

## *A conceptual framework for technology transfer to the local level in the water supply and sanitation sector in Latin America; Lessons learned from Team Learning Projects*

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### **Abstract**

Evaluations have shown that the main problems in the water and sanitation services are related to the technology transfer process to provincial and local levels. A model for technology transfer was a research-project product developed by CINARA with its partners. This model considers the interactions between research and development and the solutions built on the local and technical knowledge through learning alliances, using Team Learning Projects. The model was developed in the Learning Projects and funded by a local service agency (EMCALI) in Cali (Colombia). The approach has been validated in several projects in Latin America.

This article describes the problem of - and conventional approach to technology transfer processes. Based on experiences with a Knowledge Dialogue model and Team Learning Projects (TLP), lessons learned emerge to run Learning Alliances (LA). Developing institutions are called upon to adopt the LA approach and recognise that 'solutions' are 'process products' and LA's open spaces for learning around specific problems.

### **Introduction**

*Technical solutions should not be considered as starting point; they are the result of a process which integrates other social, environmental, cultural, economic and institutional dimensions that involve all the actors.*

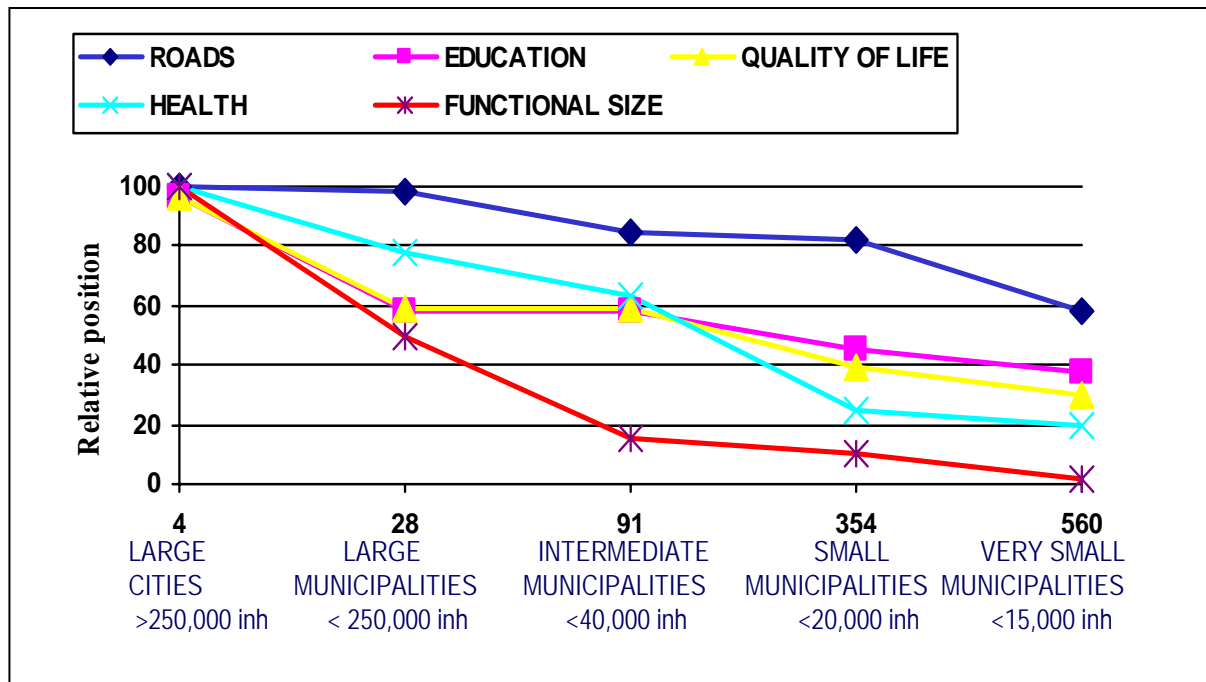
*Round Table Sophía Antípolis, France, 1994*

Nowadays, the environmental risk factors associated with technological usefulness and efficiency and their effect on human health are well known. However, the technology *software*, which are the social factors associated with technology, is less well understood. The relationship between the technology *hardware* and *software*, the communities and local institutions, and the process by which technology is transferred to those communities and institutions are scarcely understood at all. Evaluations of WSS development projects have concluded that many do not succeed because of failures in the technology transfer process carried out during projects. Inappropriate technology transfer processes between different countries, or even within a country, to the local level result in improvements which are difficult or impossible to sustain. The practical problems this creates are often evident to development and academic institutions because they result in projects that do not function efficiently or do not function at all. The institutions usually develop tools and skills to improve their project cycle and the academic discussion is focused particularly on techniques for community participation (Clever, 2001). However, the underlying problem, inappropriate processes used to transfer technology to local institutions and community, is not commonly recognised.

