Development of a group forecasting approach
Combining mathematical and judgmental information

Introduction & Objectives
One of the processes which greatly influence decision making within a company is forecasting demand. On the first hand, forecasting is made by a mathematical (statistical) model, which is based on the history of the demand, and describes the evolution of the temporary series. This method works very well in case there is no occurrence of unexpected events. Therefore the aspects of the past pattern will continue into the future.

Because of the limitation of statistical methods, and in the context of high uncertainty, it is beneficial to efficiently integrate judgmental and mathematical approaches in order to take advantage, on the one hand, of the capacity of the company’s actors to anticipate changes and integrate their knowledge, and on the other hand, of the strength of mathematical forecasting models.

The aim of this project is to develop a collaborative forecasting based on judgmental adjustment approach, to improve forecast accuracy by structuring and efficiently exploiting the knowledge of the different forecasters, by expressing it as fuzzy information. Mathematical forecasting is applied to improve initial forecast, and based on different judgmental factors.

Judgmental factors
Fig. 1: Quantum jump factor
Fig. 2: Transferring factor
Fig. 3: Transient factor
Fig. 4: Trend change factor

Conceptual scheme of the general method

ANP Network for weighted forecasters
These are the influences between the components: \( \{ C_1, C_2, (C_1,C_3), (C_2,C_4), (C_3,C_5) \} \). These relationships demonstrate that all the components directly affect the alternatives.

Algorithm

Conclusion
We found evidence that Analytic Network Process could be used to weight forecasters in order to make the forecast more accurate. For that we define the criteria that can properly value the qualities of the personnel needed and influence the weight of forecaster. The criteria ranging from the most important to the least important are seniority followed by perception, education and finally by age. The proposed approach has a substantial impact on the accuracy of the resulting forecasts. In fact, it is noticed that the MAPE and MAE have been both decreased due to the efficiency of the collaborative decision making schema using the fuzzy rule-based system.