# Establish new reports and new inquires through usage of Business intelligent tools to handle the defects of the current reports and inquires - Ministry of state for environmental affairs – Egypt

**Nedal M. Elsaid [(1)], Ahmed E. Okasha [(2)] & Abdalla A. Abdelghaly [(3)]**

1. Nedal M. Elsaid is currently pursuing Doctor of Philosophy (Ph. D.) degree in Euro Mediterranean Studies Department, Faculty of Economics and Political Science, Cairo University, Egypt.
2. Dr. Ahmed E. Okasha is lecturer in Social-Science Computing Department, Faculty of Economics and Political Science, Cairo University, Egypt.
3. Dr. Abdalla A. Abdelghaly is Professor in Statistics Department, Faculty of Economics and Political Science, Cairo University, Egypt.

## Abstract

*Business intelligence (BI) systems combine operational data with analytical tools to present complex and competitive information to planners and decision makers. The objective is to improve the timeliness and quality of inputs to the decision process. Business Intelligence is used to understand the capabilities available in the firms and the institutions.*

*Although business intelligence systems are widely used in industry, research about them is limited. This research is aiming to provide more insight that determines, analyses and solves the current reports and inquires defects for the ministry of state for environmental affairs which it is one of the most critical issues effect the decision makers.*

***Keywords:****Data warehouse, Data mart, BI, Business Intelligence,BI Methodology, BI Data framework.*



## 1. Introduction

Business intelligence (BI) applications are decision support tools that enable real time, interactive access, analysis and manipulation of mission critical corporate information which it is the ability of an organization to collect, maintain, and organize data [05]. This produces large amounts of information that can help develop new opportunities. Identifying these opportunities, and implementing an effective strategy, can provide a competitive market advantage and long term stability [06].

BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers. Implicit in this definition is the idea (perhaps the ideal) that business intelligence systems provide actionable information delivered at the right time, at the right location, and in the right form to assist decision makers. The objective is to improve the timeliness and quality of inputs to the decision process, hence facilitating managerial work [07].

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, predictive analytics and prescriptive analytics [02].

In all cases use of business intelligence is viewed as being proactive. Essential components of proactive BI are[03]:

- Real-time data warehousing,
- Data mining,
- Automated anomaly and exception detection,
- Proactive alerting with automatic recipient determination,
- Seamless follow through workflow,
- Automatic learning and refinement,
- Geographic information systems
- Data visualization

Firstly, we discuss the concept of BI and the different between Business Intelligence & data warehouse. Secondly, we focus on BI objectives and suggested methodology of Building BI in order improve the Reports and the Inquires for Environmental Affairs. Thirdly, we discuss the base of Building and Implementing BI Systems including the data framework of BI. Finally, we discuss the success factors which impact the BI system implementation.

## 2. Business intelligence and data warehousing

Often BI applications use data gathered from a data warehouse or a data mart. However, not all data warehouses are used for business

intelligence, nor do all business intelligence applications require a data warehouse.

To distinguish between the concepts of business intelligence and data warehouses[18], the researchers often defines business intelligence in one of two ways:

Using a broad definition: "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". When using this definition, business intelligence also includes technologies such as data integration, data quality, data warehousing, master data management, text and content analytics, and many others that the market sometimes lumps into the information management segment. Therefore, the data preparation and data usage are two separate, but closely linked segments of the business intelligence architectural stack [17].

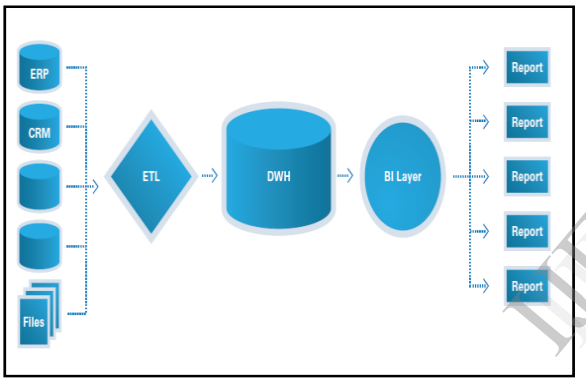


FIGURE 1 The diagram shows data flowing from left to right.