### **The Problem**

Evaluations have shown that often, the existing WSS systems do not give the expected benefits to the users, especially in small settlements and informal cities. The evaluations of the WSS Decade concluded that many projects had failed because they focused on infrastructure and did not strengthen local capacities. Thus, it is common that a WSS system does not function or function with important deficiencies a short period after the starting up of technology. Figure 1 shows a comparative analysis of the situation in Colombian cities and towns regarding services' quality. If the four largest cities have all what the country can have (100), the rest of the cities have less and it is remarkable that the lower the town's size, the lower the services' quality.

**Figure 1: Comparative analysis of service quality in Colombian municipalities**  
Source: CINARA (1996)

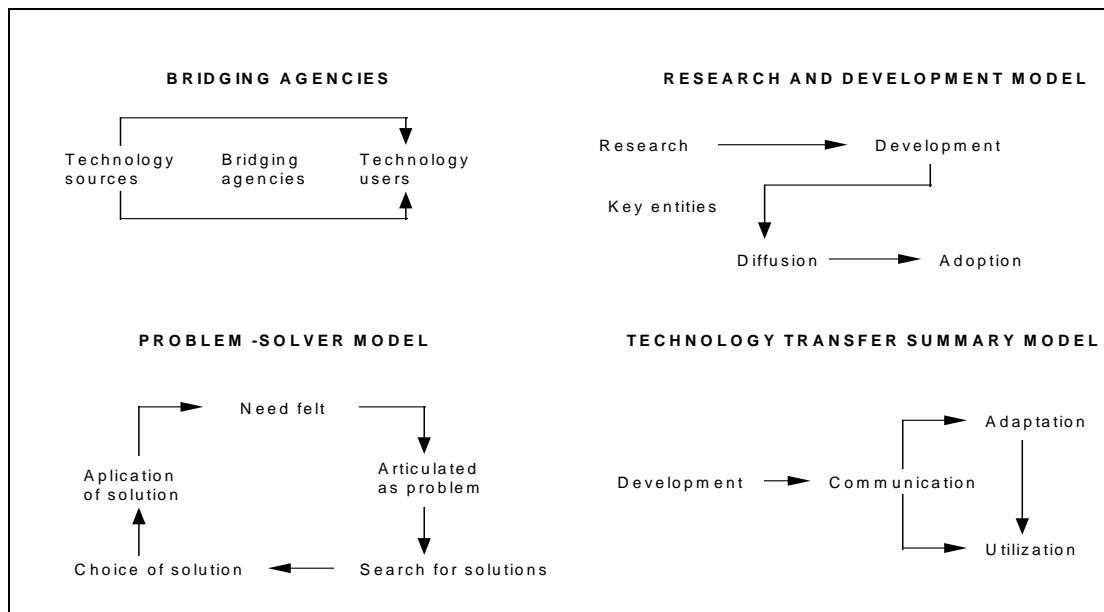


## Conventional Transfer Processes

Mogavero and Shane (1982) propose four models of technology transfer which are shown in Figure 2. The agents associated with technology transfer processes are: users, manufacturers, government agencies, private sector, local organisations and the facilitator. In some processes, especially in the private sector, an entrepreneur is needed.

There are different technology transfer modes, which vary from passive mode to active mode. The active mode involves demonstration projects in which the facilitator plays an important role as well as the users. The project 'demonstrates' to the users how to solve a problem in real scale. In many countries, the facilitation role is played by a research and development institution, especially in developed countries (Schechter, 1982). In the public sector, the final step of the transfer process is to institutionalise the solution which is the ability to use the product widely. Gruber and Marquis (1969) consider that the following human factors affect the technology transfer process: training and experience, personality characteristics, communication procedures, organisational effects, mission orientation, and motivation.

