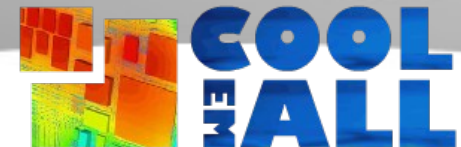


Towards Modelling the research in Green IT with Agents

Christina Herzog, Jean-Marc Pierson,
Laurent Lefevre



There are many unanswered questions:

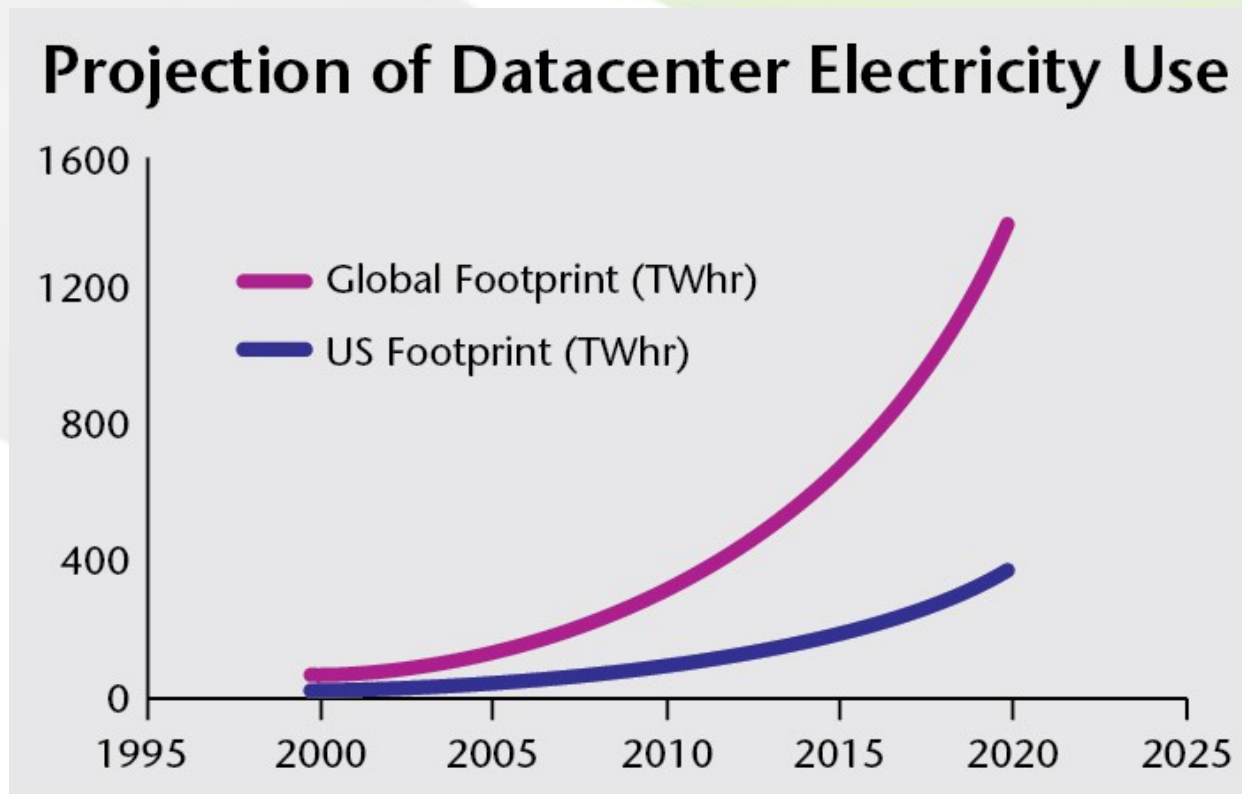
- Why is Green IT important? What is Green?
- Green washing? Hype on Green?
- “old wines in new bottles”?
- Different approaches of universities and industry?
- \$\$?
- Open calls? Crossover research?
- Governmental initiatives? Standardization?



