Organizing distributed knowledge for collaborative action: Structure, functioning, and emergence of organizational transactive memory systems

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INTRODUCTION

no research without action, no action without research
Kurt Lewin (Marrow 1977: 193)

1.1 Positioning of Research Theme

In the domain of safety and security (such as e.g. organizing a response after a crisis, or fighting organized forms of crime) specialized organizations often have to collaborate on an occasional basis with other specialized organizations to head challenges that none of the participants can head (as easily) on its own (cf. Agranoff and McGuire 2001; Wastell et al. 2004). Such collaborations are assembled and dissembled per assignment, while the situation at hand leaves participants little time to prepare and mandates them to perform instantly. Moreover, roles, tasks, and organizational arrangements to coordinate action may not be present ex ante the operation, and consequently have to be negotiated while going, or are being challenged or disrupted by unique circumstances or events (cf. Jarvenpaa and Majchrzak 2008; Majchrzak et al. 2007). Another characteristic of such temporary collaborations is that they are often more or less virtual in nature, i.e. participants are distributed in time and space and depend on technology to communicate (Cramton 2001; Griffith et al. 2003).

Temporary collaborations are known to be difficult, but failure may lead to severe consequences, as is demonstrated by the Tenerife air disaster (Weick 1990), the Mann Gulch fire-fighters disaster (Weick 1993), the friendly fire incident in Northern Iraq (Snook 2000), or the hurricane Katrina disaster (Congress 2006). In the literature temporary collaborations are being addressed from many different perspectives, including leadership (e.g. Jones and Hinds 2002), knowledge management (e.g. Rosenberg 2000), coordination (e.g. Bechky 2006; Faraj and Xiao 2006; Majchrzak et al. 2007), communication (e.g. McKinney et al. 2004), sensemaking processes (e.g. Weick 1990; 1993), and in terms of virtualness (e.g. Saunders and Ahuja 2006). One emerging theme is that of
transactive memory systems (TMS), which are shared cognitive systems that collaborating group members develop to divide responsibilities and integrate individual capabilities during interdependent problem solving (Ren and Argote 2011). Research findings suggest that well developed TMS provide the group access to a larger pool of knowledge (Hollingshead 1998; Wegner 1986), help to reduce the cognitive load of any one individual (Hollingshead 1998; Kieser and Koch 2008), improve task coordination (Lewis 2003), and as such lead to superior performance (Brandon and Hollingshead 2004; Hsu et al. 2011; Lewis 2004; Lewis et al. 2005; Littlepage et al. 2008), which may be expressed in both effectiveness and efficiency (Faraj and Sproull 2000). At the same time, TMS research on temporary collaborations is still scarce and does not relate TMS of temporary collaborations to the TMS of the involved ongoing organizations. The interrelations between these types of TMS form the ultimate research theme of this dissertation.

Before elaborating on the scientific and managerial motive for selecting this research theme, and before the research objective and research questions of this dissertation can be presented, an introduction to TMS theory is needed.

1.2 An Introduction to TMS theory

To help understanding how TMS-related concepts such as memory, knowledge, or information are being used, I first should explicate my ontological (concerning the nature of reality) and epistemological (concerning the nature of knowledge) perspective (cf. Davison et al. 2004), which is an interpretive-constructivist perspective (cf. Feldman and Feldman 2006; Orlikowski 2002). Such perspective holds that multiple realities are socially constructed by individuals, gained through understanding the meaning of processes and experiences (Carr and Kemmis 1986). Moreover, I adopt a widely accepted yet limited utilitarian perspective on TMS, i.e., 'for instrumental reasons, to provide lessons for improving present organizational performance' (Rowlinson et al. 2010: 83). It is limited in the sense that it pays little attention to socially constructed issues such as culture, morality, power, tradition, and
emotions (Feldman and Feldman 2006). Keeping these perspectives in mind, TMS theory can now be introduced.

