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Knowledge transfer dynamics and innovation: Behaviour, interactions and aggregated outcomes

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ABSTRACT

Innovation systems theory stresses the central importance of knowledge and the transfer of knowledge between the different actors of an innovation system, yet there are no methodological tools to systematically analyse the dynamics of such relationships. In this paper, we propose a multi-disciplinary approach drawing on social psychology to integrate innovation systems and knowledge transfer theory. We focus the empirical efforts for validating this approach in the water sector. Although Water Operator Partnerships are conceptualised to share best practices via knowledge transfer, our findings based on empirical evidence indicate clear points of consensus as well as issues of conflict in the dynamics of knowledge transfer between water operators engaged in such partnerships. The results indicate qualitative differences in goals of knowledge transfer as well as sources of differences and asymmetries in motivations, pressures and capabilities in the knowledge transfer process.

1. Introduction

Knowledge is crucial for creating value - it forms the basis for both, innovation and for development and is becoming ever more salient (e.g. OECD, 2013). The process of knowledge creation and diffusion has been increasingly accelerated through the widespread and rapid diffusion of information and communication technologies (ICTs) from the 1990s onwards, further adding to the importance of knowledge for innovation and development (Mansell and Wehn, 1998). Even in times when ICTs enable ever faster and easier sharing of data, information and knowledge, the transfer of codified and tacit knowledge between organisations remains crucial and relies on personal interactions and joint actions to achieve specific goals and outcomes. These interactions present potentially strong bottlenecks in the knowledge transfer process due differing (and possibly conflicting) behavioural goals and expected outcomes, structures in (dis)incentives and capabilities which have not been sufficiently explored.

Innovation systems theory stresses the central importance of knowledge and the transfer of knowledge between the different actors of an innovation system. Knowledge generation (including local and tacit knowledge), its transmission and absorption are crucial aspects of an innovation system. Innovation systems research has developed over the last three decades through seminal works by Freeman (1987), Nelson and Winter (1982) and Lundvall (1992), considering innovation as a process of interactive learning that improves the competencies of actors so that value of socio-economic benefit for society can be created from knowledge. At an abstract level, it can be described as a system whereby knowledge is created and distributed among each country's institutions (Gu and Steinmueller, 1998). Further key elements of the innovation process are actors (individuals and organisations), technology, networks and interactions, and modes of learning. The basic premise is that the actors within an innovation system learn

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in interaction with each other, through collaborative or competitive interactions shaped by rules and institutions.

Innovation systems, including the sector-specific innovation systems defined by Malerba (2002), are not static but undergo processes of change and transformation through the co-evolution of the various elements of the system. Research into innovation systems tries to describe the dynamics between these elements, albeit using mostly qualitative approaches. The use of predominantly qualitative methods or indicator scoreboards has been realised as a clear limitation of research in this field, posing limits on the insights that can be generated (Soete et al., 2010). Rip and van der Meulen (1996) had already advocated the need for an adequate conceptualisation of the processes and mechanisms of innovation systems which is partially addressed by more recent research into system functions (e.g. Hekkert and Negro, 2009) and incentive structures (e.g. Dutrenit and Vera-Cruz, 2011). While Lundvall et al. (2009) recognise that the quality of relationships between innovation system actors is not easily captured, this paper departs from the realisation that it is even more important to understand what influences the quality of such relationships.

This paper aims to provide the basis for a new understanding of the dynamics knowledge transfer. This approach is empirically demonstrated in the water sector. This sector was purposely chosen as it represents (following the taxonomy of Pavitt (1984)) a resource-based sector. This enables a fuller exploration of the basic and underlying conflicts in knowledge transfer, compared to sectors where issues of Intellectual Property Rights, patenting, secrecy and withholding characteristics and other pre-competitive activities of innovation are very salient.

Water is indispensable not only for meeting basic human needs but also for economic development given its role in agriculture, healthy ecosystems and all industrial processes (UNESCO, 2016); at the same time, challenges such as climate change, rapid population growth, rising demand for water, increasing pollution of sources leading to ever more insecure water resources, and demands arising from the water-energy-food nexus (ADB, 2013; UNESCO, 2016, 2012, 2014; Deloitte, 2012) are putting pressure on water resource management (concerned with water quality and quantity, e.g. in floods and droughts, ecosystems, waste water, and non-consumptive water use[1]) and on water supply and sanitation. To address these challenges, learning, knowledge transfer and innovation are crucial for the water sector (Wehn de Montalvo and Alaerts, 2013).

Given the salience of the water sector together with that fact that is has been overlooked in knowledge transfer and innovation studies thus far (Wehn and Montalvo, 2015), we argue that the behavioural approach for studying knowledge transfer proposed in this paper - the dynamic KT model - presents an opportune chance to fill this knowledge gap. Specifically, we propose and apply the dynamic KT model to explore the knowledge transfer arrangements of so-called Water Operator Partnerships (WOPs). Although such WOPs are institutionalised to transfer knowledge of best practices, they still present significant heterogeneous rationales that can imply significant conflict.

This paper is organised as follows. Section 2 presents the salience and status of knowledge transfer research within innovation studies, together with the details for the proposed approach to generate and validate a predictive and explanatory model to examining the dynamics of knowledge transfer. Section 3 presents the methodological aspects of gathering empirical data for generating and using the dynamic KT model. Section 4 presents the resulting insights and the sources of asymmetries; goals and expected outcomes of the knowledge transfer process leading to potential inefficacies in the process. Finally, in Section 5, we conclude with reflections on future extensions in the application of the dynamic KT model to account for the differences in rationale of diverse actors to engage in knowledge transfer and likely aggregated outcomes.

2. Theoretical context

2.1. Knowledge transfer conceptualisations in innovation studies

The specific relationship of interest in this paper is knowledge transfer (KT) across organisational boundaries which has been studied extensively and builds on insights from a range of theoretical bodies (Mowery and Oxley, 1996). It has identified a myriad of factors that can influence the process and its outcomes, including the antecedents, processes and mechanisms of knowledge transfer as well as barriers and consequences. Most studies look at the supply *or* demand sides (e.g. Inkpen, 2000; Gilbert and Cordey-Hayes, 1996), taking an essentially static approach. Particular focus has been on the demand side, where the selection, acquisition and absorption of knowledge stemming by an organisation from other actors (e.g. R&D institutes, universities, competitors) had first been conceptualised to occur via various forms of absorptive capacity by Cohen and Levinthal (1990). Methodologically, the approaches have been to measure 'the measurable', so that absorptive capacity is typically measured by proxies, such as R&D input (R&D personnel and investment) and output (patents). Furthermore, the research on absorptive capacity has focused on research-intensive firms. Recent research has attempted to develop more refined measures of adaptive capacity (e.g. Camisón and Forés, 2010) which explore and validate the dimensions of potential and realised (i.e. actually used) capacity.

