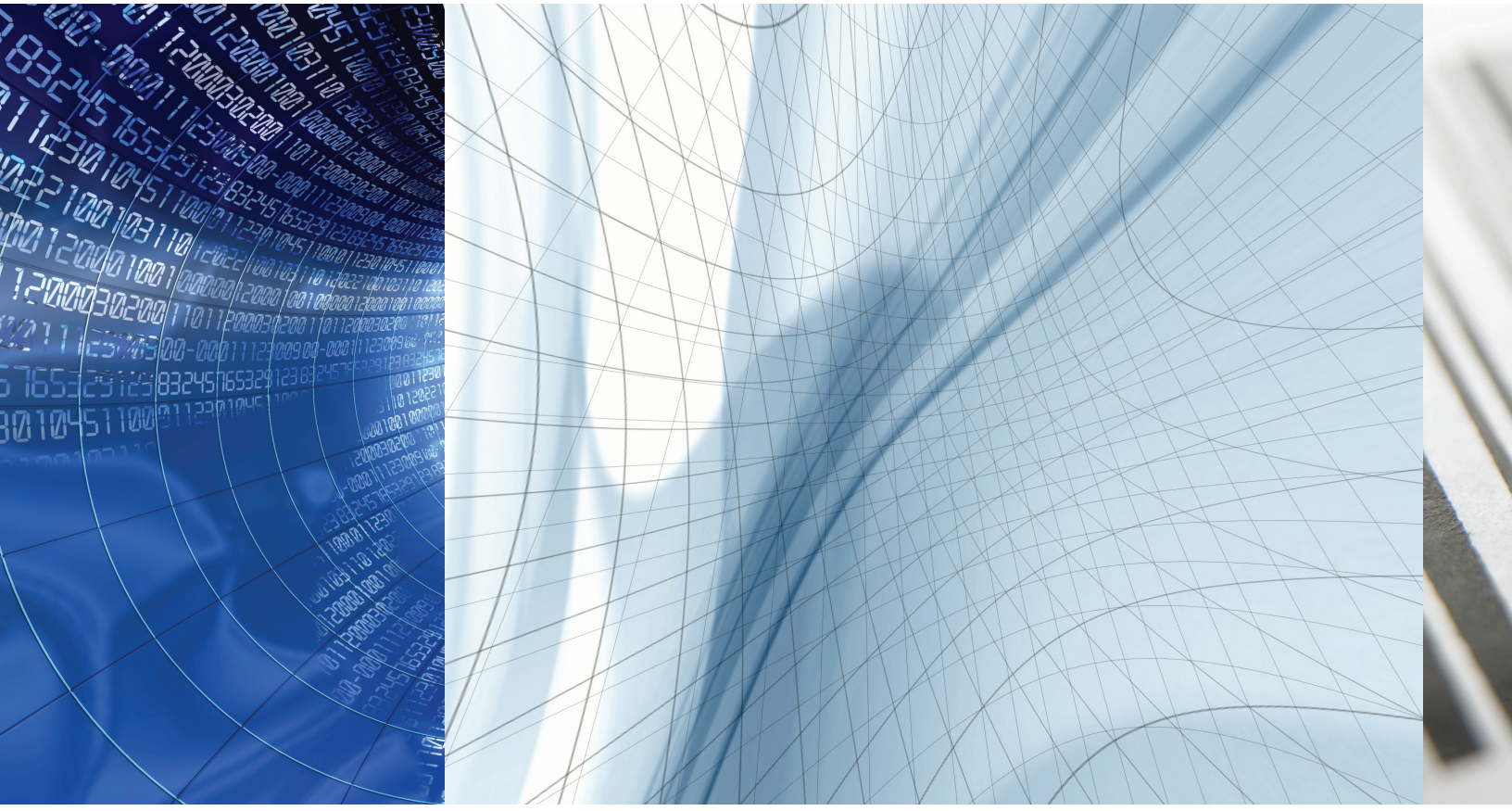
AICPA | IT Section

Business Intelligence in the Enterprise

A Framework for Enterprise Business Reporting



IT Executive Committee
Business Intelligence
Workgroup

1 Introduction

Business Intelligence (BI) has been a buzz word in the business community for many years now. Last year it ranked #8 on the 2008 AICPA Top Technology Initiatives (www.aicpa.org/toptech) survey, indicating that it was no longer just hype, but a valid business initiative that involve CPAs. This year one of BI's core components, *Application and Data Integration* broke into the #8 spot on the 2009 survey, showing that many organizations are now focusing this year on building their BI foundation.[i]

Some experts also believe that access to quality information and high performing business processes are among the last remaining points of competitive advantage. The previous paper in this series looked at how BI can help provide insight to improve decision making and drive competitive advantage in a variety of areas: customer analytics, financial analytics, and operational analytics. It also identified the key success factors and risks involved in the planning and on-going management of Enterprise Business Intelligence (EBI) initiatives.

However, many BI initiatives have humble beginnings as business reporting projects. Whether to support the publishing of financial performance reports (e.g., department profit and loss statements or budget vs. actual analysis) or weekly operations reporting (e.g., weekly sales or production volumes) these projects all utilize the same basic framework and technologies.

Utilizing a standardized project framework and reporting architecture from the beginning of these initiatives enables some consistency in their development and deployment—providing a unified structure for the project team to work in and reducing the risk of failure. It also enables them to be later integrated with less effort, and additional projects can be brought into the reporting architecture reducing their cost and time to deploy.

