

Business Intelligence 2.0: a General Overview

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Content

- Introduction
- BI & Data Warehouses in a Nutshell
- Basic Concepts related to BI 2.0
- Influence from the Web on BI
- Technical Challenges of the new BI 2.0
- General Overview of Tools Stepping Towards BI 2.0
- Conclusions

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Introduction

- The use of Business Intelligence solutions has been steadily **increasing**
 - In the recession period, the BI market grew 4%
- BI allows the business to gain a **competitive edge** by analyzing the data of the organization

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Introduction

- Traditional technologies to support BI processes range from **Data warehouses** to **OLAP** and **Data mining**.
 - These technologies allow to query the organization's **internal** data
- However, a new trend has emerged: analyzing data from **outside** the organization.

Introduction

- For example, including information like:
 - Retail prices of products sold by competitors
 - Opinions from customers
 - ...
- Result: **Richer** analysis and **better support** for the decision-making process

Introduction

- However this trend is **bidirectional**
 - As BI applications **include information from the Web,**
 - These applications have also been **evolving towards web technologies.**

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Introduction

- Evolution driven by technologies appeared in the Web 2.0:
 - Social Networks (e.g. Facebook)
 - Graph and linked data
 - Interactive Web applications
 - Cloud computing
 - Collaborative Networks
 - Process Intelligence
 - Software as a Service...



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Introduction

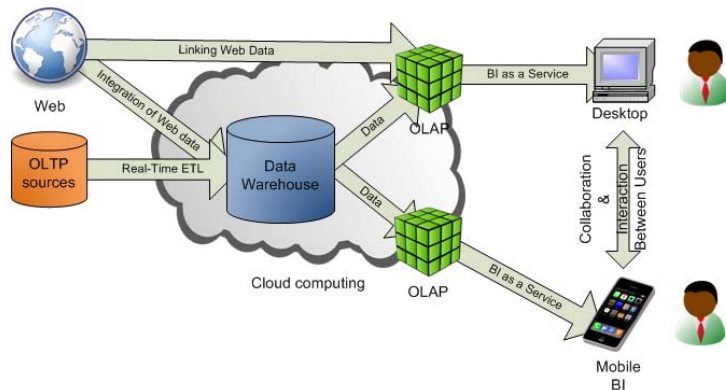
- Some authors call it BI 2.0, others BI 3.0...
 - Which are the common aspects that define the new BI?
- How is the web affecting BI and which **new features** are being included from this influence?

Introduction

- Which **technical challenges** must be overcome?
 - Which are already solved, which require further research?
- Which features are being integrated by **BI tools**?

Introduction

- A first look into a BI 2.0 architecture...



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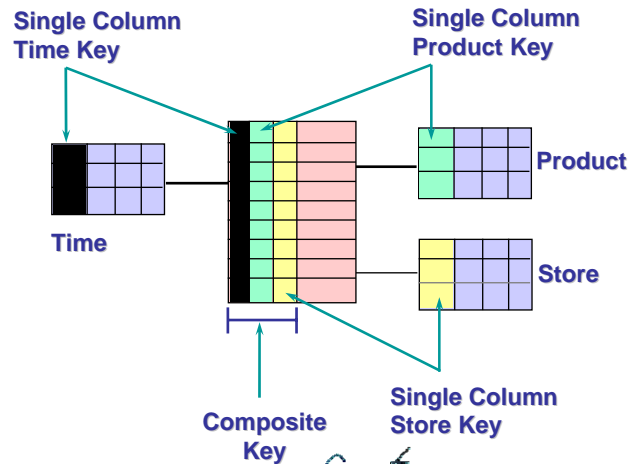
BI & Data Warehouses in a Nutshell

- Traditionally, BI has focused on analyzing huge amounts of data to support the decision-making process
- Transactional databases are not adequate for this task:
 - Difficult to retrieve the necessary information
 - Performance

BI & Data Warehouses in a Nutshell

- Necessary to develop the decisional database with an alternative design:
 - Focus on the information being analyzed
 - Improving the performance
- Result:
 - Vendors implement the logical models Star Schema, Snowflake, Fact Constellation,...
 - [Kimball, 96]

BI & Data Warehouses in a Nutshell



BI & Data Warehouses in a Nutshell

- However, as the logical model is designed to store data and improve performance:
 - It does not take into account analysts' needs
 - Schema is still difficult to understand
 - Difficult to retrieve information (SQL queries over the database)

BI & Data Warehouses in a Nutshell

- The logical level lacks detail to specify multidimensional information
- It is necessary to create models with a higher abstraction level: **conceptual models**

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BI & Data Warehouses in a Nutshell