Existing research in innovation studies has stressed the importance and advantages of gaining access to knowledge external to the firm or organisation (Contractor and Lorange, 1988; Gibbons et al., 1994; Chesbrough, 2006; Laursen and Salter, 2006; Bell and Pavitt, 1995 & Bell, 2009). Experience in the field of knowledge transfer has demonstrated knowledge transfer to be a phenomenon that inherently involves interdependencies and asymmetries between providers and recipients of knowledge, and difficulties during different knowledge transfer stages (Szulanski, 2000; Caloghirou et al., 2004; Contractor and Lorange, 1988; Dayasindhu, 2002). However, the field has not provided or tested theory with respect to the *dynamics* of knowledge transfer. While comparative studies of absorptive capacity and KT have been carried out (e.g. Van Wijk et al., 2008), there are no studies that consider the interaction between these actors *and* which have a sound, robust basis such that they can serve as an integrating theory, as proposed by this paper.

These insights highlight the importance of not merely acquiring but also transforming and exploiting such knowledge; this is captured by the definition of KT as the process of 'one organisation learning from another' (Easterby-Smith et al., 2008) and by the emphasis on the integration (Szulanski, 2000) and absorption (Cohen and Levinthal, 1990) of transferred knowledge by the recipient organisation. However, the existing literature on KT provides only patchy insights into the dynamics of the 'demand and supply' of knowledge (e.g. Etzkovitz, 2003), using predominantly linear conceptualisations of the transfer process (Easterby-Smith et al., 2008; Szulanski, 2000); attempts to conceptualize and analyse the KT process in a dynamic fashion are virtually absent. The starting point for the research proposed in this paper is that the drivers, incentives and disincentives for

[1] E.g. inland navigation and transport on water ways.

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inter-organisational knowledge transfer can be substantially different, and even conflictive, for the respective organisations involved in KT. Furthermore, as mentioned above, KT requires the interaction of people, thus it is expected that these drivers will be changing over the course of time. Understanding the dynamics of knowledge transfer and exchanges requires an approach that encompasses the exploration of the behaviour of selected key players involved in the process. This also requires taking into account both, the organisation's internal institutional contexts and the broad institutional environmental factors that might influence the process.

The aim of the approach proposed in this paper is to address both of these shortcomings and to provide a basis for advancing the theory of knowledge transfer to explain the dynamics and to predict the outcomes of knowledge transfer by generating validated predictive and explanatory methods.

2.2. A behavioural approach to knowledge transfer

In this paper we propose to use a multi-disciplinary approach (drawing on social psychology to integrate innovation systems and knowledge transfer theory). Specifically, this approach makes use of insights from the behavioural sciences (i.e. decision making theories) in order to explore the dynamic interplay of the conditions under which a knowledge provider would be more likely to engage in knowledge transfer and the conditions that might limit and determine the willingness and ability of 'potential knowledge recipients' to gain access and internalise new knowledge. These insights will provide a basis for understanding one of the most essential aspects of innovation systems, i.e. the dynamics of knowledge transfer. The proposed approach focuses on the behaviour of individual key players in the KT process and, especially, on the dynamics generated by the interaction between the various drivers of their behaviour, their goals and contexts. By taking a behavioural perspective, the proposed approach stays closer to actual behaviour and explores it in a more effective way than studies that merely looks for connections and correlations between relevant institutions and the effectiveness of knowledge transfer.

Approaches to knowledge transfer considering behaviour of the involved actors have been proposed and tested before (e.g., Osterloh and Frey, 2000; Szulanski, 2000; Tsai, 2001; Levin and Cross, 2004; Galán-Muros and Plewa, 2016) albeit with simple conceptualisations of the underlying constructs to be assessed; their explanatory use is therefore limited. More complex behaviour can be examined when adapting the methodology accordingly. Examples of empirical testing of the basic model of the proposed approach can be found in diverse innovation studies (e.g., in Montalvo, 2002, 2003, 2006; Wehn de Montalvo, 2003a,b; Taylor and Todd, 1995, 1997; Harrison et al., 1997; Harland et al., 1999; Lam, 1999; Bamberg, 1999; and Bamberg and Schmidt, 1997; Zhang et al., 2013). Moreover, it has been demonstrated that such behavioural approaches can be used to explore the relationships between two or more actors in a dynamic fashion, for example, to analyse the effect of regulation on innovation (Montalvo, 2007). The dynamic KT model proposed in this paper will enable the identification of the degree and nature of asymmetries (in expectations, norms, capacities and goals) between providers and recipients of knowledge and identify windows of opportunity to promote and improve knowledge exchanges.

2.3. Organising framework

2.3.1. The basic KT model

Research within social psychology deals with decision making in the general context of predicting and explaining behaviour. Narrow assumptions about a fully informed, rational decision maker have given way to the realisation that cognitive as well as non-cognitive factors influence the decision making process. According to Ajzen (1991) and Gollwitzer and Bargh (1996), there appears to be general agreement among social psychologists that most human behaviour is goal-directed and people are expected to behave according to their intentions, goals or plans. Plans and intentions can therefore serve as a predictor of behaviour. Thus, the 'willingness' or the 'intent' to engage in knowledge transfer can be considered the first predictor of a potential partner organisation to perform such behaviour. Since key actors are accountable for their decisions and thus seek criteria to justify those decisions, they can give an accurate understanding of their organisation's position regarding a specific strategic or planned behaviour (Star, 1991).