**Figure 2: Technology transfer models** Source: Mogavero and Shane (1982:2-3)



Many obstacles affect technology transfer from developed to developing countries. Related to developed countries, the interventions finish without the external agent confronting with the success or failure of the transferred technology. Moreover, the international agencies pressure the use of specific technologies and manufacturers according to their own interests. Some of problems take place in developing countries: resistance to change, infrastructure not adequate to Western technologies, scarce knowledge about the own resources, inadequate skills, lack of appropriate technologies for local conditions, training based on Western models (Quiroga *et al.*, 1997; Schechter, 1982). Also, there is not a scientific base in developing countries which is essential to support innovation (Price *et al.*, 1969). On the other hand, technology transfer often occurs in the temporary framework of a development project which constrains adoption and diffusion of the technology. As a result, problems associated with maintenance and availability of technical knowledge emerge. Factors such as the level of technological education, the capacity of research and development within the country, and the ability to maintain the technology have to be considered (Aasen *et al.*, 1990; Cimoli and Dosi, 1990). Jaquier (1979) argues that technology fails because the transfer process is wrong.

Until the 1970s there had been optimism about the role that Western technology could play in development reducing poverty and diseases in developing countries. In the 1980s it was clear that technology transfer from developed to developing countries had failed (Burch, 1987). Transfer of technology from developed countries did not solve the problems, it created new problems as dependency from foreign manufactures, because the operation of physical components of technology were transferred but the software, especially ‘why’ and ‘how’ technology functioned -the base of innovation- was not transferred (Quiroga *et al.*, 1997). As a consequence of these issues derived from the traditional conception of technology transfer, new approaches are emerging.

### Knowledge Dialogue Model

*The analysis of our reality with someone else’s ideas only contributes to make us more unknown, every time less frees, every time more solitaires.*

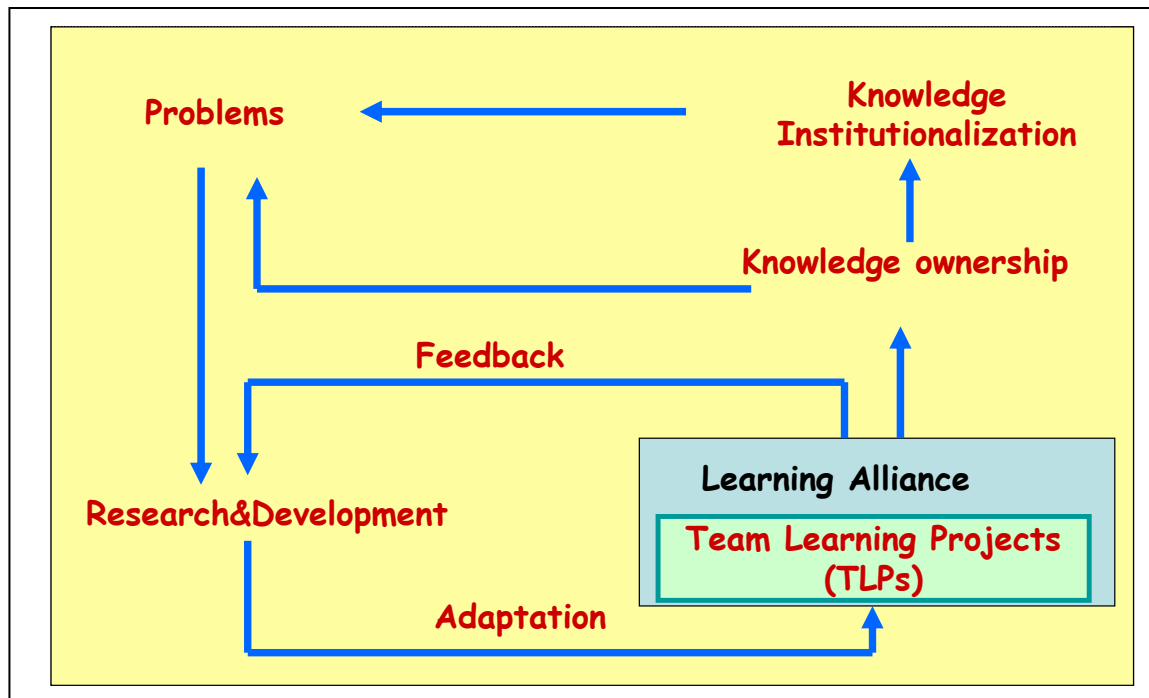
*Gabriel García Márquez, Colombian Nobel Winner, 1972*

New concepts are associated with technology transfer. For instance, the World Bank considers that the project cycle should be re-defined to include phases such as consolidation and expansion in learning environments (Picciotto and Weaving, 1994). According to Prey (1994), participatory technology development contributes to solve the problem of technology selection and transfer. It is based on the analysis of existing technologies and the process includes “identifying, testing, improving or adapting,

and using a technology” (Prey, 1994). It is also possible to introduce new components through these processes.