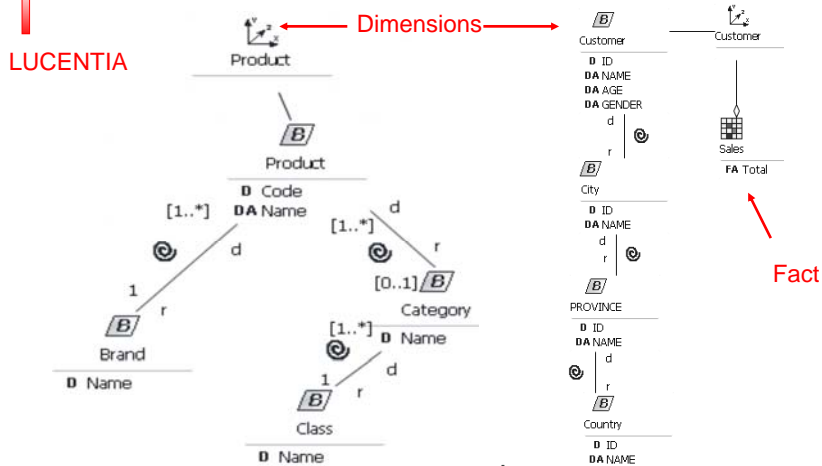
- Different **conceptual** models have been proposed to solve this issue within data-driven approaches

[Abelló et al. 2006][Trujillo et al., 2001][Luján-Mora et al. 2006][Sapia et al. 2004][Tryfona et al. 1999] [Golfarelli et al. 99] and many more

- Unfortunately, up now none has been accepted as a **standard**
 - Although supported by tools and checked in real-world projects

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BI & Data Warehouses in a Nutshell



BI & Data Warehouses in a Nutshell

- Is the multidimensional information **not relevant**?
 - No, BI tools have also implemented **their own representations**
 - Information related to facts, dimensions, and hierarchies is **highly relevant** for the analysis
 - Moreover, it enables to query the DW using **OLAP** and **MDX queries**

BI & Data Warehouses in a Nutshell

- Nevertheless, being able to query the DW does not mean that it satisfies user's needs
- Solution? Perform a **requirements analysis stage** to design the DW
 - Using a higher abstraction level to communicate with users

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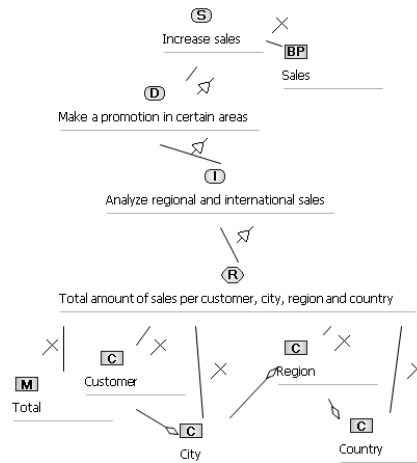
BI & Data Warehouses in a Nutshell

- As previously, there is currently **no standard** for the Requirements Engineering (RE) stage
[Giorgini, Golfarelli, Rizzi, 2008][Mazón et al. 2007]
- However, the RE stage allows us to **identify and guarantee** that the **analysts' needs are met**

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BI & Data Warehouses in a Nutshell

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User's
Requirements
Approach

Juan C. Trujillo
Alejandro Maté

First European Business Intelligence Summer School (eBISS), Ec. Centrale, Paris, 2011

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BI & Data Warehouses in a Nutshell

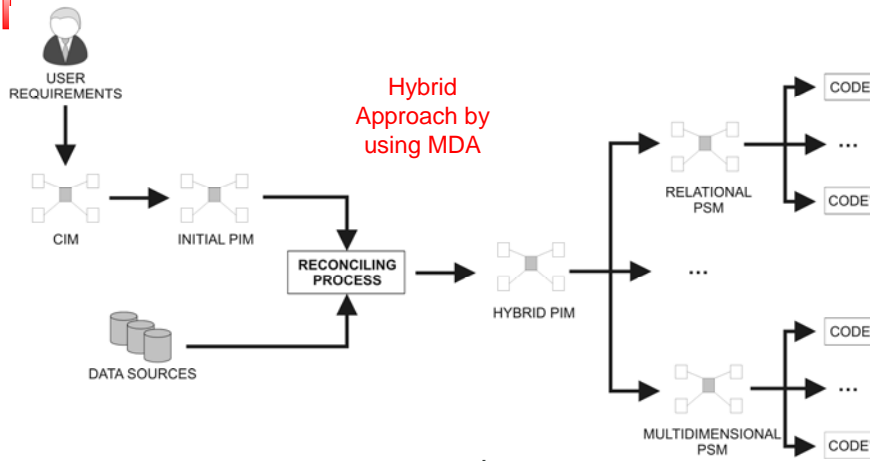
- A complete hybrid DW development approach has been proposed in the **Lucentia** Research Group
[Trujillo et al., 2001] [Mazón et al. 2008][Mazón et al. 2009]
- Considers both user requirements and data sources
- **Hybrid** approaches allow us to identify problems in early stages