Wegner (the originator of TMS theory) and his colleagues define a TMS as ‘a shared system for encoding, storing, and retrieving information’ (Wegner et al. 1991: 923), a property of a collection of actors who are assembled in a ‘social network of individual minds’ (Wegner 1986: 206). The development of a TMS is the result of (conscious or unconscious) cognitive efforts to cooperate and divide responsibilities across knowledge domains, aiding to the ‘social organization of diversity’ (Wegner 1986: 206). TMS become transactive through informational interactions among the members involved (Wegner 1986). One of the prerequisites for TMS development is shared task interdependence (Hollingshead 1998). This in turn leads to cognitive interdependence, meaning that actors rely on each other’s expert knowledge to finish a joint task (Hollingshead 2001). This reliance could be more, or less explicit, the distinction being the presence or absence of formal agreements and plans as to ‘who is to do what and when they are to do it’ (Wittenbaum et al. 1998: 179). Although most TMS studies emphasize the differentiating function of TMS, the distribution of knowledge within groups may also be more integrated. Wegner (1986) in fact used the phrase ‘integrated transactive memory' to represent those items of information that are held in common by all team members, while the team members ‘are aware of the overlap as they do share label and location information as well’ (Wegner 1986: 204). This extreme form of having in common is also known as mutual knowledge (Cramton 2001), or common knowledge (Geanakoplos 1992).

A TMS may be described in terms of representational and procedural components (Theiner et al. 2010). First, with respect to representational components Wegner (1986) differentiates between internal and external knowledge resources. External knowledge resources concern knowledge that resides in the memory of others, but may also include artifacts, or encoded knowledge resources, such as a telephone directory (Wegner 1986). External knowledge resources can be both cognitive and behavioral Ellis 2006), explicit and tacit (Griffith and Neale
To be able to make use of external knowledge resources, the internal memory of actors within the network should at least contain a label and a location (Wegner 1986), also known as meta-knowledge or 'who knows what' (Lewis and Herndon 2011). Other meta-knowledge may include knowledge of allocation, updating, and retrieval coordination (Brandon and Hollingshead 2004); emergent behavioral knowledge, such as task credibility expressing the level of trust in each others’ knowledge (Moreland and Myaskovsky 2000; Moreland et al. 1996); soft knowledge, such as belief structures, judgment, intuition (Anand et al. 1998), capability and motivation (Majchrzak et al. 2007), and affect (Huang 2009).

Second, the creation and maintenance of representations is performed by the procedural components of a TMS (Theiner et al. 2010). The procedural part of a TMS consists of three processes, i.e., directory updating, information allocation, and information retrieval coordination (Wegner 1986). Directory updating is the process of learning where particular knowledge can be found; information allocation represents the process of assigning and distributing new knowledge to those whose characteristics are best suited for its storage, which may include the transformation of incoming information to suite the characteristics of the group; and information retrieval coordination represents the process of accessing distributed knowledge resources. In addition, Wegner et al. (1991) identified three progressively sophisticated learning methods through which meta-knowledge develops. That is, people gain almost instant knowledge about someone's capabilities through stereotyping, such as inferences from roles, uniforms, posture, age, or sexe (Hollingshead and Fraidin 2003). Perceptions are further developed by self-disclosure of traits, skills, past activities, preferences, and emotions. The ultimate learning method is to develop meta-knowledge based on facts about the other's access to information. Like knowing who accessed the source, accessed it the longest time, or most recently.

TMS structures and processes are intertwined (Wegner 1986). To describe this intertwinement Klein and Kozlowski depict TMS as a multi-level construct, i.e. ‘a complex configuration of individual memory,
distributed knowledge of the contents of individual memory, and the interaction process that links that information into an emergent whole’ (Kozlowski and Klein 2000:74). Within this context emergence is defined as a bottom-up process where individual characteristics, cognition, behavior, affect, and interactions among these individuals, evolve into a higher level phenomenon. Thus, a TMS emerges and evolves as a result of transactions (Ren and Argote 2011), which result in converging images about the team’s knowledge distribution (Brandon and Hollingshead 2004) and to increasing knowledge differentiation (Wegner 1986). At the same time, higher level constructs condition lower level constructs and processes (Gittell and Weiss 2004). Hollingshead and Brandon (2003), for example, found that better directory development (directory updating) results in clearer demarcations of responsibilities (information allocation). Gupta and Hollingshead (2010) found that the TMS knowledge patterns that emerge (e.g. more integrated or more differentiated) are determined by the characteristics of the task at hand.