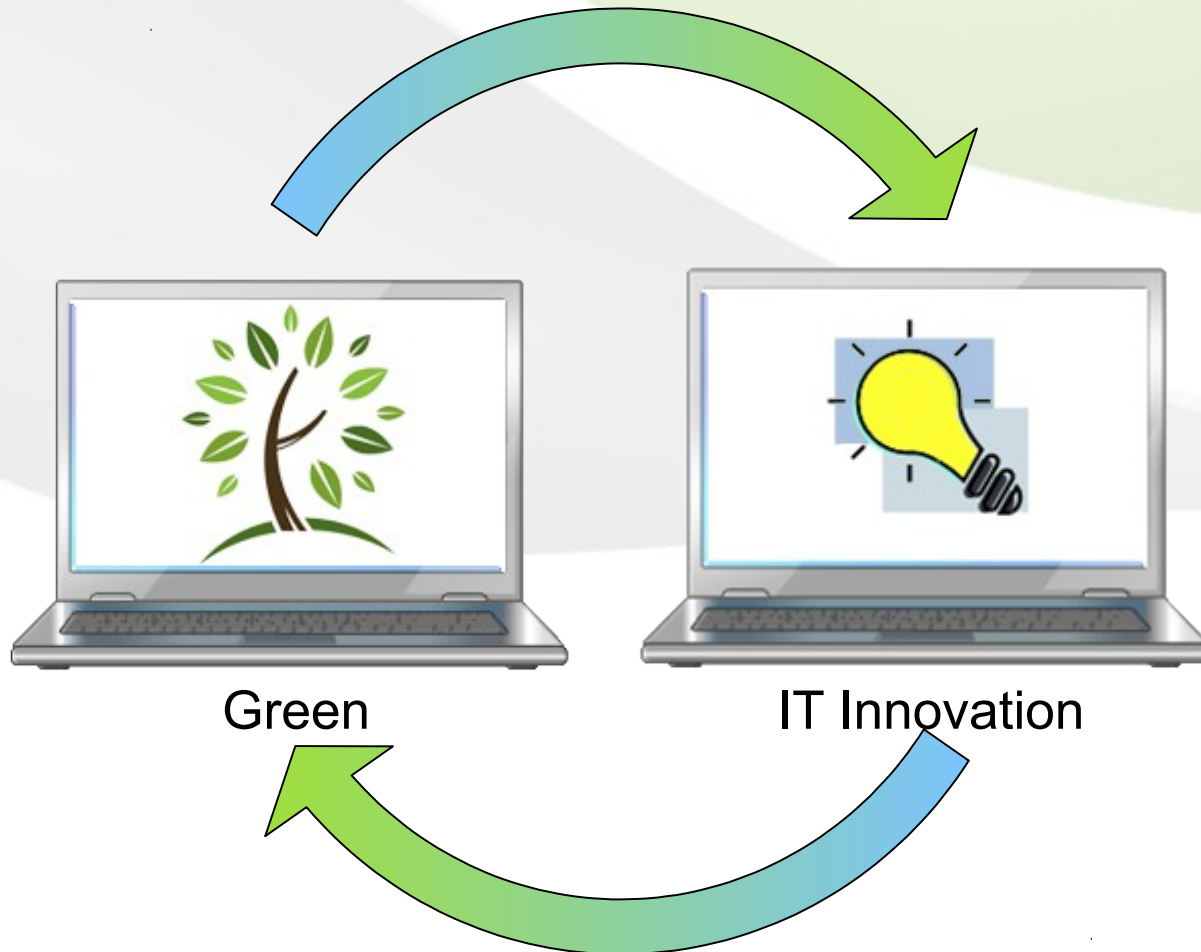
Answers are needed!!!

Energy consumption over the last years

Energy consumption is increasing



Virtuous circle in IT innovation

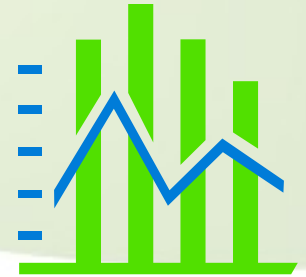
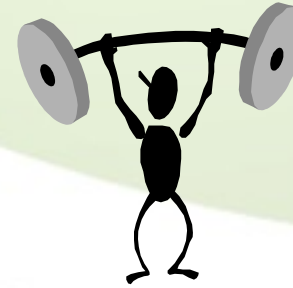


Change of focus

Before:

Research and industry focus on:

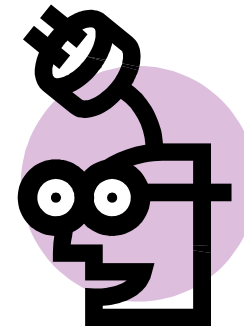
- quality of service
- performance
- reliability



Now:

Green IT and new-Energy consumption

- energy consumption awareness
- interesting and important topic
- more open discussed



IT Life Circle

What are the possibilities?