What is a reporting architecture? It's a structure that helps to drive the basic design and flow of data from disparate data sources (e.g., general ledger system, payroll system, or purchasing system) that are brought together into a unified reporting environment. Enterprise Business Reporting (EBR) is then driven off of the unified data structure, enabling enhanced consistency of data and ease of report generation and distribution.

CPAs, especially those familiar with information systems, can play a critical role in the success of a business reporting initiative—particularly at the enterprise level. Core CPA competencies such as performance measurement and quantitative analysis, as well as their innate understanding of transaction flow and cross-departmental business processes, makes them one of the few people with the prerequisite knowledge and understanding of the organization to ensure that the reporting architecture is appropriately designed. CPAs should seize on this opportunity to demonstrate the value of insightful reporting and guide the development of their firm's, company's, or client's business reporting architecture.

This paper describes a basic reporting architecture and provides a simple framework for starting and managing a business reporting project. Read on to learn how you can ensure that your business reporting project is a success.

1.1 Objective of this Discussion Paper

The AICPA Information Technology Membership Section's **Business Intelligence in the Enterprise: A Framework for Enterprise Business Reporting** is intended to provide a model that readers can use to:

- Start an enterprise business reporting project;
- Adopt into their organization's current enterprise business reporting initiative; or
- Enhance their existing business information architecture.

The adoption of the models presented in this paper can help to ensure or enhance the success of these initiatives.

[i] Note: Due to the change in ranking of the top technology initiatives in 2009, the previously planned second paper in this series, "A Framework for BI Maturity", has been replaced with this paper which is more directly related to Application and Data Integration.

This paper describes a basic business reporting architecture and provides the necessary background information to enable the reader to understand the architecture's potential applicability for their organization. The paper also provides practical guidance for initiating and managing an EBR initiative (versus a business unit only initiative) by explaining leading practices and identifying project risk factors that must be addressed to ensure the success of any business reporting project.

After reading this paper, readers should be able to help evaluate existing EBR projects to identify areas of potential risk, as well as review existing business reporting architectures to help identify where they may need to be modified to conform them to an enterprise standard that incorporates proper internal controls over application and data integration—for example, completeness and accuracy of data as it is aggregated and distributed for reporting.

While this discussion paper is intended to provide CPAs with an overall understanding of the development of an EBR program, depending on the CPA's expertise and/or comfort level with information technology (IT), or that of their staff and coworkers, they may need to seek the services of an outside professional to aid in the development or deployment of EBR capabilities or remediate deficiencies in an existing EBR architecture.

The AICPA will be offering Web-based education to complement this document and has already published a paper, *Business Intelligence in the Enterprise: A Strategic Overview for the CPA*, providing guidance in the development of an EBI strategy, including discussion of the risks and potential benefits of EBI initiatives. The next paper in this series will also provide an introduction to BI "technology basics", intended to provide non-IT professionals the basic knowledge of IT terms and concepts that they need to intelligently discuss BI technologies and technical practices with IT professionals. Additional, in-person education is also available through the annual AICPA TECH+ Conference (www.cpa2biz.com/tech).

1.2 Who Should Be Reading This

This paper is intended to be of assistance to anyone who is involved in the formation and management of enterprise-level capabilities related to BI (i.e., an EBI program) or the actual execution of an EBR initiative, including efforts to improve performance or financial reporting, and provide management with information that is more insightful and actionable.

This paper is written to present EBR from the perspective of the CPA, and as such, assumes a certain level of understanding regarding concepts and practices common to the CPA profession. However, because BI and business reporting as a whole is not a CPA-specific domain, much of the guidance presented in the paper is applicable to any professional involved in BI and business reporting from the "business-side" rather than the "technical-side".

Each of the relevant organizations and roles are discussed in the following subsections.

1.2.1 Business, Governmental, and Other Organizational Entities

BI and business reporting are not purely IT initiatives and successful EBR initiatives address cross-departmental issues and provide organization-wide value. As such, anyone involved with the development and management of an EBR program or policies related to BI would benefit from reading this paper. Additionally, because this paper focuses on the structuring of EBR capabilities, those involved with helping to elevate department or project-specific capabilities to the enterprise level can leverage the framework provided in this paper.

Many EBR initiatives start off in the finance area since access to financial performance and financial reporting data is a universal organizational need. EBR initiatives can help to address internal performance and managerial reporting needs, support compliance monitoring, and ensure the auditability of consolidated information and business reporting. A 2008 TDWI study found that 67% of BI teams are supporting the finance/accounting department.[1] Thus **Chief Financial Officers (CFOs), CPAs in Finance, and Controllers** all should generally have a direct interest in BI and EBR.

Because of its relationship to organizational operations management and compliance management, EBR should also be of interest to those in **Internal Audit (IA)**. Continuous auditing or continuous monitoring are also IA initiatives that generally rely on the disciplines of data integration and business reporting to help identify exception conditions

or flag transactions or trends that may require additional inquiry. Thus there are BI techniques and EBR capabilities that IA can leverage to support its own work.

1.2.2 CPA Firms

When the EBR structure is used to support external financial reporting or compliance requirements, CPAs in public practice should obtain an understanding of the flow of financial or compliance information through a business reporting environment as part of their assessment of IT risk for their compliance with audit Risk Assessment Standards or other applicable standard(s) that require the CPA to obtain an understanding of the IT risks inherent in the technology used in the reporting environment.

Financial data analysis and reporting is also one of the core Certified Information Technology Professional (CITP) practice areas. The information provided in this paper can help those seeking to obtain this certification start down the right path for obtaining the appropriate understanding and professional capabilities in this area. Visit www.aicpa.org/CITP for more information about the CITP credential.

