysis Services (SSAS)

1.10.3 Building Data Mining Models – for Extracting Meaningful Patterns
Here – the Data Stored within Data Warehouse are trained to give out specific patterns. Such Patterns are very useful in various business applications like:
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1.10 Tools and Techniques Used in Business Intelligence Implementation

- Market Basket Analysis
- Sales Forecasting
- Credit Scoring
- Financial Risk Management – Commodity Trading
- Customer Relationship Management

There are many tools available in the market for data mining, e.g., Microsoft SQL Server Analysis Services (SSAS).

1.10.4 Exception Reporting – Push Based

This is Push Based Reporting Technique – Where the System does not wait for the Business User to request for the specific report. Here - the System Pro-Actively sends the reports to the Business User, based on the predefined exception rules. Such Reports can be sent across multiple possible channels like Mail, Text Message, MMS etc.

Microsoft SQL Server Reporting Services (SSRS) can be used for such tasks.

1.10.5 Reporting & Dashboard Presentation – with Drilldown Capability

This is Pull based Reporting – where Business Users are expected to explicitly ask for the report and/or Dashboard. The user can further Drilldown to the detailed grain.

Microsoft SQL Server Reporting Services (SSRS) can be used for such tasks.
1.1 Limitations of Business Intelligence

Limitations of Business Intelligence Technology are as follows:

- This is a time consuming and capital intensive exercise – where the possibility of failure is proportionately large. Hence Business Intelligence Initiative has a Political Importance within the Organization, where it needs to have a support and involvement from the top level.

- Data analysts and business intelligence tools do not directly generate revenue. Hence quantifying ROI is not a direct & straight forward process.

- Analysis done & Trends Extracted are as good and accurate as the underlying data. Hence, issue with the data can impact hugely on the decision making process and its success factor.

- Effective use of Business Intelligence would involve a large scale shift in the work operations as well as decision making process of business users – at all the levels. This would demand for a different mind set and work culture. Hence, this change management – which could initially be resisted – should be carefully and tactfully done.

- Business Intelligence is a continuous process. Hence – unlike other development projects – it does not have a logical end where it can be concluded as complete. This would demand for an additional investment, even after the first defined phase of Business Intelligence is implemented.
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Business Intelligence is a set of methodologies, processes, architectures, and technologies that transform raw data into meaningful and useful information used to enable more effective strategic, tactical, and operational insights and decision-making.

Successful Implementation of Business Intelligence Initiatives is largely depends upon the Functional Experts and Visionary rather on Technical Experts. Ideally Business Intelligence Implementation has to be a Business Process Oriented Approach and not the Data Oriented Approach.

Though – a Successful Implementation of Business Intelligence can have an impressive ROI for this Resource Intensive Initiative, the risk of failure is substantially high. Hence, It should be implemented by adopting proven and structured methodologies like suggested by Business Intelligence Guru Ralph Kimball.
1. IBM, 2005
2. Seible, 2005
3. Cognos, 2004
4. Moss & Hoberman, 2005
5. Oracle, 2005
6. Competitive Intelligence (Cl), Chinese genera Sun Tzu
7. "BI" coined in 1989 by Howard Dresner - a Research Fellow Gartner Group
8. Business Intelligence for Enterprise by Mary Sudul - Pearson Education, Inc
9, 10, 11. Roger T. Ames and Henry Rosemont Jr - The Random House Publicizing
12. Critical Success Factors for Business Intelligence System, by - William Yeoh, Andy Koronios - University of South Australia