# Terms of Reference

Business Intelligence Systems and Data Mining

Project Title: Evolution of Data Loading techniques: From Batch ETL to Stream Processing

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# Background to the Project

A data warehouse can be defined as the central repository of integrated data that is modeled in such as way that the business intelligence applications built on top of it can assist the management of the business to improve decision making. Moving the data between the operational systems and the data warehouse is always a complicated task as the design and implementation of ETL processes requires high skilled IT specialists. In addition, the ETL requirements have changed as we have entered the Data Analytics era. A modern ETL approach requires near real-time data integration to the so-called real-time data warehouse. The management of almost all businesses, including start-ups and ecommerce companies, demand now reports or dashboards that are refreshed with a very high frequency – something that in the past was a requirement only for very specific industries such as telecommunications, fraud detection in banks or stock market data.

For very large-scale enterprises, the implementation of modern ETL and data integration techniques is something crucial – but these companies have the capacity and the know-how to develop in-house customized solutions that can do the work. On the other hand, small and medium size businesses are still struggling to provide meaningful business intelligence. Although the Business Intelligence concept is not new, the high-level management of most business don’t consider Business intelligence/Data Warehousing as a strategic; The consequence is that the business intelligence teams of small companies do not have the capacity to meet the reporting/data analysis requirements set by other departments. Most of the times, the main difficulty is the design and the implementation of the ETL processes. Many companies do not even have a dedicated BI Team. As a result, the data integration is slow and not scalable – it’s not rare to see whole dashboards that use as a source the operational system itself and to pull the data by using long, complex and not readable SQL queries.

This project is tackling the aforementioned data integration problem. It focuses on a specific part of the BI Lifecycle which is the design and implementation of scalable, efficient and near real-time ETL solutions that can be easily implemented without the need of self-coding or the purchase of expensive tools.

# Deliverables

* Dissertation in digital form that will include:

A literature review/fact finding section

A software implementation and the evaluation of it

A critical review of the project

* Hard copy if needed

# Academic Objectives

* Acquire a solid theoretical understanding about all different methods that are used to import data to data warehouses with an emphasis on modern ETL technologies.
* Improvement of technical skills by designing and implementing a near real-time ETL process.
* Working systematically by researching this specific topic will improve the overall knowledge and soft skills of the author as he will be able to critically evaluate research papers in his area of expertise and get a holistic overview of the topic. This will provide a good foundation for further research of similar topics outside of the scope of this project. This will also help professionally to work in a more systematic way.

# Background Research Objectives

* The main research objective is to learn more about ETL methods that can provide real-time or near real-time data loadings to data warehouses.
* Another objective is to research all existing ETL methods that are used for data loading.
* To provide a solid foundation for the need of ETL, I will also research the concept of data warehousing and why is it important for a business.

# Research Questions

* How ETL processes have been evolved since the beginning of the Business Intelligence era?
* How do event streaming platforms work and how can they provide real-time ETL?
* The project will suggest a simple framework for real-time ETL and one for traditional ETL. What is the adding value of the modern technology compared to the old one? Is it feasible for a medium size business to invest to a real-time platform?

# Product Objectives

Α Consultancy Project that will include

* A high-level overview of a Business Intelligence System and its components
* A more detailed review about data modelling of a data warehouse and how ETL is linked to that.
* A description and critical evaluation of ETL techniques in terms of updating a data warehouse, with an emphasis on real-time ETL techniques.
* Two recommended systems for real-time ETL that is scalable and easy to implement by small businesses.
* A comparison of these systems

# Risk Assessment

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| --- | --- | --- | --- | --- |
| **Risk identification** | **Probability** | **Impact** | **Assessment** | **Risk monitoring, mitigation and management** |
| The deadline of the project is not met | medium | high | high | A very detailed project plan including a Gant Chart will be the basis to work systematically and split the project in small chunks. This will ensure that the project will finish on time as all milestones should be accomplished on time. |
| The folder that contains the project files is deleted / lost because of hardware malfunction or an accidental event. | low | high | medium | All related files will be pushed to a Git Repo |
| Risk of not founding enough data for the implementation part of the project | low | medium | low | If no reliable source is found, a self-developed script will produce it in short time intervals |