

## - PhD THESIS PROPOSAL -

### EXPLORATION OF GRAPH-SUPPORTED EXPERTS' COLLABORATION FOR THE MANAGEMENT OF COMPLEX PROBLEMS

#### Applications to climate change risk management and resilience

**Context:**

Building effective conditions for experts' collaboration is crucial for the decision process. This requires the framing of a common language among several individuals with sometimes dissimilar background of expertise and knowledge collaborate. Such a difference in individual interpretative processes during collaboration implies meaning variance (Arduin, 2015), whose understanding, measurement, and management is a way to ensure information and knowledge sharing within organizations.

Graph theory can be used to support expert collaboration through the construction of connections between several graphs representing experts' understandings of the topic that is submitted to their analysis. Individuals' knowledge becomes then interrelated and experts' collaboration supported by graph theory can lead to a common understanding of problems and objectives sometimes by the calculation of different parameters (such as centrality for example) or/and simply by the artifactual aspects of the graph representation.

To describe the complex interpretation machinery, some authors talk about a "mental model", "neural apparatus", or "interpretative frameworks". Information is continuously created and interpreted during individual cognitive processes (Arduin, 2023). The aim of this research is to model, design, and develop a system enhancing experts' collaboration by focusing on experts' interpretative processes and how they could be supported by graph-theory tools.

**Methodology and milestones:**

This research will be based on the following methodology:

1. A critical review of the literature on the use of graphs as a means of enhancing collaboration and consultation capacities, both generically and for expert groups.
2. Mapping of collaboration and consultation situations between expert groups.
3. Elaborate a methodology for the use of graphs as a medium for concertation and collaboration between experts, as well as a beta version of an applied tool.
4. Testing the collaboration methodology between experts on two case studies:
  - a. Characterization of the systemic effects of climate change on the link between an industrial energy production plant and the forest ecosystem and
  - b. Characterization of the effects of climate change on the rise in the level of flood risk in mountainous areas.

**Deliverables:**

In addition to the PhD manuscript and its defense within three years, the expected deliverables are:

1. Publication of articles in journals and at conferences and seminars.
2. Development of an expert collaboration tool in beta version.

**Applications**

We are looking for engineers from top-ranking engineering schools, or candidates with a research master's degree in computer science or applied mathematics, or a background in human and social sciences and engineering.

Candidates are invited to send a cover letter and a resume, an academic transcript, and reference letters before the [date]. Preselected candidates will be auditioned the [date].

**Location:**

Paris-Dauphine University, PSL\*, UMR LAMSADE CNRS 7243, Paris, France

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