On the left are multiple source systems, which often include Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) data (see FIGURE 1).

Most BI projects will have an Extract, Transform, and Load (ETL) component. ETL refers to the technologies that move data between systems. All projects with an ETL component will need to consider how to handle data of dubious quality.

The data supporting a BI application resides in the Data Warehouse (DWH). Though most modern BI tools can report from many sources and many types of data, the most common source is still the data warehouse. Some projects will report from data marts, which are smaller subsets of a DWH, or an Enterprise Data Warehouse (EDW) which is a data warehouse that attempts to include all important data for a company or enterprise. The structure of the tables in the DWH is the data model, and is the most important component of any BI system [05].

The diagram shows a "BI Layer" between the DWH and the reports. Different tools call this layer by different terms: project, universe, catalog, cube, framework, or semantic layer" [05]. Depending on the tools used, this layer is either an abstraction of data stored within the DWH, or a copy on disk or memory (often in a proprietary format) that allows easy, fast, and consistent reporting [06].

The reports themselves are usually fairly straightforward to build once the data has correctly been loaded into the DWH and the BI Layer has been properly built. The "trivializing" of report building is one significant benefit of BI. The goal of many BI projects is to enable business people to build their own reports and do their own analysis rather than leaving the report writing to IT [16].

## 3. BI systems objectives

BI systems may be analyzed from different perspectives. Decision makers and organizations should predominantly associate BI with organizational implementation of specific philosophy and methodology that would refer to working with information and knowledge, open communication, knowledge sharing along with the holistic and analytic approach to business processes in organizations. BI systems are assumed to be solutions that are responsible for transcription of data into information and knowledge and they also create some environment for effective decision making, strategic thinking and acting in organizations. Value of BI for business is predominantly expressed in the fact that such systems cast some light on information that may serve as the basis for carrying out fundamental changes in a particular enterprise [13].

BI supports decision making on all levels of management regardless of the level of their structuralisation. On the strategic level, BI makes it possible to set objectives precisely and to follow realization of such established objectives. BI allows for performing different comparative reports, e.g. on historical results, profitability of particular offers, effectiveness of distribution channels along with carrying out simulations of development or forecasting future results on the basis of some assumptions [10].

On the tactical level, BI Systems may provide some basis for decision making within marketing, sales, finance, capital management, etc. The systems allow for optimizing future actions and for modifying organizational, financial or technological aspects of company performance appropriately in order to help enterprises realize their strategic objectives more effectively [04].

With reference to the operational level, BI

Systems are used to perform ad hoc analyses and answer questions related to departments' ongoing operations, up-to-date financial standing, sales and co-operation with suppliers, customers, etc. Observation of different cases of BI systems allows for stating that the systems in question may support data analyses and decision making in different areas of organization performance, particularly including the following [14]:

- Financial analyses that involve reviewing of costs and revenues, calculation and comparative analyses of corporate income statements, analyses of corporate balance sheet and profitability, analyses of financial markets and sophisticated controlling;
- Marketing analyses that involve analyses of sales receipts, sales profitability, profit margins, meeting sales targets, time of orders, actions undertaken by competitors, stock exchange quotations;
- Customer analyses that concern time of maintaining contacts with customers, customer profitability, modeling customers' behavior and reactions, customer satisfaction, etc.;
- Production management analyses that make it possible to identify production 'bottlenecks' and delayed orders, thus enabling organizations to examine production dynamics and to compare production results obtained by departments or plants, etc.;
- Logistic analyses that enable to identify partners of supply chain quickly;
- Analyses of wage related data including wage component reports made with reference to the type required, reports made from the perspective of a given enterprise, wage reports distinguishing employment types, payroll surcharges, personal contribution reports, analyses of average wages, etc.; and
- Personal data analyses that involve examination of employment turnover, employment types, presentation of information on individual employee's personal data, etc.

