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Building Information Objects

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Abstract

In order to stay competitive in today's business environment, organizations must realize data is a key asset that needs to be exploited in order to achieve success. The usual approach to this is the implementation of data warehouses and business intelligence applications. However, most data warehouses are underutilized by decision makers and knowledge workers due to their lack of technical knowledge about what the data represents and how to map it to the semantic business concepts of the enterprise. Through the integration of Information Objects with a Business Intelligence Reporting tool end-users can acquire consolidated view corporate information. Information Objects provides a single point of access to corporate data stored in disparate sources through the implementation of a metadata layer. Selected reports were re-created but using Information Objects, and the reports' performance and process in handling changes in requirement were compared. During first-time report generation of enhanced and existing reports no difference was found. However, the process for handling changes in report's requirements proved that Information Objects provided one single point of access, thus one single point of change, while ad-hoc reports required more effort from the developer. The implementation of Information Objects to report on data stored in disparate sources provided a better service to end-users who wanted to gain knowledge of corporate information through what-if scenarios and access to real-time data.

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Table of Contents

List of Figures

Chapter 1 – Introduction

With the continuous growth in competition and evolving customer needs, enterprises are analyzing, managing, and feeding voluminous data into the decision making process in order to predict market trends that will improve the performance of business systems to remain competitive or to achieve a competitive advantage. In the past, the analysis was conducted by marketing and finance departments through monthly or yearly reports. Currently, the reality of the matter is that in many organizations, data warehouses and business intelligence applications were implemented to provide decision makers and knowledge workers with the right information to make better operational and business decisions that will improve business performance. Decision makers and knowledge workers obtain information about the organization's systems and business processes by accessing a portal that stores reports which display corporate data. However, knowledge workers and decision makers are no longer fully satisfied with scheduled analytic reports or fixed graphs or charts (Azvine, Cui, & Nauck, 2005). In addition, due to the complexity of mapping data stored in disparate sources and the different business terms used to refer to the same data, knowledge workers and decision makers sometimes do not fully understand the data being provided, therefore, losing trust in these tools and which often end up underutilized. Decision makers demand quick answers to ad hoc queries and real-time information from business applications. All this needs to be accessible to the right people when and where needed to help them understand business processes and provide awareness of the current state of the business and its operations processes. Furthermore, as data proliferates and is stored in disparate sources, data inconsistency increases, and obtaining a comprehensive view of data gets more complicated and less reliable.

Currently, users submit requests through the Request Tracking System for new reports. The user submits the functional and logic requirements that the new report must include. All new and existing reports are developed by the combination of traditional system life cycle (TSLC) and agile methodology approaches. The request is assigned to a developer who meets with the requestor to discuss the functional requirements of the report and clarify any concerns or answer any questions the developer might have. It is strongly suggested, that the requestor provides to the developer a mockup to address the aesthetics and layout of the report. Once the developer understands the requirements and a mock-up is provided, the developer develops a prototype of the report that meets the initial functional requirements submitted and where its layout design matches the mock-up provided by the requestor. The prototype will be analyzed by the requestor to ensure all its functionality and design meets initial requirements and expectations. If necessary, one or more meetings will be scheduled to discuss changes in requirements.

For instance, if a user needs a report that displays detailed information about all client accounts, the user submits a request for a new report through the Request Tracking System detailing the logic and functionality of the desired report. A report developer is assigned to the task of developing this new report, and a meeting is scheduled between the report developer and user to go over the requirements. From the initial functional requirements, the developer designs a prototype report which includes detailed information about all client accounts. The prototype report is handed back to the customer, where the customer reviews the information in the prototype and determines what information needs to be included or excluded. Such information could include test clients or clients used during employee training. In redesigning the report’s initial functional requirements, the customer may decide that the information on test client accounts is irrelevant and request that these test or training clients be excluded from the report.

In addition, the ability to see a working version of the report may cause the user to want more meaningful information about a client's account such as demographic and financial information. The developer implements the changes in requirements and develops a new prototype which is then handed back to the user for one more round of analysis and verification that requirements have been met. Since the new requirements involve introduction of financial and demographic information that are stored in disparate sources, one or more meetings will be needed to address and ensure correct relationships between disparate sources.