- Re-furbishing
- Re-construction
- Re-using
- Re-thinking

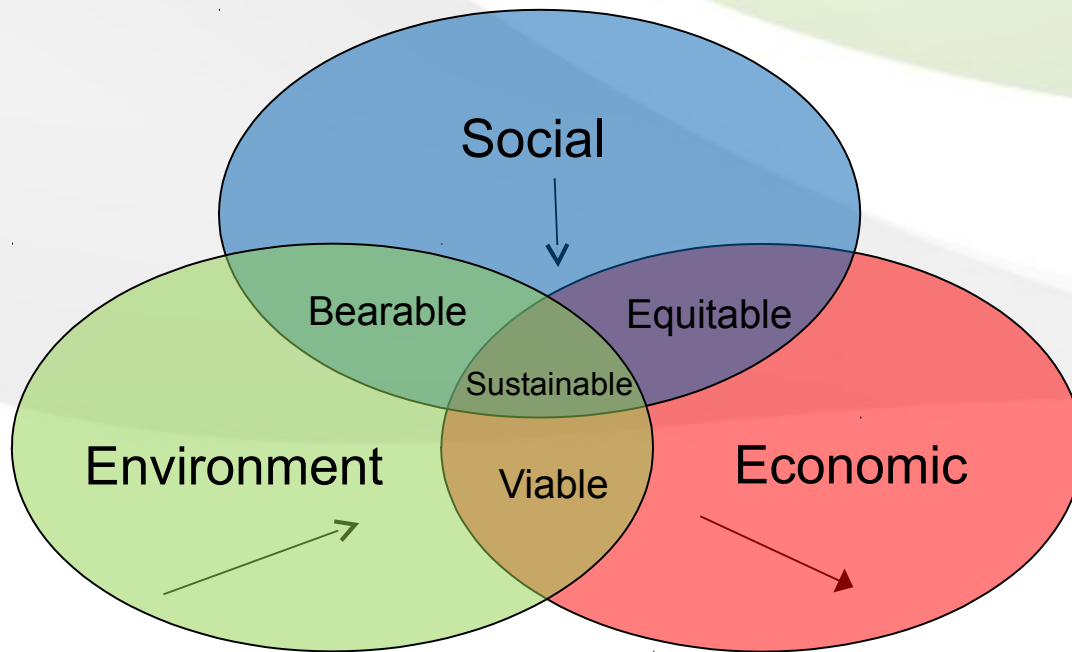


Green IT influences the IT Life Circle and the 4 Rs.

Definition of Green IT

Green IT:

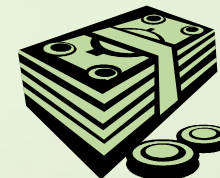
Tendency to the movement (effort) towards sustainability



Example: a company chooses new server room



academia vs/with industry



Research and Innovation Process

Duties, Core Competences, Approach, Priorities of Topics,
Selection of Topics

Criteria and Dissemination

Criteria of Efficiency, Criteria of Quality of Work, Reference Groups,
Distribution of Results,

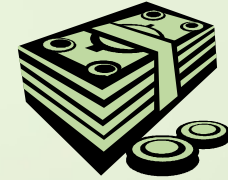
Organisation

Freedom of Action, Funding, Organisational Framework,
Relation With Other Units of the Organisation

Examples:



academia vs/with industry



Approach

Search and find: e.g: measuring load of servers, changing cooling, to develop new DCIM (Data Center Infrastructure Management) software

Decide and act: e.g.: buy DCIM software ready to use

Criteria of Efficiency

Scientific reputation: e.g: Plenty of un-investigated problems, BUT not « old wines in new bottles »

Profit and company value: e.g: ROI (return of investment), Green hype, Green washing

Freedom of Action

High but limits through resources: e.g: GreenIT allows breakthrough research, many open public calls where Green IT is present

Limits through management: Some innovations might be too ambitious with only long term ROI

Motivations, the reasons of the actors being involved in standardization bodies

The **differences in the approaches** from the academia's and industries' point of view may play an important part in the cooperation and in the – existing or not existing – standards.