The notion that TMS are multilevel phenomena has two implications for (organizational) TMS development. First, TMS are emergent and, hence, cannot be designed. Second, by devising organizational principles and structures, its emergence can be influenced. Hence, like is the case with communities of practice (cf. Wenger 1998), TMS can be designed for. Where the latter implication justifies an interventionist approach to TMS development, the former directs the focus of possible interventions.

1.3 Motivation

The choice to study organizational TMS in relation to temporary collaborations is driven by a dual motive, i.e. a scientific motive and a managerial motive.

\[\text{\footnotesize \textsuperscript{1}}\] For an overview of emergent TMS characteristics and conditioning contextual features and effects that have been addressed in the literature, cf. Appendix 1.
1.3.1 Scientific motive

TMS support collaborative action and are antecedent to it (Jarvenpaa and Majchrzak 2008). Rosen et al. (2007) found that, among other factors\(^2\), failure of distributed collaboration can often be traced to the absence of a well-functioning TMS. Thus, if TMS are to be strengthened, it is important to understand their structure, functioning, and emergence.

Empirical TMS research has been conducted at various levels of analysis, including dyads (Wegner et al. 1991), groups (Moreland et al. 1996; Rau 2005), virtual teams (Griffith et al. 2003; Kanawattanachai and Yoo 2007), globally distributed teams (Oshri et al. 2008), organizations (Jackson and Klobas 2008), emergent response groups (Majchrzak et al. 2007) and inter-organizational level (Jarvenpaa and Majchrzak 2008). A review of TMS research between 1985 and 2010 by Ren and Argote (2011) revealed that the vast majority of these studies has been conducted at team level. Studies at organization level and at the level of temporary collaborations are scarce. This lack of research hinders organizational TMS development efforts, because TMS-related findings at one level of analysis are often not applicable to other levels of analysis (cf. Peltokorpi 2008). Consequently, several scholars call for TMS research at organization level (e.g. Jackson and Klobas 2008; Peltokorpi 2008; Ren and Argote 2011), while others call for studying TMS in geographically distributed collaborations; the latter not only because they received little attention, but because still little is known about short-term collaborations in real-life settings, how experiences in temporary collaborations impact future collaborations, what the effects are of management structures (as most studied collaborations were highly self-directing), and how technologies can help the group to develop a shared cognitive division of

\(^2\) Factors mentioned in the literature include the building of trust, the use of compatible technologies, the role of team leaders, differences of routines, diversity of contexts and cultures, failures of communication, and time constraints (e.g. Cramton 2001; Hinds and Mortensen 2005; Rosen et al. 2007).
labour (cf. Cordery and Soo 2008; Kanawattanachai and Yoo 2007; Lewis et al. 2007; Powell et al. 2004; Ren and Argote 2011).

The scientific motivation of this dissertation is rooted in these two types of calls for research, to which one dimension is added: organizational TMS should provide for stable structures to enable future temporary and geographically distributed collaborations (cf. Moreland and Argote 2003; Powell et al. 2004). Thus, the scientific motive of this dissertation is to increase our understanding of the structure, functioning, and emergence of organizational TMS, and understand its relation with the TMS of temporary and geographically distributed collaborations.

