Portals for Business Intelligence

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INTRODUCTION

Today, the business domain is confronted with a paramount avalanche of documents and business data. Continuous capturing of business data, be it success indicators or other performance metrics, have led to a tremendous amount of information sources. At the same time, the number of documents—each carrying valuable information once perceived in a proper context—is also booming at tremendous speed. Three issues arise: (1) how to derive data patterns that are perhaps critical for the mission of a company, (2) how to extract knowledge structures from unstructured data, and (3) how to identify relationships among structured and unstructured data. The latter is of particular importance for instance for the search of evidence in unstructured data for certain business tasks. A combination of all three issues will improve information intelligence services in particular for the case of business intelligence. In the context of business intelligence, companies strive to assess their competitive strategies by analyzing relevant information in structured as well as unstructured data. The first issue has been addressed by data mining algorithms, which are well established in research and industry. The second issue revolves around text mining while going beyond mere information retrieval, and it is currently well-recognized by major vendors of document management systems. Both issues are supported by portal concepts for the navigation in distributed information sources. The third issue is rather a combination of the former issues by orchestrating methods for the exploration of unstructured and structured data.

Subsequent business scenarios illustrate the need for the identification of patterns and for the combination of knowledge that has to be derived from both structured and unstructured information sources:

- **Customer Relationship Management (CRM):** Companies systematically collect customer data acquired from sales, marketing, or service in structured databases. Such information is often linked with socio-demographic data and analyzed with data mining technology. However, marketing specialists are also confronted with huge amounts of text data such as e-mails or letters from customers, sales conversation protocols, or telemarketing transcripts. It is actually the unstructured data, possibly classified along product catalogues, that plays a central role in marketing. Whereas sales and failure statistics provide quantifiable information, text data helps the analyst to figure out the *why*. In order to identify customer and problem categories, text relationships in collections need to be detected and combined with the structured customer data (cf. Cody, Kreulen, Krishna, & Spangler, 2002).

- **Sales Planning:** Data warehousing and OLAP are key technologies for providing deep insights into business-relevant key data, often stored in multidimensional databases. Financial forecasting and planning, however, cannot rely only on structured, internal data. Solid decision making also relies on text-based information found in articles from news magazines or the trade press. In the travel and tourism sector, for instance, information on products, booking rates and capacities is stored in multidimensional databases. Planning the supply for future seasons requires a detailed statistical analysis of such data. In addition, external information sources from the travel press have to be considered tackling questions like: "Do terror attacks influence travel activities and booking behavior of specified customer groups?" and "Are there cultural events, which make traveling to certain destinations more attractive?" Exploring relevant articles according to both, their news category and their individual semantic relationships helps analysts to assess and collect "soft" information for decision-making (Abramowicz, Kalczynski, & Wecel, 2002).

- **Market Analysis:** Analyzing actors in a specific market segment is an important instrument for the early planning of upcoming production lines, for the continuous monitoring of partners and competitors, or for building strategic alliances. Company profiles offered by specific providers are typically semi-structured according to predefined templates. Clustering companies according to their business idea (typically described in brief text summaries) and relating this information to size, capacities, or turnover (typically encoded in structured attributes) helps analysts to

better understand the current situation in the focused business sector (Schoop et al., 2002).

BACKGROUND

Business Intelligence: Analyzing Business-Critical Data

Business intelligence (BI) refers to a collection of methods and technologies that support enterprise users in making sound and well founded business decisions. As an umbrella term, BI includes a spectrum of methods and applications for collecting and analyzing business-critical data. The spectrum ranges from tools for querying, information filtering, and monitoring over reporting and planning methods for online analytical processing (OLAP), up to approaches for statistical data analysis and forecasting, as well as data and text mining.

A Technology Portfolio for Business Intelligence

By its very nature, BI includes a phalanx of specialist's tasks and technologies (cf. Figure 1). Many of these tasks are concerned with the exploitation of quantitative, structured data, often derived from a company's operational databases. Tools for online analytical processing (OLAP) are used for tasks like reporting, planning, or the analysis of key performance indicators (KPI, e.g., revenue, costs).

In this process, the analyst must know which hypotheses he or she wants to test and hence what queries to pose. In addition, data mining techniques allow an analyst to cluster or correlate data in order to detect patterns in the data set (e.g., in order to derive segments of customers from sales data in marketing).

On the other hand, business executives heavily rely on qualitative information (often from external sources) when they prepare or draw a decision. Business analysts like the Gartner Group state that more than 80% of strategically relevant business data resides in unstructured media such as e-mails, letters, news items from the trade press, or company documents. Using retrieval tools, the user must know exactly what he or she looks for. Besides, text mining plays an important role in BI. It supports analysts in the process of identifying interesting relationships among text documents or textual entities described in text documents (cf. Becks & Seeling, 2001). Text mining is a vivid field of research and development and currently also well recognized by vendors of document technologies.

While many BI technologies have matured and are nowadays well-established in research and industrial use—such as OLAP, enterprise resource planning, document management, or desktop search—one important issue still remains: The separated analysis of structured and unstructured information leads to a mental barrier that eventually hampers holistic business decisions. Moreover, the analysis is often limited to internal management information while ignoring information available outside the company. In many situations, such separated analyses approaches have even lead to inconsistent and even contradictory assessments of the enterprise's situ-

Figure 1. Portfolio of BI technologies
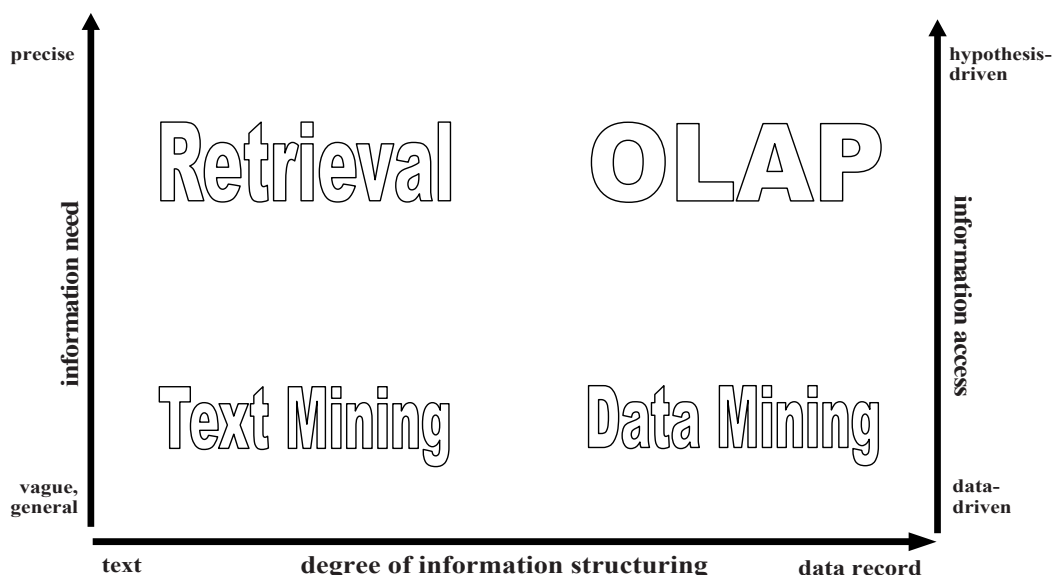
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