1.2.3 Accounting & IT Educators

Accounting educators may leverage content from this paper to introduce their students to an emerging practice area for CPAs and to provide an example of the diversity of areas in which CPAs can practice other than financial accounting, audit, and tax. The content of this paper can also be used to supplement coursework on internal controls over a non-financial accounting area and the financial statement assertions (e.g., completeness and accuracy)—to demonstrate their application in a non-Generally Accepted Accounting Principles (GAAP) situation.

Accounting and IT educators may leverage content from this paper to help their students understand the need for business involvement in technology dependent initiatives, and to help them identify the “soft skills” necessary to ensure an initiative’s success.

2 Enterprise Business Reporting

Business reporting commonly occurs in many organizations as the regular exercise of presenting monthly financial reports generated from the general ledger system and distributing them to an organization's managers. However, this application of business reporting is limiting in that it is often after-the-fact, and by the time reports are published, it is too late to take action to remediate the conditions for the period being analyzed.

Just as Enterprise Business Intelligence (EBI) takes silo or department-focused Business Intelligence (BI) projects and broadens their application and scope to the entire organization, so does Enterprise Business Reporting (EBR) broaden the application of business reporting concepts from single system (e.g., general ledger) and single perspective (e.g., financial) to the enterprise level.

The shift to the enterprise level can however introduce some complexities into the reporting environment. These include:

- **Data required for a "complete picture" may be stored in disparate systems**—this is often thought of as "process-centric" reporting, where the objective is to report on a complete end-to-end business process rather than just the part of the process contained within a given system (i.e., system-centric reporting). Process-centric reporting often requires the integration of data from multiple sources into a single data store for reporting. For example, an organization wishes to create a comprehensive report of its accounts receivable process. However, a customer's accounts receivable balance may consist of salesperson-facilitated and e-commerce sales transactions whose details are stored in a sales order and e-commerce systems respectively. These must be brought together to have a complete picture of the customer's purchase history with a company and to determine the current accounts receivable balance.

- **Data fields in disparate systems may not be defined in the same way**—this results in the need to develop a data field mapping scheme among the systems, including the handling of field definition discrepancies that may be inconsistently applied among the systems. For example, a payroll system may have "department number" and "account number" defined as separate fields in its data output, as these are both components of the "general ledger account number" (a single field) in the accounting system. The length of fields may also differ, as well as whether a field is required for data processing or not.

- **Data in disparate systems may be stored at different levels of granularity**—this results in the need to create data aggregation and reconciliation algorithms to enable confidence in the data being presented. This situation parallels the relationship of a general ledger account to an account subledger. For example, the accounts payable general ledger account, which contains summary amounts due by vendor, versus the accounts payable subledger, which contains detailed bill and credit memo information for all vendors.

- **Computations may be performed differently in different systems**—this results in the need to obtain organizational agreement on the definition of a given computation, which may sometimes match only one system or neither system. Gross profit is a common example of this, where a sales system may compute this as gross sales less discounts, returns and allowances, and a standardized cost of goods (e.g., average cost of inventory); whereas the accounting system may use the LIFO or FIFO method instead.

- **Different departments may define a term in different ways**—this is similar to "computations may be performed differently in different systems", which results in the need to obtain organizational agreement on the definition of a given term. For example the term "sales" to the Sales Department generally means signed contracts, versus "sales" to the Accounting Department generally means realized revenue. So obtaining a three-year $6 million contract may be considered $6 million in "sales" to the Sales Department, but only $2 million (the current year's portion) to the Accounting Department. This may sound like a relatively easy issue to address, but a survey conducted by TDWI found "inconsistent data definition" to be the top cause of data quality problems at the enterprise level with 75% of survey respondents pointing to this problem.[2]

Because the shift to the enterprise level can easily increase the complexity of a business reporting initiative multi-fold, care must be taken to use a standardized architecture to structure the initiative and additional risks must be assessed and mitigated to ensure the success of an Enterprise BR initiative.

2.1 Business Information Architecture

A Business Information Architecture (BIA) is a structure that helps to drive the basic design and flow of data from disparate data sources (e.g., general ledger system, payroll system, or purchasing system) that need to be brought together into a unified reporting environment. While this architecture is applicable to any business reporting project, it becomes increasingly important as reporting moves to the enterprise level so enterprise reporting can be driven off of a unified data structure, enabling better consistency of data and ease of report distribution..

The diagram below (Source: IntrapriseTechKnowlogies LLC, 2009) shows the standard conceptual components of a BIA and the flow of data among the various components. Data storage areas are represented by cylinders, data flows by lines and arrows, human or system interaction by rectangles, and supporting architecture constructs by the parallelogram.