1.3.2 Managerial motive

This research is conducted at the Dutch National Policing Services Agency (Korps Landelijke Politiediensten, KLPD), an institution which is comparable to national police organizations in other countries. Organizational units of the KLPD are often engaging in temporary collaborations to solve problems that the units cannot solve (as easily) by their own. Strategic management theory suggests that through the combination of distributed resources an organization is able to develop novel capabilities and services (Bosch et al. 1999; Matthews and Cho 2001). These novel services add value for its stakeholders (Barney 2001), which in the case of public services (such as provided by the police) may be expressed in increased effectiveness or responsiveness (Batley and Larbi 2004). Recognizing the potential value and complexity of temporary collaborations, the managerial motive of the KLPD to support this research is twofold. First, to increase the effectiveness and responsiveness of the organization through exploring and exploiting the potential of distributed knowledge resources in temporary collaborations. Second, to increase the robustness and resilience of temporary collaborations in order to gain control over, and maintain control in erratic situations, and forestall failure.
1.4 Research Perspective and Objective

At organization level, three TMS studies have been published (Ren and Argote 2011). The perspective taken in this dissertation deviates from the ones taken by these studies. Anand et al. (1998) conceptually discussed organizational TMS from an information management perspective. Nevo and Wand (2005) conceptually discussed organizational TMS from an organizational memory management perspective. And Jackson and Klobas (2008) empirically studied how TMS theory could be extended from team level to organization level. Given that TMS have a function in the development, management, and coordination of expertise (Oshri et al. 2008), the perspective adopted in this dissertation surpasses the management perspective of the two conceptual studies (i.e. Anand et al. 1998 and Nevo and Wand 2005), as emphasis is given to organizational development aimed at strengthening temporary collaborations. And rather than extending TMS-theory from teams to organizations, in this dissertation I try to identify how the two levels are intertwined in terms of structure, functioning, and emergence. This perspective is chosen because it more fully treats the interplay between the enduring organization (accent on development and management) and temporary collaborations in which the organization participates (accent on coordination).

Following the scientific and managerial motivation behind this dissertation, the objective of this dissertation has been formulated as:

1. to develop organizational TMS theory as a lens to study how distributed knowledge resources may be involved in collaborations, which are temporary and geographically distributed, to head tasks that none of the participants can head (as easily) on its own, and
2. to identify which features of organizational TMS contribute to the robustness and resilience of these collaborations.

1.5 Research Questions

This dissertation starts from the finding that organizational TMS do exist (cf. Anand et al. 1998; Jackson and Klobas 2008; Nevo and Wand 2005; Wegner 1986) and that they play a critical role in the development,
management, and coordination of distributed knowledge resources (cf. Oshri et al. 2008).

At organization level, knowledge may be retained in various types of knowledge resources, including people, information systems, documents and archives, routines, processes and procedures, organizational standards and structures, etc. (cf. Griffith et al. 2003; Oshri et al. 2008; Wegner 1986; Yuan et al. 2010). The choice of where to allocate the responsibility for the development or retention of a certain knowledge domain affects the processes of knowledge transfer and integration at a later stage (Carlile 2004; Desouza et al. 2008) and is subject to knowledge management (Alavi and Leidner 2001; Oshri et al. 2008). Approaching organizational TMS from this angle, the first explorative research question is:

RQ 1: How can knowledge transfer among (different types of) knowledge resources in an organizational TMS be strengthened to support temporary and geographically distributed collaborations?

This research question is addressed by the first research project, reported in chapter 2. This research project was conducted in an experimental yet real-life environment. The number of people involved in the experiments was limited to 10 to 30 people. They made use of supportive information systems and worked together in a geographically distributed setting, and thus, could be typified as a virtual team (Griffith et al. 2003). The main conclusion of the first research project was that knowledge transfer in organizational TMS can be strengthened by 1) organizing for transactivity among knowledge resources of the same type, 2) transforming knowledge from one type of knowledge resource to another, and 3) by organizing differently, e.g. through virtual teaming.

Where the first research project shows that different types of knowledge resources may be used to strengthen organizational TMS, much remains unclear about how various types of knowledge resources are formally related to TMS theory. It is only since recent that information systems (Choi et al. 2010; Jackson and Klobas 2008; Nevo and Wand
2005; Yuan et al. 2007), organizational rules (Kieser and Koch 2008), and e.g. standards, guidelines, and templates (Oshri et al. 2008) have been included in TMS research as alternative resources for knowledge storage and retrieval. All of these studies, however, adhere to the description of TMS as a 'social network of individual minds' (Wegner 1986: 206).