Juan C. Trujillo
Alejandro Maté

First European Business Intelligence Summer School (eBISS), Ec. Centrale, Paris, 2011

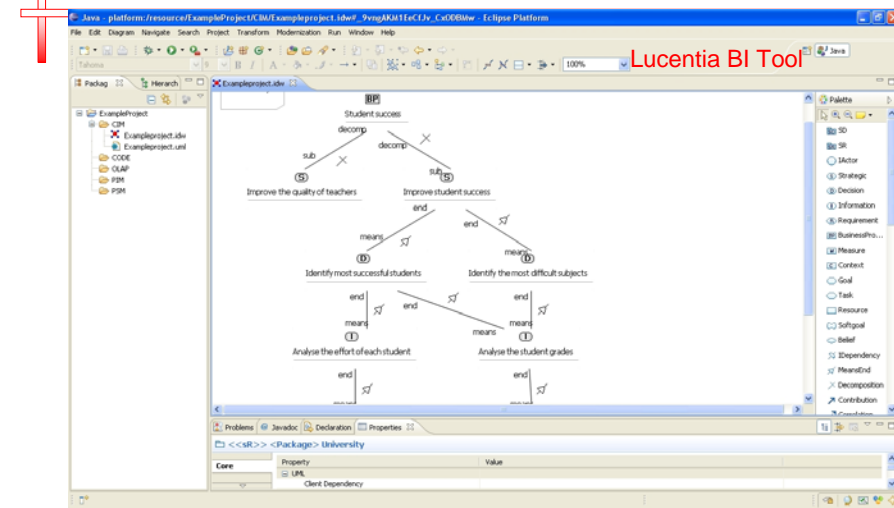
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BI & Data Warehouses in a Nutshell



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BI & Data Warehouses in a Nutshell



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BI & Data Warehouses in a Nutshell

- Since there is a proposal for automatically deriving DWs, has every problem been solved in this area?
 - No. There are a series of challenges still open
 - Traceability of user's requirements
 - Quality measures to drive the design
 - Security constraint from the early stages
 - And many more

BI & Data Warehouses in a Nutshell

- Business processes evolve, therefore the DW must support this evolution
- We require to analyze information present in the Web
 - This information is typically unstructured
 - Accuracy and correctness are not guaranteed

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Basic Concepts related to BI 2.0

- When talking about BI 2.0 it is important to define some **basic concepts**
- **Real-time**
[Thiele et al. In Press], ...
 - All the information used must be fresh and up-to-date
 - Exceptional situations previously unknown
 - E.g. Sales data without the list of products

Basic Concepts related to BI 2.0

- Real-time information

Vuelta de Londres-Gatwick - Alicante

« Semana anterior Semana siguiente »

Dom, 19 Jun 11	Lun, 20 Jun 11	Mar, 21 Jun 11	Mié, 22 Jun 11	Jue, 23 Jun 11	Vie, 24 Jun 11	Sáb, 25 Jun 11
from 29,99 EUR	from 21,99 EUR	from 14,99 EUR	from 21,99 EUR	from 29,99 EUR	from 29,99 EUR	from 29,99 EUR

Seleccione un vuelo

<input type="radio"/>	Sin Tasas Adulto	29,99 EUR	Mar 21 Jun 11	10:10 Salida	<input type="radio"/>	Vuelo
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Costes: 14,99 EUR
Facturación en línea: 6,00 EUR
Delay/Cancel Levy: 2,00 EUR
Impuestos/ tarifas: 0,00 EUR
Precio total: 22,99 EUR

Basic Concepts related to BI 2.0

- Software as a Service (SaaS)

[Essaïdi et al. In Press]

- Software is now consumed as a remote service
- Use of Service Oriented Architecture (SOA) and SOA Protocol (SOAP) for interoperability
- Recently applied to BI solutions, resulting in BI as a service

Basic Concepts related to BI 2.0

■ Cloud computing

[Armbrust et al. 2009], [Larry Ellison, Wikipedia]

- Integration of several, heterogeneous elements into a network
- Middleware provides homogeneous interface
 - Services provided consumed through SaaS
- Supports the addition of new elements

