

The Challenge of Knowledge Integration: Cognitive, Communicative and Social

Summer school on transdisciplinary methods

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- Founded 1973
- 120 Member-Cities
- Workforce: ca. 140 staff members (excl. students)
- Difu's work covers all issues facing today's cities and those of the future:
 - urban construction, urban development, social issues
 - Infrastructure, economy and finances
 - Mobility
 - environment and sustainability
 - politics, law and administration
- Research projects often are designed and performed in inter- and transdisciplinary manner

Personal Background

- Head of the department for “Infrastructure, Economy and Finances” at the Difu.
- Key research activities:
 - City of the Future,
 - Urban Transformation an Infrastructure Systems,
 - Services of General Interest,
 - Institutional Change of Public Services and Governance of Public Utilities,
 - Accompanying Research and Evaluation.
- Long standing experiences with transdisciplinary research projects together with national and international partners.



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Agenda



1. The term „Knowledge“
2. Knowledge integration and transdisciplinary research
3. Approaches on cognitive integration
4. Organizing an integrative research process
5. Communication as part of research process
6. Conclusions

Knowledge

Types of „Knowledge“

- Scientific knowledge
 - based on rational und theoretical or empirical well-grounded insights (in contrast to e.g. assumption or opinion)
- Everyday knowledge and practical knowledge
 - Based on experience and information

Types of „Knowledge“

- Explicit knowledge (direct verbalizable) and implicit knowledge (only indirect verbalizable).
- Individual knowledge and organisational knowledge.
- Detailed knowledge and comprehensive knowledge.
- Strategic knowledge and operational knowledge.
- Expertise (know what) und factual/procedural knowledge (know how).
- System knowledge (present problems and their future development), target knowledge (values and norms can be used to form goals of the problem-solving process), transformation knowledge (how a problematic situation can be transformed and improved)

„Knowledge“

- Is not neutral but related to context.
- Becomes know-how, if implemented by activities or decisions through organizations or actors/individuals.
- Can be handed
 - in written form or verbal,
 - explicit by methods, rules, handbooks etc.,
 - implicit with learning by doing.

Knowledge Integration and transdisciplinary research

Transdisciplinary Research

- pick`s up real live problems resp. questions,
- involves [...] disciplines adequate to problems (differentiation) and oversteps disciplinary or professional boundaries,
- involves knowledge from praxis [...] and realizes reference to praxis in a way, that it is adequate for developing action strategies and implementation,
- ensures [...] connectivity of subprojects/-tasks, organises interdisciplinary integration of scientific knowledge and links practical knowledge in a adequate manner,
- formulates new scientific insights resp. questionnaires' and/or relevant action strategies and solutions for praxis.

(Evalunet 2005)

Transdisciplinary Research & Knowledge Integration: Motivation

- broad challenges (globalization, urbanization, climate change, migration, etc.,
 - uncertainty of knowledge,
 - complex and controversial problems
 - big hazards,
 - no simple solutions,
 - many different interests
 - etc.
- For analysing the interplay of patterns in society, natural, technical and cultural factors as well as political or technical regulations makes it necessary to interlink knowledge from different disciplines.
- Transdisciplinarity and social learning to handle with uncertainty of knowledge

Knowledge Integration: Basis of Transdisciplinary Research

- Knowledge integration in transdisciplinary research means to connect different perceptions on a problem to a holistic perception.
- In transdisciplinary research it is not only the question *what kind of knowledge* is to be required but as well *how* new knowledge can be produced cognitive, organisational/social und communicative.

Knowledge Integration: Normative Requirements

- to bring together disciplinary generated resp. existing knowledge,
 - to bring together different scientific disciplines,
 - to bring together scientific knowledge and knowledge from praxis,
 - to bring together different cultures of knowledge and practices.
-
- Knowledge Integration aims on
 - bringing together different knowledge inventories
 - systemizing (functional different) knowledge.
 - Knowledge Integration has directly to do with the design of a transdisciplinary research project.

