

Measuring Interdisciplinary Performance by Analyzing Mixed Node Publication Networks

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Context

Research Cluster: Integrative Production Technology for High Wage Countries

In the **Cluster of Excellence** (CoE) more than 20 institutes of material and production technology at RWTH Aachen University do research together on fundamentals of a sustainable production strategy. Aim is to assure the production in High-Wage Countries – and this in the context of the dynamic framework of a world affected by globalisation. Four integrated cluster domains (ICDs) investigate **Individualized Production**, **Virtual Production Systems**, **Integrated Technologies**, and **Self-optimizing Production Systems**.

Cross-Sectional Processes

As a supportive measure three **cross-sectional processes** (CSPs) were established to interlink the ICDs and to ensure sustainability of the cluster. Three dimensions of sustainability are addressed: People (CSP1), Science (CSP2), and Structures (CSP3). The CSP1 - **Scientific Cooperation Engineering** - supports the CoE by providing means of Knowledge & Cooperation Engineering, Interdisciplinary Innovation Management, Diversity Management, and Performance Measurement.

Interdisciplinary Innovation Management

The measure **Interdisciplinary Innovation Management** supports the integration of experts from different scientific cultures and disciplines in order to enable the generation of synergies among the actors. The section focuses on the development of an **interdisciplinary school of methods** bringing together individuals with different methodological approaches, bearing in mind that the trade-off between disciplinary and interdisciplinary excellence has to be balanced. As a service to the CoE the Interdisciplinary Innovation Management offers seminars and workshops for **supporting interdisciplinary cooperation and publishing**. In order to assure efficacy of these measures are evaluated in cooperation with the Performance Measurement measure of the CSP1.

Scientific Cooperation Platform

One effort of the Interdisciplinary Innovation Management, which is currently being developed, is the Scientific Cooperation Platform. On a web-based platform researchers can view their individual publishing efforts using both statistical analyses and graph based **visualizations of cooperation**.

Furthermore the platform will provide the following shared means:

- **Context sensitive Calendar**
A shared view of Cluster-level, ICD-level, project-level appointments showing only data relevant for the logged in user.
- **Interdisciplinary Terminology System**
A wiki-based terminology system, supporting disciplinary specific definition of terminology without enforcing a stripped-down shared definition.
- **FlowChart Project Planning System**
A process tool simplifying project planning and communication by providing simple visualizations of project progress, dependencies and results.
- **Technology Platforms**
Performance-indeces based database of available technology assisting finding a technology partner within the CoE or industry partners from outside the CoE.
- **User Profiles**
Profile pages containing information about CoE members and their research as well as their publication data.

Method

Mixed Node Publication Network Visualization

The visualization of publishing behavior is provided using a mixed node approach. **Nodes** are either **authors or publications**. Connections are inserted according to authorship and contribution. The visualization provides feedback on individual, ICD-level, and Cluster-level publishing efforts.

Search

A user can navigate the network graph and **find other researchers** that

- deal with similar topics,
- have similar co-authors,
- and have published in similar outlets.

Publications will be, if available, **downloadable** by clicking the node in the network graph. User nodes will link to **user profiles**, showing information about the researcher.

Analysis

Additional **meta-data** can also be used to structure network graphs, among them:

- disciplinarity (see Figure 1),
- location on campus,
- further research projects,
- affiliation,
- expertise, etc.

This allows for graph-automorphism based analysis. **Graph metrics** that will be offered to the researchers encompass:

- **Centrality** measures (betweens, degree, eigenvector)
- Graph **entropy** measures (topological information content, parametric graph entropies, network entropies)

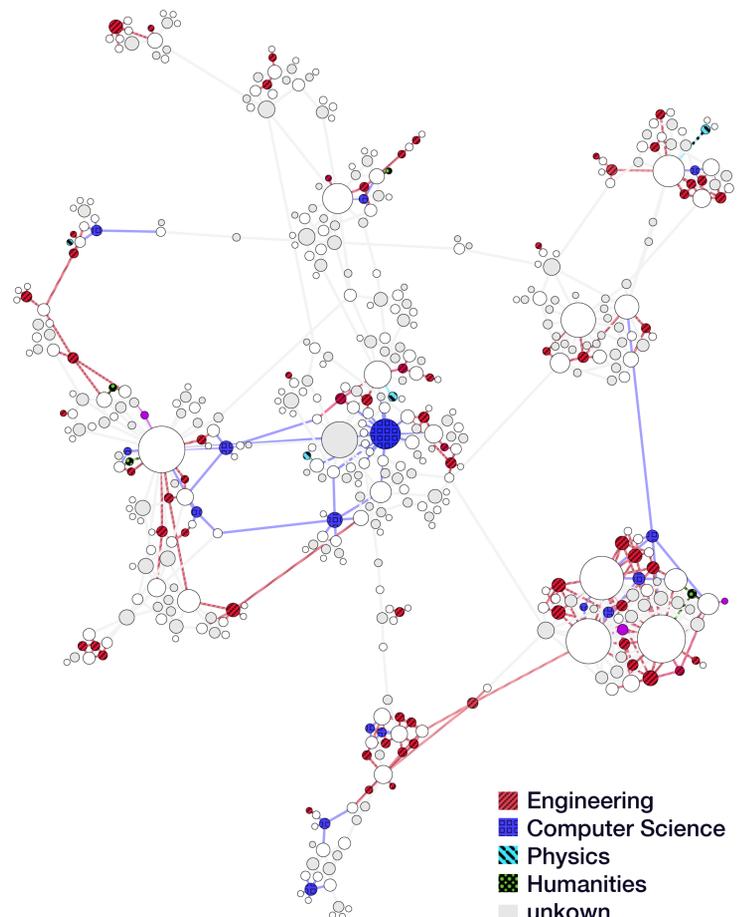


Figure 1. Anonymized mixed node publication network visualization of all cluster related publications from the first funding phase. Disciplinarity data of authors is yet incomplete. Typical workgroups emerge as well as important weak ties connecting the work groups.