From a technical perspective, BI systems offer an integrated set of tools, technologies and software products that are used to collect heterogenic data from dispersed sources in order to integrate and analyses data to make it commonly available. BI tasks implicate a technological structure of the BI systems. The structure in question consists of the following modules [06]:

- Tools to extract, transform and load data (ETL, Extraction-Transformation-Load tools) they are mainly responsible for data transfer from transaction systems and the internet to data warehouses;
- Data warehouses - they provide some room for thematic storing of aggregated and already analysed data; analytic tools (OLAP, On-Line Analytical Processing) - they let users access, analyse and model business problems and share information that is stored in data warehouses;
- Data mining tools - they enable their users to discover various patterns, generalizations, regularities and rules in data resources;
- Tools for reporting and ad hoc inquiring - they allow for creating and utilizing different synthetic reports; and
- Presentation layer - applications including graphic and multimedia interfaces whose task is to provide users with information in a comfortable and accessible form.

To recapitulate, the most important components of the BI technological infrastructure consist of key information technologies that are related with data acquisition along with storing (ETL tools and data warehouses) and information technologies potential that mainly refers to versatile analyses of data along with presentation of data (OLAP techniques and data mining).

## 4. Improvement of Reports and Inquires for Environmental Affairs

The National Environmental Action Plan (2002-2017), identifies the need to consider multilateral environmental agreements (MEAs) and their associated obligations for incorporation into national policies and plans. It mentions that monitoring and evaluation, particularly with regard to information management, is the "most significant constraint to effective environmental policy making and implementation in Egypt" [20].

The need for a "unified methodological framework" for monitoring activities is identified as essential, together with the need to synchronize data collection, storage, accessibility and usability. Moreover, the Minister of State for Environmental Affairs (MSEA) most recent policy directives include "supporting the multilateral environmental agreements to which Egypt is a signatory" [20].

Although an integrated monitoring, evaluation and reporting system for the MEAs created and used to monitor and report the implementation of MEAs in Egypt, The current approach does not have an unified methodological framework and data collection and management is not standardized. The existing set of environmental indicators is not comprehensive and does not respond to the information requirements which it needed the officials standards, norms and procedures are in place and use by the relevant institutions on the other hand the government particularly its relevant Ministry, the MSEA should pursues its policies and budget support to

integrate the 3 Rio conventions monitoring and reporting obligations into the national environmental monitoring and reporting system [08 , 09, 12].

Also the current regulation is not comprehensive for the implementation of an adequate national environmental monitoring system. so the government of Egypt is required to improve its related regulatory framework by stating roles and responsibilities of relevant agencies, as well as set of regulations stipulating of all relevant agencies in monitoring and reporting on the implementation of the Rio conventions [19].

In turn, these constraints affect others. In this respect, proper monitoring, evaluation and reporting is a necessity for a more effective implementation of the conventions obligations at the national level, not only for its own sake, but also for other constraints directly or indirectly dependent on it. Inadequate monitoring, evaluation and reporting for the activities and obligations of the three Rio Conventions in Egypt are a consequence of a number of factors. These primarily entail the following [11, 12]:

- Data collection and management is carried out by a variety of different entities.
- Poor coordination between entities responsible for the data collection and management.
- Weak integration of technical and scientific expertise.

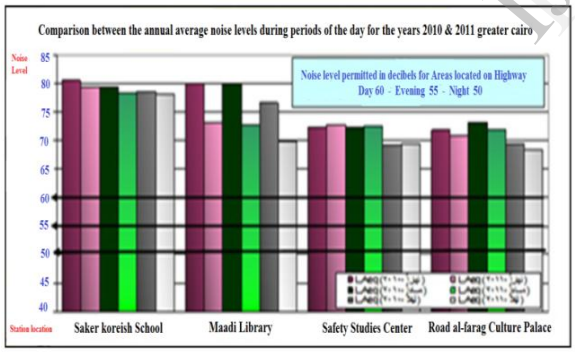


FIGURE 2 static reports sample - Areas located on Highway report – ministry of state for environment – network of monitor noise levels

### Summary analysis for the current reports and inquires:

- **Control size of report results:** Control the size of report results by limiting the number of rows in the report definition.
- **Change the contents of the report:** The system administrator modifies static reports programmatically.
- **Export report results to Microsoft Excel**: You cannot export a static report to Microsoft Excel or any other platform.
- **Create new report definitions**: The system administrator can modify static reports programmatically.
- **Delete report definitions:** Cannot delete custom static report definitions static report definitions.
- **Save completed reports:** Completed static reports are stored with their data in the Completed Reports module in Business Desk.
- **Use the drill through feature to view additional report data for selected reports:** The drill through feature is not available for static reports.

