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Organizational Aspects of Learning for Sustainability in Local Government

A study on Hungarian municipalities

by
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Pusztai Csaba

Abstract

Sustainability poses a great challenge for governance because of the inherent complexity and uncertainty involved in both understanding the dynamics of socioeconomic and ecological systems and also in the coordination of action to address these problems. Facing this challenge, problem solving at all levels of government needs to embrace the opportunities for learning in a multi-stakeholder context.

This thesis is a study on how municipalities in Hungary develop their capacity for addressing sustainability. I argue that this learning process for sustainability is much embedded in the local organizational culture. Municipalities with a culture more open to dialogue and inquiry will tend to be more successful in developing *meta*-knowledge to deal with substantive and strategic complexities. I argue that this learning process is facilitated by the informal advice relationships municipal departments maintain in their social network.

In addressing my research problem, I took a quantitative approach. Based on a theoretical model specifying the key factors of learning for sustainability and their hypothesized relationships, I drew data via a survey from 161 Hungarian municipal departments involved in some aspect of local policy in one of 19 cities. Using various multivariate statistical techniques, I explored the patterns of advice seeking between departments and I also estimated a path model to test my hypotheses on organizational factors of learning for sustainability.

My findings indicate that informal relationships are important in delivering opportunities to municipal departments to learn about problems. Unfortunately, interaction with other actors is dominantly motivated by political benefits (securing approval). Actors with a perceived potential to reformulate problems are peripheral. A learning oriented culture was found to have a substantial direct influence on generating meta-knowledge for sustainability. But it was also found to have a positive mediated effect on learning by facilitating informal communication with actors and also motivating departments to build more diverse advice networks.

My results draw the attention to the often neglected or downplayed role of organizational factors in developing local government capacity to address issues in a sustainable way. The importance of informal relationships and soft factors such as building trust, a shared identity and an organizational culture open to dialogue and inquiry highlight the responsibility of local leadership and public management in advancing municipalities towards a more sustainable future.

Keywords: sustainability, organizational learning, local government, municipality, advice network, Hungary

To the loving memory of my maternal Grandpa,
who passed away before I could finish my dissertation.

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List of Acronyms and Abbreviations

ANOVA	Analysis of Variance
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
CoR	Coefficient of Reproducibility
CoS	Coefficient of Scalability
CSO	Civil Society Organization
df	Degrees of Freedom
DISCUS	Developing Institutional and Social Capacities for Urban Sustainability
EDA	Exploratory Data Analysis
EFA	Exploratory Factor Analysis
HCA	Hierarchical Cluster Analysis
HSD	Honestly Significant Difference (Test)
ICLEI	International Council for Local Environmental Initiatives
ICT	Information and Communication Technology
IUDS	Integrated Urban Development Strategy
ISC	Institute for Sustainable Communities
KM	Knowledge Management
KMO	Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)
LA21	Local Agenda 21
LASALA	Local Authorities' Self-Assessment of Local Agenda
MDS	Multidimensional Scaling
MI	Modification Index
ML	Maximum Likelihood
MMR	Minimum Marginal Reproducibility
MSA	Measure of Sampling Adequacy
NHIP	New Human Interdependence Paradigm

OECD	Organization for Economic Co-operation and Development
PCA	Principal Component Analysis
PHP	Personal Home Page
PLS	Partial Least Squares
PSU	Primary Sampling Unit
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modeling
SD	Standard Deviation
SNA	Social Network Analysis
SPSS	Statistical Package for the Social Sciences
SSU	Secondary Sampling Unit
TLI	Tucker-Lewis Index
ULI	Unit Loading Identification
UN-HABITAT	United Nations Human Settlements Program
UNFPA	United Nations Population Fund
WHO	World Health Organization
WSSD	World Summit for Sustainable Development

CHAPTER 1

Introduction

Cities have become the focal point of the quest for sustainability in many respects (e.g., Beatley 2000; Giddings, Hopwood, Mellor, & O'Brien 2005). Much of the earth's population and much of human activity are concentrated in cities and therefore cities are often seen as the manifestation of *the unsustainable*. While national and international efforts play an unquestionable role in addressing issues associated with global sustainability, action at sub-national levels of government is also deemed desirable. The rationale is that local governments (municipalities) are located closest to their communities and therefore are also often in the best position to influence many aspects of development at the micro level. Their ability to do so is of course limited by many factors including economic, political, legislative, budgetary constraints, just to name a few.