Hence, there seems to be consensus that IT and other types of knowledge resources may be used in TMS. But how this relation looks like is still being subject for future research. Yuan et al. (2011), for example, call for research to better understand the choice between interpersonal and technological resources for knowledge storage and retrieval, and to what extent the two complement each other. Likewise, Choi et al. (2010) ask for future research to learn how TMS and IT tools interact, while Lewis and Herndon (2011) go as far as hypothesizing that artificial knowledge resources may substitute (parts of) TMS, but only if they can emulate and facilitate transactive processes. In line with these calls for research and the scope of this dissertation, the second question is formulated as follows:

RQ 2: how are different types of knowledge resources related to a TMS, which develops for supporting temporary collaborative action in a geographically distributed setting?

This research question is subject of the second research project and reported in Chapter 3. The question was studied by analyzing and intervening in the tasks of planning and executing a collaborative police operation, involving circa 600 officers. The division of labor between these two tasks is common-place in organizations which partition complex organizational tasks, and integrate the results at a latter stage. Where the processes of dividing and integrating responsibilities for knowledge domains over actors (what and who) are being described by TMS theory, the processes of dividing and integrating actions (what and how) are being described by organizational routines theory (cf. Feldman and Pentland 2003; 2008). Or in other words, where TMS theory describes patterns of actors, organizational routines theory describes patterns of actions. As these patterns are obviously related, it may be expected that borrowing
insights from organizational routines theory may shed light on how different types of knowledge resources are related to TMS. This thesis has been worked out in the second research project. Next to formally describing different types of knowledge resources in TMS theory, the findings of the second research project suggests that organizational TMS consist of multiple functionally nested TMS, which' interrelations can be characterized in terms of overlap in actors, actions, relations among these actors or actions, the content of informational interactions, and supporting artifacts.

As will be shown in Chapter 3, these observations provide angles to devise interventions to strengthen organizational TMS in support of temporary collaborations. But they also raise new questions. For example, contrary to extant TMS research (e.g. Brandon and Hollingshead 2004; Lewis 2004), TMS appear to be interrelated and nested and do not require all members to be equally well informed of the capabilities of all other members. Moreover, collaborative patterns that these members develop in one TMS in support of one task may differ from collaborative patterns in other TMS that are developed to support other tasks (cf. Gupta and Hollingshead 2001). This raises the question how TMS associated with enduring organizational tasks are related with TMS associated with temporary organizational tasks. The latter question formed the lead for the third and last research project, which is introduced next.

Public organizations, responsible for particular sets of services, are structured by function, product or region, or combinations thereof (Daft 2012). The resulting organizational structures are predominantly vertical in nature, meaning that similar tasks and functions are grouped in specialized units, decision-making is centralized, and communication and reporting follow hierarchical lines (Andrews et al. 2007). Temporary collaborations, on the other hand, are predominantly horizontal in nature, meaning that responsibilities for tasks are shared, decision-making is decentralized, and communication and information exchange is based on personal contacts (Andrews et al. 2007). Within the context of this research predominant vertical modes of organizing are associated with functional enactment, while predominant horizontal modes of organizing
are associated with networked enactment. To describe the ability of an organization to switch forth and back between its regular functional mode of organizing and a temporary network mode of organizing, the concept of hybrid enactment is introduced. Given the dialectical structures of functional enactment (vertical) versus networked enactment (horizontal) the question is how an organizational TMS can develop which supports hybrid enactment: how can it support both modes of enactment? Further using and developing TMS theory as a theoretical lens to study hybrid enactment, the third and last research question is formulated as follows:

RQ 3: How can functionally structured organizations develop their ability to engage in networked operations, in addition to their functional mode of organizing?

This research question is subject of the third research project and reported in Chapter 4. It was studied by analyzing a small-scale networked operation, involving three collaborating teams. The study brings to light subsystems of organizational TMS which emerge in support of hybrid enactment, and a learning cycle among these subsystems. Both subsystems and the learning cycle provide opportunities for organizational development.