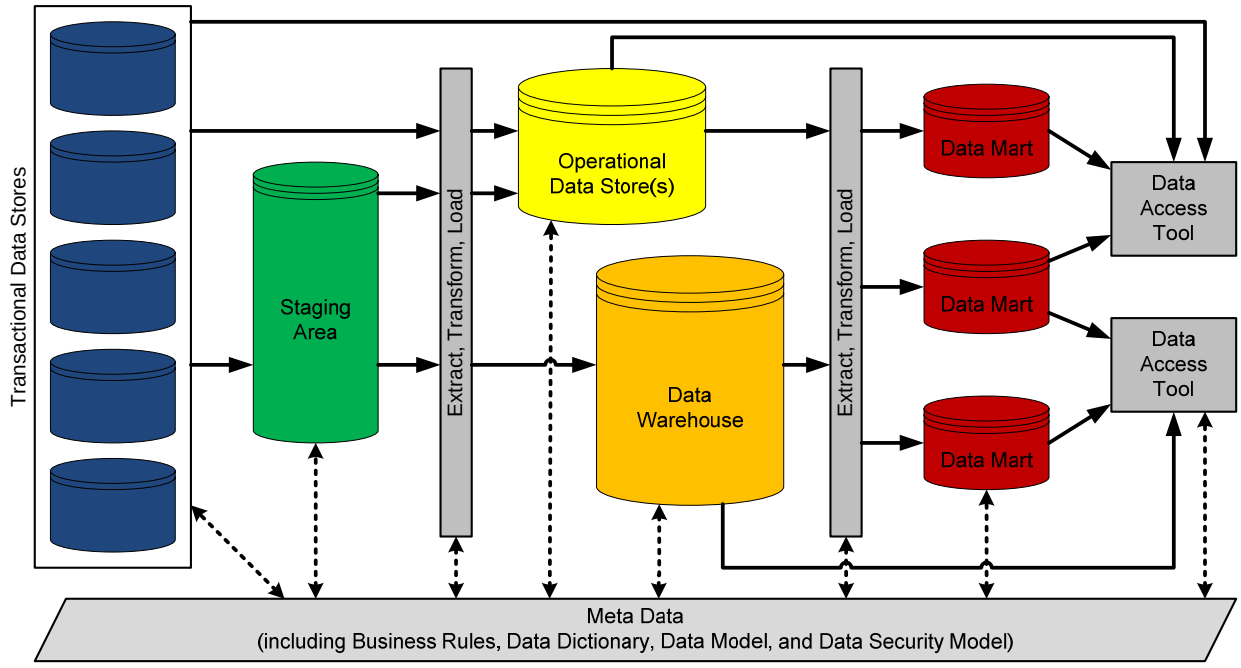


Figure 1 – Business Information Architecture (Conceptual Components)

Each of the BIA components is described below (in alphabetical order):

- **Business Rules –** *Business rules* are standardized definitions of how a particular part of data processing is handled (e.g., definition of a computation) or what a particular piece of data may look like (i.e., acceptable characteristics of a data element). There are many different types of *business rules*, but the two most commonly used business rules within a BIA are inference rules, which define the way a computation is performed, and validation rules, which define the acceptable values for a given data element**.**

  An example of an inference rule is that *Net sales equals gross sales less returns & allowances less discounts*. This rule could also be represented by an equation: *Net sales = gross sales – returns & allowances – discounts*.

  An example of a validation rule is that a U.S. zip code must be either a five character, all numeric value, or a ten character value consisting of five numeric characters a dash and then four numeric characters.

(Further information about the different types of *business rules* will be discussed in the next paper in this series.)

- **Data Access Tool –** A *data access tool* is a type of software that provides an end-user access to data from one or more data storage areas. Enterprise *data access tools* enable end users to retrieve standardized reports based on their security permissions and also often provide ways to display data graphically, for example on a dashboard. *Data access tools* do not need to be complicated, for example, Microsoft Excel provides the ability to retrieve data from databases and then an end-user can utilize all of Microsoft Excel's built-in functionality to perform additional computations or analysis, or create graphs, charts, or pivot tables.

- **Data Dictionary –** A *data dictionary* is documentation of the data elements (individual pieces of data), their data types (e.g., text, numeric, date/time, etc.), and an explanation of the data element (e.g., intended use, meaning). A *data dictionary* usually documents the *data model* for various applications and data stores and may be used by business users to understand the data they are accessing.

- **Data Mart –** A *data mart* is a special type of database that usually acts as a distribution point for aggregated or other derived data. Data is normally extracted from the *data warehouse*, the appropriate standard computations (e.g., sum, average) performed or analysis algorithm applied, and then the results are stored in a *data mart*. Business users are then provided with access to the *data mart* via a *data access tool*.

- **Data Model –** A *data model* is the standardized representation of data elements (individual pieces of data), data entities (a group of data elements that describes a particular person, place, or thing), and their relationships. For example, a customer and an invoice may be two examples of data entities. The customer data entity is also usually a group of data elements such as customer name, customer number, and customer address; whereas the invoice data entity may consist of data elements such as invoice number, invoice date, customer number, and delivery date.

  The relationship between the customer data entity and the invoice data entity may then explained as a link created by the customer number. Relationships are also normally described by their cardinality, which defines the relationship in quantitative terms. For example, a customer (data entity) may have multiple invoices (data entity), linked by the customer number. The figure below shows what this may look like when depicted in a relational data model.

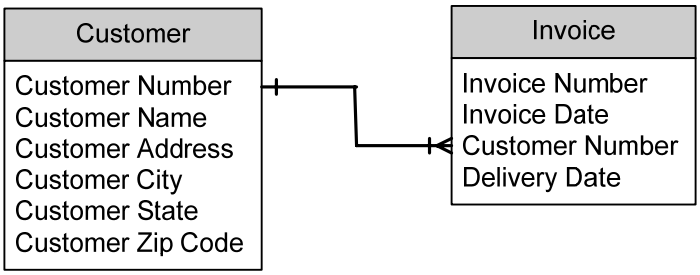


Figure 2 – Sample Relational Data Model

There are different types of data models and each of them is used to convey particular information about a particular set of data. (Further information about the different types of data models will be discussed in the next paper in this series.)

- **Data Security Model –** A *data security model* is documentation of the security model governing a given *data model.* It is most commonly seen in the form of logical security requirements, identifying the user roles and the operations (e.g., create, read, update, or delete) they are allowed to perform on a given data set.