Furthermore, there is also the case where user A has been using a report designed for user B and where user A wants a same exact report with an extra layer of information. For instance, the report containing all information about all accounts has been deployed and currently has been used by its original requestor, user A. However, user B has also been using the same report and now desires to have this report modified to add information about all the different segments of an account, therefore providing more in-depth and detailed information. Clearly, user A and user B have different purposes and needs to be addressed by the report. Therefore, modifying the existing report to address user B's needs is not an option as it will affect user A's needs simultaneously. The only solution is to create a similar report with the segment information to address user B's needs. Consequently, maintenance and support for two very similar reports that display the same information will be required.

The combination of the TSLC and agile development techniques has proved to be an effective and efficient approach to development of reports because it serves as a better alternative to the customer. When the customer requests a report, he or she does not know the magnitude of information that a report can provide, so very basic requirements are provided to help guide the customer on what information to look for. As such, using a prototype helps the customer get the request fulfilled; where new ideas or suggestions emerge that help redefine requirements, new information is discovered; furthermore, the quality of the emergent design is improved. Although new and existing reports are developed using the agile approach, there is significant effort and time allocated to the development of reports that are closely similar to existing reports, with the difference of excluding or including extra fields. In addition, there are constant enhancement requests submitted by internal users to have new fields and new logic added to existing reports that could potentially affect the original purpose of the report. In addition, issues can arise when two users desire separate reports that display the same amount of information. Maintenance and support for two very similar reports will now be required, and extra work will be added to report developers and administrators when they work on these reports.

Moreover, the need to define functional and logic requirements to develop reports causes the demands for reports to decrease as additional work from the requestor is required, while the need for reports still remains the same and in most cases increases. Requestors initially do not know the type, detail and format of the information to be displayed; therefore, they expect the report developer to guide them in the process of defining requirements. The process of designing a report and defining its requirements to extract corporate information for decision makers and knowledge workers is time consuming. The access to corporate information and the ability to create their own personalized reports, without the help of technical staff, will provide decision makers and knowledge workers with reports that meet their needs.

Business Intelligence (BI) strives to provide access to data through applications customized for non-technical users and business users. However, these applications still require technical expertise to develop and run statistical analysis as well as setup reports that can be run by other users (Azvine, Cui, & Nauck, 2005). The development of reports is not an easy task; it requires understanding and knowledge of what data and how it is managed by each system, how to integrate data of different types of sources and how they are related. Most warehouses and systems are often designed for specific types of processing, not specifically for providing information in the form expected by regular users with different needs and requirements (Cardwell, Hauch, & Miller, 2005). In addition, it is also necessary to consider how a voluminous amount of data relates to the concepts and semantic terms used by decision makers and operational workers.

The solution for this continuous increase of data in disparate sources and inconsistency is metadata, which is generally described as “data about data.” This concept helps end-users understand the various types of information resources available from data warehouse and business intelligence application environments. The combination of business intelligence applications and metadata can provide decision makers and knowledge workers with real time information on demand, which can be shared across a whole organization through Intranets or corporate portals. Decisions can be based on what-if scenarios, drill downs, aggregation and disaggregation, where all can provide information that would help discover patterns in given periods of time (Gorla, 2003).

The main objective of this study was to explore the benefits of implementing Information Objects across an organization. *Information Objects* is a metadata layer that represents ways in which a business process accesses data. A business process can be focused on a whole set of data warehouse or an individual data mart (List, Schiefer, & Stefanov, 2002). Information Objects can be seen as pre-packaged information that has been compiled for users with no Information Technology (IT) background. These compiled objects of information can be utilized by users in reports or in interactive analysis with low intervention of report developers.

This thesis investigated the following questions:

- What are the potential benefits for implementing Information Objects (metadata layer) to the current business intelligence application?
- How would Information Objects improve the performance of decision makers and knowledge workers?
- How will Information Objects improve how end-users perceive data?
- What are the base metrics which would determine whether Information Objects is a success?