Eg one of the motivations for the industry in joining a group is to promote their own technology to become a future standard



Green IT for Standardization Bodies, Initiatives and their relation to Green IT focused on the Data Centre Side, Christina Herzog, Energy Efficiency in Large Scale Distributed Systems Conference, EE-LSDS 2013, 22-24 April 2013, Vienna, Austria, Springer LNCS, 2013, ISBN: 978-3-642-40516-7 (Print) 978-3-642-40517-4 (Online)

Standards bodies defined

There are strictly managed standards existing. Such as those managed by

- the International Organisation for Standardisation (ISO)
- the International Telecommunications Union (ITU)
- and the International Electrotechnical Commission (IEC)
- as well as a wide variety of other de facto initiatives, metrics and frameworks being also classified as (non strictly) standards.

Legislation plays also a role in the development of common approaches to (Green) IT and its initiatives should also be considered as important.



Standards bodies defined

There are a variety of classes of initiative that can be categorised as a de facto or actual standard

- Metrics
- Frameworks
- Projects



These various classes of standard types are also administered by a range of different organisations from formal to informal

- government-backed groups
- professional bodies
- and principally supplier-led organisations



Standards bodies defined

Standard (de factor or actual) body type	Nature of standards	Example
International, regional and national and government-backed standards bodies	Highly structured standards, requiring some degree of certification/enforcement	ISO, UN ITU, IEC, CENELEC-CEN, ETSI
Institutes and professional bodies	Structured and de-facto frameworks, metrics, and projects. Some certification required	BCS, IEEE, ASHRAE, Uptime Institute
Supplier and industry groups	De-facto standards, projects and other initiatives.	The Green Grid, Open Compute Project
Technical initiatives, projects, supplier product development,	Loosely structured initiatives, published research etc.	EC projects

This table shows standard body types, their nature of standards and is giving some examples.

The standard body type section shows

- which kind of body it is
- who can join

Standards bodies defined

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The second colon shows what these bodies

- are providing,
- how they are structured
- and what they can provide for the standardization.

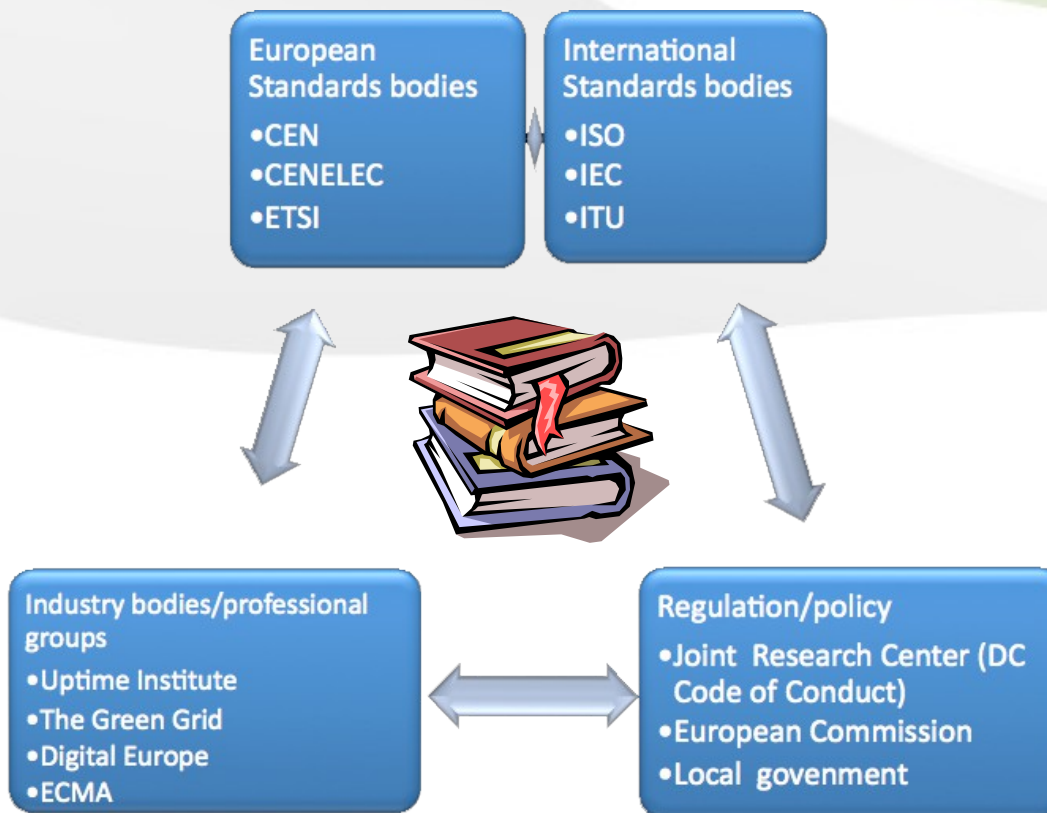
Standards bodies defined

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In the last column you find some examples of bodies, organisations, initiatives and an example of an EC project, which can also be considered as having influence in the standardization of energy saving networks being also classified as (non strictly) standards.

