



MSc GFIS



Future BI

Learning Objectives:

- ▶ Top 10 Business Intelligence Trends by Tableau
- ▶ Use of Cloud Computing in Analytics
- ▶ Location based Analytics
- ▶ Data Privacy
- ▶ GDPR's Impact on BI



Emerging Trends (I)...

1. The Value of Artificial Intelligence
2. Advancements in Natural Language Processing
3. Embedded Analytics
4. “Data for Good” Movement
5. Data Ethics and Privacy
6. Data Management is now even more critical in modern BI deployments



Emerging Trends (II)...

7. Data Visualisation -Storytelling
8. Enterprise get smarter about BI adoption
9. Data Scientists are in demand
10. Data is moving faster to the cloud faster than ever
11. ...proposal for the next trend...Democratization of location data, advancements in this area!

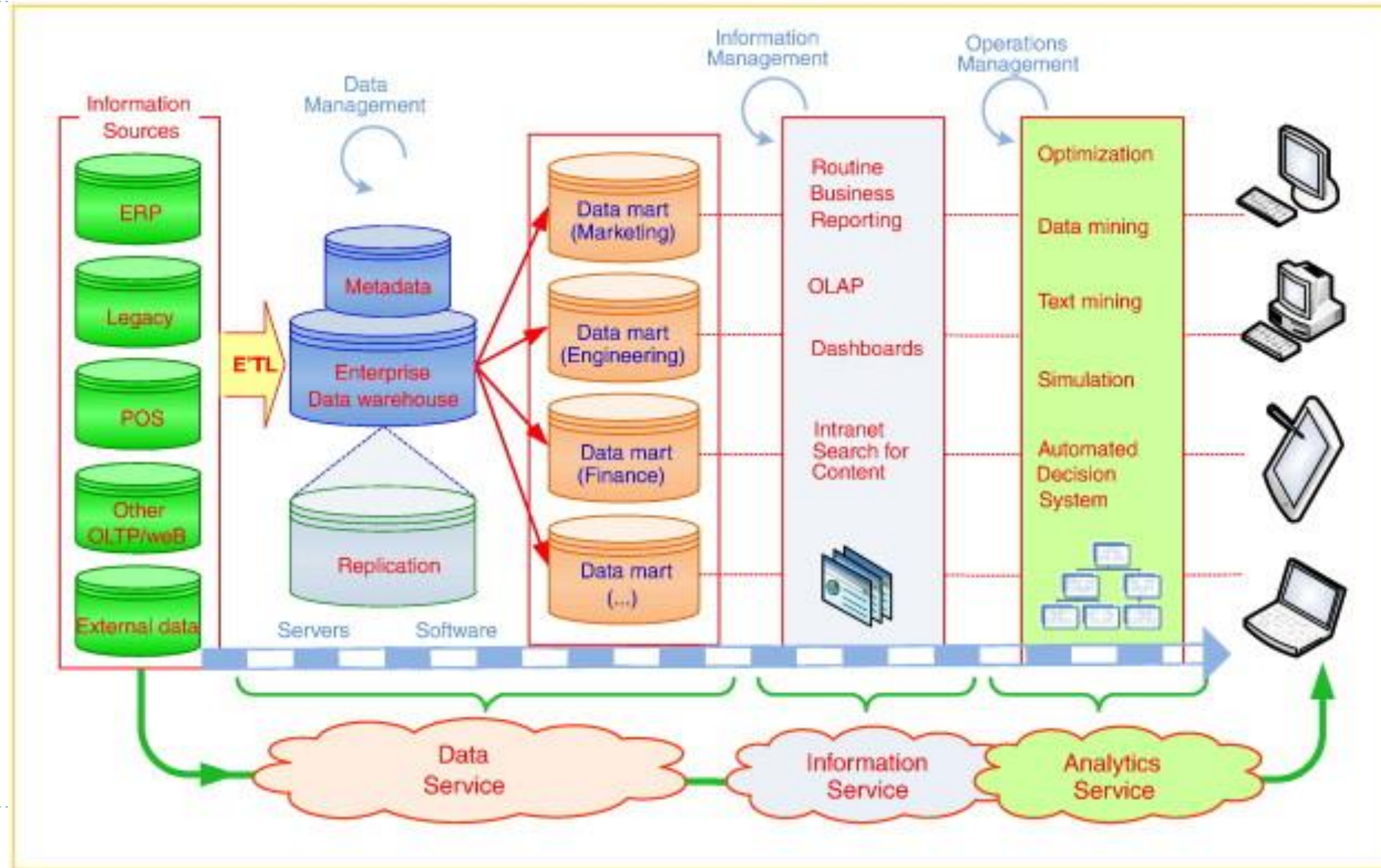


Cloud Computing and Business Intelligence

- ▶ A style of computing in which dynamically scalable and often virtualized resources are provided over the Internet (Wikipedia)
- ▶ Users need not have knowledge of, experience in, or control over the technology infrastructures in the cloud that supports them.
- ▶ Cloud computing = utility computing, application service provider grid computing, on-demand computing, software-as-a-service (SaaS),...
 - ▶ Cloud = Internet
 - ▶ Related “-as-a-services”: infrastructure-as-a-service (IaaS), platforms-as-a-service PaaS
- ▶ Examples:
 - ▶ Web-based e-mail , social networking sites, Google Docs, Google Drive,
 - ▶ e-commerce, BI, CRM, SCM.- Amazon's web services



Service-Oriented BI



Variations of Service-Oriented Architecture and the Cloud

- ▶ Data as a Service (DaaS)
- ▶ Software as a Service (SaaS)
- ▶ Platform as a Service (PaaS)
- ▶ Infrastructure as a Service (IaaS)
- ▶ ...



Major cloud platform providers in analytics:

- ▶ Amazon Elastic Beanstalk
- ▶ IBM Bluemix
- ▶ Microsoft Azure
- ▶ Google App Engine
- ▶ OpenShift



Representative Analytics as a Service Offering

- ▶ Teradata - Aster Analytics as a Service
 - ▶ IBM Watson Analytics
 - ▶ MineMyText.com
 - ▶ SAS Visual Analytic and Visual Statistics
 - ▶ Tableau
 - ▶ Showflake
 - ▶ Predix by General Electric
- Most of these have free/restricted/trial offerings