The goal was to present an overview of how adding this metadata layer (Information Objects) could improve the usability and trust of decision makers and knowledge workers towards an organization’s data warehouses and business intelligence application. This approach serves as an example to other organizations, helping them to explore and exploit all the data stored in disparate sources and ultimately improve the decision making process and day-to-day operational decisions. Through the employment of a business intelligence application and implementation of a metadata layer, business decision makers will understand the real value of their information. Viewing information and knowledge as important assets, they will support business intelligence expenditures.

Chapter 2 – Review of Literature and Research

This study focused on the analysis of Information Objects (the metadata layer) and how its implementation benefits decision makers, knowledge workers and IT developers. In today's market and industries, organizations have to exploit and discover new knowledge from all the information their systems store. Information integration is crucial for an enterprise to remain competitive or achieve a competitive advantage. The integration of information in disparate silos can provide an enterprise with the benefit of understanding and discovering new market trends, unified views of critical business data, and the opportunity of leveraging existing information in new ways (Cardwell, Hauch, & Miller, 2005).

Business Intelligence is often used by organizations to access all corporate data and provide business users and leaders with insights that will help them make better decisions and align day-to-day operations with strategic goals (Dieu, Dragusanu, Fabret, Llirbat, & Simon, 2009). The main goal of BI tools is to provide end-users with proactive responses, through continuous real-time analysis and observation of data that can assist in changing business processes during execution (List, Schiefer, & Stefanov, 2002). However, to supply reports through a BI tool requires the intervention of a BI developer who beyond, having the knowledge of creating reports, must also understand how the data from disparate sources are connected and how they relate back to business terms. Such information stored in disparate sources can cause confusion, delays in developing reports, and unfulfilled customers (Whiting, 2006). Furthermore, decision makers and operations users are no longer satisfied with ad-hoc reports, but are demanding that more interactive analysis solutions be implemented.

Data warehouses and data marts are commonly employed as solutions to the current problem described above. They store consolidated data from different sources, with the main goal of using it for reporting purposes (Castellanos, Dayal, Simitsis, & Wilkinson, 2009a; List, Schiefer, & Stefanov, 2002; Strauch & Winter, 2004). The data warehouses and data marts are populated by physically moving data from disparate sources or from business processes. Data is loaded either by events generated by other systems or on a time-basis. Once data is loaded, ad-hoc queries or reports can be run against this single data source, and information and knowledge can be derived from the results generated (Castellanos, Dayal, Simitsis, & Wilkinson, 2009b).

The main disadvantage of the data warehouses and data marts is that they lack the ability to provide business users with the capability of having an interactive analysis of data and what-if scenarios. Moreover, the integration of new systems or alteration of existing systems that process data requires an update of the data warehouse or data mart. Today, BI tools need to handle changes in business scenarios while delivering real-time information, data modeling, data analysis, and action based on insights (Cella, Golfarelli, & Rizzi, 2004).

An e-Business Portal or Intranet is another approach used by organizations to enable mining and integration of data stored in disparate sources. As the Internet continues to proliferate and organizations start to developed Web applications, portals have become a good choice for enterprises to adopt when dealing with data integration. They serve as a single gateway to personalized information needed to perform better decision making. In addition, they provide the following advantages: no client software is required to be installed, common User Interface (UI), and easy universal access (Hu & Zhong, 2005). However, large and medium companies store data in different systems using a variety of technologies, and most of the systems have become legacy systems. In the end, it is common for an organization to have different sources that contain disjointed, overlapping, unrelated, and even duplicate data (Cardwell, Hauch, & Miller, 2005).