## 5. Suggested Methodology of Building BI Systems

Building and implementing BI systems require organizations to have some culture of working with information and information technologies, which is related to [06]:

- thorough and ongoing research into organizations' informational needs (present and future);
- authentic co-operation of the users involved (i.e. decision makers and operational personnel) with organizations IT departments and knowledge management centers;
- information sharing and
- abilities to interpret analyses and use such analyses in management properly.

Suggesting the methodology of building and implementing BI systems, the authors have benefited from sound business practices set by enterprises that succeed in building BI systems. Any general model to be suggested may be a set of guidelines and some kind of a pattern for organizations that want to use any BI system. The model in question pays particular attention to the role of end users in the whole life cycle of the BI systems including the phase of the BI usage in particular.

Parameterization of the BI system carried out by its user is required for its correct performance. Such parameterization involves providing repositories with knowledge (employees, customers, suppliers or co-operators). Using BI systems will succeed in business only when their users keep [17]:

- Identifying and modeling knowledge;
- Monitoring and modifying data repositories;
- Creating their own analyses and reports;
- Learning how to interpret results and ask sophisticated questions; and
- Improving business and decision making on the ongoing basis

All the above has to be manifested in the system performance. Taking into account significant influence users have on the BI system performance allows for suggesting two major iterative stages in the approach to building and creating the systems in question.

## 6. Building and Implementing Business Intelligence Systems

Designing the data views which are helping in the target database (a repository), where data from source bases will be sent and creating a design of a data warehouse that serves as a basis for loading a BI system. Such a design should be created in order to provide easy configuration of database related reporting and querying mechanisms [05]. on the other hand in order to make sure that a data warehouse is systematically updated to include data that come from e.g. transaction systems, it is necessary to create also mechanisms of data import.

Such mechanisms ought to allow for importing all data and should enable users to perform incremental import that only requires processing of data that have reached source systems since the last import. Incremental import does not burden source systems and mechanisms of data processing. Mechanisms of data transfer simultaneously perform a controlling function that is responsible for data consistency. Import procedures are created so that they could record erroneous data to be then transferred to a repository base, which enables to correct the data in the place of their origination, and subsequently to transfer such data to the base [03].

It is necessary to provide for a few or at least two groups of reports. The report form should cover predefined reports that are systematically updated by potential users. Such a group should also provide more advanced users with some possibilities to create their own reports according to their individual needs. The latter type of reports and reporting involves reports that result from unexpected individual needs that concern details to be found in data [07].

Many enterprises will need to use multidimensional analyses, which means that a BI solution ought to aim at OLAP modules (that let users mine and view data in different perspectives) and data mining (that contributes to better understanding of customers' preferences, nature of such preferences, supply chain, geographical impacts, etc.) Depending on the specifics and needs of organizations[14]:

A layer of data presentation is an important element of BI systems. With reference to the above, it is necessary to pay much attention to designing an interface. Development of interfaces is clearly influenced by two tendencies. The former involves application of a spreadsheet as an interface. For instance, Oracle provides business users of its Oracle database with a possibility to use

## 7. DATA FRAMEWORK FOR BI

BI requires analysts to deal with both structured and semi-structured data [10].The term semi structured data is used for all data that does not fit neatly into relational or flat files, which is called structured data. We use the term semi-structured (rather than the more common unstructured) to recognize that most data has some structure to it. For example, e-mail is divided into messages and messages are accumulated into file folders.

One implication of the BI framework is that semi-structured data are equally important, if not more, as structured data for taking action by planners and decision makers. A second implication is that the process of acquisition, cleanup, and integration applies for both structured and semi structured data [15].