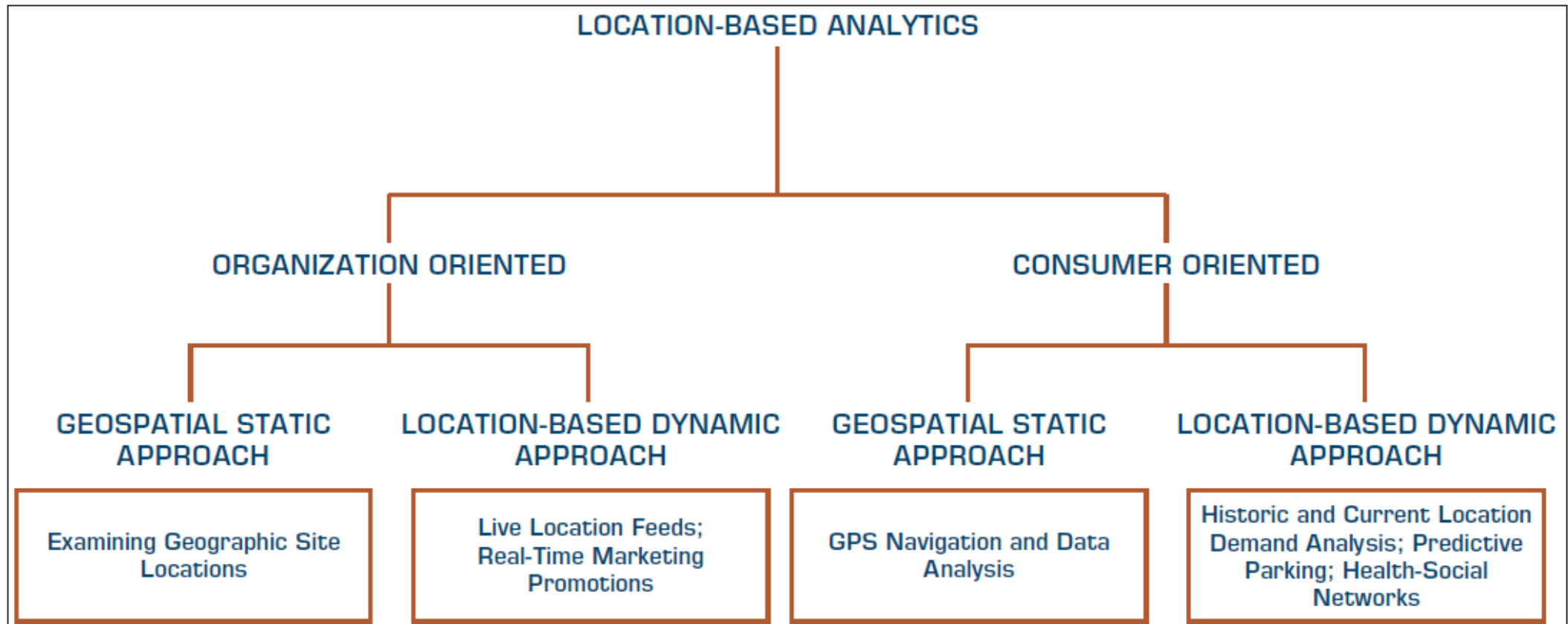


Location-Based Analytics

- ▶ Geospatial Analytics
- ▶ Geocoding
 - ▶ Visual maps
 - ▶ Postal codes
 - ▶ Latitude & Longitude
- ▶ Enables aggregate view of a large geographic area
- ▶ Integrate “where” into customer view



Location-Based Analytics



Location-Based Analytics

- ▶ Location-based databases
- ▶ Geographic Information System (GIS)
 - ▶ Used to capture, store, analyze, and manage the data linked to a location
 - ▶ Combined with integrated sensor technologies and global positioning systems (GPS)
- ▶ Location Intelligence (LI)?
 - ▶ Interactive maps that further drill down to data/information details about any location



Use of Location-Based Analytics

- ▶ Retailers – location + demographic details combined with other transactional data can help ...
 - ▶ determine how sales vary by population level
 - ▶ assess locational proximity to other competitors and their offerings
 - ▶ assess the demand variations and efficiency of supply chain operations
 - ▶ analyze customer needs and complaints
 - ▶ better target different customer segments



GIS Applications

- ▶ In addition to business/retail applications, GIS based analytics are being used in
 - ▶ Agricultural applications
 - ▶ Crime analysis
 - ▶ Disease spread prediction
- ▶ For more applications, look at
 - ▶ esri.com (producer of ArcGIS)
 - ▶ grindgis.com
- ▶ LI can be combined with weather and environmental data to create a richer data/information infrastructure



Real-Time Location Intelligence

- ▶ Many devices are constantly sending out their location information
 - ▶ Cars, airplanes, ships, mobile phones, cameras, navigation systems, ...
 - ▶ GPS, Wi-Fi, RFID, cell tower triangulation
- ▶ Reality mining?
 - ▶ Real-time location information = real-time insight
 - ▶ Path Intelligence (pathintelligence.com)
 - ▶ Footpath – movement patterns within a city or store
 - ▶ How to use such movement information
- ▶ Interesting Examples:
 - ▶ CabSense – finding a taxi in New York City
 - Rating of street corners; interactive maps, ...
 - ▶ ParkPGH – finding a parking spot



Data Privacy

- ▶ What do people really mean when they say I'm concerned about privacy?



Privacy – EU vs US vs Asia

- ▶ Privacy means different things, in different countries, and to different people
- ▶ In Europe, privacy is considered a fundamental human right. This means that privacy is considered to be core to who we are as human beings and therefore, the law protects it as a right