Knowledge Integration: constraints of possibility

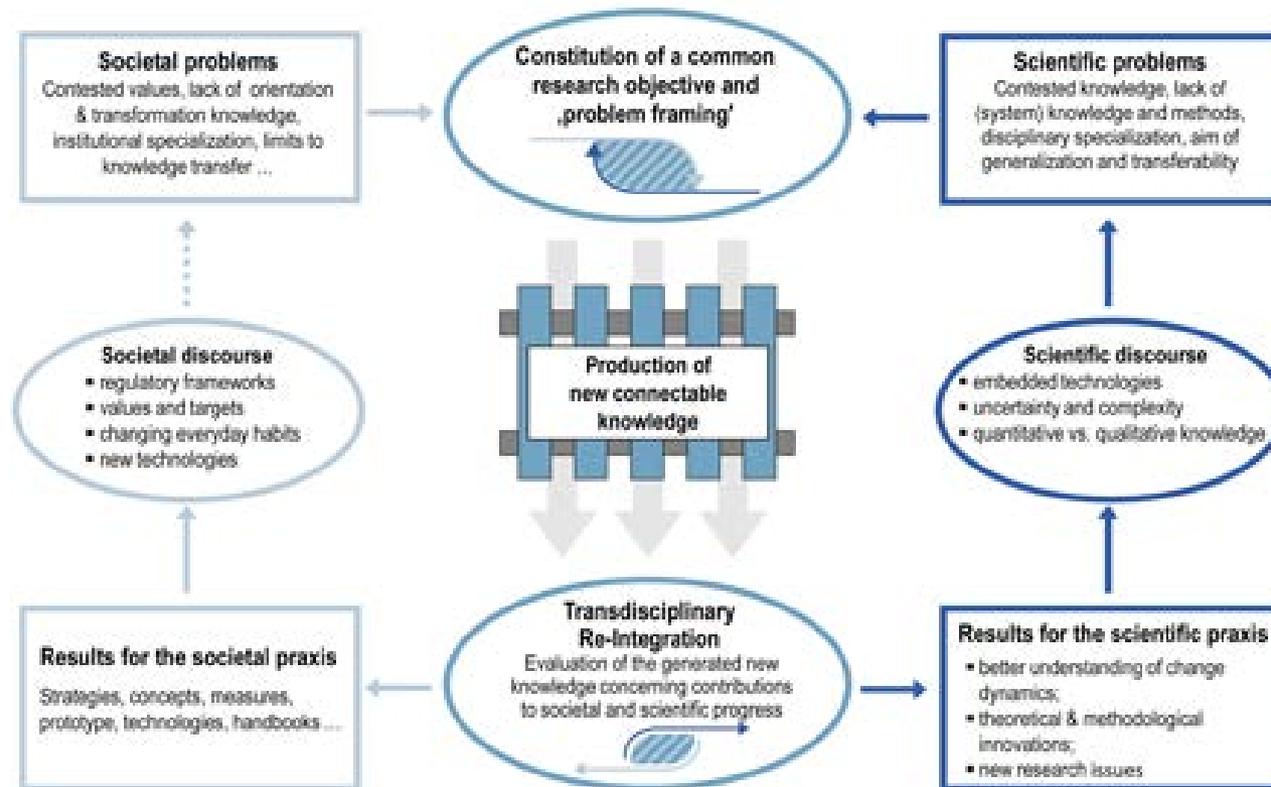
- Theoretical and methodological inventories of knowledge are too different.
- Lack of openness and willingness to engage in others knowledge.
- Lack of resources for knowledge integration:
 - Money
 - Time
 - Knowledge about the *How?* of integration,
 - Reputation

Knowledge Integration: constraints of necessity

- Not every problem needs knowledge integration.
- Different problems need to have different deepness of knowledge integration.

Knowledge Integration

The ideal transdisciplinary Research Process (ISOE Model)



Source: <https://www.isoe.de/en/research/transdisciplinarity/>

Cognitive Integration

Cognition

- refers to research relevant activities of the stakeholders involved in a project (in sense of perception, imagination, learning, understanding etc.),
- steps fare out pure logic-rational operations on terms without recognition of interest,
- refers to the interplay of necessary differentiation of knowledge and knowledge integration.

Cognitive Integration = Integration with regard to contents

- Cognitive Integration as Key-Term of transdisciplinary research.
 - Cognitive Integration as basic requirement
 - a) for a successful transdisciplinary research process,
 - b) to produce robust knowledge that can be adapted to problem solutions.
 - Cognitive Integration aims on integration of
 - different problem perception,
 - incommensurable (not comparable) knowledge,
 - methods and practices from different scientific disciplines or social practices
- Cognitive Integration asks for appropriate methods of integration.

Cognitive Integration – Relevance

- Formulation and definition of the common project objectives and questions.
- Formulation of comprehensive strategic targets & questions.
- Development of an integrative instrument.
- Common orientation for all sub-projects and their networking.
- Synthesize of the research work.
- Strengthening the (potential) outcome and impact of the project.

Way`s of cognitive integration

1. Integration by common work on terms:

- Terms often have different meanings relating to disciplines or theoretical backgrounds (Example: Term „*Resilience*“),
 - Different technical terms can be a hard barrier for transdisciplinary research.
- In transdisciplinary research it is e.g. necessary,
- to have a discourse about the projects central terms,
 - to describe technical terms in disciplinary manner and to lay open the different understandings,
 - to identify the possible connectivity for other disciplines,
 - to explore the possibilities for common use of terms (= common language),
 - to definite of common terms (glossary).

Way`s of cognitive integration

2. **Integration by theoretical framework:**
 - Theoretical framework enables or restricts a common work between different disciplines.
 - Theoretical framework is the reference point for an interdisciplinary choice of methods.
- In transdisciplinary projects it is e.g. necessary,
 - to have an problem describing heuristics, that all participating disciplines are able to capture the underlying problem and can describe an overall research question,
 - to abstract concrete relationships, processes or structures, so that the are workable in a theoretical / methodological manner,
 - to pay attention on a conceptual framework, that describes the state of the art and gives connecting points for other disciplines.

Way`s of cognitive integration

3. **Research questions and hypotheses:**

- On the basis of common terms and the theoretical framework.
 - As team work by partners with different disciplinary background.
- In transdisciplinary projects it is e.g. example necessary,
- to formulate the problem and the (guiding) research question(s) similar in a scientific and praxis oriented perspective,
 - to formulate hypotheses on a broad basis by the view`s of all involved partners and to put them in relationship.