Based on the notion that goals and intentions predict behaviour, it is proposed that the behaviour of both, knowledge providers and knowledge recipients, in specific situations and contexts can be explained in terms of attitudes (A), social norms (SN) and the control over the knowledge transfer process (C) mediated by intentions (or willingness (W)). The basic model to explain behaviour (i.e., B ≈ W═W(A,SN,C) is well supported by empirical evidence, it has performed with an explanatory reliability up to 91% of the variance on behaviour (Ajzen, 1991). In addition, Montalvo (2006) and Wehn de Montalvo (2003a, b) have demonstrated that it can serve as a meta-theory to integrate different fields of scientific enquiry to explain innovative behaviour (e.g. the willingness to share data and information (and embedded knowledge) across organisational boundaries). The basic model of the willingness to engage in knowledge transfer proposed for this paper is illustrated in Fig. 1 and the

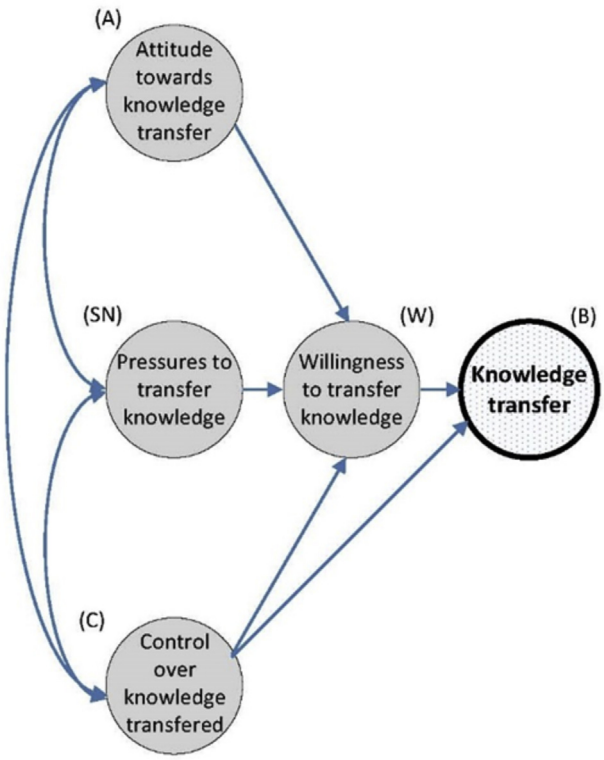

Fig. 1. Basic model of knowledge transfer.

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essential components are elaborated below.

2.3.1.1. Expected Outcomes: Key players' attitudes towards engaging in knowledge transfer. Attitude is defined as the degree to which people have a favourable or unfavourable evaluation or appraisal of a specific behaviour. Following this definition, the attitude towards engaging in knowledge transfer activities is an index of the degree to which key players and decision-makers like or dislike (approve or disapprove of, agree or disagree with, etc.) any aspect arising from their engagement in knowledge transfer activities. Each belief (or piece of information) links knowledge transfer to specific outcomes or attributes that are valued positively or negatively. Thus, it can be expected that organisations (or key players) will prefer behaviour that implies desirable consequences. The attitude towards a specific knowledge transfer process results from the accumulated connotative load associated with the salient beliefs or relevant information regarding the implications of the planned innovation. Examples of negative attitudinal salient beliefs on the side of the knowledge recipient are: a likely knowledge application is risky, it can be unreliable, costly and time consuming to develop; the economic rewards are insufficient; etc. On the side of the provider: the exploitation conditions are not secure; lack of trust in the recipient, etc. Such beliefs imply negative connotations for negative outcomes. These beliefs can be expected to contribute to the formation of a negative attitude toward the engagement in knowledge transfer. A negative attitude is likely to prevent any engagement in transferring or intending to acquire and develop new knowledge. With the perception of positive outcomes, or in the presence of a positive attitude, the opposite can be expected.

2.3.1.2. Enabling Ecosystem: Key players' perceived social norm to engage in knowledge transfer. The perceived social norm can be conceptualised as the social pressure that arises from the context in which the organisation operates. Here the organisation's perceived social norm can be defined as the importance that the key players in the transfer process give to different crucial referents to engage, or not to engage, in knowledge transfer. It results from the accumulated connotative load of normative beliefs that key players may hold. That is, it depends on how key players perceive their important referents within their organisation to be thinking about what their organisation's behaviour should be. For example, in the case of a firm, potential recipient pressure could arise from staff suggestions, shareholder expectations, or from the behaviour of competitors, pace of technological innovation in the sector, customers' expectations, legal requirements, public perceptions, and industry standards and norms, etc. It can be expected that potential providers face different pressures (or no pressure at all) to bridge their knowledge production to business applications.

2.3.1.3. Instrumental Capabilty: Key players' control over the knowledge transfer process. Perceived control is defined as the perceived ease or difficulty of performing the behaviour. An efficient transfer of knowledge can be considered as a behaviour that in many cases is not under total volitional control of the organisations. Perceived control over any knowledge transfer process is an index of the presence or absence of the requisite resources and opportunities to carry out the transfer of knowledge. These beliefs may be based on past experience on similar projects, second-hand information or any other factors that increase or reduce the perceived difficulty or feasibility of a specific innovation project. Overall perceived control over the knowledge transfer process arises from the accumulated connotative load of beliefs with regard to the perceived ease or difficulty to achieve the planned outcomes stemming from knowledge transfer. Depending on the perceived control over technological (i.e., technological capabilities and opportunities, coordination problems due to geographic distance to the recipient, lack of good intellectual property regimes) or organisational (i.e., organisational learning, and networks and alliances to acquire new skills and knowledge) change, the willingness of the organisation to engage in knowledge transfer can be expected to be either strong or weak.

2.3.2. Knowledge transfer across organisational boundaries – the dynamic KT model

The basic KT model presented above gives an indication of what might be the behavioural drivers of knowledge transfer in specific situations. A wide variety of factors - depending on the knowledge type, knowledge transfer process type in question and the internal and external contexts of the knowledge providers and the knowledge recipient (Szulanski, 2000) - all influence the dynamics of knowledge transfer between providers and recipients of knowledge. The dynamic KT model presented in Fig. 2 considers the respective determinants of both, the knowledge providers and the knowledge recipients, and thus provides a basis to systematically explore the dynamics of knowledge transfer.

2.3.2.1. Individual player's behaviour. Applying the definitions given above, the knowledge transfer behaviour of individual players can be formulated as an implicit function of those factors affecting the decision to engage in activities of knowledge transfer as follows:

$$B_{NT} \sim W = W(A,\ SN\ C)$$

where:

B_{NT} is the overt behaviour, the engagement of the organisation in a specific knowledge transfer;
W is the organisation's plan or intention to engage in knowledge transfer;
A is the organisation's attitude toward the engagement in knowledge transfer;
SN is the organisation's perceived social norm concerning the engagement in knowledge transfer;
C is the organisation's perceived control over the knowledge transfer process;
~ suggests that willingness is expected to predict knowledge transfer.

2.3.2.2. The dynamics of knowledge transfer. The dynamic KT model presented above can serve to describe the different sources of incentives, pressures and capabilities of providers and recipients of knowledge as well as to account for interdependencies and asymmetries between actors as well as the effect of ambient factors. It provides the basis to assess the direct effects and the sources of indirect effects of the behaviour of the supplier of knowledge upon the potential recipient, and the reverse.