On the other hand, an object technology approach is starting to be considered by organizations as a way to solve the problem of data integration and flexibility between business systems (Lau et al., 2008; Sutherland, 1995). This approach strives to solve the problem of warehousing business process data, so that it can be analyzed and reported effectively using BI tools. This object technology, known as Information Objects, is basically a metadata layer that will represent corporate data as objects stored in different sources. These objects are defined at an information level of abstraction that consists of data structures that specify its attributes, states, functions, procedures and behavior with other information objects (Brey, 2008). This layer sits above the physical layer and represents business terminology; each object has detailed information of how data in the physical layer is related to a business concept. When a user requests a report to run using Information Objects, the request goes through a semantic layer that converts the object to a Structured Query Language (SQL) statement. This semantic layer is a map of complex corporate data that provides a unified view in business terms. The SQL statement is then submitted to the database engine which returns the result which is then transformed back to the object for the user to view (Gorla, 2003).

The Information Object layer offers three functionalities, as shown in Figure 1:

- data access functionality standing at the bottom level as a single interface to retrieve metadata and query from disparate data repositories;
- data foundation functionality standing at the middle level, which enables the creation of relationships between metadata objects; and
- information object functionality that enables the creation of Information Objects which can be used to create ad-hoc queries, which could then be used by Business Intelligence tools.

