Kick-off Meeting Master Management

* **Who are we and what are we doing?**
  + Radical Innovation Project in which we work on characterizing and measuring Radical Innovation relying on information provided by patent documents
* **What is radical (technological) innovation?**

*The label ‘radical innovation’ is used in the literature to represent a special, rare kind of innovation either in terms technological or economic characteristics. At this point, our main interest lies in technological characteristics (invention < -- > innovation).*

Definition Radical Invention

“Radical invention includes the introduction of new concepts based on a different set of principles that depart significantly from past practices. It provides new functional capacities which are a discontinuity with prevailing capabilities. It serves as the basis for new potential applications.“

Characterizing technological invention

In order to assess an invention’s ‘radical characteristics’ we identify 3 main attributes (dimensions) on which an invention should be scored in order to assess it’s ‘radicalness’.

1. *Knowledge origins*

In order to make a technology properly serve its purpose, a number of problems have to be identified and solutions to these problems have to be proposed. Knowledge from which a technology draws to do this are termed ‘knowledge origins’ of a technology. We distinguish between *Scientific Origins* and *Technological Origins* depending on whether knowledge used was drawn from scientific advancements or present in previous technologies. A typical characteristic of ‘radical inventions’ is that they draw from fields of knowledge that are different from the fields of knowledge related technologies usually build on.

1. *Functionality*

This dimension describes the actual functioning of the technology. It is about the technological components and the principles it uses for its working. ‘Radical inventions’ have the characteristic of using new (combinations of) components and principles to serve their purpose compared to previous technologies related to these purposes.

1. *Impact on future technological progress*

A third dimension concerns the impact a technology has on future technological progress. Technology usually evolves by a sequence of ‘minor’ advancements to existing technologies, adding up to achieve considerable improvement. A technology can be used as a whole and as such directly impact other technologies. On the other hand, the ideas and knowledge an invention embodies might be used in future technologies and as such a technology might exercise ‘indirect impact’ on future developments. Furthermore, a technology might directly/indirectly impact a broad range of technologies in different technological fields. In sum, radical inventions can be characterized by having a large and broad direct/indirect impact on future technological developments.

* **What is a patent indicator?**

Patent documents provide us with a window on technological developments actually occurring in ‘the real world’. It is an extremely rich source of data with exceptionally wide coverage of technological advancement.

Our project is mainly concerned with extracting information out of this huge database in order to provide better measurement of the technological characteristics of inventions. Moreover, since patents can be assigned to firms, technological fields and countries, having good measures of inventive activity will considerably impact future research on the topic of emergence and effects of radical innovation.

A patent indicator has the goal to provide a measure of some well-defined concept (in our case: knowledge origins, functionality and impact of an invention).

* **Which new indicators did we develop?**
  + New Knowledge Origins
    - New Scientific Origins: An invention makes a citation to a scientific publication from scientific field that has never before been cited by inventions in its technological field.
    - New Technological Origins: An invention cites a another invention from a technological field that has never before been cited by inventions in its own technological field.
  + New Functionality: An invention is assigned a combination of technological classes that has never before occurred together
  + Impact
    - New Impact: An invention is cited by another invention from a technological field that has never before cited its own technological field
    - Direct Impact of novelty: Inventions citing the invention with novel knowledge origins/functionality also use the novelty in the invention
    - Indirect Impact of novelty: The novelty introduced by the invention is being used by a lot of future inventions.

*Work in progress*

* **Current analyses**
  + On individual patent level
  + By country/technological field/year
* **What is validation?**

Having identified a number of concepts we are interested in, as well as indicators which we believe (based on a number of assumptions) to measure these concepts, we are interested in the extent to which they actually reflect the dimensions we aim to measure. In order to be able to do this, we have to score a number of inventions on the dimensions proposed (NOT using the indicators) and analyze whether the indicators score as expected.

There are multiple angles from which this problem can be tackled. Basically it always involves making an assessment of inventions by mapping inventions/technological fields based on the dimensions proposed. Next, one should engage in linking patents to the mapping exercise in order to test whether the expected outcomes in terms of the indicators are in line with expectations based on the mapping exercise.

* **Input of this project**
  + Patent-based measures for nearly all patents in existence.
* **Aspired output**
  + Based on mapping inventions/technological fields, validating the indicator and providing a better understanding of what exactly the indicators measure
  + Strengths of the indicators: as assessed by the analysis, which characteristics are successfully measured?
  + Weaknesses: Based on this analysis, what are we failing to take into account and which might be the particular problems in the composition of the indicator
  + Improvements: based on the information available in patents, could we develop ideas for improvements of the indicators, why would they measure which concept better?
* **Roadmap**
  + Assignment of interesting technological fields to students based on their interest
    - Student should come up with a (number of) candidate technological field(s) with following requirements:
      * Personal interest (he/she should be willing to engage in an in-depth analysis of technologies in this field)
      * Patenting is common in the field
      * Appropriate ‘size’ (not too large because of feasibility of in-depth analysis, not too small to guarantee a ‘critical mass’ of patents that satisfy the dimensions we are concerned with)
      * Field selected should be homogenous enough, it should be possible to clearly define the field of interest (for example: serving a particular purpose)
    - Given candidate fields we together assess the most appropriate one

*Sources:* <http://web2.wipo.int/ipcpub/#refresh=page>

*This link brings you to the website of the International Patent Classification, we advise you to browse here for inspiration for technological fields. Note: 1 technological field can consist of multiple IPC-codes, 1 IPC-code can cover multiple parts of technological fields*

* + Get insight into the concept of radical innovation/the dimensions we want to measure
    - This step is critical to understand the framework that will be used to score the inventions in the technological fields on the dimensions outlined above. ***Relevant documents will be sent in January***
  + Get insight into the information available/used in patents
    - What is a patent, which information is in there?

<http://www.epo.org/> *provides a rich source of information on patents, procedures used and legal texts*

* + - How are our indicators composed?

***Relevant documents will be sent in January***

* + Collect literature for the mapping exercise
    - Definition of technological field
    - Applications
    - Identification of major technological contributions
    - Overview (timeline) of what has happened over the years/what is happening
  + Come up with a search key to find patents in this field (this might consist of a number of IPC-codes, a number of keywords that should occur in the abstract of the patent,…)
  + Selecting patents/inventions that will be scored on our dimensions (and validated by a field expert) *(to be discussed with supervisor/coach)*
  + Scoring the patents selected (and validating the outcome with help of a field expert)
  + Diving into our indicator scores and identifying whether they match to what was to be expected based on the previous two steps
  + Identifying the measurement problems of the indicators
  + Link back to what you know from patents to improve the indicator