3. Methodology

3.1. Case selection: Water Operator Partnerships

Our study investigates the knowledge transfer arrangements of so-called Water Operator Partnerships (WOPs). These were selected constitute the specific context for our empirical research because their numerous occurrence presents a unique opportunity to overcome the problem facing studies on knowledge transfer, i.e. the lack of a sufficiently large population of relevant knowledge

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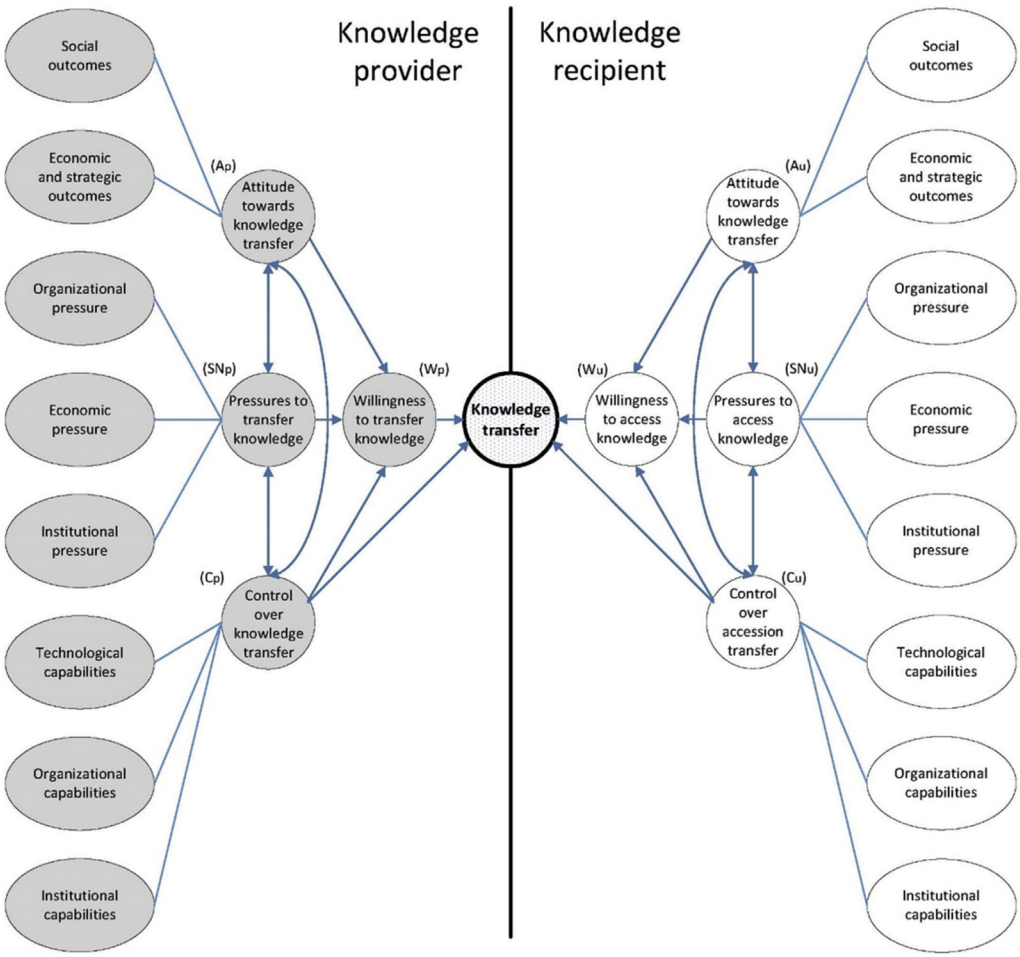

Fig. 2. Sources of behavioural (a)symmetries for knowledge transfer.

transfer occurrences from which to draw a representative sample for empirical research.[2] At the same time, as argued above, given the cross-cutting nature of water, this will also help to start a much-needed discourse about water-related innovation, informing about how water-related challenges can be addressed by innovation (that may not necessarily be water-specific) and, moreover, how the generation, diffusion, adoption and use of such innovations can be fostered (Wehn and Montalvo, 2015).

Water Operator Partnerships were launched in 2006 by the United Nations Secretary General's Advisory Board on Water and Sanitation (UNSGAB) as a new development mechanism to promote access to water supply and sanitation, led by the ex-prime minister of Japan, Ryutaro Hashimoto, as was part of the "Hashimoto Action Plan". These partnerships link water operators (utilities) with the aim of transferring knowledge and expertise (North-South as well as South-South), strengthening the capabilities of water operators in developing countries. A WOP can be defined as any form of simple or structured partnership between two (or more) water operators. The nature of these partnerships can vary greatly in terms of contract (e.g. strategic alliance, fixed contract) and timing (the length of time the partnership is set up for, whether it is ongoing or finished) but is typically set up on a not-for-profit basis. In WOPs, performance improvements of the recipient water operator are aimed for by supporting the operational improvement process of the recipient water operator through a strong emphasis on inter-organisational knowledge transfer, learning and capacity development (rather than delegating distinct services to the providing water operator) (Pascual Sanz et al., 2013; Pearson, 2014).

The Global WOP Alliance (GWOPA), hosted by UN-HABITAT, was created in 2009 to increase the number and foster the impact of WOPs and is supported by utility associations worldwide representing thousands of water utilities, regional development banks, international financial institutions, labour unions, civil society organisations, development partners, and learning institutes. Regional WOPs consist of water operators in a partnership from the same region, including South-South exchanges between operators. At the regional level, professional water associations and development banks are working with specific WOPs programmes, supporting WOPs financially and technically.

[2] GWOPA's database of WOPs aims to record the practice at global level and is one of the few indicators available to track trends and shifts in this movement (GWOPA, 2015). The database is not exhaustive (currently 183 cases) and many more WOPs are taking place in all regions of the world (GWOPA, personal conversation 15.1.2015); however, it can be considered a good indicator in terms of geographic distribution of WOPs. To date, according to the database, the geographical distribution of mentees engaging in WOPs is as follows: 31% Africa, 33% Asia, 23% Latin America, 8% Europe, 5% North America. For the origin of mentors, the distribution is: 13% Africa, 25% Asia, 36% Europe, 18% Latin America, 8% North America (www.gwopa.org/en/wop-profiles).

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3.2. Unit of analysis

Concerning the level and unit of analysis, it is possible to apply the dynamic KT model in inter- or intra-organisation setting (i.e., across organisations or across departments of the same organisation). Knowledge exchanges at levels of analysis higher than the individual and business units generally encompass important social processes such as sharing, interpreting, and combining information and sorting this information so that it can persist in the face of personnel turnover within organisations. Thus, important social processes come into play when analysing knowledge transfer at levels of analysis higher that the individual and the group. The unit of analysis in this research are the interactions in knowledge transfer activities between organisations whereas the unit of observation will be key individuals within organisations that can best represent their organisation's views on knowledge transfer behaviour.

