

## 5. ESTUDIOS MONOGRÁFICOS Y OPINIONES SOBRE LA PROFESIÓN

### OR AND EURO; WHERE ARE WE GOING?

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#### 1. Introduction

It has been a great honour for me to be invited by one of the largest and more active members of EURO, SEIO, the Spanish Society of Statistics and OR to make a contribution for their newsletter. During my term as President of EURO, our organisation celebrated 30 years of activities, EURO being established the 29 of January 1975 in Brussels. It has been the occasion to make a balance about the presence of our discipline and of our associations. I am very glad to be able to share these thoughts with the readers of the SEIO newsletter.

#### 2. Where do we come from?

Is it possible to talk about decisions in a formal way? Is it possible to see within real life problems an abstract and formal (possibly mathematical) structure? Despite O.R. is a relatively young research area, the above questions are old as science. Aristotle in the 4th century BC used to call “preferences” as “rational desires”, thus introducing a formal dimension to an everyday human activity: express preferences and decide. Euler in the 18th century managed to show that an apparently trivial problem of organising a walk under some constraints can have a precise mathematical structure.

One of the first decision problems to be thoroughly discussed in a formal way is voting. The famous discussion between the “Conte de Borda” and the “Marquise de Condorcet” in front of the French Academy of Science just before the French revolution can be considered as the beginning of what today is known as “social choice theory”: how societies and other collective bodies can take decisions. An almost 250 years old discussion including two Nobel prizes (K. Arrow and A. Sen).

However, it is the industrial revolution and the dramatic development of the Western societies in the 20th century that gave the strong impact to the study of this particular activity: deciding. The management of complex systems, from industrial

plants to economic districts, from railway networks to regional development, have shown already at the beginning of the 20th century that deciding can be the subject of scientific investigation and the object of precise practices (just consider the contributions of F. Taylor to the concept scientific management or of W. Pareto to the concept of compromise).

Nevertheless, the term Operational Research will appear only thanks to the second world war. The British army started employing just before the war a number of scientists in order to handle some crucial “decision problems” such as:

- where to install the radars aimed to support the air defense of the island?
- how to decode the German secret communication code?
- how to improve the success rate of bombing German U-boats?
- how to organise the logistics of the D-day?

The undeniable success of the British and Allied scientists in replying to the above questions showed that solving such complex problems was feasible and more important that there was a methodology in solving them. The path to apply such findings to the civil life immediately after the war was open. Dantzig in 1948, von Neumann and Morgenstern in 1944 and the O.R. and Decision Theory pioneers (Ackoff, Berge, Beer, Blackett, Churchman, Vajda including the Nobel prizes Allais, Kantorovich, Koopmans, Nash and Simon) have been able in a ten years interval to establish a corpus of knowledge and methods on how decisions can be taken, should be taken, can be aided to be taken on which generations of researchers and practitioners have been formed.

#### 3. Where are we?

Today Operational Research is so largely used that often people do not even recognise it. Industrial production, logistics and network management are all based on O.R. methods. Moreover, less ap-

parent problems are also handled thanks to O.R. methods: micro-chip layout, tarification of services, environmental assessment, DNA sequencing are all problems whose solution heavily relies on Operational Research.

Research in O.R. has enormously evolved. Originally interesting essentially for mathematicians and economists it now attracts the attention of psychologists and cognitive scientists, computer scientists, engineers and political scientists. From “simple” optimisation techniques and normative theories of decision making O.R. is now concerned by problems involving the presence of multiple criteria or with a complex combinatorial structure. Descriptive and prescriptive approaches to decision making have been developed and the issue of how a decision problem is structured and formulated became a current research subject.

The term itself “Operational Research” evolved since it now covers subjects known as Management Science, Decision Analysis, Decision Aiding and Support and Decision Sciences. Moreover, several research areas in Computer Science (Artificial Intelligence, Planning, Data Mining), in Engineering (Production Scheduling, Logistics, Transportation, Aerospace), in Political Science (Governance, Regional Planning, Evaluation of Public Policies), in Medicine and Biology (Molecular Biology, Epidemiology, Health Care Planning) heavily involve Operational Research.

O.R. is a perfect example of the development of inter-disciplinary research in the last 50 years. Contributions from fields as far as mathematics and psychology have been merged to theoretical and operational achievements used in fields as far as planning the crew shifts in airlines or sequencing the DNA or supporting the application of disarming treaties in Europe.

Last, but not least, Operational Research is now established as a crucial teaching subject in the curricula of a large variety of University degrees ranging from Engineering to Mathematics and from Computer Science to Business Studies and Architecture.

This is reflected also to the structure of the community of OR in Europe. The first OR society, in UK, was established in 1948 as an exclusive “Club”. EURO has been established in 1975 in Brussels by 11 societies (including SEIO). Today there are 29 societies within EURO representing a community of

more than 10000 people all over Europe. There are almost 30 EURO Working Groups with regular activities and our events (conferences, summer schools, awards) meet an increasing success. EJOR, EURO’s flag scientific publication is today one of the most respected journals in the area of OR world-wide.

Of course this has not been a linear process. OR has gone through moments of crisis, tough internal discussions, deep introspection and questioning about this existence. There have been moments in which our community has wondered whether OR was still a discipline to belong to. We have to be extremely proud to belong to such a community which despite such critical moments emerged stronger than ever. The roots of OR are within real problems of our societies and thus difficult to eradicate.

#### 4. Where are we going?

**Life itself is a matter of OR!** EURO celebrated its 30 years initiating a branding campaign aiming to show the importance of OR for the world and the big challenges in front of us.

Supporting complex decision situations is an activity which evolves but does not disappears. Despite the achievements of the past and the existence of software packages including decision procedures and optimisation algorithms life itself is calling OR to contribute to a better world.

Corporate Governance and more in general global governance issues in a world where economies and cultures are merging calls us for new exciting challenges. The legitimation of Operational Research critically depends on its capacity to provide reliable support to decision processes within such a context. The huge amount of data today on the web showed that is not the quantity of information that makes the difference in conducting a decision process, but the intelligence in using it. Such an intelligence (in data mining, in planning, in artificial intelligence devices, in multi-agent systems etc.) derives from the capacity and autonomy of agents to make decisions. Operational Research is strongly solicited today to provide the Information Society with tools which can enable such a capacity.

But O.R. is not concerned only by the evolution of the economy and its impact to the society. Is concerned also by the cultural evolution of our societies as well by its impact on the real life of the people living within our societies. As Europe is becoming an

every day reality for millions of citizens, as our responsibilities with respect to the huge challenges of our societies increase, OR is called to play a key role in shaping the future for the coming generations.

Humanitarian security, environmental management, crisis management, food security and quality, health care planning, epidemiology, natural resources management, are examples of new challenges to our research agenda.

We are proud to think that, as in the past OR contributed to solve crucial problems in different contexts, it will be able in the future to play a key role for our global society. I am sure that when we are going to celebrate the 100 years of our discipline we are going to be able to say: if this is a better world it is also because of us and the contribution of OR.

Paris, in flight to Ouagadougou, 13/6/2007