Way`s of cognitive integration

4. Reflection on appropriate methods

- on the basis of existing disciplinary and transdisciplinary methods (learning by case studies).
 - by developing common methods.
 - by orientation on a common research objective (boundary object).
- In transdisciplinary projects it is e.g. necessary,
- to check which methodological skills are represented by the research team,
 - to check which methods have to be developed new,
 - To check, which methods have been proved in other transdisciplinary projects (e.g. scenarios, system modelling, stakeholder dialogue etc.).

Way`s of cognitive integration

5. Assessment procedures

- on the basis of common guiding principles and/or
 - on the basis of multi-criteria assessment procedures (with transdisciplinary development of criteria).
- In transdisciplinary projects it is e.g. necessary,
- to formulate expectations on successful project,
 - to develop criteria of success,
 - to organize discursive assessment processes (e.g. scenario-workshops)
 - to evaluate (formative and summative) success and learning effects during the project (by the project team),
 - to evaluate the project`s results at the end or (with time lag) after the project (by project team and users).

Way`s of cognitive integration

6. Modelling

- on the basis of (computerized) simulation technologies,
 - for a definite part of reality.
- In transdisciplinary projects it is e.g. necessary,
- to use graphical, technical or semantically models
 - to create the modelling in iterative steps (validation of hypothesis)
 - to explain the real world problem by system modelling,
 - to forecast the future state of a system,
 - to picture the relationships between different factors of a problem.

Way`s of cognitive integration

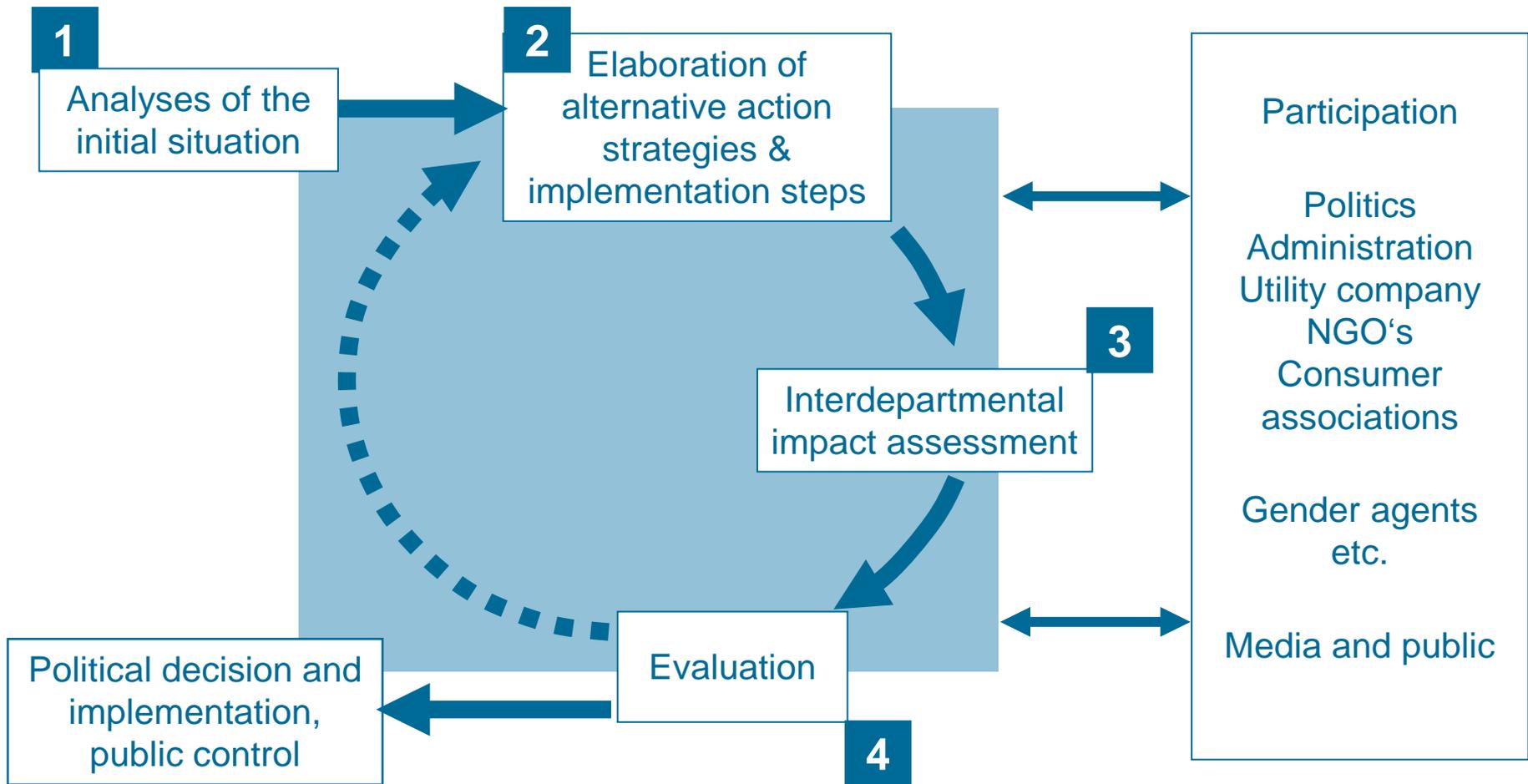
7. **Boundary Objects (Services and Products)**

- Without boundary objects no common work is possible.
 - A boundary object quasi represents the common interest and is the nucleus of common efforts.
- In transdisciplinary projects it is e.g. necessary,
- to define common products and target services,
 - to formulate a list of common questions that have to be worked during the project,
 - to formulate a normative guiding question, mostly focused on the real world problem to be solved or affected.