3.3. Data collection, model generation and analysis

Empirical research was carried out based on the above framework to elicit the obstacles and drivers for knowledge transfer in the context of water operator partnerships. Specifically, two focus group discussion (FDG) were undertaken with 13 and 14 water operators respectively (see Annex 1), from relevant geographic regions[3] that are involved in water operator partnerships either as a mentor organisation (knowledge provider), mentee (knowledge recipient) or both.[4] The sessions were held in English in November 2013 and June 2014 respectively during consultative group meetings of the BEWOP project.[5]

For the data collection methods, we implemented the research design of Ajzen's (1991) approach, namely using qualitative research to identify relevant beliefs underlying the three main components. This is also in line with previous implementations of the TPB (Plengsaeng's et al., 2014, Ngo Thu and Wehn, 2016; Gharesifard and Wehn, 2016). The validity and predictive power of human behaviour in specific situations using these methods has been widely demonstrated in several fields, including in innovation studies (Bamberg, 1999; Montalvo, 2002, 2003; Wehn de Montalvo, 2003a; Lam, 1999; Zhang et al., 2013).

We therefore asked three sets of open questions during the first FDG to elicit beliefs related to the three main components of the TPB: i) expected outcomes - what are the advantages/gains of KT with other water operators, the disadvantages/drawbacks of KT?; ii) conducive ecosystem - which people or institutions want operators to engage in KT with other water operators and which ones may be holding them back from engaging in KT?; and iii) instrumental capabilities - what do operators need in order to engage in KT with other water operators (e.g. information, knowledge, skills/abilities, experience, technological facilities/infrastructure, resources (time/financial), etc. and what particular circumstances or opportunities their organisation relies on for KT with other water operators and which hurdles/constraints/people/institutions are stopping the operator organisation from KT activities with other water operators. The collected material was transcribed and identified beliefs were clustered according the framework into beliefs about expected outcomes, conducive ecosystem and instrumental capabilities, for mentor (knowledge provider) and mentee (knowledge recipient) organisations respectively, resulting in a model of knowledge transfer (dis)incentives in WOPs.

The second FGD was used to present, discuss and validate (by means of a questionnaire) the initially constructed draft model. Specifically, the questionnaire instrument (see Annex 2) listing three tables with the preliminary findings for the three elements of the model was used to collect additional beliefs (related to both, the knowledge provider and/or the knowledge recipient) that participants deemed to be missing from the draft model. In addition, a final question invited respondents to provide any comments on the preliminary results. The questionnaire had been designed according to the core components of the TPB. It was administered after the preliminary model and its components had been introduced and explained first. Together, these aspects ensured its content validity. Face validity was supported by both, careful design, internal team testing and the fact that the questionnaire asked for *additional* beliefs (to those already listed) rather than quantitative measures for existing ones. Hence, questions were not aimed at measuring a construct but designed to add missing beliefs *per* construct. Reliability with respect to internal consistency among questions was not an issue due to the nature and limited number of tasks, i.e. to review the three main TPB components (rather than scoring several items per construct); inter-rater (different respondents) and test-retest reliability (by the same respondents) resulting in similar responses was ensured through the simplicity of the questionnaire design. Since the questionnaire gathered qualitative data, statistical analysis of the responses to assess reliability and validity was not appropriate (see Cronbach, 1994; Kline, 1998). The resulting inputs were used to make minor adjustments to the model.

4. Results: Knowledge transfer dynamics in water operator partnerships

Salient elements of the structure of the perceived knowledge transfer incentives, pressures and capabilities by recipients and providers are discussed below.

4.1. Water operators' expected outcomes from engaging in knowledge transfer

In the WOPs context, expected outcomes refer to the degree to which people have a favourable or unfavourable evaluation or appraisal of engaging in knowledge transfer activities. The findings indicate that the expected outcomes of knowledge transfer for both, knowledge providers (i.e. *mentor operators*) and knowledge recipients (i.e. *mentee operators*), seem to stem from beliefs about social outcomes (implications beyond their own organisation from engaging in KT) and economic and strategic outcomes for their respective organisations. Social outcomes appear to be relating to the millennium development goals[6] (achieving these in terms of universal access to drinking water and improvements in the provision of water supply). For the knowledge providers, economic and strategic outcomes relate to staff morale and confidence of staff engaging in KT (boosts from helping their counterparts through their learning process), accumulation of knowledge and expertise (from having to apply their knowledge in a different setting) and the potential to acquire further business opportunities. In contrast, the beliefs regarding economic and strategic outcomes of knowledge transfer for the knowledge recipients relate to expected improvements as measured by the standard key performance indicators for water

[3] From Africa, Asia, Europe, the Arab region, Latin America and North America.

[4] For example, a water operator may be a knowledge provider in one WOP and a knowledge recipient in another WOP.

[5] BEWOP (Boosting the Effectiveness of Water Operator Partnerships) – a collaboration project between UNESCO-IHE and GWOPA (2013–2018).

[6] Which were replaced by the Sustainable Development Goals that came into force in 2016.

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operators (e.g. service coverage, water quality, non-revenue water, continuity of service, staff/connection ratio) and beliefs related to the learning process (e.g. not having to face problem alone) as well as having 'quick' access to relevant best practice.

4.2. Water operators' conducive ecosystem to engage in knowledge transfer

The conducive ecosystem relating to knowledge transfer in WOPs is characterised by various social pressures arising from the context in which the respective water utilities operate. It is indicated by the importance that the water operators give to different crucial referents to engage in KT. The empirical results suggest that *organisational pressure* regarding knowledge transfer stems from management. Furthermore, for some mentor organisations, KT with receiving organisations is part of their mandate. In the typically non-competitive setting for most water operators, *economic pressure* for mentor organisations appears to arise from concerns about their corporate image (with KT engagement helping to improve this) but also intellectual property rights (i.e. limiting KT to specific aspects). For the mentor organisations, economic pressure to engage in KT arises from their customers, many of whom are suffering from poor services (interrupted water supply, poor water quality, slow repairs, lack of access altogether etc.). Improvement of services is therefore often an urgent source of pressure for water operators to engage in KT. *Institutional pressures* arise from national policies, albeit different ones for mentor (e.g. trade policy and international development policy) and mentee organisations (water policy (e.g. tariff setting, (de)centralisation, appointment of lead utility staff) and development policy (e.g. accountability for results). Furthermore, mentee organisations may experience pressure from donors and funding organisations to engage in WOP-based KT activities to complement and ensure the sustainability of infrastructural investments (so that the KT process is not truly 'demand-led'); furthermore, when mentee organisations run no financial risks in WOPs, funding structures may in fact hinder KT processes when funding is stopped as soon as specific targets are reached ('easy money makes utilities lazy').