To create business intelligence information, the integrated data are searched, analyzed, and delivered to the decision maker. In the case of structured data, analysts use Enterprise Resource Planning (ERP) systems, extract-transform-load (ETL) tools, data warehouses (DW), data mining tools, and on-line analytical processing tools (OLAP). But a different and less sophisticated set of analytic tools is currently required to deal with semi structured data.

The transition between structured and semi-structured data types and between internal and external data sources is not defined sharply. For example, semi-structured data from e-mail and Web sites deal with both internal and external data sources intranets and extranets for Web sites. Nevertheless, this matrix is useful to guide research and to view the available analytic tools for BI. For example, ERP systems capture operational (internal) data in a structured format, whereas, CRM focuses on customer (external) information[18].

BI architecture for structured data axes on a data warehouse. as example The data are extracted from operational systems and distributed using Internet browser technologies (Figure 3). The specific data needed for BI are downloaded to a data mart used by planners and executives. Outputs are acquired from routine push of data from the data mart and from response to inquiries from Web users and OLAP analysts [17]. The outputs can take several forms including exception reports, routine reports, and responses

to specific request. The outputs are sent whenever parameters are outside pre-specified bounds.

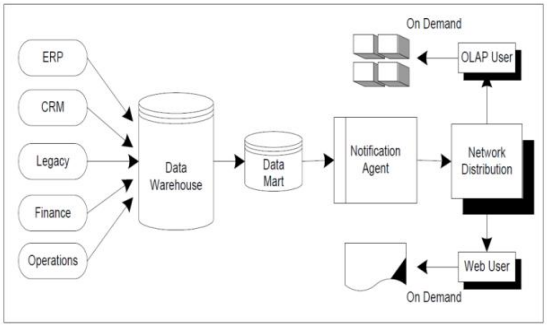


Figure 3. Typical BI Architecture for Structured Data

## 8. Case Study: Business Intelligence Application

In order to have a real case study to apply the BI application, we have chosen a data mart of the monitor noise measurement for developing an application of environment affair- Egypt

The evaluation of the noise value is a difficult task with respect to a business one. The major difference is that in the business environment hard metrics, such as price or amount. Such hard metrics are not applicable to the environment affair for the most activities. It is fundamental to develop an application that enables environment Ministry - Egypt to measure the success or failure of environment affair activities.

In particular, data mart contains data the noise measurement enrolled to the environment affair. This data mart has been designed through the integration of the logical schemas of two transactional databases: (a) (Noise record per each major area include the entry places), that is the current database that supports all the administrative processes and services to the requesters and users in accordance with the environment affair; and (b) secondary database that stores noise residual historical.

The database (a) and the database (b) represent also the repository of data used to feed the data mart, after the Extraction Transformation Loading (ETL) process. The data mart's logical model can be thought of as a set of data cubes, whose main dimensions are: noise record , noise level , major areas study; these are the base dimensions, because they represent the minimum information to express what , where and when aggregation levels for business analysis. According to these coordinates, it is possible to find data; a single datum is stored in a cell of the cube and it represents the value of a measure; a measure is the quantitative description of a fact; and, in a business context, a fact is a meaningful event to be analyzed.

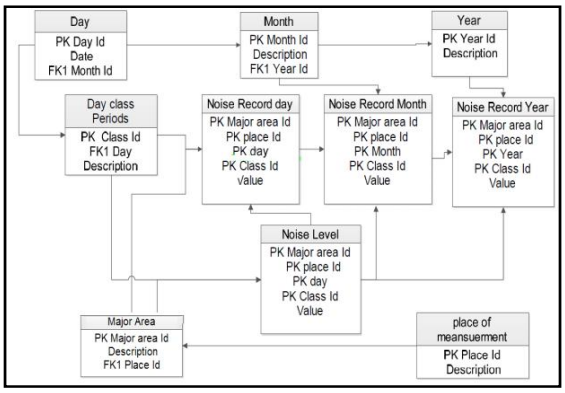


Figure 4. The noise database model diagram

A dashboard is a collection of different visual elements usually charts arranged on a single web page, providing a summary of the most important results or findings related to a particular subject.