Integrative acting instruments

Example:

netWORKS-Approach for Integrated Strategy Building



Source: netWORKS

Integrative acting instruments

Example:



KURAS-Methode on target oriented planning of rainwater management

Problem Analyses Stakeholder Targets Feasibility



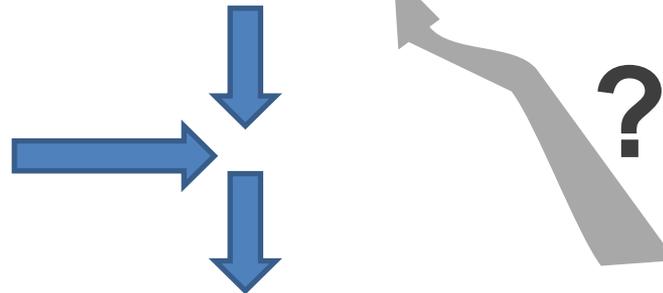
Urban Climate

1. Oberflächengewässer
Freiraumqualität
Nutzen auf Gebäudeebene
2. Grundwasser
Kosten
3. Ressourcennutzung
Biodiversität



Infiltration

	Bewohner			Umwelt				Ökonomie	
	Nutzen auf Gebäudeebene	Freiraumqualität	Stadtklima / Bioklima	Biodiversität	Grundwasseranreicherung	Grundwasserqualität	Oberflächengewässer	Kosten	Ressourcennutzung
	Green	Yellow	Green	Green	Red	Green	Green	Red	Green
	Green	Red	Red	Red	Red	Green	Green	Yellow	Red
	Yellow	Yellow	Green	Green	Green	Yellow	Green	Red	Green
	Yellow	Yellow	Green	Green	Red	Green	Green	Green	Green
	Red	Yellow	Green	Red	Red	Green	Green	Green	Green
	Red	Red	Red	Red	Red	Green	Green	Green	Green



Assessment: Effective combinations of measures for districts



Source: according to KURAS

Integrative acting instruments

Example:

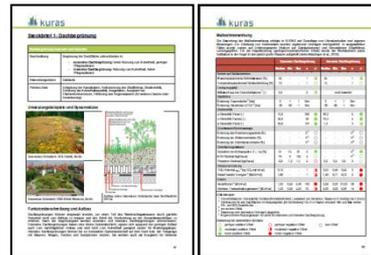


KURAS-Methode on target oriented planning of rainwater management

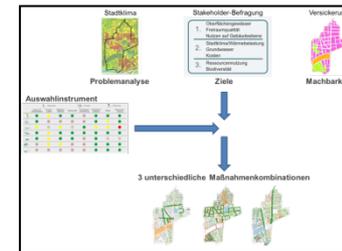
Results on the basis of board stakeholder participation



Choice Instrument



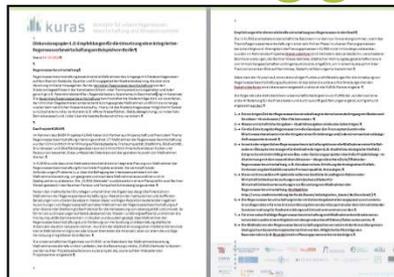
Characteristics on measures



Guiding Manual



→ Discussion paper with working guide for practionieers



Source: according to KURAS

Social and organisational Integration

Social and organisational Integration

Example Urban Research:

Why Municipalities participate in transdisciplinary project?

- to pick up themes
- to put topics on the agenda
- to enforce topics
- to perpetuate topics
- to allow a view from outside
- to get insights
- to learn from each other
- to get (new) resources
- ...



<https://kommunen-innovativ.de/kommunen-und-forschung>

Social and organisational Integration

Example Urban Research: Possible Roles of Municipalities in a Research Cooperation

- Object for analyses
- Participation on research process
- Own research contribution
- Co-initiator and designer of change Processes resp. transformation processes (transformation management)
- Contact partner for stakeholder from economy and civil society
- Corrective for application (practise orientation) and transferability
- Guarantor for target group orientation
- ...



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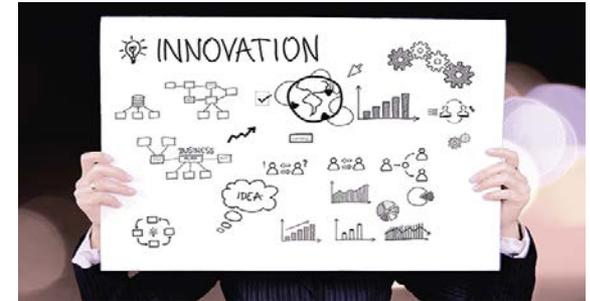
Social and organisational Integration

Example Urban Research: Typical difficulties in transdisciplinary cooperation

- Big differences between research affine municipalities and such with less experiences in research cooperation.
- Less knowledge and experiences on site of (young) researches with interests of practice partners.
- Inadequate reflection of local (political, cultural, economical etc.) conditions.
- Not clarified expectations on the common project.
- Lack in matching of project process and (local) political processes.
- Lacking personal resources in administration.
- Deficient or complex funding conditions.
- Lacking perspective for the research theme beyond research funding.
- ...