- **Data Warehouse –** A *data warehouse* is a special type of database that is often the central repository of atomic level (i.e., smallest possible unit or non-aggregated) data for the enterprise. Before data is allowed into the *data warehouse* it usually must go through a cleansing process in a *staging area* which validates the integrity of the data and conforms it to an enterprise standard *data model*.

- **Extract, Transform, Load (ETL) –** *ETL* is the process by which data is moved between the various data storage areas. This process consists of three general steps: (1) *Extract* that data from the source database, (2) *Transform* or process the data according to the *business rules* applicable for mapping or moving data between the source system and the target system, and (3) *Load* the transformed data into the target database.

- **Meta Data –** *Meta data* is "data about data" and often helps to explain to system developers how a given data element or set of data should be handled. *Meta data* can also provide context for a given data element or set of data to end-users. There are a variety of techniques used to communicate *meta data*, of which *data models* and *business rules* are two examples commonly used as part of a BIA to describe the actual data being stored in the databases or the processes being applied to that data.

  Meta data can also describe the state of a set of data. For example, number of exceptions (violations of a *business rule*) found within the set of transactions for a given business day, is an example of an actual quantitative data point that represents *meta data* that may be kept in a database and used for reporting for analysis. If the exceptions represented a violation of corporate policy, this *meta data* could be used to raise flags for management and internal audit to follow-up on.

- **Transactional Data Store(s) –** A *transactional data store* represents the source system(s) in which business transactions are initiated, processed, or recorded. Common examples of a *transactional data store* include general ledger systems, point-of-sale systems, e-commerce systems, purchasing systems, and payroll systems. The primary function of these systems is to capture and facilitate the execution of a business transaction (e.g., a sale to a customer, a purchase from a vendor, a paycheck to an employee) or recording of an accounting action (e.g., a journal entry to record depreciation or a journal entry to reclassify unearned revenue).

- **Operational Data Store –** An *operational data store* is a data storage area that may contain transactional data (from a *transactional data store*), *meta data* (e.g., exception data), derived data (e.g., daily aggregates of manufacturing production levels), and its own data for processes that it supports. Data may be loaded into an *operational data store* directly from a *transactional data store* or from a *staging area* after it has been cleansed or processed. As denoted by its name, *operational data stores* are designed to be a more immediate source of data (i.e., it doesn't necessarily have to pass the rigorous cleansing required for data to enter a *data warehouse*) supporting operational-level process management (e.g., continuous monitoring) and oversight (e.g., internal audit/continuous auditing).

- **Staging Area –** A *staging area* is an intermediary data storage area where data from *transactional data stores* is temporarily stored while it is cleansed, validated, and conformed prior to being loaded into a *data warehouse*. Exception conditions or other *business rule* violations identified as part of data processing within the *staging area* may also be pushed into an *operational data store* for reporting and analysis.

  If data in the *staging area* is determined to not be of sufficient quality (i.e., there are a significant number of exceptions or violations that would cause potential misrepresentation of data in downstream reporting) or unable to be successfully mapped to the enterprise data model, the data is normally held there until the issues can be resolved.

The definitions provided above are introductory definitions of these components and are intended to provide just enough context to understand the general role of the component and its function within the BIA.

Each of the components of BIA also provides different types of information—this is demonstrated by the following diagram (Source: IntrapriseTechKnowlogies LLC, 2009). Components shown in Figure 1 and in Figure 3 below, use the same colors to help identify the parallels between the two diagrams.

