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- *Data-driven decision makingto improve firm and service performances*
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OUTLINE OF THE RESEARCH

Nowadays terabytes or petabytes of data are generated with high velocity and variety. These flows of data come from different sources and affects almost every fields of our life. In the manufacturing context, also firms produce and analyze a huge amount of data (i.e. sales transactions, market trends, product descriptions, customer's feedback, maintenance records). These data represent a precious asset that, if adequately exploited, can provide an important competitive advantage. However, to this aim, it is necessary to develop and use appropriate techniques and tools able to collect, re-organize and interpret data in order to extract useful managerial information.

The process of mining knowledge from large set of data, known as Data Mining, can be seen as an iterative sequence of the following steps:

1. Data cleaning (to remove noise and inconsistent data)
2. Data integration (where multiple data sources may be combined)
3. Data selection (where data relevant to the analysis task are retrieved from thedatabase)
4. Data transformation (where data are transformed and consolidated into formsappropriate for mining by performing summary or aggregation operations)
5. Data mining (an essential process where intelligent methods are applied to extractdata patterns)
6. Pattern evaluation (to identify the truly interesting patterns representing knowledgebased on interestingness measures)
7. Knowledge presentation (where visualization and knowledge representation techniques are used to present mined knowledge to users)

The applicability of these steps in many different fields makes Data Mining a transversal and interdisciplinary subject able to give great improvements both to industry and social organizations.

The research objective is focused on the development of Decision Support Systems (DSS) able to explore the actual opportunities offered by Data Mining techniques in the context of the planning and of the organization of production systems of goods and services

In particular, through the analysis of two real case studies in the fields of manufacturing processes and of public service re-organization, we exploit Data Mining techniques in order to find trade-offs to bridge the gap among technology, business organization and users' requirements.

The first case study deals with the development of a web integrated architecture of a DSS for process and logistics management in the field of naval-building sector. Data from suppliers and customers are integrated to improve performance in terms of time and cost operation.

The second case study concerns the re-organization of the collection and delivery phase of postal services. A huge amount of data, related to market trends, facilities' and customers' locations, is used in order to find trade-off between efficiency indicators and users' accessibility to the service.

The innovative aspects of the work are represented by the application of Data Mining techniques in combination with optimization models to produce scenarios able to support decision maker in the choice of appropriate options for the actual management of the problems.

In particular one of the main issues is related to the integration of different tools to manage, analyze and visualize big, unstructured and heterogeneous data. Another fundamental aspect is related to the data mining that is an important phase in the value chain of Big Data for information extraction and predictions.

Considering that Data Mining is intrinsically a multidisciplinary technique, the objective of the work focuses on the possibility to use and integrates mathematical, statistical and computer science models and tools to provide solutions to typical management problems.

This aspect opens various opportunities of collaboration between different research fields and research groups existing in both the Universities.

Publications

Proceeding Conference:

Territorial districting models for the reorganization of postal services
Bruno, G., Cavola, M., Diglio, A., & Piccolo, C. (2017). Territorial districting models for the reorganization of postal services. VIII International Workshop on Locational Analysis and Related Problems 2017, Segovia (ES)

An optimization model to rationalize public service facilities
Cavola, M., Diglio, A., & Piccolo, C. (2018). An Optimization Model to Rationalize Public Service Facilities. In *New Trends in Emerging Complex Real Life Problems* (pp. 141-149). Springer, Cham.

Journal Articles:

Reorganizing postal collection operations in urban areas as a result of declining mail volumes: a case study in Bologna
Bruno, G., Cavola, M., Diglio, A., Laporte, G., & Piccolo, C. Submitted to Journal of the Operational Research Society -

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