Social and organisational Integration

Example Urban Research: Innovation and City Council



Quelle: pixabay.com

Constraints

- Concentration on execution and statutory duties.
 - Maximal 10% of the financial, temporally and intellectual resources are available for cross-sectional tasks.
 - Overcrowding of tasks, staff reduction, aging of staff as innovation barriers.
 - ...
- Narrow space for innovation and strategies.

Social and organisational Integration

Example Urban Research: Innovation and City Council

Prerequisites

- Courageous and convinced actors in administration.
 - Backing in organisation.
 - Confederates in politics and other resorts.
 - ...
- Cooperation with research and research funding can open possibilities for innovation.



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Social and Organisational Integration - Principles

1. Define a common agenda

Challenge

- To find appropriate partner.
- Development of research agenda, objective and procedural method.
- Realizing interests and reference systems of all partners.
- Reducing disparities between partners as well as creating confidence and motivation.
- Estimate inhibiting external conditions, where the project team possibly has less influence) (e.g. freedom of research and expression)

Implementation

- Put the formulation of core problem and research questions in the centre.
- Determine project structure and methods of integration.
- Ask for mutual expectations on targets and results.
- Determine a strategic position for success.
- Find out chances and risks in cooperation.

Social and Organisational Integration - Principles

2. Interaction with different Stakeholder

Challenge

- Awake interest in aimed objectives and results.
- Including stakeholders during the whole research process.
Questions: Who? Why? When? How intensive?
- Exchange not only with a core group of players from practise but including other interests and perceptions.

Implementation

- Assuring political backing for the project.
- Establish methods and platforms for stakeholder integration and participation and mutual learning.
- Definition of desired output (products) and/or outcome (results) together with target groups.

Social and Organizational Integration - Principles

3. Clear Responsibilities

Challenge

- In every transdisciplinary project there is a division of work: every partner should contribute his particular competences.
- Get rights and duties clear, in particular with regard to common responsibilities (research agenda, report and evaluation).

Implementation

- Clearing roles and duties for all phases of the project.
- Contract a cooperation agreement.
- Define solution approaches for possible conflicts.
- Arranging an arbitration agreement in case of conflicts.

Social and Organisational Integration - Principles

4. Reflexive Research Design

Challenge

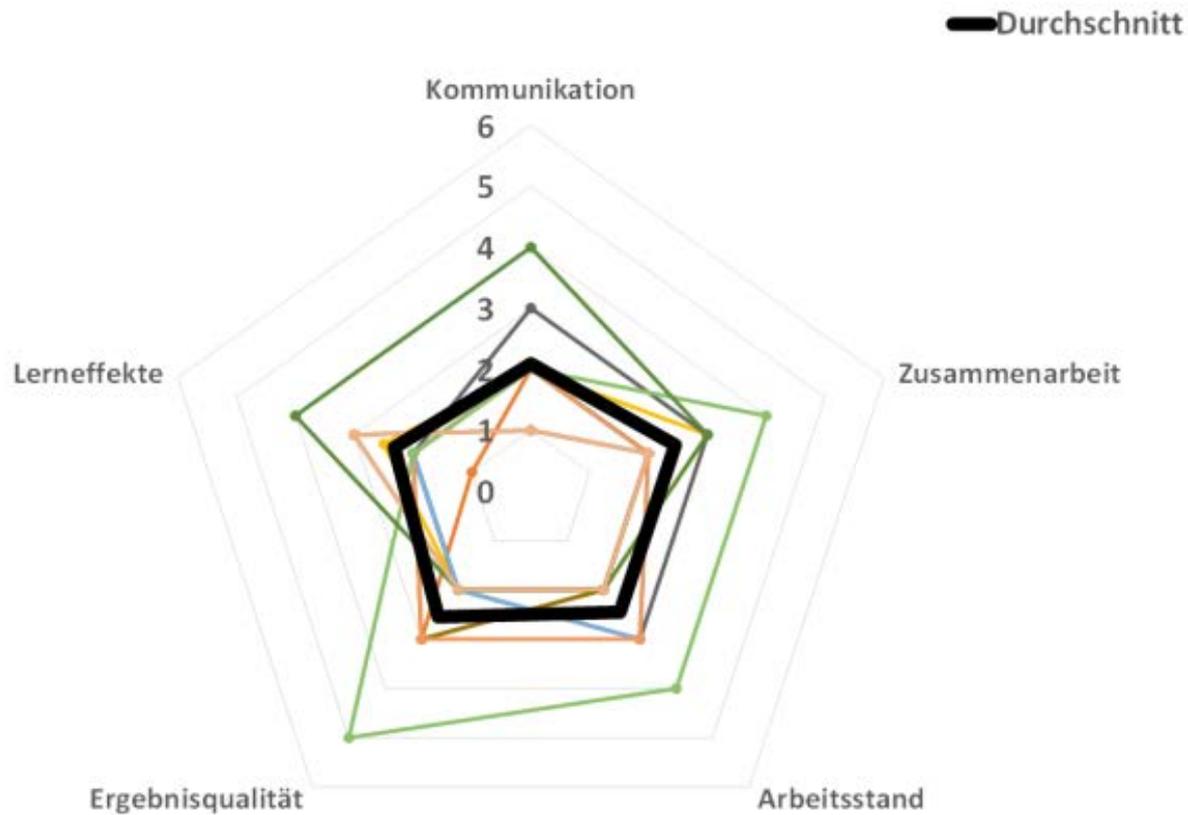
- Partners regular have complex and not always consistent obligations.
- Reflection not only on success but also on failures or objectives that could not get.