- ▶ In the US, data privacy is often characterized as the right to be left alone.
- ▶ In parts of Asia, privacy is often thought in terms of the right to hide one's true identity and remain anonymous

Privacy and changes

- ▶ Privacy and what it means, is always evolving.
- ▶ Today we think nothing of seeing people walk around taking pictures on their mobile phones, but over a hundred years ago, taking pictures in public was seen as an offensive act.
- ▶ The culture of privacy built in your organization must be designed to adapt to changing ideas of privacy



Acronyms in Data Privacy

- Personally Identifiable Information (PII)
- Some use Personal Information (PI)
- Data subject
- User – someone being watched



Data privacy and security is one of those threads that ties together every industry

Personal Data Vs PII

- ▶ **Personally identifiable information** is data that can be used to directly or indirectly identify a particular person. This consists of such data items as a person's name, address, email address, or phone number. For example:
 - ▶ *John Doe, 27 First St., NY 12345*
- ▶ **Personal data** is data about the person and contains PII data. For example, this record is personal data:
 - ▶ *John Doe, 27 First St., NY 12345, occupation bus driver, salary \$41,000*
- ▶ If we remove the PII data from this record, it no longer contains personal data. Instead, it becomes anonymous:
 - ▶ *Occupation bus driver, salary \$41,000*



Data Privacy Laws

- ▶ Irish Data Protection Act 1988
- ▶ EU Data Protection Law 1995
- ▶ Data Protection Amendment 2003
- ▶ General Data Protection Regulation (GDPR) 2018



Data Protection Law 1995

- ▶ Obtain and process the information fairly
 - ▶ Keep it only for one or more specified and lawful purposes
 - ▶ Process it only in ways compatible with the purpose or purposes for which it was given to you initially
 - ▶ Keep it safe and secure
 - ▶ Keep it accurate and up to date
 - ▶ Ensure that it is adequate, relevant and not excessive
 - ▶ Retain it no longer than is necessary for the specified purpose or purposes
 - ▶ Upon their request, give individuals a copy of their personal data
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- ❑ Organisations found to be in breach of the DPA 2003 could be fined up to €100,000 by the ODPC.
 - ❑ The Data Protection Directive 1995 and all local laws derived from it, including the Act of 2003, have now been superseded by the GDPR.