Basic Concepts related to BI 2.0

■ Collective Intelligence

[Gruber et al. 2008]



- Originally refers to emerging behaviours
 - E.g. Ant colonies can solve the *Travelling Salesman Problem*
- Social Networks also present emerging behaviours
 - Decentralized groups are able to take decisions as a group and promote initiatives

Basic Concepts related to BI 2.0

■ Crowdsourcing

[Howe et al. 2009]

- Delegating a task to a crowd
 - e.g. Mechanical Turk services in Amazon
- Each individual contributes with a **little effort** to the global goal
- Depending on how the crowd is **organized**, the **collective intelligence** can achieve **better solutions** than a single expert

Basic Concepts related to BI 2.0

■ Social Networks

[Berthold et al. In Press][Golfarelli et al. In Press]



- Group of participants which can **interact** with each other
 - Typically they collaborate, achieving goals **faster** and with **better results** than a single individual would
- The most relevant data are the **contributions from the participants** and the **relationships** between them

Basic Concepts related to BI 2.0

▪ Linked Data

[Berlanga et al. In Press] [Bizer et al. 2009]

- Knowing the **relationships** between each piece of data and the rest
- In order to be able to reason and infer knowledge, the relationships must be **semantically tagged**
- Allows to obtain knowledge **automatically**

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Basic Concepts related to BI 2.0

▪ Opinion mining

[Balahur et al. In Press]

- Describing the **general feelings** of a group of **people** towards a certain **element**
- Requires to **analyze** unstructured data, **understand** its content and obtain a **conclusion**
- Highly **relevant** to identify **how customers perceive products**

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Basic Concepts related to BI 2.0

- Process Oriented BI

[Golfarelli et al. 2004]

- Point of view focused on Business processes and their logic
- Tries to relate the stored data to the process performance
 - Extensions of BPMN 2.0
- Allows to identify and restructure business processes presenting problems

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Influence from the Web on BI

- As society evolves, the ratio of connectivity has increased
- The business environment is rapidly changing
- Physical barriers disappear
 - Business provide their services online

Influence from the Web on BI

- Customers can access a wide variety of offers with no additional cost
 - The customer becomes more critic
- New technologies allow customers to interchange opinions
 - Social Networks, Twitter, online reviews...
 - Customers influence other customers

Influence from the Web on BI

- Businesses need to consider **as much information as possible** when taking decisions
 - What do the competitors offer?
 - What do our customers think about our products?
- Decisions must be **agile**
 - Otherwise, customers will **leave**



Influence from the Web on BI

- How is BI and BI tools being **altered** by this new **dynamic environment**?
 - New interfaces
 - Using always fresh, up-to-date information
 - Decisions are no longer isolated
 - Data is presented in a more significant manner
 - Focus on analyzing the immediate future

Influence from the Web on BI

- New interfaces
 - New requirement introduced: data must be checked from *anywhere*
 - *Web interfaces* replace desktop applications
 - Introduction of *Mobile BI*

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Influence from the Web on BI

- Mobile BI
 - Accessing data using *mobile devices*
 - Limitations in screen size and memory
 - Transfer only the *necessary data*
 - Show only the *necessary information*
 - Navigation must be *interactive* and *simple*



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Influence from the Web on BI

- Up-to-date periods
 - Traditionally information was provided in the form of reports
 - However, currently reports are **only checked** to identify the source of an **existing** problem
 - They are not interactive, and **difficult to relate to business goals**
 - The information provided by reports arrives **too late**



Influence from the Web on BI

- Is monthly or weekly information **fresh enough**?
- In order to answer this question let us consider an **example**:
 - After the recent security breaches in Sony, **how much time** was required for its image to be hurt in **the whole world**?
 - Under a **day**

Influence from the Web on BI

- Decisions are no longer isolated

[Berthold et al. In Press][Golfarelli et al. In Press]



- Traditionally, decisions would be taken by **executives** in an **isolated** manner
- However, it has been proposed that it is better to take decisions using **collective intelligence** or even **crowdsourcing**
- Often, employees have **relevant knowledge** regarding a specific problem

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Influence from the Web on BI

- Two main alternatives for taking decisions in group:
 - **Discuss** the decision through collaborative BI with other employees (i.e. interacting like in a Social Network)
 - Allow employees to **enrich the existing data** and **contribute** with their own information
 - Then, **exploit** this information in order to take a decision

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Influence from the Web on BI

- In order to achieve these **collective decisions**, data should be **interactive**
 - Users should be able to **easily interchange information**
 - Did you know that **Excel** is the **3rd most used BI tool** in Spain?
[Pentao 2011]
 - Users should be able to make annotations and **enrich the data with relevant information**