Implementation

- Iterative (step for step) procedure with critical discussion of intermediate data/results (quality assessment and common learning)
- Regular self evaluation with regard to research process as well as research results.

Integrative acting instruments

Example: Formative Project Evaluation



Source: netWORKS

Social and Organisational Integration

Supporting factors



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- Spatial reachability of partners
- Intensity of cooperation (in time)
- Separation of responsibility in cognitive and social integration
- „Open minded“ partners (questioning own patterns of thought; capability to take new perspectives)

Communication

Communication – Background and Objective

Quality-Characteristics of Research Results

- in scientific aspects productive in relation to theories, concepts, methods, models etc.
- social robust und accepted (developed in interexchange resp. Cooperation with practise),
- relevant with regard to the problem that has to be solved,
- target group oriented with regard to format and address/speech,
- transferable and generalizable

Communication – Relevance

- Every research project is based on existing knowledge and enlarged this.
- Difficulty for researchers as well as for users to filter out the relevant insights from multiple supply of scientific contributions.
- Strategic aims of a project should be considered in a strategic communication.
- Research results have to be translated in target group oriented formats and languages.
- Appropriate communication channels have to be identified.

Communication – Questions

- What is the object of communication?
 - How the research project can be communicated (strategic)?
 - How good ideas can be transported widespread?
 - How to overcome barriers of communication?
 - Which target groups should be addressed?
 - How to awake interest in different target groups?
 - How mind-sets are changing?
 - What is the role of key actors („door opener“)?
 - What is successful communication?
- Objective: coherent concept on knowledge communication, related to the needs of different target groups.



Source: www.refina-info.de

Communication and Transfer

Example Urban Research: Expectations on foreword-looking urban research

- Target-group orientation: municipal player, federal institutions, (public) economy, intermediaries (e.g. associations)
 - Address of key-player (Multiplications, potential Chance Agents in politics und administration and beyond)
 - Strengthening the impact of communication by activating approach: early addressee-feedback instead of simple "sender-message-receiver" model
 - Product with as much as possible concrete operations guidelines or support (e.g. manuals, working-paper serious games and others)
 - Multifarious (interactive) interchange formats (seminars, webinars, coaching etc.)
- Objective: initiate action-changing

Communication – Target Groups

- Scientific Community
 - Research Project with Stakeholder
 - Specialized Field Community
 - Different Disciplines
- Research Funding
- Other research funding (International, EU, National, Foundations etc.)
- National State, Municipalities
- Public and private sector of the economy
- Intermediaries
- Associations
- General Public
- ...



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Communication – Address

- Bring up needs and challenges, using a „current angle“, the „source of a story“
 - Argue the concrete benefit (of an innovation)
 - `additive character‘ offered by innovations
 - Developing narratives (Story-Telling, emotional speech, using good-practice examples, possibilities for identification etc.
 - ...
-
- Quality assurance by cross-disciplinary countercheck
 - Quality assurance by peer review (user, practitioner)