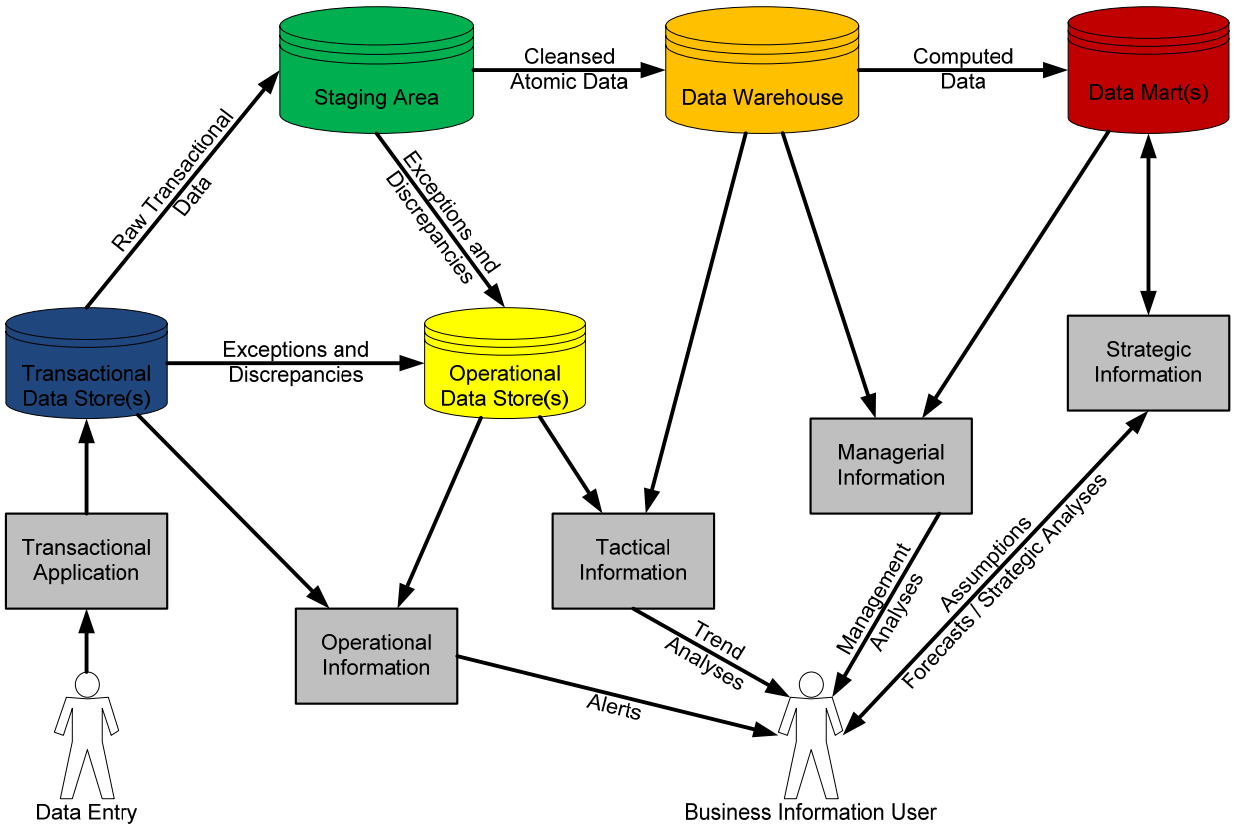


Figure 3 – Business Information Architecture with Business Information Types

Each of the business information types serve different audiences and have different intentions. In applying the BIA to a business reporting project, the type of information that a project is trying to provide needs to be mapped to the appropriate business information type and its related component(s).

2.2 Business Information Types

As shown in the BIA, there are four fundamental categories of information provided by a business reporting initiative:

- **Operational Information** – *Operational information* represents the direct results of operations. This information is generally provided in "real time" and its general intention is to report on the current state of operations and provide information that is immediately *actionable*—i.e., it enables those with direct control over operations to quickly identify exception or lagging conditions and take immediate or near-term action if necessary to remediate the conditions.

- **Tactical Information** – *Tactical information* represents the aggregate direct results of operations over time or against near-term operational measures. This information is generally provided on a periodic basis, with periods generally ranging from a week to a month depending on the cycle time for the process being reported upon. The general intention of *tactical information* is to aggregate operational data over time and compare it against known operational metrics and benchmarks or to identify operational trends. Like *operational information*, *tactical information* also focuses on providing *actionable* information, but its focus is more on identifying exceptions or lagging conditions that occur over time or that may require a

person to take one step back from direct work processes to adequately evaluate. The actions taken to remediate tactical conditions generally are near/short-term focused and localized in effect.

- **Managerial Information** – *Managerial information* represents the aggregate direct and indirect results of a business unit over time or against varying operational measures. The primary difference between *operational, tactical,* and *managerial information* is that *managerial information* tends to be more reflective in nature, explaining "what happened" rather than "what is happening". *Managerial information* may be provided on a periodic basis, ranging widely from daily to monthly depending on the cycle time of the process being reported upon. Managerial information is generally more of a "big picture" perspective of operations and may thus include both direct results of operations (e.g., gross profit and direct selling expenditures) and indirect results of operations (e.g., carrying cost of inventory, general and administrative expenditures, and depreciation). Actions taken in response to managerial exception and lagging conditions are generally not as clear cut and may take longer to demonstrate their impact than those at the operational or tactical level.

- **Strategic Information** – *Strategic information* represents the "big picture" results of an organization over time, against varying industry or macro-organizational measures, or anticipated organizational performance, whether extrapolated based on historical performance trends or derived from management forecast. While most presentations of *strategic information* will contain a lot of reflective information, the main objective of *strategic information* presentation is to be forward-looking and provide insight into the direction of the organization. Compared to the other categories of business reporting information which rely primarily on data generated by other transactional or operational systems, *strategic information* is normally the result of direct inputs from management (e.g., assumptions and forecasts), analysis of historical information (e.g., extrapolation and trend analysis), and information imputed from the previous two components (e.g., applied predictive analytics and "what if" scenario analysis).

The definitions provided above are not intended to draw hard lines of categorization, and an organization's existing reports may present a blend of information from the above categories. However, it is important to recognize the component parts of those reports and align them with the intended purpose and use of those components to ensure adequacy of information and fitness for use in a given situation.

2.3 Business Information Risks

Business information risks (BIR) are business-level risks that are inherent in any initiative that seeks to provide data or information for use in support of business analysis and decision making. Compared to data-level, database-level, or system-level risks, all of which must generally be addressed by an IT professional, business-level risks are risks that must be addressed by a business professional that understands the need for providing assurance of the integrity and reliability of data, and who also understands how information is used to support the operation and management of an organization.

Sound familiar? "Assurance of the integrity and reliability of data" is a core CPA competency that is a direct extension of a CPA's background in financial statement auditing. Many of the assertions that CPAs seek to address as part of a financial statement audit, for example accuracy and completeness, are also important when providing information that will support internal business analysis and decision making. Just as investors and bankers need quality information to make their decisions related to an organization, internal managers must also be provided with high quality information to ensure that they are making the best decisions possible for the growth and management of an organization.

There are four major categories of BIR and control objectives associated with each. General descriptions of each are provided below. The parallels to the financial statement assertions should be evident and the techniques to address these risks, though not detailed here, are analogous to those incorporated into the financial reporting process—again making a CPA a prime candidate to assist in addressing these risks.

- **Information Quality** – *Information quality* is essentially ensuring that the information provided to users is free from error, or as we say in the in the CPA world, free from *material* error. *Information quality* for EBI can be thought of as four primary controls points: Accuracy, Completeness, Cutoff, and Precision.

