ISSI Workshop Proposal

**Title:** Forecasting science: Models of science and technology dynamics for innovation policy

**Organizers:**
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**Description:**
In a knowledge-based economy, science and technology are omnipresent and their importance is undisputed. Equally evident is the need to allocate resources (both monetary and labor) in an effective way to foster innovation. In the last decades, science policy has embraced scientometrics to gain insights into the structure and evolution of science and devised diverse metrics and indicators. However, it has not invested significant efforts into modelling the dynamics of science, technology, and/or innovation (STI) (mathematically, statistically, and computationally). While it may not be possible to predict the nature and essence of the next scientific or technological innovation, it is often possible to predict the circumstances leading to it, i.e., where it is most likely to happen and under which conditions. Some examples are: Which career paths are more likely to lead to high impact works? Which funding system has the highest return on investments? Which institutions will be most productive over the next years?

The book *Models of Science Dynamics* [1] provides a review of major model classes (from population dynamics models to complex network models) accessible to a science policy audience. The proposed workshop builds on the book, but aims to create a more up-to-date inventory of exemplary computational models that can be used to forecast STI. In addition, the workshop aims to attract contributions that use mathematical models as a heuristic tool to design thought experiments about the future of STI.

Specifically, we are proposing a workshop for the community of researchers working on models of STI to both share their latest research and collectively create a roadmap to foster future modeling efforts including:
- **future fundamental research** – resulting in a plan for a textbook on models of STI including identification of possible topics and authors
- **applied research** – identifying use cases for different models of STI
- **data mining**, discussing data sharing challenges and opportunities
- linking models of STI to: (a) research on (alt)metrics (where and how can models of science be connected with automatic metrical systems); and (b) science policy debates (where and how can models of STI inform science
policy debates in a sustainable and reliable way, turning from occasional model exercises to a STI observatory, etc.

**Workshop format**
Extended abstracts are solicited for presentation and reviewed by the workshop organizing committee. We specifically seek models which *predict/forecast* the structure and/or dynamics of STI. The focus of the workshop is on mathematical, statistical, and computational models, but we do not exclude qualitative models as long as they can be used to develop scenarios of future STI dynamics.

Interested participants are invited to submit an extended abstract (max 4 pages) about their model that comprises:
- a descriptive title
- list of authors and their affiliations
- an abstract
- sections discussing the research questions addressed, related work, modelling approach and implementation, results/insights gained, and model validation
- a reference list.

We particularly encourage contributions which have not yet been covered by the chapters of the *Models of Science Dynamics* book. Examples are stochastic and statistical models, system dynamics approaches, data-driven models, geographic models; models of scientific careers, models of the peer review process and evaluation regimes, models of funding allocations, models of the costs of Open Access publishing, and so on.

**References**