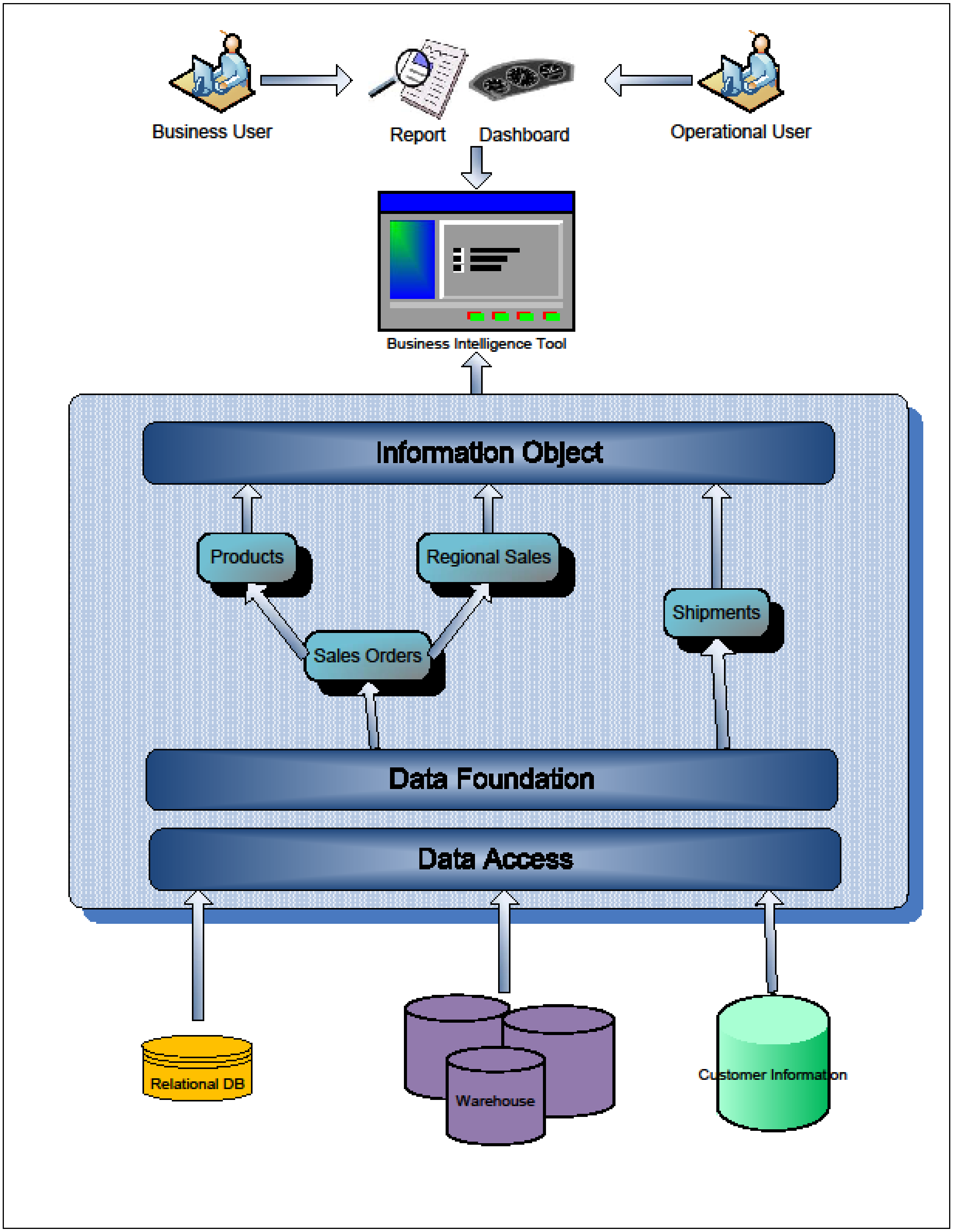

Figure 1: Information Object functionality layers.

For instance, departments creating similar reports but deriving information from different systems generate inconsistent results. With an Information Object layer as a common single point of truth to all business units, this problem could be avoided and potentially provide cost savings.

Furthermore, as users employ BI tools to report on corporate data stored in disparate sources and with different levels of sensitivity, there is the need for mechanisms to enforce regulatory compliance and privacy policies. Information is required to be protected based on the authorization level of the users (Bhatti, Gao, & Li, 2008). Security and control capabilities can be added to this object technology through products like MetaMatrix MetaBase or BIRT Exchange. Access to information can be controlled through security policies that can be independent of metadata. Requests and use of Information Objects by users can be tracked and controlled to similar levels of security as well as which information sources can be accessed and when (Cardwell, Hauch, & Miller, 2005).

Moreover, an Information Object layer provides decision makers and knowledge workers with a better overview of corporate information. The Information Object approach enables reports to extract data in real-time from disparate sources, join and synthesize the data and produce a unified representation of corporate information that can be used to create knowledge.

In addition, decision makers and knowledge workers can enhance their operation decision making by having a BI tool that is more integrated into business operations of the organization. Through an Information Object layer, personalization can be achieved as specific information can be filtered or selected for an individual by using an individual’s profile. Technically, Information Objects can be matched against the meta-information about users stored in their profile. Users can perform what-if analyses and drill-drowns that will provide valuable insights which are fundamental for better decision making (Gorla, 2003).

Moreover, an Information Object layer will enhance how corporate data is perceived by users as a unified view and single gateway to personalized information. Any data changes to the disparate sources can easily be modified by an administrator to accommodate the mapping rules without a change been perceived by the end-users, and with minimum latency. This approach enables the new information to be seamlessly merged with old data. Information Objects can describe a business process as the names of these objects represent the flow of a process as a chain of events and functions. In addition, they can be targeted to be easily understood and used by end-users (List, Schiefer, & Stefanov, 2002).

The success of an Information Object layer implementation to an existing BI tool relies on the effectiveness and efficiency of delivering and modifying reports and seamless alteration of information object structure. The integration of different silos of information and providing a single gateway of information to the end-users is another metric to be used. Moreover, users' feedback on the process for creating reports and the personalization of the information available to them and the acceptance of this technology is a metric that determines the success of Information Objects.

Information integration of disparate sources is crucial for organizations to acquire a better understanding of corporate data and to leverage existing information in new ways. Today's approaches such as data mart, data warehousing, e-Business Portal, and Intranets lack the capability to provide interactive analysis of data, what-if scenarios, and overlapping or duplicating data located in different sources. With Information Objects, corporate data will be represented in a consolidated view. Real-time extraction of data from disparate sources and synthesized data will produce a unified representation of corporate information that can be used to create knowledge. Future changes of disparate sources or addition of new ones will only require changes in the mapping rules without the end-users perceiving the changes.

Chapter 3 – Methodology

The project consisted of two phases within a year's time frame: research and project tasks. The research section encompassed an analysis of Information Objects and the necessary hardware and software platform to accommodate this research. This phase included a summary of all the benefits and advantages provided to end-users and IT by Information Objects. From all existing reports available to end-users, two reports were selected to be implemented using the Information Object approach. The selected reports were analyzed to determine what requirements were needed to implement new versions of these reports which would utilize Information Objects.