1.6 Contribution of Research Questions to Research Objective

The answers to the three research questions provide the building blocks required to reach the objective of this research. First, knowledge of knowledge transfer processes among (different types of) knowledge resources in TMS (research question 1), understanding the formal relation between different types of knowledge resources and TMS (research question 2), and the relation between vertically and horizontally organized knowledge patterns (research question 3), together provide for a theoretical lens to study how distributed knowledge resources may be occasionally involved in collaborations which are temporary and geographically distributed (first part of research objective).
Second, increased knowledge of the structure, functioning, and emergence of organizational TMS, TMS of temporary and geographically distributed collaborations, and the relations among them, contribute to the identification of features of organizational TMS that contribute to the robustness and resilience of these collaborations (second part of research objective).

Finally, as will become apparent in the overall reflections in Chapter 5, the three empirical studies provide valuable cues for future research surpassing the overall objective of this dissertation. This includes a promising lead with respect to the linkage between organizational TMS theory and the knowledge-based view (KBV) of the firm (cf. Barney 2001; Spender and Grant 1996). KBV holds that knowledge is a strategically important resource for competitive advantage (Wiig 1997), and that consequently the integration of specialized knowledge is one of the essential capabilities of an organization (Grant 1996). KBV, however, is a macro theory, meaning that it lacks (a much wanted) explanation of how capabilities are rooted in micro level individual actions and interactions (Abell et al. 2008; Felin et al. 2012; Foss 2011). Organizational TMS theory as being developed in this dissertation does provide such micro-level foundations. Another promising lead for future research concerns the role of organizational TMS theory in constructing an information governance framework, aimed at the development, management, and coordination of organizational knowledge resources.

1.7 Research Context

The opportunity for this dissertation stems from my position as senior advisor at the National Policing Services Agency (KLPD) (cf. Figure 1.1).

The KLPD carries out coordinating and supportive tasks for 25 regional police forces and is responsible for a number of autonomous tasks that are most effectively handled at (inter) national level. These include the fight of serious and organized crime, and safety and security-related to the national infrastructure (highways, waterways, railways, and airways). The KLPD employs over 5000 employees (circa 10% of the
total Dutch police force). Its departments vary in size from circa 100 to circa 1000 employees.

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**Figure 1.1: KLPD organizational structure**

In the aftermath of 9/11 and the terrorist attacks in Madrid and Amsterdam in 2004, the KLPD initiated several projects aimed at strengthening coherence among its departments. The general idea behind these initiatives was that through knowledge sharing and collaborative action the contributions of the KLPD to national safety and security could be increased. Or theoretically formulated: that additional value could be created by developing the combinative capabilities of the organization. Being involved in these initiatives as senior advisor, the quest of the
KLPD provided opportunities to develop organizational TMS theory as a lens to study the exploration and exploitation of knowledge resources in temporary and geographically distributed collaborations.

1.8 Research Methods

In Table 1.1 an overview is given of the research methods used in this dissertation.

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<td>5 Reflections</td>
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Table 1.1: Applied research methods

As the research design of the first two empirical studies is identical, its description is included in this introductory chapter. All other details are specific to one study and, hence, reported in their respective chapters.

1.8.1 Design

In the first two research projects, the research objective was pursued by introducing changes (the application of theory in practice) and observing the effects of these interventions (academic reflection), which is the basic contention of action research (AR) (Baskerville 1999). Due to the dual motive of this dissertation, i.e. a scientific motive aimed at increasing understanding, and a managerial motive aimed at organizational development through the initiation of interventions, AR is conceived the most appropriate research method (Argyris and Schön 1996; Reason and Bradbury 2001; Cummings and Worley 2004). To ensure rigor, I sought a research relationship with an external researcher to provide for psychological and emotional distance and shared reflections on theoretical lessons learned (cf. Markus et al. 2002), and followed the five principles for canonical action research put forward by Davison et al.
The Principle of Client-Researcher-Agreement.

