

## Development of Business Intelligence Reports for KPI Management on a Bauxite Mine

Maria Silva<sup>1</sup>, Allan Reis<sup>2</sup>, Werthon Santos<sup>3</sup>, Cristiano Esteves<sup>4</sup> and Ricardo Sousa<sup>5</sup>

1. Operations Analyst

2. Process and Laboratory Manager

3. Planning and of production Supervisor

4. Engineer

5. Geologist

Mineração Paragominas, Paragominas, Brazil

Corresponding author: maria.daniely@hydro.com

### Abstract



This paper describes real time management of mining, stripping, quality, crushing and maintenance of mobile equipment. For this study, business intelligence is used to support decision making, by preparing customized reports containing online, daily and monthly bauxite mine data. For automated report design, the needs of the mining operation, production planning and control, mine planning and mobile equipment management areas were mapped to create dashboards with Key Performance Indicators (KPI) management information. Additionally, the Server Management Studio (SQL) query was created containing data directly collected from dispatch system report server, and the Microsoft Power BI tool was also used to manage and control mining production and stripping indicators. The automated management of indicator's data resulted in KPI data optimization, data conversion into real time information, support to decision making, real time KPI management and information accuracy.

**Keywords:** Automation, monitoring, data optimization, management, dispatch system.

### 1. Introduction

As time goes by, the search for technological innovation in the production processes of the companies becomes the rule. Real time management of mining, stripping, quality, crushing and equipment maintenance indicators help dispatch system controllers to make timely and correct decisions about the changes needed relying on increased information accuracy thereby improving data control, optimizing processes through an intelligent database manager, adding efficiency to data control, optimizing processes using the intelligent database manager and resulting also in improved management by using the Power BI tool in the real time strategies of mine and plant and maintenance KPI's to consolidate graphic reports to monitor the achievement of production and physical indexes. Hence, the advancement of the automation of processes and data and, consequently, of machinery, becomes more frequent leading to productivity gains, quality improvement, cost cutting, online data monitoring management, support to the decision making process, increased task implementation safety and better corporate business management strategy. This paper presents the digital transformation of raw data into real time information in the mining, stripping and maintenance processes through optimized reports using Server Management Studio (SQL) queries and the Power BI software, enabling to build dashboards with tables and graphs.

#### 1.1. History of the Industrial Evolution

Before reaching the current status there was a long process of industry transformation generally known as fourth industrial revolution or 4.0 industry.

The first industrial revolution started in the 19<sup>th</sup> century with mechanization and generation of mechanical energy, allowing the automation of a whole set of manual tasks.

The second industrial revolution was hallmarked by the use of electricity for mass production of goods leading to increasing productivity and the size of the industries. However, production of customized products was still unfeasible.

The third industrial revolution came about in the mid-sixties from automation using electronic systems with low operating costs.

Today we are in the fourth industrial revolution that was triggered by the development of Information and Communications Technologies (ICT). Its technological basis is the smart automation of cyber-physical systems with decentralized control and advanced connectivity (IoT functionalities) [3].