4.3. Water operators' instrumental capabilities for the knowledge transfer process

As argued above, in many cases, knowledge transfer processes are not under total volitional control of the participating organisations. Instrumental capabilities for the knowledge transfer process constitute an index of the presence or absence of the requisite resources and opportunities to carry out the transfer of knowledge. The preliminary results indicate quite a range of relevant beliefs in this regard. For the mentor operator, control over *technological capabilities* refers to relevant technical expertise as well as didactical and local language skills for effectively and efficiently facilitating the learning process of the mentor organisation. For the mentee operator, these are complemented by perceptions about individual capacity (knowledge, skills, experience and attitudes of staff members) as well as their integration into existing routines or changes to these due to acquired knowledge. In terms of *organisational capabilities*, both organisations are reliant on knowledge management within their respective organisations (which includes not only the acquisition of knowledge but also procedures for sharing and applying knowledge) as well as managing the KT process (matchmaking - finding a relevant partner organisation; guidelines for managing the KT process and expectations over time internally and externally; and power relations with the partner organisation). Availability and presence of staff at the receiving partner's location can be a relevant constraint for both organisations of the partnership. Perceptions about these resources may differ with those of the mentee organisation who may need more frequent and longer exposure to knowledge providers. Finally, for both, mentor and mentee organisations, another facilitating or disabling factor in KT is constituted by perceptions about the *institutional capabilities* to influence the enabling environment, e.g. the availability of funding for the WOP and, in the case of the mentee, the (in)stability of the national or local political situation.

4.4. Knowledge transfer between water operators

The belief systems for both, knowledge providers (mentor water operators) and knowledge recipients (mentee water operators) as outlined above, provide a first insight into the interdependencies and asymmetries between providers and recipients of knowledge in the context of water operator partnerships. A summary of the respective beliefs is presented in Table 1 below. For example, both belief systems subscribe to the ultimate goal of improving the recipient water operator's performance. The perceived short term gains for the respective organisations are also apparent: both perceive the WOP-related travel activities as a means to reward the staff of their respective organisations. Depending on the urgency with which such reward systems is pursued, this practice is to the detriment of the KT process: concerns about the success of the learning process at the mentee water operator are not necessarily matched by the mentor water operator whose aims relate to the morale and confidence of their own staff and the acquisition of further projects. Similarly, concerns by the knowledge provider about compromising Intellectual Property Rights (IPR) may limit their engagement in knowledge transfer in all the areas deemed necessary by the knowledge recipient.

It is also apparent that both, the knowledge providing and the knowledge receiving water operator, are influenced by their respective enabling environments as a source of pressure for engaging in (or inhibiting) knowledge transfer depending on specific policy goals. Although elements of the enabling environment appear in both sets of beliefs systems, this does not necessarily imply similarities in the way in which these influences are perceived (positive or negative, strong or weak influence). Moreover, the influence of the enabling environment is also captured by the extent to which perceived (in)stability of the national and local economic and political situation presents (dis)abling conditions for knowledge transfer. It is clear that the recipient water operator is subject a whole range of influential actors in its enabling ecosystem, namely its customers, the local regulator (where such a function exists), donors and funders of its activities (not only the WOP), as well as policy and legal frameworks. Depending on the pressures these actors exert upon the recipient water operator (for or against its engagement in KT via a WOP), this can create tensions in the interactions with the knowledge providing water operator.

Also, the effectiveness of the knowledge transfer process appears to hinge on complementary (but not necessarily available) technological capabilities in terms of expertise as well as didactical skills of the mentor water operator and absorptive capacity of the mentee water operator, not least including its ability to overcome fears of its employees for job or power loss. Perceptions of the respective control over, and importance of, managing the KT process may differ considerably between the involved water operators, potentially leading to problems in the KT process. Both belief systems raise the issue of financing their WOP-based KT activities, including concerns of the knowledge recipient about the financial WOP aspects of the recipient water operator. The resulting model of knowledge transfer dynamics is presented in Fig. 3.

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Table 1
Summary of belief systems regarding knowledge transfer in Water Operator Partnerships.

	Knowledge providing water operator	Knowledge receiving water operator
Expected Outcomes of Knowledge Transfer	- Staff morale: productivity boost for own organisation from changed mind set of own staff (self-confidence, open mind, pride); long distance travel to recipient water operator as perks - Knowledge gains/losses: accumulation of knowledge & expertise from insights into problems faced by other organisations; IPR concerns - Business development: acquisition of further projects, access to new markets - Corporate image gains/losses depending on recipient water operator's performance improvements - Societal benefits: Improvements toward attainment of MDGs/SDGs[71] and regulatory standards by knowledge recipient; development of regional leadership in technical areas that can lead to economic development within a region	- Staff morale: perks such as overseas travel, frustration if new insights are not implemented - Innovation and knowledge access: quick access to best practice, learning support for range of topics and over period of time - Business development: prospect of becoming WOP mentor in the future - Quality of service/performance improvements
Conducive Ecosystem for Knowledge Transfer	- Management - Mandate - Corporate social responsibility - Solidarity principle with other water operators/interest in teamwork for problem solving - Enabling environment: National policy (trade, development), legal framework, political support to engage in WOPs	- Management - Customers: Internal performance contracts (coverage) - Local government - Regulators - Donors/funders - Enabling environment: National policy (water, development), (in) stability of the national or local economic and political, compatibility of acquired knowledge with national policy/strategy/regulatory framework
Instrumental Capabilities for Knowledge Transfer	- Technical competencies: relevant technical expertise for recipient operator's problem areas - Mentoring/didactical skills,[82] sensitivity towards cultural differences - Knowledge management within own organisation: handover between short term experts - Management of the KT process, interpersonal relations with recipient operator for communication/management of the WOP - Funding of the WOP and political situation in the enabling environment	- Absorptive capacity: availability of relevant staff for KT activities, interpersonal relations with staff of knowledge providing water operator, ability to influence fear of change/job loss/power loss, leadership - Management of the KT process: interpersonal relations with recipient operator for communication/management of the WOP - Funding of the WOP and political situation in the enabling environment

5. Discussion

5.1. Actions to improve knowledge transfer in WOPs

The results of the above analysis suggest two levels of actions forward to improve knowledge transfer in WOPs. In general terms, the realisation that the belief systems of the respective water operators may not be compatible throughout the various stages of knowledge transfer (Szulanski, 2000) is a crucial first step. While attention is being paid to 'matching' water operators for possible WOPs by GWOPA and other mediators at the start of the process, their respective incentive systems are nevertheless subject to change over time and may evolve to become (increasingly) incompatible. The participating water operators need to be (made) aware and find ways of taking stock of this, for example through relevant contractual measures such as review milestones or other tools, in order to be able to address it. This implies a tailored, case-by-case approach by the participating water operators and mediating parties, if applicable; this is a process that can be mediated at best rather than enforced or advanced through regulation.