Standards bodies defined

The following figure broadly describes the various stakeholders in the development and implementation of new technical initiatives, standards (and regulations) in Europe and internationally of which a project must be aware and look to engage with.



Standards bodies defined

Industrial bodies, professional groups develop and propose some standards. When a large community accepts these, they can be promoted to international standardization bodies, as it is at the moment discussed for the PUE (Power Usage Effectiveness) standard and already done.

Government can use these defined standards to enforce regulations, as for instance for the operation of data centres in the DC Code of Conduct.



Classification of energy users

This classification would lead to energy savings as international laws may be voted and penalties applied for those being not energy efficient enough.

For instance, **new data centres** will only be constructed if they have a **certain classification**.

Old data centres may have to be **renovated** or **pay a fee** based on a certified metric.

Before doing such a **classification it is needed** to understand the scope of these standardisation bodies and to identify several organisations involved in standardisation activities, both formal and informal.

This includes governmental, industry-related and lobbying groups.

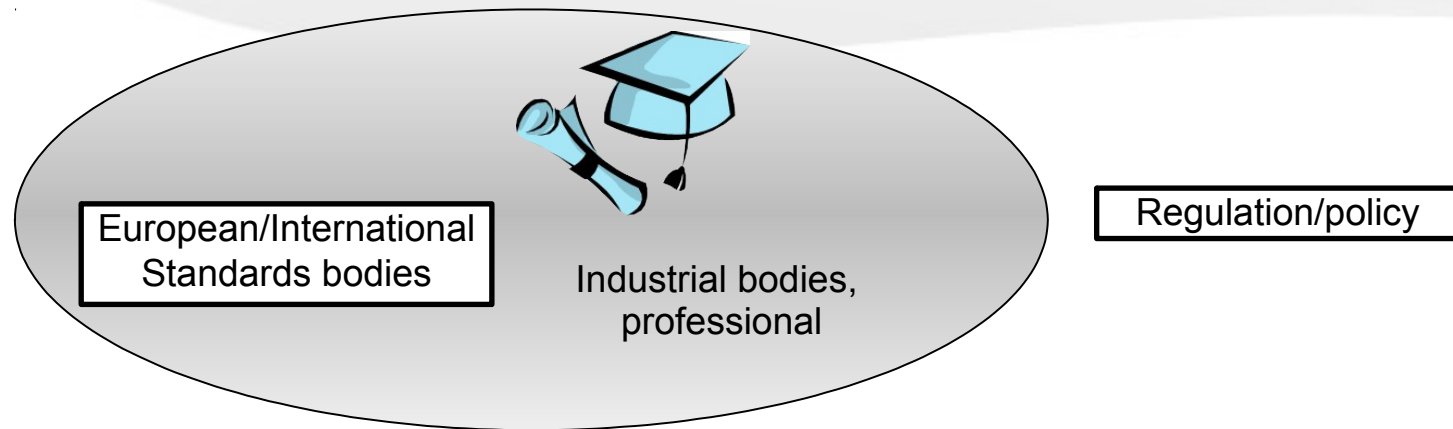


Gaining Influence

We, as coming from universities we can influence the industrial bodies, we can discuss with people having influence, we can join some groups.

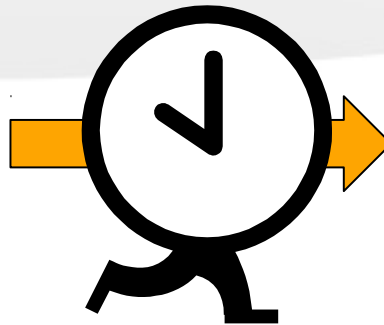
We are limited in influencing government decisions!

Nevertheless: Go for it!!