Communication and Transfer

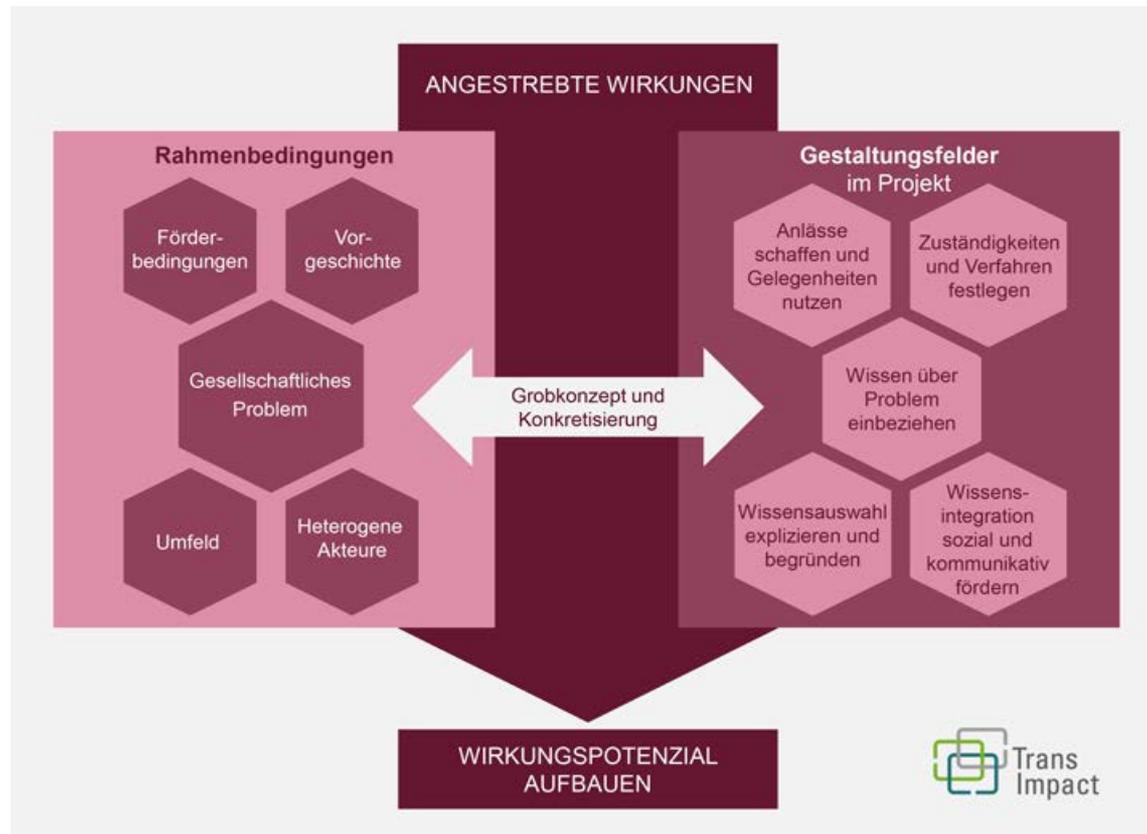
Possible Impacts of transdisciplinary und transformational research

- Output in form of products is not to be confused with outcome and impact.
- Scientific impact is not easy to measure.
- Early view on possible impacts is a prerequisite for building up appropriate impact potentials.
- Avoiding of a static understanding of impact: not simple cause and effect relationship.
- Understanding of impacts in contexts:
 - Geneses und history of a project,
 - Way of cooperation in research process and production of results,
 - Local conditions of implementation.

Communication and (possible) Impacts

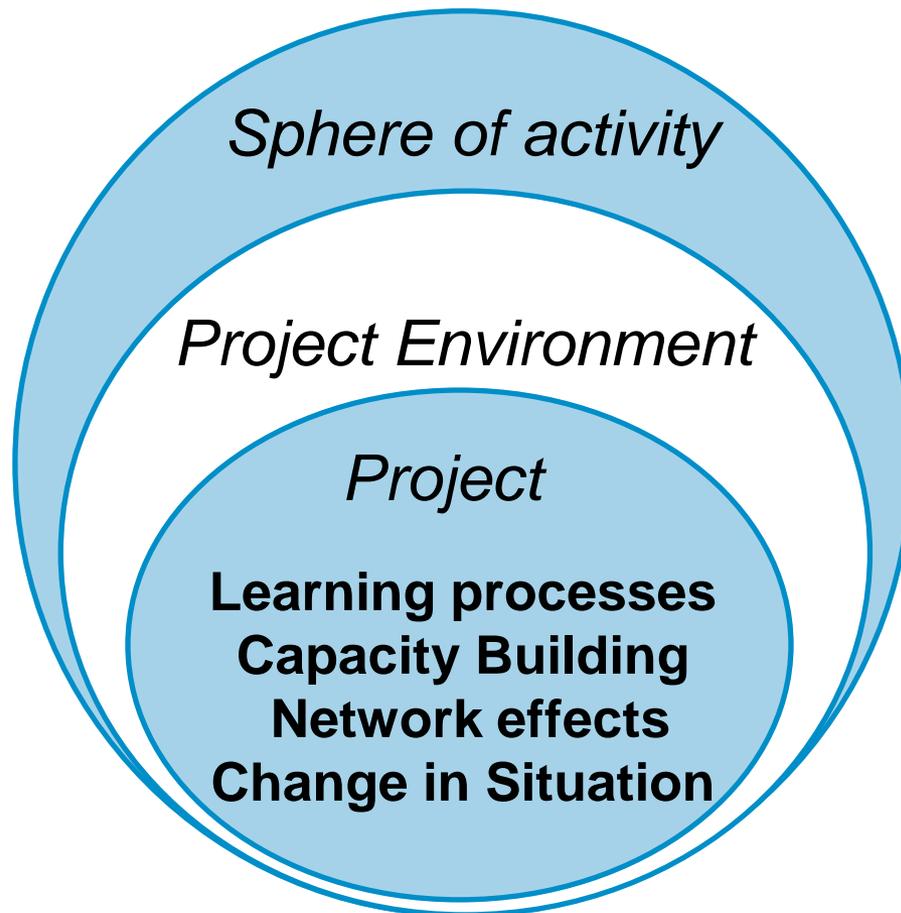
Possible Impacts of transdisciplinary und transformational research