Addressing the issues highlighted earlier, KT via WOPs may benefit from three concrete actions. Firstly, the institutional set up for selecting the specific individuals involved in the KT process at either end appears to influence the KT outcomes. This aspect presents a 'moment of truth' of the involved parties with respect to their ultimate intentions (increased project-based income versus performance improvements of the recipient water operator). If the latter is the case, then careful selection of involved employees based on job relevance and capacity rather than rewarding will be inevitable. Secondly, and related to this, the importance of interpersonal relations stands out, both for managing the overall WOP process as well as for the effectiveness of the person-to-person KT. The teams at either 'end' of the WOP therefore need to be able to work well with each other. Finally, it will help if the knowledge providing water operator (better) takes into account the diverse influences in the enabling environment of the recipient water operator and its absorptive capacity in terms of local leadership and effecting change and new practices.

5.2. Advancing innovation studies

We have conducted the first empirical investigation of the proposed approach in the water sector and provided qualitative results. By targeting the research on the dynamics of knowledge transfer in this sector, it generated important, specific insights for this crucial sector, ultimately supporting the innovation processes in the water sector. Moreover, as argued by the OECD (2010), it is crucial to include non-manufacturing sectors in broader innovation strategies. At the same time, this sector provides a substantial sample of knowledge transfer occurrences in order to validate the proposed approach. In addition, extending the theory of innovation systems to the water sector opens this academic field of enquiry up for further research on non-manufacturing and utility sectors whose success is critical for many developing countries.

Methodologically, the approach as presented in this paper provides an advance by providing the basis for both, a quantitative and a dynamic approach to knowledge transfer research. While most studies on knowledge transfer rely on small-sample, in-depth studies of a few organisations and look at the supply or demand sides, taking an essentially static approach, the approach introduced here aims for both, i) a dynamic approach exploring the behaviour of both players involved in knowledge transfer and ii) a substantial sample of knowledge transfer occurrences in order to validate this new approach. Moreover, this approach seeks to serve for longitudinal research of knowledge transfer in order to investigate changes in the structure of the (dis)incentives for knowledge

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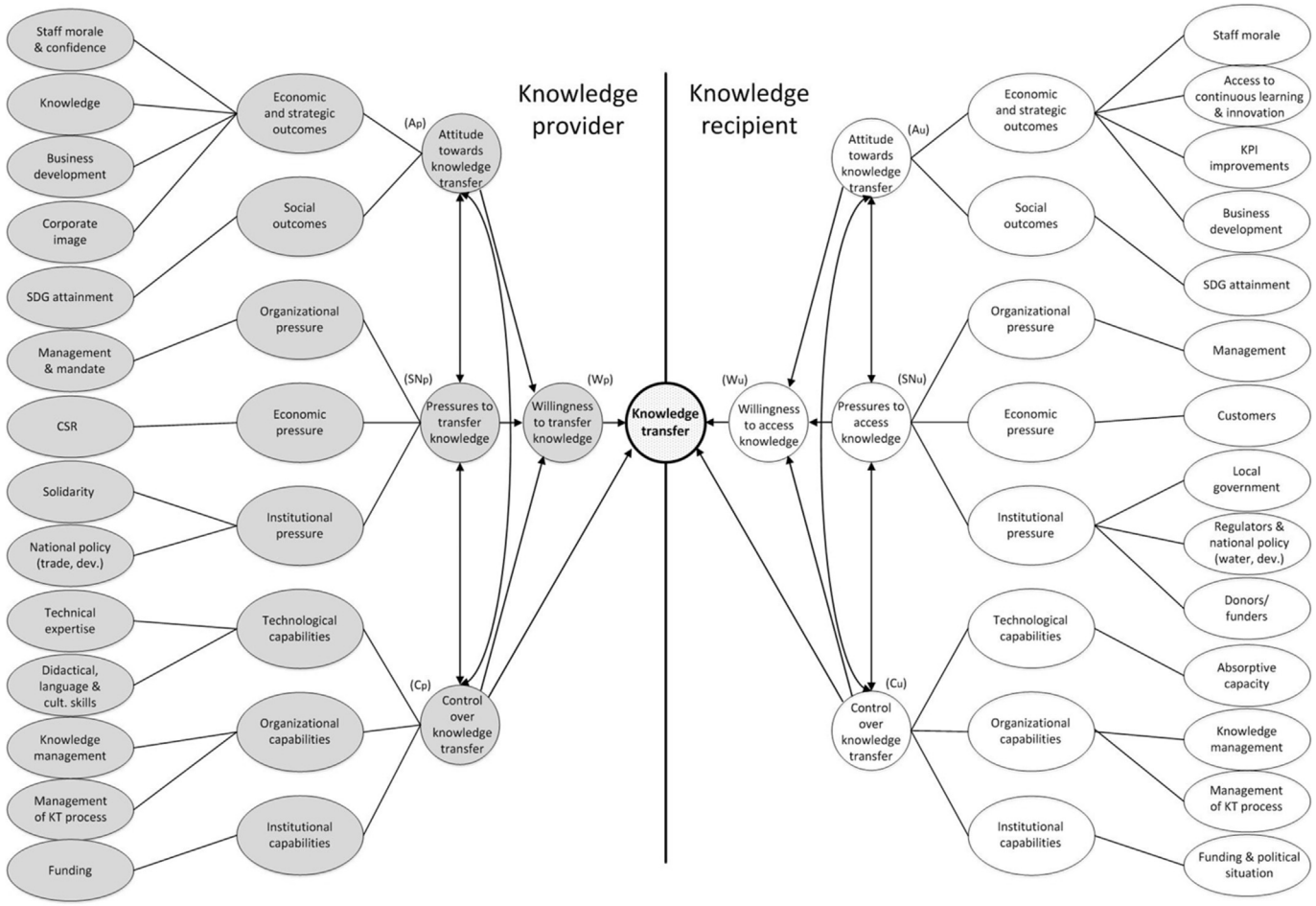

Fig. 3. Knowledge transfer dynamics in Water Operator Partnerships. Note: SDGs= Sustainable Development Goals; CSR=Corporate Social Responsibility; KPI = Key Performance Indicators.

transfer over time.