Influence from the Web on BI

- Data is presented in a **significant way**
 - Traditionally, and currently by default, tools focus on **how** to present aggregated data
 - Bar graphs, spreadsheets, stacked bars...
 - However, decision-makers wish to use the data to **identify** which **strategies** are **working** and which ones are not


Influence from the Web on BI

- Tendency:
 - Relate the data to **balanced scorecards** by means of dashboards
 - Allows us to easily identify the status of our business strategy
 - Other proposals relate data directly to **business goal models** or to **business process models**

Influence from the Web on BI

- New focus of analysis
 - Long-term decisions are **still important**
 - However, due to the **dynamic environment** there is a new necessity to focus on the **immediate future**
 - Apparition of problems which require **immediate attention**
 - **Still more visualization is needed**

Influence from the Web on BI

- Increasing number of short-term decisions 
 - These decisions require real-time information
 - i.e. Do I need to restock my products to meet the demand for the rest of the day?
 - Reliance on predictive data mining, with a strong time restriction

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Technical Challenges of the new BI 2.0

- The new aspects envisioned for BI 2.0 cannot be accomplished unless we overcome a series of technological challenges
- Some of these challenges have already been thoroughly studied while others are still open for further research

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Technical Challenges of the new BI 2.0

- Making a brief review we require:
 - Support for real-time data
 - Scalable architecture for multiple collaborating users accessing the DW
 - Include Web data into the analysis
 - Provide predictive algorithms to analyze the information
 - Analyze and relate business processes to the stored data
 - Establish semantic relationships between data in order to automatically infer knowledge (linked data)

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Technical Challenges of the new BI 2.0

- Real-time Data Warehouses
 - Real-time Data Warehouses have been the focus of research in the past years
 - The most significant difference between traditional and real-time DW is how data is captured

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Technical Challenges of the new BI 2.0

- Real-time Data Warehouses
 - Traditionally, data is captured in operational databases when a transaction is processed
 - Then, at some point defined by the refreshing cycle, all the new data is loaded through ETL processes
 - This process is known as bulk-feed

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Technical Challenges of the new BI 2.0

- Real-time Data Warehouses
 - Bulk-feed has several drawbacks:
 - Negative impact on performance of both operational and decisional databases
 - The DW does not have the most up-to-date data
 - Solution?
 - Alter the way of capturing data
 - Obtain the information simultaneously as it is stored in transactional databases (trickle-feed)

Technical Challenges of the new BI 2.0

- Real-time Data Warehouses
 - In order to load transactions into the DW as they are captured we can:
 - Use triggers in transactional databases
 - Extract the information from logs
 - Use replication techniques
 - The ETL process is transformed into a modeled parallel flow of data towards the DW
 - Information may be incomplete at certain points
 - Important to model unexpected flows (exceptions)

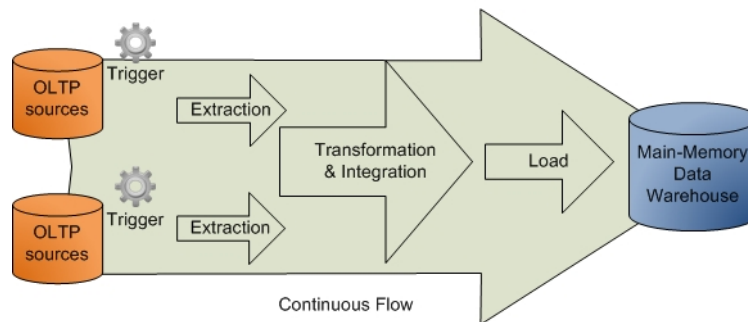
Technical Challenges of the new BI 2.0

- Real-time Data Warehouses
 - Finally, as queries must be processed **simultaneously** as data is being loaded we need to consider:
 - **Minimizing query delay** by using parallelization or main-memory databases
 - Using replicated tables, in order to guarantee the **correctness** of the analysis
 - These tables can be swapped in short cycles

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Technical Challenges of the new BI 2.0

- Real-time Data Warehouses



- More in Dagstuhl seminar: Real Time DWs

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Technical Challenges of the new BI 2.0

■ Scalability

- BI 2.0 envisages constant real-time data flows into the DW
- Number of users querying the DW is also expected to increase
- The scalability of the system becomes an important factor

Technical Challenges of the new BI 2.0

■ Scalability

- How can we increase the scalability of the BI system?
 - How can we increase the scalability of a system in general?
 - More powerful single pieces of hardware
 - More hardware elements
 - How does this translate into BI?