GDPR's Impact on Business Intelligence

- ▶ The GDPR consists of six principles that define a new set of rules designed to give EU citizens control over personal data that is stored and processed by businesses and to consolidate all previous data protection regulations under a single regulation. The six principles are:
 - ▶ Data minimization
 - ▶ Storage limitations (data retention)
 - ▶ Lawfulness, fairness, and transparency
 - ▶ Integrity and confidentiality
 - ▶ Accuracy
 - ▶ Purpose limitations



(1) Data Minimization

- ▶ Data minimization ensures that organizations are only collecting the minimum amount of personal data required to fulfill a purpose.
- ▶ This goes against the grain for many BI systems.
- ▶ Data analysts are often trained to extract as much data as possible when loading a data warehouse. This reduces the need for successive visits to the data source for that extra piece of data.
- ▶ However, the GDPR dictates that you only hold the personal data required to serve specific business processes.

(2) Storage Limitations (Data Retention)

- ▶ The predecessor to the GDPR (EU Data Protection Directive 95/EC/46) required businesses to minimize the retention of personal data such that it was not retained for longer than needed for the purposes for which it was collected.
- ▶ The GDPR, which replaced this directive on May 25, goes further: to comply with the principles of storage limitation and data minimization, the business's data controllers must ensure that personal data is only stored for a limited time period.

3. Lawfulness, Fairness, and Transparency

- ▶ An individual -- also known as a data subject -- has certain rights. Specifically, they are:
 - ▶ Right to rectification
 - ▶ Right to be informed
 - ▶ Right to access
 - ▶ Right to data portability
 - ▶ Right to erasure (Right to be forgotten)
 - ▶ Right to object
 - ▶ Right to restrict processing
 - ▶ Rights relating to automated decision making (robots), including profiling



4. Integrity and Confidentiality

- ▶ When it comes to keeping data private, the GDPR requires that your enterprise pay attention to three particular areas.
 - ▶ **Data at rest.** Personal data should be locked down with secure access controls such as the use of roles and passwords. If you have a data warehouse containing personal information, this should be secured so that access is strictly limited.
 - ▶ **Data in transit.** Personal data in transit should be transferred via secure networks such as secure file transmission protocol (SFTP) or encrypted. Moving an individual's personal or sensitive information between sites or transmitting data to third parties must be done securely.
 - ▶ **Data breach.** Businesses must report certain types of data breaches within 72 hours of detection.



5. Accuracy

- ▶ The accuracy (or inaccuracy) of management information and data used in analysis has been the source of much contention for business intelligence professionals.
- ▶ Accuracy is a relative term and at times hard to measure; it is perhaps more important to identify inaccurate or misleading information and manage the accuracy of individuals' personal data through a series of steps:
 - ▶ Verify the source of the data
 - ▶ Validate the accuracy of personal data you obtain
 - ▶ Employ processes to accept challenges to accuracy and apply changes where necessary



6. Purpose Limitation

- ▶ As part of the GDPR, your organization is limited to using personal data only for your original, stated purpose:
 - ▶ **Purpose specification.** Data must be collected for specified, explicit, and legitimate purposes only.
 - ▶ **Compatible use.** Data must be processed in a way that is compatible with those purposes.



Conclusion

- ▶ The GDPR is not the end but the beginning, and the regulations will surely continue to change as BI evolves.
- ▶ The GDPR requires ongoing monitoring of your use of individuals' personal data along with understanding where that data is stored and who has access to it.
- ▶ With the growing use of artificial intelligence and robots for analysis and decision making, this heralds a new era for BI.



Resources:

- ▶ [Tableau's Top Ten BI Trends](#)
- ▶ For your own interest, you may like to view some of ERSI's [white papers](#) in GIS, location analytics, map technology etc.
- ▶ [Transforming Data With Intelligence \(TDWI\) – Part I GDPR](#)
- ▶ [TDWI Part II GDPR](#)
- ▶ [Wikipedia – Information on Privacy Law](#)