    - **Accuracy** – Directly analogous to the financial statement assertions, *accuracy* is the assertion that "amounts and other data relating to recorded transactions and events have been recorded appropriately," and that the information provided is "disclosed fairly and at appropriate amounts." (AU Section 326.15)

    - **Completeness** – *Completeness* can also be directly interpreted from the financial statement assertions as "all transactions and events that should have been recorded have been recorded." (AU Section 326.15)

    - **Cutoff** – Since EBR often deals with varying periods of time, *Cutoff* as related to business reporting is also a concern parallel to the financial statement assertions with a small modification: "Transactions and events have been recorded in the correct [reporting] period." (AU Section 326.15)

    - **Precision** – In EBR, one may not only be working with monetary amounts, so ensuring that every value is precise to two decimal places (e.g., cents) may not be sufficient. The *Precision* control objective is therefore concerned with ensuring that the appropriate level of granularity is achieved for a value being presented or a computation being performed that may use that value.

The importance of *accuracy, completeness,* and *cutoff* should be evident to any CPA. The *precision* issue frequently presents itself in two ways. The first is the lack of *meta data* enabling a value to be properly attributed to a group or category for reporting. For example, if one report presents sales by region and another report presents sales by customer segment; does each sale transaction have identified both the region and the customer segment? Are those identifiers properly preserved as data is cleansed or aggregated before being presented on the reports?

The other common *precision* issue is more of a technical one, but its risk needs to be properly communicated to IT to ensure that they address it in their design. Depending on the database technology used, different data types have different levels of precision. For example, in Microsoft Access, there eight different data types that can be used to store numbers. Two of these are commonly used for financial calculations:

> *Currency* – Stores values from -922,337,203,685,477.5808 to 922,337,203,685,477.5807. Note the consistent limitation of four decimal places.
>
> *Single* – Stores values from $-3.402823*E^{38}$ to $-1.401298*E^{-45}$ for negative values; $1.401298*E^{-45}$ to $3.402823*E^{38}$ for positive values. Note the use of the mathematical construct E to the x^{th} power, indicating that this can store very large or very small numbers, but its *precision* will vary depending on the actual number of digits that need to be stored.
>
> An analogous example for the way a *single* data type works is that there could be three spaces that can each display one digit, and between any two digits a decimal can be placed. So basically the numbers 0.00 through 999 can be displayed. The *precision* of this number is limited though to two decimal places with a number between 0 and 10: 0.00 to 9.99; one decimal place with a number between 10 and 100: 10.0 to 99.9; and only whole numbers from 100 on: 100 to 999. The *single* data type works essentially the same way, but with a much larger number of digits.

So in performing an expense allocation computation, it would be good to make sure that the calculated ratios for the allocation method are stored in a data type like a single, but that the final allocated dollar amounts are stored in a data type like Currency. However, CPAs don't need to dictate the data type used, they just need to ensure that they communicate the *precision* requirements to the IT person designing the database so that the IT person and ensure that the correct data type is used. CPAs should however design their tests of the resulting system to ensure that the correct *precision* was achieved and that the final allocation calculation was done *accurately.*

- **Information Presentation** – Just as "classification and understandability" are financial statement assertions that seek to ensure the clarity and usability of information by financial statement readers, *information presentation* seeks to ensure that information provided to business users is appropriate for the analysis/decision it is used for, and that that additional factors that may affect their use of the information is quantified (i.e., disclosed).

    - **Fitness for Particular Use** – While financial statements have a well defined scope and parameters for how they are used, the information provided by EBR can be as diverse as the organization itself and thus the scope of when it is used and parameters for how it is used can be broad. When information is provided to business users, its *fitness for particular use* should be assessed and proper *disclosure* made if there are limitations or other qualifying factors that may impact the way it is used.

    - **Disclosure –** Similar to financial statement disclosures, business information *disclosures* describe particular conditions, limitations, or provide additional details that may impact a business user's interpretation or use of a particular set of data. Unlike financial statements, there is not a well defined set of situations that identify when *disclosure* for business information is required and how it is provided to business users. Thus professional judgment based on an understanding of the organization and how it uses information is crucial to meeting this control objective.

  For example, a retailer's BIA may not have yet incorporated detailed point-of-sale data, however daily purchasing data from its accounts payable system is available. For fresh prepared food items that expire within a day and are replenished on a daily basis, it is possible to impute the volume of sales based on purchased quantities. Items purchased on a given day, must be sold that day or they expire and are expensed as write-offs. By netting purchased volumes against write-offs, items sales volume can be derived, and analysis can be performed to help optimize profitability of items by optimizing purchase quantities to minimize write-offs due to over-ordering and minimize lost sales opportunities due to under-ordering. However, it would not be appropriate to use the imputed sales amounts for store revenue recognition or sale tax payment calculation. So in making the imputed fresh food sale information available to business users, there should also be an accompanying *disclosure* that identifies this as derived data rather than actual data and that there are limitations to the situations in which it should be used.

- **Information Timeliness** – Different business decisions have different timelines by which they must be made or different timelines by which their impact is evident. Depending on the type of business information being provided and the decision it is intended to support, *information timeliness* is important. *Information timeliness* can be expressed by two primary control objectives: *latency* and *currency*.

    - **Latency** – The primary control concern for *information timeliness* is *latency* or how quickly data is made available to a business user. *Latency* is focused on whether information is made available or provided "in time" to support an analytical process or business decision that relies upon that information. Generally a one moves across the business information spectrum, from *operational information* to *strategic information*, *latency* becomes more acceptable, particularly since the period being analyzed or the impact of decisions made based on the data is longer. However, high *latency* of *operational information* may mean that the information is provided too late to prevent a problem from occurring and that "damage control" procedures must be invoked.