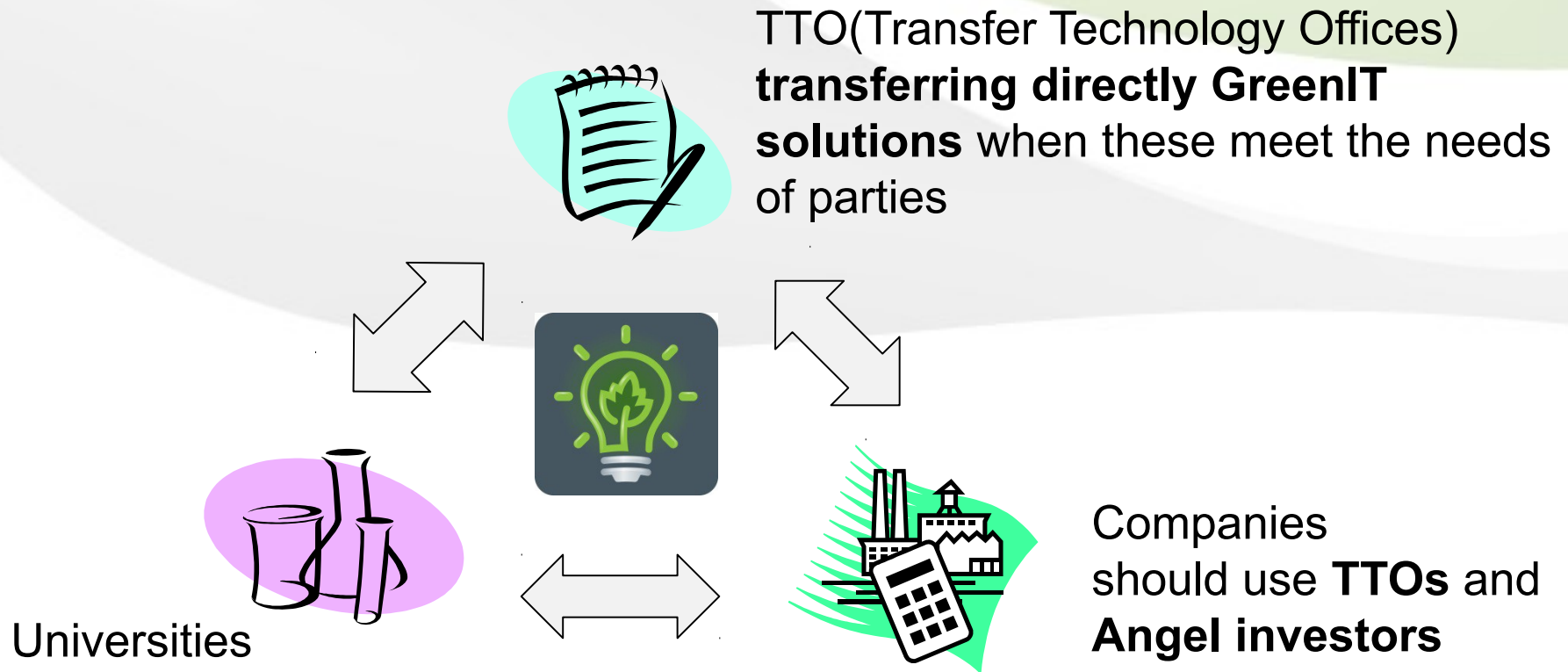
Green IT is a young research field:

it is still possible to build up good databases on ongoing research and to follow innovations as the community is still manageable

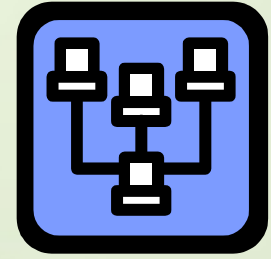


On-going work

The aim is to model the links between the industry, the researchers *and TTO related to their influence on Green IT*