Dashboards can be connected to live data that is automatically updated in real time, or based on a completed survey project or other finite datasets which it can come from multiple datasets.

Dashboards should be accessible on any internet capable device anytime and anywhere, providing a significant advantage over traditional static reports. we can create free dashboards that are accessible only by specific people. You simply create a user ID for each person who should have access and then set the appropriate permissions.


Figure 5.log in as authorization menu for the prospective system

The dashboard may also contain interactive charts, which allow the viewer to make changes to the chart to show different data, different breakdowns, and different filters, enabling them to run multiple scenarios and uncover new insights on the fly .

The examples below shows a dashboard containing four charts relating to a particular noise records data, showing noise stander level and several other metrics. This single dashboard

provides an instant view of all the key performance indicators.

Being able to see these results graphically and control how the information is displayed is a major advantage of dashboards over static charts and reports. Dashboards bring the data to life and enable a level of analysis that can be performed by anyone, While viewing the different charts in this sample dashboard, a user may want to see the data in a different way:

- Sliced by Major Areas or place of measurement..
- Showing Noise levels permitted.
- Showing more than one year of data.
- Showing the thirds breakdown instead of day

By using an interactive chart in this dashboard, you can provide the user with those options, as shown below.

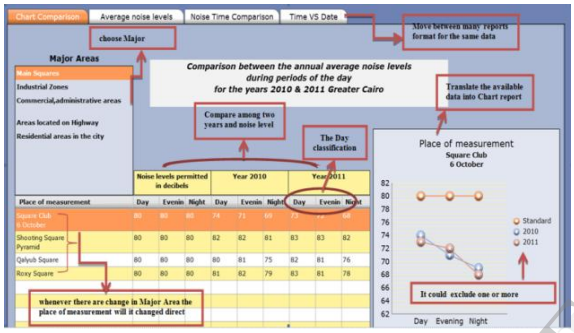


Figure 6. The Monitor Noise Chart Comparison Report (Proposed BI application)


Figure 7. The Monitor Noise Time VS Date Report (Proposed BI application)

### Summary analysis for the proposed reports and inquires

- **Control size of report results:**Control the size of report results by not displaying detailed data.
- **Change the contents of the report:**Use the PivotTable feature to add and remove dimensions and measures from the report results, specify filters, and expand or collapse dimension levels..
- **Export report results to Microsoft Excel**: can export the results of a dynamic report to Microsoft Excel or platform.
- **Create new report definitions**: can modify existing dynamic reports or create new ones based on a SQL Server query or an OLAP cube. .
- **Delete report definitions:**can delete custom dynamic report definitions. You cannot delete default dynamic report definitions.
- **View report results as a chart:** can view completed dynamic reports as Pivot Charts.
- **Use the drill through feature to view additional report data for selected reports:**For dynamic OLAP reports you can double-click a cell in the PivotTable data area to retrieve the detailed data for that cell.

## 9. Success factors of implementation

Before implementing a BI solution, it is worth taking different factors into consideration before proceeding. these are the three critical areas which need to assess within our organization before getting ready to do a BI project [01]:

1. The level of commitment and sponsorship of the project from senior management.
2. The level of business need for creating a BI implementation.
3. The amount and quality of business data available.

### 9.1. Business sponsorship

The commitment and sponsorship of senior management is according the most important criteria for assessment. This is because having strong management backing helps overcome shortcomings elsewhere in the project. However, "even the most elegantly designed DW/BI system cannot overcome a lack of business management sponsorship" [05].

It is important that management personnel who participate in the project have a vision and an idea of the benefits and drawbacks of implementing a BI system. The best business sponsor should have organizational clout and should be well connected within the organization [06].

It is ideal that the business sponsor is demanding but also able to be realistic and supportive if the implementation runs into delays or drawbacks. The management sponsor also needs to be able to assume accountability and to take responsibility for failures and setbacks on the project.

Support from multiple members of the management ensures the project does not fail if one person leaves the steering group. However, having many managers work together on the project can also mean that there are several different interests that attempt to pull the project in different directions, such as if different departments want to put more emphasis on their

usage. All stakeholders in project should participate in this analysis in order for them to feel ownership of the project and to find common ground [07].