In Colombia, CINARA proposes a change from technology transfer to knowledge dialogue where there is recognition that each actor has useful knowledge. Research and development play an important role in the adaptation of technology (CINARA-EMCALI, 1997; Quiroga *et al.*, 1997). As Figure 3 shows, a new model for the transfer process is proposed based on previous concepts: *the knowledge dialogue model* (Restrepo-Tarquino, 2002). This model requires:

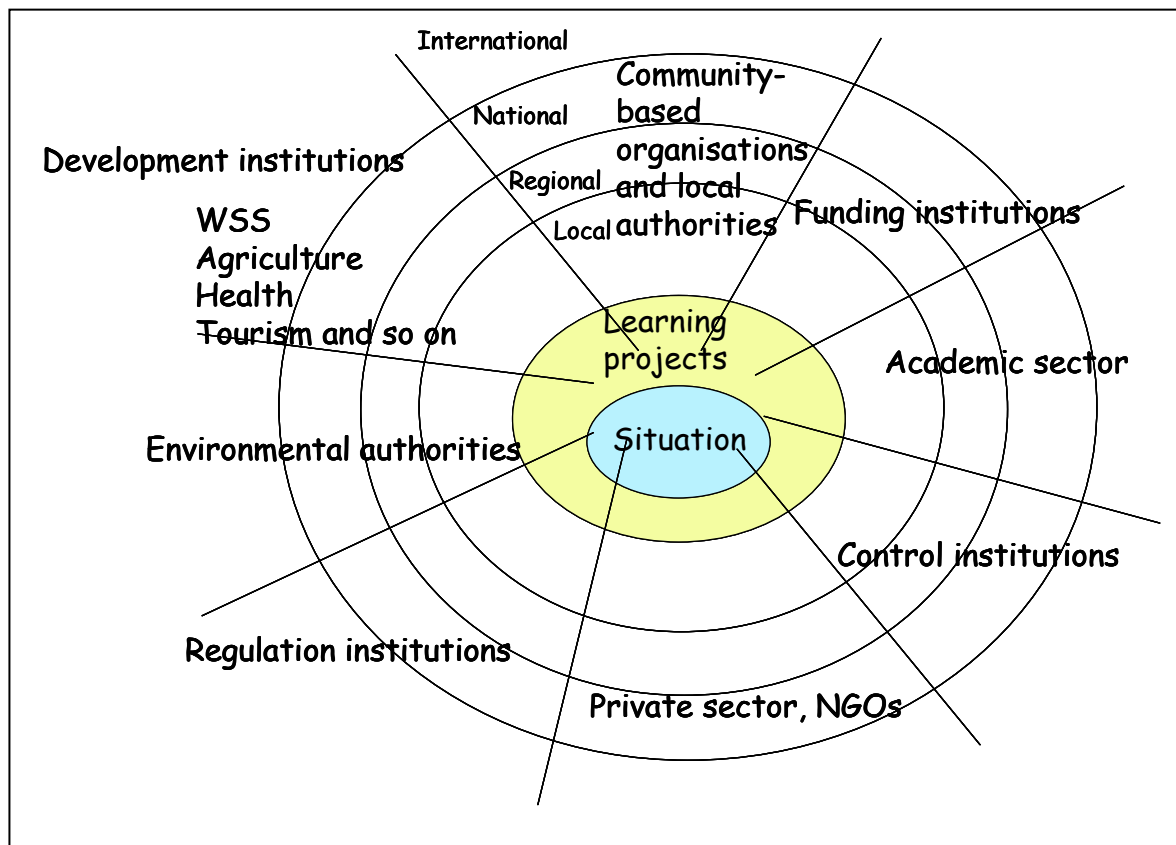
**Figure 3:** *Knowledge dialogue model for the transfer process*  
Source: Adapted from Restrepo-Tarquino (2002)