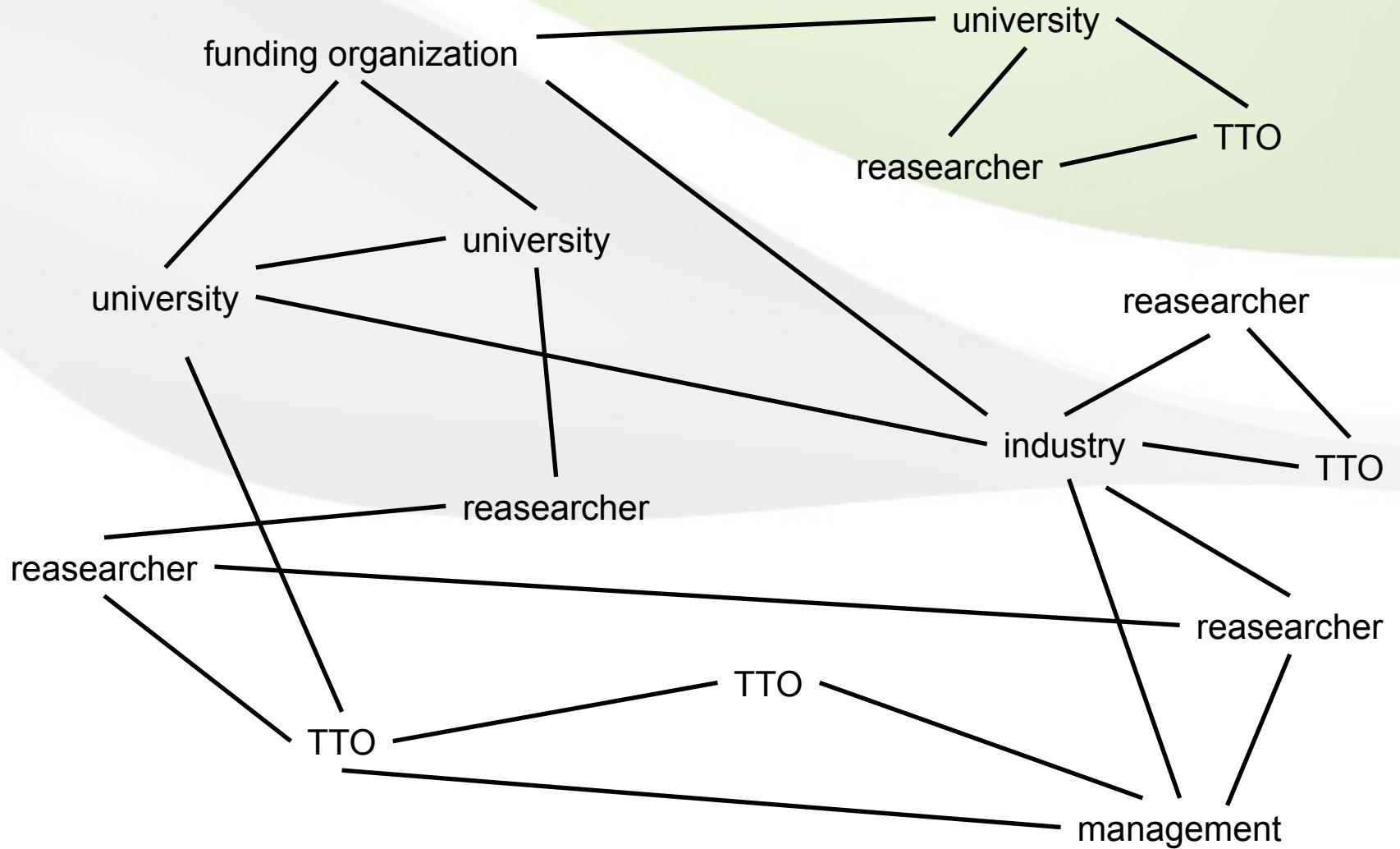


A multi-agent system (M.A.S.) is a computerized system composed of multiple interacting intelligent agents within an environment!



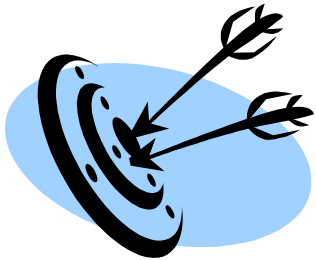
Our objective is to use this framework for the preceding model.

Therefore a need for identifying agents and their interactions (in terms of values and functions), towards an objective function allowing to compare the “Greenness” (with the definition before) of a situation compared to another example.



Aims of MAS

- Support decision makers
- Reasonableness of joining a consortium
- Anticipate the impact of the funding for policy makers
- Predict success and outcome of a project or cooperation



First step:

- online survey
- statistics for the evaluation of interactions between different actors

Second step:

- find some links between actors
- see how these links influence the scenarios

Third steps:

- model these links
- provide the result

If you want to participate and get results then
contact me!



Thank you!



Questions?

Christina Herzog