

# **An introductory course on Decision Support Systems based on solving small management problems**

**Jorge Pinho de Sousa**

**João Claro**

INESC Porto, Faculdade de Engenharia da Universidade do Porto

Campus da FEUP, Rua Dr Roberto Frias, 4200-465 Porto, Portugal

[jsousa@inescporto.pt](mailto:jsousa@inescporto.pt); [jclaro@fe.up.pt](mailto:jclaro@fe.up.pt)

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*Abstract: In this paper we describe our experience in teaching an introductory course on Decision Support Systems to students with quite heterogeneous backgrounds and often with a low quantitative education. This course was designed based on “active learning” principles and is structured around the resolution of small management problems. Some years of experience have shown the potential of this approach, with an average excellent performance of the students.*

*Keywords: Decision Support Systems; active learning; executive education.*

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## **1 Context**

In recent years we had a regular experience in teaching courses on Decision Support Systems for several programs of the University of Porto, to students with quite heterogeneous backgrounds and often with a low quantitative education. This is the case of a master program in service management, executive MBAs or similar programs.

Most of these students are quite practice oriented, having clear difficulties in dealing with a more abstract or mathematical reasoning. Moreover the different backgrounds and education experiences create a considerable challenge in terms of how to cover the different topics in a way that is understandable to the non-familiarized students but still meaningful to those that have already studied similar topics.

In order to deal with these issues, we have developed a flexible syllabus based on a small set of principles, that we have successfully tested in recent years in quite

different contexts. A first general principle of our approach to these courses is to always trigger the learning process with the presentation and discussion of some simplified “management problems” without providing any “formal” approaches to solve them. These approaches are only presented in a later stage, when the students have already found by themselves what “to do”.

Although the requirements may vary, we are here talking of courses that in general have a total load between 45 and 60 contact hours, and a considerable amount of expected home-work. In terms of credits this load represents 6 ECTS.

## **2 General principles**

Focus is put on the idea that practical decision-making problems can have a quite different nature depending on their impacts and time horizons. This distinction between more strategic or operational problems is deeply explored with examples, in order to allow the students identify the main types of models and techniques that can be used in practice. The modeling process and the adequacy and limitations of models are informally explored in the initial stages of the courses. Students are repeatedly faced with simple “problematic situations”, and are asked to describe / model the associate problems in some formal ways, and then to design some simple heuristic procedures to “solve” those problems.

We do not assume any particular background knowledge but rather explore common sense reasoning and the professional experiences of the students. They should become aware that in practice, solving a problem is strongly constrained by the available time and resources, and that many alternative models can be used, possibly in a complementary way.

Focus is put in understanding the type of problem and context, in modeling, and in heuristic “thinking”. A special aspect of this approach consists in confronting students with “realistic” management problems that they have never tackled before, and let them develop their own understanding on how to solve them (with a very light guidance). Nevertheless, it should be clear that we do not want solutions to the specific instances they are studying, but rather general procedures (“algorithms”) to be applicable in any possible problem instance of that type.

Moreover the importance of problem structuring and qualitative aspects in decision making are fully discussed, thus justifying the need for the integration of quantitative approaches in more general Decision Support Systems.

### **3 Course structure**

In order to cover what we consider to be a broad set of tools of practical interest, and framed by this strategic/operational problem perspective, we have organized the course around the following topics: 1) Organizations and decision processes; decision levels, complexity and analysis paradigms; the role of quantitative models and methods in decision making; 2) Structuring of decision processes; influence diagrams; organization of models in spreadsheets; data modelling and analysis; sensitivity and "what-if" analysis; scenario analysis; 3) topics in Decision Theory and Multicriteria Analysis; situations of uncertainty and risk; structuring of decision alternatives and criteria; decision trees; 4) Operations Management, formulation of problems and optimization models: linear programming and extensions; network flow problems; combinatorial optimization problems: heuristic methods for practical problems solution - design and implementation; 5) Simulation models: general structure and application domain; queues: brief introduction to theory, models and applications; statistical and event-driven simulation; interactive visual simulation.

### **4 Conclusions**

The introductory course presented in this paper was designed for students with quite heterogeneous backgrounds and with a low quantitative education. Active learning is emphasized, through the adoption of a set of principles that strengthen problem resolution and the discussion of small but realistic management problems. This is particular effective if we want to take advantage of the practical professional experience of the students and successfully deal with their "cognitive" styles.

Some years of experience have shown the potential of this approach, with an average excellent performance of the students.