- An organisation which plays the facilitator role, this organisation should not replace the existing institutions. On the contrary, it should help other organisations to play their role in projects with identity.
- Scenarios to make decisions at different levels and consensus scenarios where the different actors can make decisions together.
- Spaces to strengthen capacities at institutional and community level. This implies participative training to all actors in which each one recognises that they may learn from the others.
- Participatory analysis of the problems which allows to take into account the different interests of the actors.
- Participatory search for solutions. All possible alternatives should be analysed included the existing options.
- Participatory monitoring and evaluation. This gives feedback to find out new problems that may be introduced into the transfer model.

In order to apply what is developed in the research and development component of the model, team learning projects are proposed to solve specific situations. These kinds of projects are developed by the actors interested in solving the situation, which organise themselves in a Learning Alliance as shown in Figure 4.

**Figure 4: Stakeholder overview of a Learning Alliance for development**



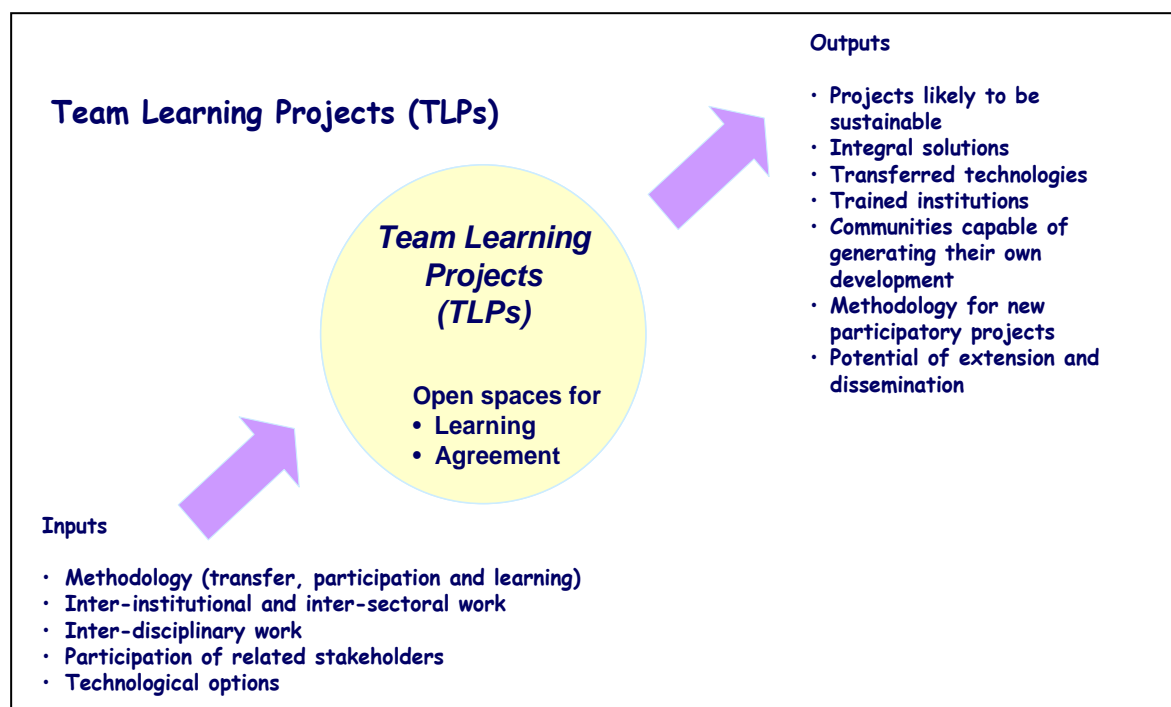
The Learning Alliance is conceived as a group of different kind of organisations, which are interested to tackle a specific problem. Their interest in the problem could be different as well as their functions and missions. One of the institutions in the Alliance coordinates activities, which are mainly around specific projects used to learn how to solve the problem, geared towards action. The Learning Alliance is open, allowing the participation of everyone interested in the problem. It develops joint phases such as planning, monitoring, adjustments and evaluation. However, the responsibility of specific activities within the phases is given to the alliance members, who have to produce the agreed products.