Technical Challenges of the new BI 2.0

■ Scalability

- First option: More powerful pieces of single hardware
 - In BI this means better dedicated servers
 - Exadata (Oracle)
 - TwinFin (Netezza)
 - Information is stored by the organization
 - Potentially more secure
 - Privacy



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Technical Challenges of the new BI 2.0

■ Scalability

- Second option: Simply more hardware
 - The recent apparition of cloud services allows us to create a flexible system
 - Use more power as you need
 - Pay-as-go
 - Two approaches:
 - Public Clouds (i.e. Amazon, Azure Cloud, iCloud)
 - Private Clouds (with your own high-end servers!)

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Technical Challenges of the new BI 2.0

- Processing semi-structured and unstructured data
 - Highly relevant information is posted online
 - Customers' opinions
 - Retail prices from competitors
 - Reviews of products
 - However, this information is not structured

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Technical Challenges of the new BI 2.0

- Processing semi-structured and unstructured data
 - Two different situations:
 - Semi-structured data (XML)
 - Presents some basic structure
 - The structure helps in interpreting and integrating the data into the system
 - Unstructured data
 - NLP
 - Is Hadoop the right solution ?

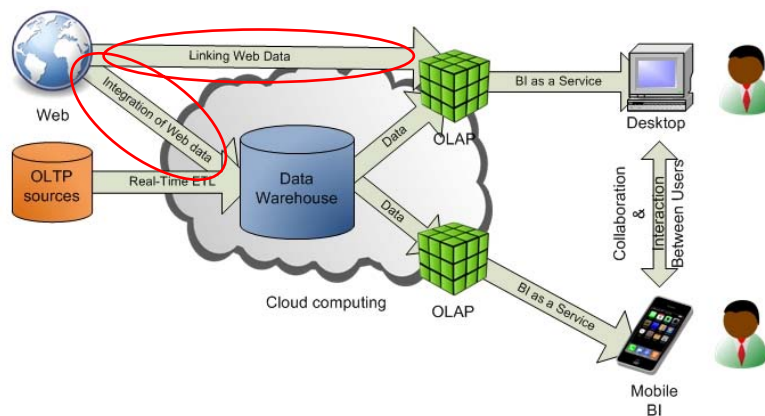
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Technical Challenges of the new BI 2.0

- Processing semi-structured and unstructured data
 - How to include the web information into the BI System?
 - Integrate this information into the **enterprise DW**
 - Correctness of the data inside the DW will **not be guaranteed!!**
 - Create a **separate DW** for Web information
 - Link this information as a **detailed view** after generating the analysis cube

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Technical Challenges of the new BI 2.0



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Technical Challenges of the new BI 2.0

- Predictive data mining algorithms
 - As the focus of analysis shifts towards the immediate future, the importance of predictive analysis increases
 - Descriptive techniques are pushed into the background
 - Historic information and classifications are still important but not the focus

Technical Challenges of the new BI 2.0

- Predictive data mining algorithms
 - It is necessary to predict what will happen in the immediate future
 - A number of existing predictive techniques already exist
 - However, they have not been designed to fulfill the current needs in BI 2.0

Technical Challenges of the new BI 2.0

- Predictive data mining algorithms
 - Huge amounts of data are required to take a decision
 - This situation requires automatic analysis
- Strong time constraints
 - The result must be provided to solve a short-term problem
 - We need an answer, even if it is not the *best answer*



Technical Challenges of the new BI 2.0

- Analyzing business processes
 - Business processes are gaining increased attention from the research community
 - By modeling business processes, we are able to identify the flow of data through the business activity

Technical Challenges of the new BI 2.0

- Analyzing business processes
 - Advantages of modeling business processes:
 - Easier to understand the business activity
 - Identification of deadlocks
 - Allow us to perform Business Process Intelligence
 - Which steps in the process are not working as intended
 - Which processes should be remodeled

Technical Challenges of the new BI 2.0

- Analyzing business processes
 - Challenges:
 - Business process models lack information about the structure of the underlying data
 - Necessary to relate the existing data with business process models in order to analyze them

Technical Challenges of the new BI 2.0

■ Linking data

- As we have previously seen, the **most important feature** of a piece of data in BI, is its **relationships** with other pieces of data
 - Relationships allow us to **reason** and **inere knowledge**
- There are different kinds of relationships
 - Some are **explicitly** modeled
 - Some are **implicit** in the data

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Technical Challenges of the new BI 2.0

■ Linking data

- **Explicit relationships:**
 - Explicit relationships are those **already modeled** in the system
 - i.e. Facts and Dimensions
 - They are the basis for **analysis** and **structuring** the information

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Technical Challenges of the new BI 2.0