A researcher-client agreement (RCA) is a major aspect of rigorous AR (Davison et al. 2004; Hult and Lennung 1980). Hence, for each of the two AR-projects a formal agreement has been drafted with the client. Both client and researchers agreed that AR was suitable for these studies because they adhere to all elements of Hult and Lennung’s widely cited definition of AR: ‘Action research assists in practical problem solving, expands scientific knowledge, enhances actor competencies, is performed collaboratively in an immediate situation, uses data feedback in a cyclical process, aims at an increased understanding of a given social situation, is applicable for the understanding of change processes in social systems, and is undertaken within a mutually acceptable ethical framework’ (Hult and Lennung 1980: 247).

Client commitment has been established by the participatory and collaborative approach (cf. Avison et al. 2001). In both AR projects, practitioners were actively involved in the reconnaissance of the problem situation and the formulation of solutions and interventions. Due to my position as senior advisor I had full access to the KLPD and took shared responsibility for actions taken. Line managers in the organization acted as decision-making authorities. One of the challenges of doing research within one’s own system is to build on the closeness which one has with the system and at the same time create and maintain a distance towards it (Coghlan and Brannick 2001). I could draw on being an insider because I had build relationships with many parties involved. Having such a network and understanding the language of the organization are general advantages of being an insider researcher (Roth et al. 2007). To provide for psychological and emotional distance and shared reflections on theoretical lessons learned, cooperation was established with dr. Erik J. de Vries of the University of Amsterdam. Such role taking has been reported in an AR study of Markus et al. (2002) as well. The financing of the study was in line with this role taking. Being employed by the KLPD I could

(2004), which have been followed in other AR studies as well (e.g. Iversen et al. 2004; Lindgren et al. 2004). These are elaborated next.
focus entirely on the research projects. Erik de Vries was employed by the University of Amsterdam and participated as part of his regular research work.

Ethical issues have been addressed in the RCA to ensure that consequences on personnel, privacy and confidentiality of information about project members and safety of the project members during experiments were well understood and taken care of, and that the legal rights of citizens were respected. With regard to editorial control and publication the RCA did not include any restrictions other than that secret or confidential information on criminal investigation routines could not be made public (for obvious reasons).

*The Principle of a Cyclical Process Model*

In accordance with the Principle of the Cyclical Process Model the most widely adopted cyclical process of AR forwarded by Susman and Evered (1978) is being followed: diagnosis, planning, action, evaluation, reflection (D-P-A-E-R). In this approach practical problem solving and theory development inform and support each other. For such studies it has been recommended to differentiate between problem solving activities (D-P-A-E) and contributions to theory (the R-phase and Discussion) (Chaisson *et al.* 2008). These phases are reflected in the structure of chapter 2 and 3.

*The Principle of Theory*

In accordance with the Principle of Theory the relevance of the research projects has been elicited earlier in this chapter, and will further be elaborated upon in the theory sections in Chapter 2 and 3. In addition, the findings are reflected upon in Chapter 5. Moreover, theories used to guide diagnosis, interventions and reflections are described within the respective AR cycles. Both AR-projects have characteristics of an explorative study which is reflected in the AR cycles and which accord with the AR principle of Learning through Reflection. Although several authors claim that the validity of AR depends on the presence of a theoretical framework as a premise (Baskerville and Wood-Harper 1996;
Baskerville and Myers 2004), others disagree because especially at the start of the project theoretical preconceptions might be counter-productive (Davison et al. 2004), or might restrict multiple interpretations (Walsham 1995). This suggests more openness to AR studies that do not start from detailed theoretical preconceptions right away (an example of such a study is Kock (2001) who inductively derived patterns from statistical and grounded theory-based analysis), or studies in which theoretical conceptions change along the way (e.g. Markus et al. 2002, and Kohli and Kettinger 2004).