Schema for structuring potentials of impact by knowledge integration



Possible Impacts of transdisciplinary und transformational (urban) research

- Forms of impacts -

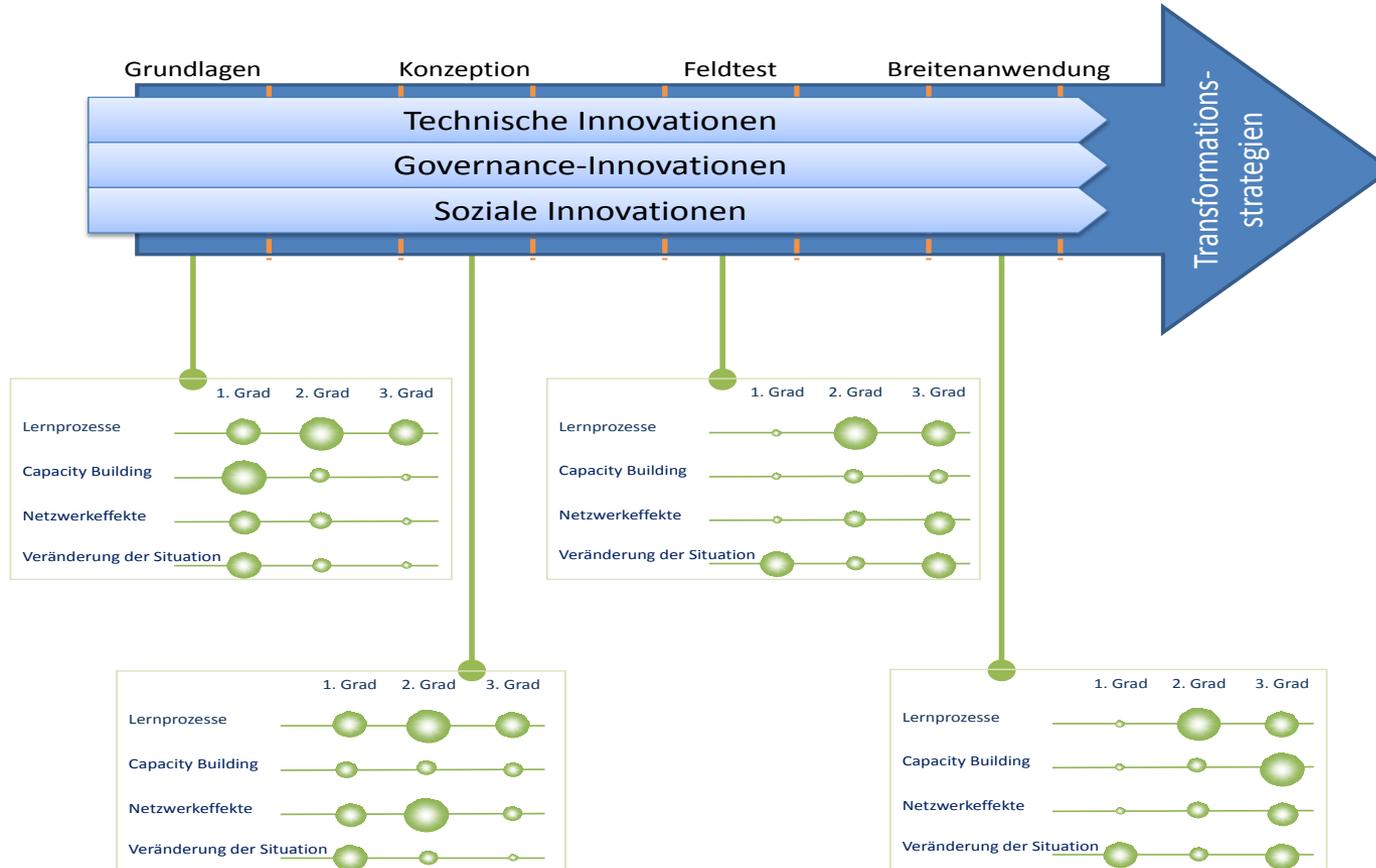


Example: Synthese- und Vernetzungsprojekt Zukunftsstadt (SynVer*Z)

- **Learning processes** that lead to action changing
- **Capacity Building** in shape of (concrete) transformation resp. action knowledge
- **Networks effects** in terms of new relationships and mutual trust.
- **Improving Situation** by concrete measures, regulations, shift in planning, new technologies etc.

Possible Impacts of transdisciplinary und transformational (urban) research

- Transition Strategies and Impacts-



Quelle: SynVer*Z, ISOE

Conclusion

Conclusion (1)

- Knowledge integration as basic requirement of transdisciplinary research.
- Knowledge integration needs an appropriate organized research process:
 - all members of a project team should together discuss the object of research and the research question(s)
 - recursive and iterative acting
 - orientation on solutions and implementation
 - integration from the beginning and not only ex-post
 - transfer by intermediaries and other appropriated stakeholder

Conclusion (2)

- Project team collects, differentiates, categorises and systematizes the knowledge inventories.
- Project team makes explicit, why the collected knowledge is relevant for problem solution.
- Project team provides transdisciplinary knowledge in models, compendiums, handbooks etc.
- Knowledge integration requires an early approach to relevant stakeholder.
- Knowledge integration needs specific methods and tools to bring project partners together and to produce common project results (*see the following workshop sessions*)

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