- Linking data
 - Implicit relationships:
 - Although not explicitly modeled, **implicit correlations** between data can be **discovered**
 - Data mining, artificial intelligence can help to identify these relationships
 - However, they require that all the information is **included** and **related** in the analysis

Technical Challenges of the new BI 2.0

- Linking data
 - What about the analysis of **different sets** of data?
 - e.g. Decrease in sales in our products related to an increase in sales from our competitors
 - Unless these sets are **not joined** in a single analysis, this information will **not be identified**
 - However, we cannot join **all** the information to perform a **single** analysis of the **whole system**

Technical Challenges of the new BI 2.0

- Linking data
 - Nevertheless, if the important relationships are identified and modeled, new knowledge can be inferred
 - Ontologies for modeling the domain
 - Preserving the existing relationships using traceability
 - Domain-dependent
 - It is important to include meaningful semantics for the analysis

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General Overview of Tools Stepping Towards BI 2.0

- How are BI vendor tools integrating BI 2.0 features?
- Which features are better supported?
- Which ones are most lacking?

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General Overview of Tools Stepping Towards BI 2.0

- Brief analysis of tools to provide an overview
 - Microstrategy
 - Pentaho
 - Cognos
 - SAS
 - Microsoft
 - SAP

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General Overview of Tools Stepping Towards BI 2.0

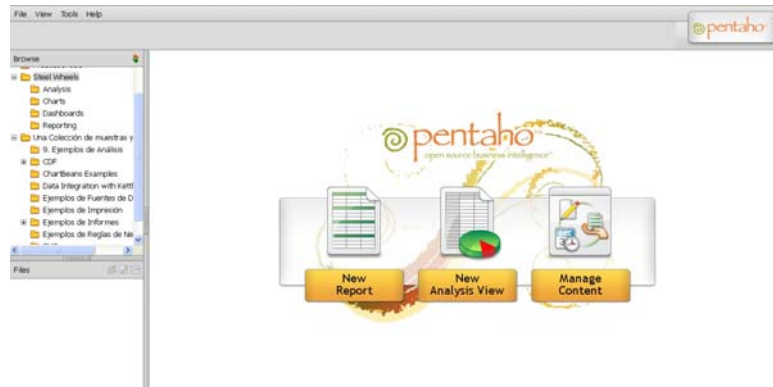
- Microstrategy
 - Positive aspects:
 - **Web interface**. Includes dedicated **Mobile BI** support
 - **Scorecards** and **Dashboards** connecting Key Performance Indicators (KPI) to **provide visibility**
 - Limitations:
 - **Limited predictive analysis** support
 - Interaction and **collaboration** between users?
 - Integration of **business processes**?

General Overview of Tools Stepping Towards BI 2.0

- Pentaho
 - Positive aspects:
 - **Open source**, multi-platform, **Web interface**
 - Includes **Dashboards** for presenting linked data
 - Some **predictive algorithms** included
 - Includes some **collaborative features** when integrated with LifeRay
 - Limitations:
 - Designing and integrating **dashboards** requires some effort
 - Interactivity and **data enrichment**?
 - Integration of **business processes**?

General Overview of Tools Stepping Towards BI 2.0

- Example of a BI web interface (Pentaho)



General Overview of Tools Stepping Towards BI 2.0

- Cognos (IBM)
 - Positive aspects:
 - Web interface. Support for Mobile BI
 - Dashboards and Scorecards
 - Collaborative support and data enrichment with annotations
 - Limitations:
 - Predictive analysis support?
 - Business processes?

General Overview of Tools Stepping Towards BI 2.0

- SAS:
 - Positive aspects:
 - Web interface. Support for Mobile BI
 - Highly customizable Dashboards
 - Allows linking elements
 - Special visualization tools
 - Limitations:
 - Predictive analysis?
 - Collaborative BI?
 - Business processes?

General Overview of Tools Stepping Towards BI 2.0

- Microsoft BI:
 - Integration of several tools:
 - Excel
 - PowerPivot
 - SQL Server
 - Sharepoint

General Overview of Tools Stepping Towards BI 2.0

- Microsoft BI:
 - Positive aspects:
 - Web interface
 - Dashboards and Scorecards through mashups
 - Allows to link elements and interact with other users
 - Supports adding tags to our profile in sharepoint
 - Analysis through Excel and PowerPivot
 - Allows to include data from the Web

General Overview of Tools Stepping Towards BI 2.0

- Microsoft BI:
 - Limitations:
 - Additional effort to use different technologies at the same time
 - Predictive analysis limited to Excel functions
 - Lacks some collaborative functions
 - Direct interaction between users
 - Adding annotations to the data, so other BI users can see them