The Principle of Change through Action

A description of actual actions taken in the two AR-projects is given in Chapter 2 and 3. In this section the Principle of Change through Action is being described in terms of action researcher role-settings. In the first study my role can be depicted as collaborative, meaning that all decisions on interventions have been taken collaboratively. Due to the duration and sheer size of the second AR-project (involving several 100s of people of various organizational departments), my role in this project was facilitative. That is, I functioned as 'an expert among the study subjects' while the responsibility for immediate solving rested by these subjects (Baskerville and Wood-Harper 1998: 95). In such setting 'the task of the researcher is to facilitate or help the subjects with expert advice, technical knowledge or an independent viewpoint. However, the subjects are responsible for determining exactly what interventions will be created' (Baskerville and Wood-Harper 1998: 95). Hence, instead of directly intervening in the process, observations and recommendations were discussed with the senior management. In addition, for the second research project I participated in an evaluation committee who visited action sites, interviewed stakeholders and operational participants, and drafted and presented evaluation reports. In both projects the Principle of Change through Action was followed by describing the diagnosis of the problem and its causes, and how interventions addressed these causes in the AR cycles. To do so the organizational situation before and after the
interventions was assessed together with members of the KLPD. The nature and timing of interventions are being described in the AR cycles.

*The Principle of Learning through Reflection*

The dissertation adheres to the Principle of Learning through Reflection by the semi-thick description of findings and coverage of implications for practice and theory in the discussion and conclusions section of each chapter, and the overall reflections presented in Chapter 5. The outcomes of both studies have been reflected on collaboratively with the practitioners involved, and the degree of success is described in each of the two chapters.

*Data Collection*

The descriptions of the five AR-phases (D-P-A-E-R) derive from three forms of data that have been collected: direct observations, collective reflections and organizational documentation (*cf.* Table 1.2).

Direct observations were being recorded in personal notes. Resulting notebooks provided the qualitative datum required to codify incidents. Recorded is all that is related to changes in concepts (or new ones being introduced) and progression in understanding and changes in attitude of project members. Data on collective reflections stems from reflection sessions on the grounds and multi-interpretable outcomes of interventions (as proposed in Guba and Lincoln, 1989). These reflections not only led to new insights, they also stimulated political support from the participating departments and provided directions for new data to be collected and concepts to be developed. All material was stored in project directories, which were available to all participating project members.
First Action Research | Second Action Research
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Direct observations | Notes of personal observations made during field visits, brainstorm sessions, workshops, management meetings, and consultation and advising activities over a period of 30 months (October 2006 – March 2009) (ca 840 pages).
| Notes of personal observations made during field visits, brainstorm sessions, workshops, management meetings, and consultation and advising activities over a period of 20 months (April 2009 – December 2010) (ca 970 pages).
Organizational documentation | Project plans (11); Minutes of meetings (61); Expert interviews (6); Powerpoint presentations (65) and other project materials (17); Minutes of workshops (4); Intranet and KLPD Magazine articles (many).
| Action plans, scripts and briefing materials (many); Powerpoint presentations (2); Intranet and KLPD Magazine articles (many).
Collective reflections | Evaluation reports (4).
| Evaluation reports (2).

Table 1.2: Overview of empirical data

1.9 Structure of this Dissertation

In this chapter the overall objective and guiding research questions have been presented, as well as an introduction to TMS theory, a description of the research context, and the action research method that has been used in the first two research projects (cf. Figure 1.2).

In chapter 2, 3, and 4 the three empirical research projects are being reported. These chapters include (additional) details about the theories used in these studies, their respective research context, the research method, and the data collection. Due to the exploratory nature of this dissertation, each research project fueled the next research question and subsequent research project, which is visualized by the arrows in
Figure 1.2. The concluding reflections of this dissertation, as well as leads for future research, are presented in chapter 5.

**Figure 1.2: Setup of this dissertation**

Adapted versions of chapter 2, 3 and 4 are in the process of publication. In addition, a paper addressing a number of ethical issues related to advanced data processing techniques as discussed in Chapter 2 and 3 has been published as chapter in an anonymously peer-reviewed book (Schakel et al. 2012). Appendix 1 provides an overview of antecedents, moderators, and effects of TMS that have been studied at dyad, triad, or team level. Finally, in support of organizational TMS development, Appendix 2 entails a preliminary outline of a taxonomy of knowledge resources, which is forwarded in Chapter 5 as one of the leads for future research.