This thesis is a study on how municipalities learn for sustainability in Hungary. For the purpose of this study, learning for sustainability is understood as a cognitive shift reflected in *the accumulation of knowledge in local government to conceptualize and treat problems in more complex, systemic terms* (Berkes, Colding, & Folke 2003; Evans, Joas, Sundback, & Theobald 2005).

The interest in Hungary is motivated by the perception that here sustainability is generally less embraced as a master concept in policy and planning at the local level than in many countries that have a similar character. This may not come as a surprise in the light of the relatively recent political history of the Hungary. Hungary's change of political systems at the end of the 1980's was coupled with a shift in the way public administration was organized as well. The socialist much-centralized council system, where local authorities were the weakest component of the power structure, was replaced by a local government system in the name of decentralization and democratization (Bohm 1994).

In theory, the environment is one area where national policy has been often associated with the promotion of democratic values and institutions, (e.g., greater public participation and accountability in decision making) at all levels of government. However, the literature of democratic transition actually points to a range of potential obstacles to developing new norms and practices at the local level, such as the persistence of centralism, administrative formalism, or

fiscal weaknesses (Assetto, Hajba, & Mumme 2003). Uncertainty about mandates, funding sources, procedures also creates frustration for local governments. In addition, Davey (1995) cites political fragmentation and an atmosphere of political confrontation as additional barriers to developing local governance capacity. Just very recently, in mid 2011, the proposed new Act on Local Governments which is to overhaul the local government system from 2012 has ignited fierce debate between local governments and the central government.

Environmental agenda setting is still centrally dominated (Assetto, Hajba, & Mumme 2003). So the marginal commitment to integrate sustainability principles into municipal level policies and decision-making may be directly attributable to the lack of a comprehensive national government program or campaign which would help set up local sustainability initiatives as it worked well in the case of other countries. Also, while democratization created opportunities for citizen participation, there is still little tradition of local participation and decision-making remains dominated by corporatism (Assetto, Hajba, & Mumme 2003).

Instead of focusing on the role of central government and top-down *streaming* of policy ideas (or rather the lack thereof) in mainstreaming sustainability, this study concentrates on bottom-up (locally self-organizing) processes which may foster the generation of knowledge relevant for governing sustainability and establishing practices in local policy even in the absence of support or mandate from higher levels of government (Maloney, Smith, & Stoker 2000).

In identifying the primary research problem, the study makes a number of fundamental assumptions which will help frame the research questions precisely and develop a theoretical perspective in which these questions are approached. First of all, it is argued that the concept of sustainability closely corresponds to a governance process characterized by special *mode* of problem treatment (Loorbach, Frantzeskaki, & Thissen 2011). Whereas in the conventional paradigm, the environment was (or still *is*) treated as an isolated domain of policy, the paradigm of sustainability implies integrative efforts where the environment is put into the context of other policy domains and conversely, other domains are related to the environment. As for municipalities, the thesis makes a case that the idea of sustainability implies a necessary conceptual and cognitive shift in the way urban development is framed by local governments.

Sustainability represents a 'wicked' policy problematique which is characterized by a great deal of complexity and uncertainty. Some of the complexity and uncertainty is created by the very nature of the interrelated

issues and a fair share of it is attributable to the number and variety of societal actors that are affected by these problems and/or are involved in acting upon them. It is often argued then that such a wicked problematique can only be effectively harnessed if actors (e.g., local governments) come to appreciate the inherent complexity of the situation and its implications for governance and decision-making in general. This developing appreciation is seen as a form of building capacity for governance. It is a *learning* process which involves accumulating knowledge about the substantive and process dimensions of governing sustainability and which leads from conventional reductionist thinking and strategies toward a more holistic and integrative perspective.

This sustainability-oriented learning takes place within and among a community of actors including the local government as well. Interactions in forms ranging from sharing information to collaboration serve as vehicles of developing, sharing and utilizing the knowledge relevant to manage their communities in more sustainable ways. While traditionally many of these exchange relationships have been structured by hierarchies (bureaucracies) or market transactions, learning within and across organizational boundaries to a great deal takes place in a horizontal web of relationships often referred to as *networks* (Kettl 2009).

Both the concept of learning (e.g., refined problem representation) and network (e.g., involving an array of actors) are often advocated as desirable characteristics of modern environmental management and good governance for sustainability in general (Newig, Günther, & Pahl-Wostl 2010; Voss, Bauknecht, & Kemp, Rene 2006). At the same time—beyond normative theory—these master concepts are also used as analytical categories in different fields of organizational and political science. This correspondence and sparse evidence that social networks actually promote learning (Henry 2009) makes them particularly relevant for approaching my research problem.