General Overview of Tools Stepping Towards BI 2.0

- SAP:
 - As in the previous case, composed of various tools
 - Provides complete support for analyzing the business strategy combining desktop applications with web applications

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General Overview of Tools Stepping Towards BI 2.0

- SAP:
 - Positive aspects:
 - Web interface for ad-hoc analysis. Includes Mobile BI support
 - Dashboards and scorecards
 - Complete workbench for data mining tasks
 - Compatibility with other vendors tools, empowering analysis capabilities
 - Excel
 - Enterprise applications

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General Overview of Tools Stepping Towards BI 2.0

- SAP:
 - Limitations:
 - The **collaboration** between users is limited
 - Lacks support for **enriching data**
 - **Interaction** between users is not integrated in the system
 - These aspects are being **improved**

General Overview of Tools Stepping Towards BI 2.0

- Final considerations:
 - Most tools support **cloud computing** using a **SaaS** or **BI as service** approach
 - Some tools include support for using the **cloud** in specific tasks
 - Cognos: Guide to deploy the system
 - Microsoft: Deploying the system into Azure Cloud
 - Pentaho: Data Integration in the cloud

General Overview of Tools Stepping Towards BI 2.0

- Final considerations:
 - Visibility of the business strategy is provided mainly by using **Dashboards**
 - Requires some **effort** to build the desired dashboard and it is **not always intuitive**
 - Could be **improved** by adding support for building the dashboard in an **interactive way**
 - Collaborative aspects are **limited**

Content

- Introduction
- BI & Data Warehouses in a Nutshell
- Basic Concepts related to BI 2.0
- Influence from the Web on BI
- Technical Challenges of the new BI 2.0
- General Overview of Tools Stepping Towards BI 2.0
- **Conclusions**

Conclusions

- BI 2.0 has to deal with several aspects:
 - Real-time analysis
 - Intuitive and interactive analysis from anywhere
 - Collaboration between decision-makers
 - Linking and enriching data
 - Focusing on the immediate future
 - ...

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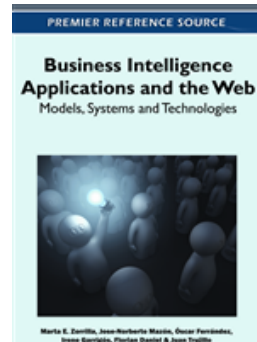
Conclusions

- Further research needs to be done in:
 - Predictive algorithms with strong time restrictions
 - Identify the most effective way of presenting the data
 - Develop a series of best practices when taking decisions in a collaborative manner
 - Process Intelligence and Process Mining
 - ...

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Conclusions

- Further research needs to be done in BI:



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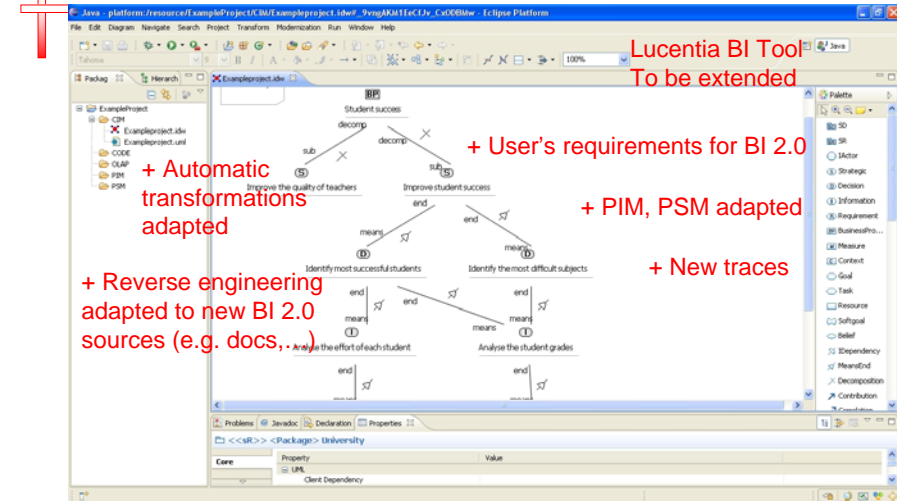
Conclusions

- In our Lucentia Research Group:
 - **Process Intelligence**
 - Mining processes
 - Linking processes to data from BPMN 2.0
 - **Traceability** of user's requirements
 - **BI 2.0 security and quality**
 - **Web Warehouses**
 - **Advanced visualization** techniques
 - **More:**
 - <http://www.lucentia.es>
 - Recent publications on DB&LP

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Conclusions



Business Intelligence 2.0: a General Overview

THANK YOU. QUESTIONS?

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