The second phase, a project task plan, encompassed the implementation of Information Objects on the reports selected in the first phase. The implementation was divided into five phases, where each had its own time frame for completion. The first phase pertained to the investigation of Information Objects, specifically its implementation to the current Business Intelligence tool and what objects were created for which reports. The second phase dealt with the deployment of these Information Objects. The third phase focused on granting Information Objects and report access privileges to their respective test users. The fourth phase encompassed the testing of all these new Information Objects and the reports created while using them. Also during this phase, a verification of the results displayed by the reports was conducted. The last phase analyzed the benefits of this new feature regarding the amount of flexibility it has granted to end-users and the minimization of workload on the administrators' and developers' sides.

In this second phase, the data used in these reports was converted to Information Objects, and each Information Object was set up for user access. The end-users had the capability of accessing the new version of reports created using Information Objects. Furthermore, the

Information Objects were modified to access another disparate source which merged new information with old information, without the need to modify the report itself. A third report was developed based on the Information Objects created that displayed summarized information.

On the technical side, this project was carried out in a controlled environment. This environment consisted of a web server with the following software and hardware specifications:

- Windows NT 2003,
- Oracle 10g,
- Business Intelligence Suite (I-Server, Information Objects and Report Developer Desktop applications),
- Tomcat Web Server (bundled with the Business Intelligence Suite),
- 2 GB RAM,
- 60 GB Hard Disk Drive, and
- Intel Core Duo 2 GHz.

After the implementation of Information Objects by report developers, these and the reports employing them were deployed to this controlled environment. Then, the test users verified access to assigned reports and Information Objects by logging onto the Business Intelligence Portal, where the project's primary focus was the investigation and implementation of Information Objects. This feature will help provide a better understanding of how Information Objects affect the amount of work that developers and administrators spend creating custom reports and modifying existing reports, by granting the privilege to power users to create reports based on report templates. Users' feedback will help in the understanding of the benefits of Information Objects to perceive the data and report performance between the regular reports and the new enhanced reports. Additional feedback will be requested about the latency in report development and integration of data stored in disparate sources.

Chapter 4 – Results

The integration of Information Objects into the Business Intelligence Reporting tool minimized the effort put out by administrators and report developers in working on the requests mentioned in Chapter 1. Two reports were selected that contained data from disparate sources. Information Objects were created for the two selected reports and relationships between objects were established and stored at the metadata layer. New versions of existing reports were created using Information Objects, with the same source of data as the existing reports. After testing the new versions of the reports and comparing them to the existing reports, the original and the enhanced reports were modified to display more information stored in other data sources.

From the end-user's perspective, existing and new versions of reports were run, and their dataset results were compared. As expected, the results from the reports using Information Objects matched the results of query-based reports. Upon first time report generation, existing and enhanced version reports took the same amount of time, two minutes. End-users did not perceive any difference in the presentation of the information. For every time an ad-hoc based report was run, the SQL query was executed against the database source and the report generation took two minutes to complete. On the other hand, reports based on Information Objects retrieved data from the source only once, and the data was cached on the server. The first time the reports were generated it also took two minutes to complete. However, the second and third time the reports were run, the report using Information Objects returned data in less than 20 seconds. This decrease in report generation time was due to the fact that the Information Objects were cached on the I-Server side of the BI tool and every subsequent runs, the cached Information Objects were called by report instead of retrieving the data directly from its source.