In distinct ways, the model presented above represents an advancement of the Ajzen model (Ajzen, 1991) that has been criticised for being static; our approach provides a basis for analysing how the relationships between the cognitive, normative or motivational, and instrumental aspects of behaviour contribute to behavioural outcomes. In relation to the field of innovation studies, our approach also builds on Montalvo (2002, 2003), Dijk and Montalvo (2009, 2006), Wehn de Montalvo (2003a, 2003b), Zhang et al. (2013), Plengsaeng et al. (2014), Ngo Thu and Wehn (2016) and Gharesifard and Wehn (2016)) since it enables the integration of knowledge generated in the areas of cognitive, institutional and capabilities-based approaches in a unified framework.

The model stresses behaviour, interactions and aggregated outcomes in two ways. First, it enables to account for the behaviour of two or more actors in the knowledge transfer process. Second, it allows to aggregate different rationales across actors and reduce complexity into a few indexes explaining knowledge transfer behaviour and aggregated effects across a given sample of actors. Nevertheless, in addition to considering the actors' positions, differences, drivers, motivations and goals, we also need to consider the nature and form of the relationship of different actors in the innovation system as this will provide insights about the co-evolution of their respective behaviours. An indication of the way forward has been provided by Montalvo (2007) where a modified Lotka-Voltera model has been used to predict outcomes and interactions between actors in the innovation system.

6. Conclusions

This paper has outlined a conceptual framework for research on knowledge transfer for a new, integrated understanding of inter-organisational knowledge transfer. We reported qualitative empirical research required to identify key elements of the model in the specific application for the water sector. The results indicate qualitative differences in goals of knowledge transfer as well as sources of differences and asymmetries in motivations, pressures and capabilities in the knowledge transfer process.

Future research can be envisaged that will examine the dynamics of knowledge *sharing*, i.e. the multi-directional diffusion of knowledge in a multi-relational environment rather than bi-directional. This may concern knowledge sharing at an organisational level among many organisations (i.e. in a network setting) or at the level of individuals, such as people who are members of Communities of Practice within the context of knowledge networks

[7] Millennium Development Goals/Sustainable Development Goals.
[8] 'show me how to do it instead of telling me how to do it'.

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for the purpose of knowledge sharing.

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Annex 1

Participants in empirical research.

November 2013-Focus Group Discussion

Organisation	Country
Swaziland Water Services Corporation	Swaziland
National Water and Sewerage Corporation (NWSC)	Uganda
K-Water	Korea
PERPAMSI (Indonesian Water Supply Association)	Indonesia
SABES-P	Brazil
MCP Water Board	Suriname
Belize Water Services	Belize
Water Supply and Sewerage Authority, Palestine	Palestine
ONEE (Office National de L'eau et Electricité)	Morocco
VEI (Vitens Evides International)	The Netherlands
SIAAP (Sanitation Service Provider, Paris)	France
APASERV Satu Mare, Romania	Romania
Contra Costa Water District, California	USA

June 2014 - Focus Group Discussion, incl. questionnaire

Organisation	Country
Swaziland Water Services Corporation	Swaziland
NWSC	Uganda
NamWater	Namibia
MWAUWASA (Mwanza Urban Water Supply and Sanitation)	Tanzania
PERPAMSI	Indonesia
Hunter Water	Australia
CAESB (Companhia de Saneamento Ambiental do Distro Federal)	Brazil
Water Supply and Sewerage Authority, Palestine	Palestine
MCP Water Board	Suriname
ONEE	Morocco
VEI	The Netherlands
SIAAP	France
EMASESA(Empresa Metropolitana de Abastecimiento y Saneamiento de Aguas de Sevilla)	Spain
Contra Costa Water District, California	USA

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Annex 2

Questionnaire on preliminary results
Knowledge Transfer Drivers
from 1st meeting of the Water Operators' Consultative Group (Barcelona)

Dear WOCG members,

Please consider the preliminary findings presented in the tables below.

For each question, please pay attention to the *two different perspectives* (external water operator vs. local water operator). You are invited to answer all the questions, regardless of your own organisation's role in WOPs.

Please note: we are not asking you to *evaluate* the existing findings. We would like you to help us identify ***missing aspects***.

We will process all your responses anonymously.

Respondent name: _____

Respondent organisation & country: _____

1. Please list additional ***expected outcomes (pros & cons)*** of KT in WOPs, if applicable.

Expected outcomes (pros & cons) of KT in WOPs	
External water operator	**Local water operator**
- Improvements toward MDG attainment - Gains in self-confidence of own staff - Accumulation of knowledge & expertise - Acquisition of further projects	- Improvements towards MDG attainment - Learning support for range of topics and over period of time - Performance improvements of own organisation - Quick access to best practice
Additional ***expected outcomes (pros & cons)*** of KT in WOPs:	Additional ***expected outcomes (pros & cons)*** of KT in WOPs:
Not applicable/no opinion: ☐	Not applicable/no opinion: ☐

2. Please list additional ***sources of pressure*** (not) to engage in KT via WOPs, if applicable.

Sources of pressure (not) to engage in KT via WOPs	
External water operator	**Local water operator**
- Management - Enhancement of corporate image - Mandate to engage in KT with developing country operators - IPR concerns - Enabling environment: National policy (trade, development)	- Management - Customers - Donors/funders - Enabling environment: National policy (water, development)
Additional ***sources of pressure*** (not) to engage in KT via WOPs:	Additional ***sources of pressure*** (not) to engage in KT via WOPs:
Not applicable/no opinion: ☐	Not applicable/no opinion: ☐

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3. Please list additional ***required capabilities /opportunities*** to engage in KT via WOPs, if applicable.

Required capabilities /opportunities to engage in KT via WOPs	
External water operator	**Local water operator**
- Relevant technical expertise - Didactical skills - Knowledge management within own organisation - Management of the KT process - Enabling environment: (in)stability of the national or local economic and political situation	- Absorptive capacity - Availability of knowledge providing water operator staff - Knowledge management within own organisation - Management of the KT process - Enabling environment: (in)stability of the national or local economic and political situation
Additional ***required capabilities /opportunities*** to engage in KT via WOPs:	Additional ***required capabilities /opportunities*** to engage in KT via WOPs:
Not applicable/no opinion: ☐	Not applicable/no opinion: ☐

4. Any comments you may have on these preliminary results or on the study on KT in WOPs:

Thank you for your time!
The BEWOP team

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