    - **Currency** – Information *currency* asks the question of whether the information provided accurately represents the actual current state of the business process or business condition being managed or analyzed. Similar to *latency*, the determination of information *currency* is directly related to the type of business information being provided. While *latency* is concerned with how quickly information is provided to the business user, *currency* is looks at how quickly the information provided becomes "stale" or how quickly it must be refreshed to be reliable.

The stock market is a good example where *information timeliness* is an important factor. The *currency* of a stock price is of high concern to a stock trader (operational business user of stock price information) because it can change quickly while trading is going on. How quickly changes in stock price are communicated or made known to a stock trader is represented by the *latency* of that trader's information resources. Contrast the stock traders needs to that of a corporate investment portfolio manager's needs, where rather than looking at the minute-to-minute changes in stock price, the manager is looking at the changes in stock price on a day-to-day basis (short-term investments) or over time (long-term investments).

- **Information Auditability** – Audit trail capabilities are often provided by accounting systems and other well designed applications where understanding what changes were made to data and when they were made are important. However, these audit trails only track what happens to data while it is in that system. With a Business Information Architecture, data moves among systems and a mechanism is needed to track what happens to data as it is changed by each *extract, transform, and load* process in the course of its movement. This is where *information auditability* comes into play. *Information auditability* is concerned with two primary control points: *source traceability* and *transformation traceability*.

    - **Source Traceability** – *Source traceability* is the ability to map the information presented or data used in a computation back to its original source, whether it be a paper document or an electronic transaction. For financial statement purposes, this is generally a short path with the financial statements being traced back to the general ledger, and then from the general ledger to a source document or source system (and possibly one more step from the source system to a source document for that system). However, in a BIA, information provided through a *data mart*, may have come from a *data warehouse*, which got its data from a *staging area* that was fed from the general ledger, whose transaction was started by a source document. So *source traceability* can become a more complex risk to manage as the BIA is put in place and as it grows.

    - **Transformation Traceability –** Additionally as data is changed (not necessarily in value, but in level of aggregation or in the way it is mapped to related data elements) as it moves through the components in a BIA, identifying what transformation and associations were made to the data helps to provide assurance that the data was not fundamentally altered in value or its associated relationships when it is prepared for final presentation to a business user—this is the objective of *transformation traceability*.

  While *information auditability* is generally easier to achieve for financial statements due to the shorter trail that must be followed and since the transformations performed at generally simpler (primarily summations), *information auditability* for EBR initiatives presents a greater challenge since the variety of types of data, sources of data, and variation in transformations applied to data can vary a lot more.

BIR are addressed by the establishment of an information control environment, a subset of an organization's internal control environment. Many organizations already have this in place, but it is focused primarily on the information related to their audited financial statements. The use of an Enterprise Information Architecture, requires that this control environment be extended to the data moving through the architecture. Just as different organizational areas have different levels and types of inherent risks, the risks for different BIA components and business information types vary. By applying their expertise in risk assessment and the design of internal controls, CPAs can play a critical role in helping an organization to manage and mitigate its BIR.

3 Summary

Enterprise Business Reporting (EBR) initiatives are a natural starting point in the development of Enterprise Business Intelligence capabilities for many organizations. These initiatives often start off in the accounting/finance area, seeking to provide financial and operational information to business users expediently and effortlessly. The development and deployment of EBR capabilities, however, includes some risks that must be managed to ensure the timely delivery of high quality information to support prudently informed decision making. When used to support financial reporting, data auditability also becomes a key issue that must be addressed for the success of an EBR initiative.

Enterprise business reporting initiatives provide CPAs with an opportunity to provide additional value to their organizations by leveraging their skills in quantitative analysis and risk management to help mitigate the risks inherent in data integration and business reporting projects. The CPA's expertise and knowledge of compliance requirements, security best practices, and understanding of the organization business transactions and their flow through the organization, makes CPAs a great candidate to help analyze and document business requirements to drive the technical development of the EBR environment.

EBR is the first step toward helping an organization gain an understanding of its operations and acquiring increased, high-quality business intelligence. By following a standardized project framework and working with a unified business information architecture, organizations can help to ensure that initial investments in EBR can be leveraged by future reporting projects, and provide the foundation for the development of an organization's business intelligence capabilities.

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4.1 About the Author

Donny C. Shimamoto, CPA.CITP, is the founder and managing director of IntrapriseTechKnowlogies LLC, a Hawaii-based consulting company dedicated to helping small businesses and middle market organizations leverage strategic technologies, proactively manage their business and technical risks, and enable balanced organizational growth and development. Donny also works with larger organizations as a trusted business advisor, facilitating organizational strategic planning and execution, IT governance and planning, enterprise architecture, information architecture and assurance, business process improvement, and business intelligence initiatives.

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As an active member of the AICPA's Information Technology Executive Committee, Donny has been highly involved in several AICPA initiatives including development of an IT Competency Model for CPAs and the publishing of guidance by the IT Section on IT Considerations for Risk-Based Auditing. He is also on the planning committee for the AICPA's annual TECH+ Conference, where he is responsible for the coordination of program content related to Business Intelligence and an advocate for the Business & Industry sector.

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4.2 Working Group Members

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5 Endnotes

[1] *2008 TDWI BI Benchmark Report: Organizational and Performance Metrics for BI Teams* (Chatsworth, CA: 1105 Media, Inc, 2008), page 6.

[2] Philip Russom, *Taking Data Quality to the Enterprise through Data Governance* (Chatsworth, CA: 1105 Media, Inc, 2006), page 12.