From the developer’s perspective, the development of the new version of reports based on Information Objects presented no issues. The creation of reports using Information Objects required the creation of mapping rules. These mapping rules consisted of establishing the relationship between data and how they represent corporate data in business terms. The creation of Information Objects is basically explaining a SQL query into business terms and rules. Once an Information Object has been created, it can be used to create reports by referencing these items in the report development. Although establishing the relationship between Information Objects required further planning and thinking with regards to scalability and adaptability for future changes, creating the reports required the same amount of time and effort as creating a query-based report. However, the modification of the information being displayed in the reports required more effort from the developer when modifying query-based reports. These reports that required changes, needed the SQL query to be modified and new queries to be added to fulfill the new requirements. This process took 15 minutes to modify the SQL query and create the necessary fields; however this coding time depends on how familiar and knowledgeable the developer is regarding the data source. In addition, coding time depends on the complexity of the SQL query as not all queries follow the same logic and where its structure is defined on how the data is accessed. For instance, accessing data from different sources where the processes that populate them are not related, increases the complexity of the SQL query. Therefore, future modifications of the SQL-based report will require more time and effort from the developer. In this case, the developer’s experience and knowledge helped to modify the query in a shorter time. On the other hand, reports based on Information Objects presented a smooth process of modifying information to be displayed in the reports, regardless of whether the data pertained to a different data source. This process also took 15 minutes as it basically was establishing the mapping rules into business terms which were based on the new logic added to the SQL query of the existing reports. However, the process for adding the Information Objects to other reports was very simple and took five minutes as it was basically referencing these new items in the reports, as opposed of modifying the SQL query and dealing with the complexity of the query structure and logic, where coding time depends on the knowledge and familiarity of the data source.

The development of a report based on Information Objects was conducted once by one of the test users. According to the feedback from the user, this process was not complicated and did not present any difficulties in understanding what corporate data the Information Objects were portraying. User was successfully able to add new columns of information to an existing report where its result dataset provided more detailed information. This process took four minutes and required no intervention from a report developer, as the report and Information Object were already deployed.

The deployment of SQL-based reports and Information Objects based reports was similar. Both reports required the administrator to follow the same release process of deploying them to the Business Intelligence Portal. However, with Information Objects based reports also required the deployment of the Information Objects to the BI Portal, as they are necessary to generate these reports. Similarly to report access, access to Information Objects was required to be setup by administrators.

Chapter 5 – Conclusions

Managing, analyzing, and using information stored in disparate sources is not only an issue found in the e-Business field but also found in e-Science, e-Learning, e-Government and any type of Web Intelligence system (Hu & Zhong, 2005). Through the use of Information Objects, personalization can be achieved and information can be tailored to a group or single individual. However, due to licensing fees, security features were not implemented or tested during this project. Access privileges to reports and Information Objects could be granted to users according to their roles in the organization. Selected or filtered information can be displayed in a report that could be based on the profile or characteristics of the individual, which would determine the level of security and data sensitivity. From a technical perspective, metadata of corporate data can be matched to the metadata of a user. Personalization can be divided in three different categories (Koch & Schubert, 2002):

- Identical presentation to all customers with a collection of static information. The information is the same to every user.
- Personalization by category through the assignation of users to groups with similar interests.
- Individualization determined according to the needs and preferences of each user.

Through the integration of Information Objects with BI tools, corporate information and reports move from a static view to a dynamic view that could provide a personalized view that addresses the users' needs as shown in Figure 2.