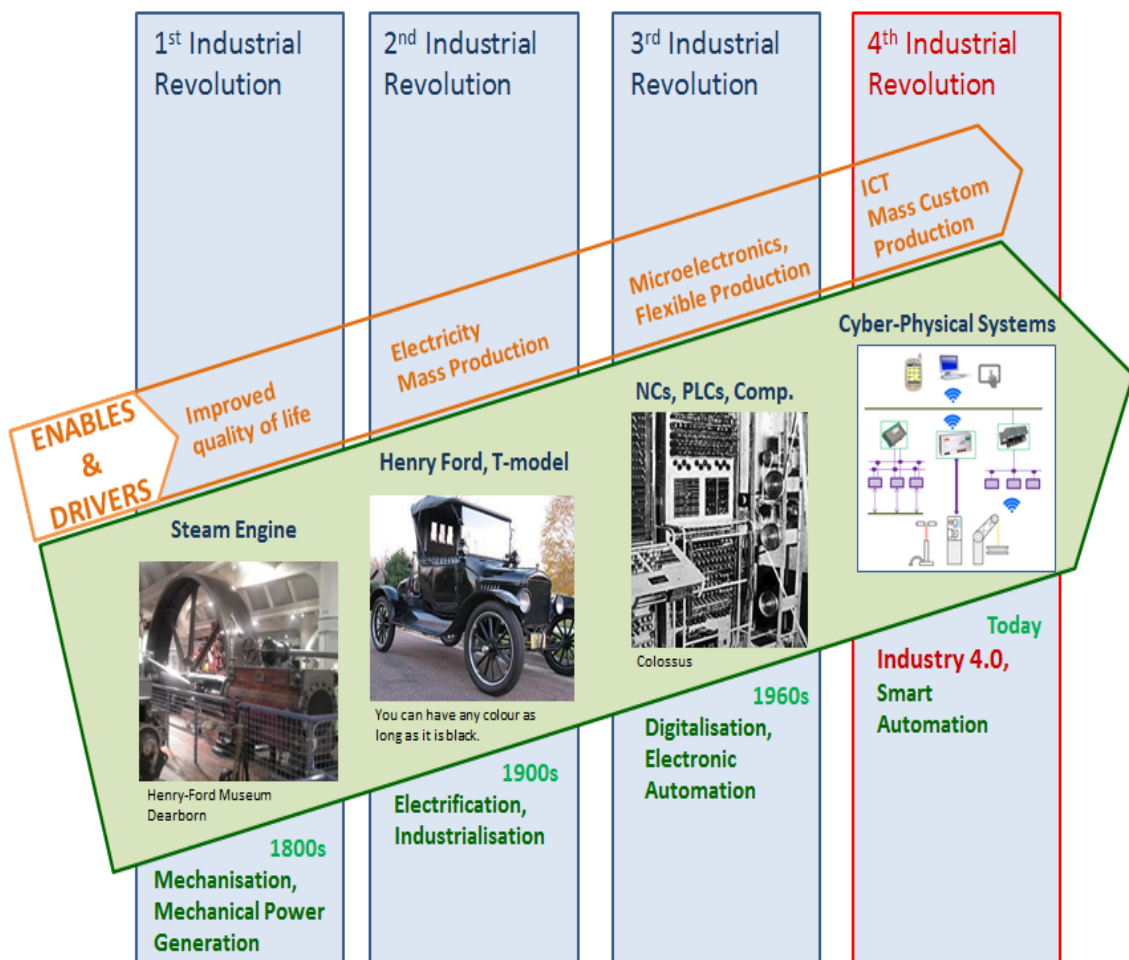


Figure 1. The four stages of the Industrial Revolution [3].

## 1.2. Server Management Studio (SQL)

The Database of a company is the main data storage safety tool because of high capacity and processing restrictions. A database allows us to collect data with online transactions using the Server Management Studio (SQL) for intelligent database management, enabling real time connection with the database server.

#### 4. Conclusion

Data automation using business intelligence tools resulted in increased accuracy of monitoring of the mining, stripping, quality, crushing and mobile equipment maintenance activities at the Bauxite mine. The use of this tool also enabled to program automatic updates.

Access to real time process information was enabled by preparing reports optimized with the Server Management Studio (SQL) and Power BI in the dispatch system and in the management and control of mining and stripping indicators, respectively.

Real time management and, above all, the interactive management of the indicators presented in this paper proved to be of utmost importance to support the decision making process and to the planning of activities at the Bauxite mine, thus ensuring information accuracy.

#### 5. References

1. Intel IT Center, Big Data Visualization: Turning Big Data Into Big Insights, White Paper, March 2013, pp.1-14
2. M. Khan, S.S. Khan, Data and Information Visualization Methods and Interactive Mechanisms: *A Survey*, *International Journal of Computer Applications*, 34(1), 2011, pp. 1-14.
3. ROJKO, Andreja. Industry 4.0 concept: background and overview. *International Journal of Interactive Mobile Technologies (iJIM)*, v. 11, n. 5, p. 77-90, 2017.).