In the alliance, all actors practice a leadership and assume a compromise and responsibility. All of them contribute, learn and benefit from the actions. The proposal coincides with some authors' arguments that claim that development is a complex process and that even recommend to reform the cycle of the development projects toward phases that include learning, demonstration effects and replicability (Picciotto *et al.*, 1994, Choguill *et al.*, 1993; Narayan-Parker, 1989).

It is possible that the Alliance solves the problem and no new projects are needed, so the Alliance can disappear. Another situation is that once the problem is solved, some members agree to continue solving another problem. The main point is that the Alliance operates through concrete learning projects. The members recognise and adapt knowledge produced in the Team Learning Projects and apply it within their daily work. However, the challenge for the alliance is the knowledge institutionalisation, which is the knowledge incorporation within the organisations' regulation, mission, administrative acts, and so on. To join a LA encompasses openness to change.

The Team Learning Projects are focused on people, and knowledge is constructed in a collective way (Figure 5). This is why none of the agents (institutions, community, university etc) claims to have or own the solution. They coincide, instead, in that solutions are conjointly constructed.

**Figure 5: Team Learning Projects (TLPs)** Source: Restrepo-Tarquino (2002)



## Results

*... given that we are the founders, creators and agents of the project, we know that it was well designed and well coordinated by the organizations that should do it. Thus, we know that it is a big project, worth of being taken care of. So, it is necessary to be alert regarding any eventuality.*

*User of San Felipe (Tolima)*

About 35 projects of this kind have been carried out in municipalities and departments in Colombia. The model is being transferred to other countries and learning alliances around specific problems have been promoted in Bolivia, Ecuador, and Nicaragua. The TLPs carried out till date show that all the participants have knowledge and a valuable experience. A "knowledge dialogue" is thus created, more than a knowledge transfer, in which everybody contributes with her / his ideas in the search of solutions.

- Campo Elias, a farmer from Cerinza, indicated in a meeting, "In this program everybody is the teacher of everybody and everybody is learning from everybody"
- Nelly Guapacha from El Hormiguero, Cali, told foreign visitors that community felt they were treated as human beings and now they have new projects which they are negotiating with institutions and NGOs.
- An inhabitant of the Pacific Coast expressed: "Also, one recommends as expert of the region, owner of the region, of the ecosystem, where it is more convenient and generally there are always problems with these engineers because they always want to impose their knowledge on the natural, native knowledge."

In the Alliance, each actor performs her / his role without losing identity. The approach gives equal importance to academic and institutional knowledge next to knowledge and experience from the community. It values the interaction between the technical, socio-economical, and environmental aspects and strongly promotes critical, creative capacity of men, women and children involved in the process (Galvis *et al.*, 1996). The basis to work together is trust and the certainty that each one will received concrete benefits working jointly.

## Lessons Learned

- Learning Alliances works only based on trust and around concrete situations and solutions. The function of the learning projects is to operate its actions.
- Alliances are created by different institutions, with different interests, backgrounds, missions, and functions. That is the value of the alliance. Participation usually depends on the concrete benefits perceived and received by its members.
- Activities, responsibilities, and products should be very clearly assigned from the very beginning. The coordinator is the person who really maintains the alliance's harmony and progress.
- The Learning Alliance's holistic vision makes possible to identify new projects not only in the sector but also in other sectors such as education and agriculture.
- The integral vision permits the improvement of the environment and the implementation of environmentally safe technologies.
- Community knowledge is valuable and complemented with the technical knowledge by the institutions. Knowledge is not exclusive.
- Joint work between actors makes it possible to solve problems considered unsolvable by isolated agents.
- Women, treated as equal, with consideration and respect, participate critically and creatively in the solution of problems related to water and sanitation.
- A project developed in a learning environment permits the growth and fluid interaction among the participants, making 'horizontal' communication easier.
- Both communities and institutions benefit from the projects in learning environments: not only do they learn technical knowledge, but also tolerance, respect and flexibility; values such as solidarity, fraternity and others pointed towards sustainable human development are learned along the way.

## Perspectives

Learning Alliances around specific problems and projects have proved to be successful and replicable. The opening towards communitarian and inter-institutional cooperation, trying to strengthen the local level, is operated through Team Learning Projects, which can become a space for the construction of both theoretical and practical knowledge.

The challenge now is that development institutions recognise that 'solutions' are 'process products' and open spaces in learning alliances around specific problems and projects.

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