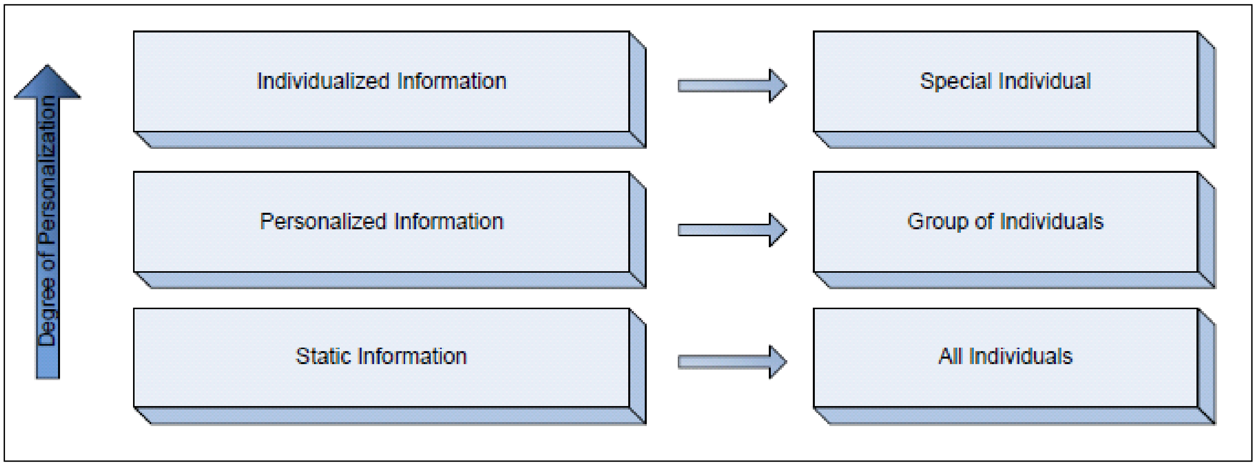

Figure 2: Degrees of personalization.

Furthermore, current BI tools are targeted to analysts or IT developers, but provide little support to users with no IT background. With the implementation and integration of Information Objects with BI software, users will be able to improve their performance and decision making regardless of their background. Business and operations users will be able to retrieve information without knowing the data source or relationships between systems and processes. Information can be personalized to adjust the users' needs and preferences (Azvine, Cui, & Nauck, 2005). In addition, BI tools should not be viewed by management as a pure and static information retrieval system, but rather as a real-time tool that supports decision makers and provides business and operational users with knowledge and awareness of the current business state. In other words, BI should become more proactive in assisting in the day-to-day decision-making processes.

Information Objects maximized usability, utility and deployment flexibility while simultaneously minimizing the overhead associated with each and every report. Information Objects provided normal users with virtual metadata views of corporate information in business-friendly terms. The benefits found in the development and integration of Information Objects are the following:

- Unified data access: information objects are reusable all across reports. This can help the creators focus on how to present information rather than how to obtain it. The number of individual queries operating against transactional systems is reduced.
- Real-time information for consumers: This refers to a business friendly view of corporate information. It can be provided to end-users as they request it through the lightweight queries that are executed.
- Information Object designers: with graphic designers for IT simplifying the query construction and definition of metadata abstractions, users are capable of picking tables and fields to be viewed in reports with no code necessary.

Moreover, Information Objects can easily be adapted to changes in business processes while SQL queries need to be modified every time for every report that access data where new information is added or removed. In contrast, Information Objects serve as single point of access which must to be modified only once. Therefore, when any data changes occur in any of the disparate sources or business processes, the administrator can easily modify the mapping rules to accommodate the changes. Therefore, this type of administrative task saves time, effort, and money for administrators and the organization. Administrators will be able to grant the privilege to power users to create their own custom reports through the use of Information Objects. BI administrators and developers will be able to focus more on the administration and management of the reporting system, as well as the creation of report templates and Information Objects.

Through the deployment of Information Objects, end-users will have the option of creating their own reports instead of requesting and waiting for reports to be created by developers. In addition, what-if scenarios can be run which could lead to business state awareness. As a result, end-users then have the capability of creating their own on-demand custom reports to a desired level of detail that would meet their needs without requesting modification of shared reports or needing of an IT background. However, any modification of ad-hoc reports requires notice to other users about the new change and its approval.

A BI tool integrated with Information Objects would become an active tool that could support better business decision making by continuously

- observing and discovering events and trends in a business environment through real-time reports,
- discovering and analyzing business exceptions through what-if scenarios and real-time reports,
- converting data into meaningful business information.

Organizations that combine their existing Business Intelligence tool and Information Objects will have a better approach to report on corporate data and use it to gain understanding of the business and its state. This new approach will provide a reporting portal were users will have access to information that is relevant to their day-to-day duties, and end-users will have the option of creating their own custom reports, which will provide real-time information and what-if scenarios. An Information Object layer provides decision makers and knowledge workers with a better overview of corporate information. The Information Object approach will enable reports to extract data in real-time from disparate sources, join and synthesize the data, and produce a unified representation of corporate information that can be used to create knowledge. In the end, Information Objects will enable users to maximize the benefit of existing information through a unified view of business-critical data and detect redundancy. Corporate data can be managed appropriately through the existence of a single point of access.

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