### 9.2. Business needs

Because of the close relationship with senior management, another critical thing that must be assessed before the project begins is whether or not there is a business need and whether there is a clear business benefit by doing the implementation. The needs and benefits of the implementation are sometimes driven by competition and the need to gain an advantage in the market. Another reason for a business-driven approach to implementation of BI is the acquisition of other organizations that enlarge the original organization it can sometimes be beneficial to implement DW or BI in order to create more oversight [10].

Companies that implement BI are often large, multinational organizations with diverse subsidiaries. A well designed BI solution provides a consolidated view of key business data not available anywhere else in the organization, giving management visibility and control over measures that otherwise would not exist [13].

### 9.3. Amount and quality of available data

Without accurate and complete data, it does not matter how good the management sponsorship or business-driven motivation is. Without proper data, or with too little quality data, any BI implementation fails. Before implementation it is a good idea to do data profiling. This analysis identifies the content, consistency and structure of the data. This should be done as early as possible in the process and if the analysis shows that data is lacking put the project on the shelf temporarily while the IT department figures out how to properly collect data [07].

When planning for business data and business intelligence requirements, it is always advisable to consider specific scenarios that apply to a particular organization, and then select the business intelligence features best suited for the scenario [06].

Often, scenarios revolve around distinct business processes, each built on one or more data sources. These sources are used by features that present that data as information to knowledge workers, who subsequently act on that information. The business needs of the organization for each business process adopted correspond to the essential steps of business intelligence. These essential steps of business intelligence includes but not limited to [05]:

- Go through business data sources in order to collect needed data.
- Convert business data to information and present appropriately.
- Query and analyze data.
- Act on those data collected.

## 10. Conclusion

Although an integrated monitoring, evaluation and reporting system for the MEAs created and used to monitor and report the implementation of MEAs in Egypt, The current approach does not have an unified methodological framework and data collection and management is not standardize, The existing set of environmental indicators is not comprehensive and does not respond to the information requirements which it needed the officials standards.

Building and implementing BI systems is one of the essential need in order to conduct "unified methodological framework" for monitoring activities is identified as essential, together with the need to synchronize data collection, storage, accessibility and usability.

Business intelligence systems combine operational data with analytical tools to present complex and competitive information to planners and decision makers. The objective is to improve the timeliness and quality of inputs to the decision process. Business Intelligence is used to understand the capabilities available in the firms and the institutions

Each methodology of information system designing and implementing should be characterized by certain canons. In case of BI systems particular attention ought to be paid to the following issues:

- BI systems should be rapidly implemented, which is quite difficult because such systems are specific for each enterprise. Although basing on standard components shortens time required to build BI, each implementation necessitates adjusting of a particular system to specific requirements of an enterprise.
- BI solutions ought to be flexible. As soon as business changes, organizations should adjust their BI systems to new conditions.
- BI systems ought to be independent of their hardware and software platforms. Hence, it is recommended that a system of multidimensional analyses should co-operate with different bases (e.g. DB/2, Oracle, SAP, or MS SQL Server) and work in already tested and commonly applied operation systems (e.g. Windows, Unix or OS/400). Such solutions will

allow for better adjusting the system in question to information technology related infrastructure of an enterprise.

- While creating BI systems, it should be necessary to pay some attention to the fact that there are different information technology systems in organizations (e.g. transaction systems, ERP, etc.).
- BI solutions have to be saleable. Flexibility and open architecture allow for easy expansion of the system. It is necessary in a situation when there are new informational needs or when an amount of information to be processed remarkably increases).
- BI systems should be based on modern technologies. It is necessary to pay much attention to solutions provided by household names of the computer industry. Only then, it is possible to expect stability and reliability of purchased technologies.
- BI systems pose a chance for the effective management of an enterprise. However, they require analysts', designers' and users' high business, information and organizational culture. Skills to identify, model (in the processes and organization structures) and share knowledge constitute only some factors that determine a correct development of the BI systems.

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