1.1 RESEARCH QUESTIONS AND OBJECTIVES

Based on the above, the overall aim of this thesis is *to investigate empirically how municipalities in Hungary develop capacity for addressing sustainability via organizational learning processes taking place in an intra- and interorganizational network setting*. This overarching research question is broken down into three sub-questions:

(1) What constitutes the context, content and process of learning for sustainability within municipalities (the local level of government)?

(2) How do municipal departments take advantage of the information and knowledge available in their intra- and inter-organizational advice networks to improve their decision making capacities?
(3) How does the municipal organizational context influence the development of knowledge relevant for governing sustainability ?

In pursuit of the overall aim and answer to the research questions, the following objectives have been identified:

(a) Develop a theoretical model of learning for sustainability in a municipal organizational context.
(b) Develop a survey to measure key aspects of learning for sustainability and its hypothesized factors in a municipal organizational context. Collect data on a sample of Hungarian cities.
(c) Using the primary data, conduct quantitative analyses to explore the advice seeking patterns of municipal departments and to test the plausibility of hypotheses about the sustainability-oriented learning within municipalities.
(d) Based on the empirical results, identify potential leverage points for improving governance for sustainability in municipalities.

1.2 VIGNETTE OF THE RESEARCH STRATEGY AND DESIGN

This thesis unfolds in the hypothetico-deductive tradition. After the literature review, it approaches the research problem by first elaborating a theoretical framework which details the key concepts of interest, namely sustainability-oriented learning and its presumed organizational factors, leading to the formulation of the hypotheses. The plausibility of the hypotheses are evaluated using department-level empirical data collected via an online survey completed by public managers (department heads) representing 161 municipal departments in 19 major Hungarian cities. The study is cross-sectional in its research logic, so data represents a single time period. In addition to the quantitative data, I also conducted personal interviews with a sample of key informants from the population of survey respondents to aid the interpretation of results.

The analysis of the empirical data analysis relied on multivariate statistical techniques including confirmatory factor analysis (CFA), exploratory factor analysis (EFA), multidimensional scaling (MDS), hierarchical cluster analysis (HCA), structural equation modeling (SEM) using partial least squares (PLS) approach.

1.3 IMPLICATIONS, CONTRIBUTION AND SIGNIFICANCE OF THE STUDY

As noted in the beginning, the majority of studies on local governance for sustainability approach the theme from a legislative, political, policy, or financial perspective. These represent factors that tend to create a similar context for cities within a country and rather different contexts across countries. For this reason, many studies on local sustainability either focus on a small number of best practices or aggregate findings over cities within a particular country assumed to be a homogeneous population. These studies typically seek to unveil the general pattern that emerges within a country or how and why these patterns may differ across countries (e.g.,Lafferty & Meadowcroft 2000).

Rather than trying to aggregate and generalize over a group of cases, the contribution of my research lies in its focus on the latent diversity of municipalities and their organizational units. Accordingly, its primary goal is to explore how certain organizational factors account for this heterogeneity as opposed to finding determinants of homogenization. The heterogeneity is captured at the level of municipal departments by identifying idiosyncratic organizational factors such as organizational structure, culture, or their advice relationships with various partners within and beyond the boundaries of their municipality.

This choice of perspective, of course, does not intend to suggest that homogenizing forces are not important in explaining city level policy choices. The *micro* (organizational) perspective implies that diversity in these organizational factors is of no lesser importance than the *macro* perspective in providing an explanation for success or failure in embedding the principles of sustainability in local policy making. More generally speaking, little research has been done to illuminate the subtle factors which explain why "knowledge transplants" (e.g., Local Agenda 21 and other programs) promoted by higher levels of government take root and flourish in some cities and not in others (Hartley & Benington 2006).

The adoption of an organizational perspective makes this research project special in another regard as well. Documents, programs, or policies often serve as the units of analysis in many studies. Their content is often used to make inferences about the processes that may have lead to their creation, assuming that they are a true reflection of 'what is actually happening'. In contrast, the organizational perspective I adopt takes a look 'behind the scenes' by studying aspects of interest that are not reflected in and by official documents and therefore cannot be simply reconstructed from documents.

Finally, the choice of Hungary as the research site for this study is valuable for at least the following two reasons. First, it provides an opportunity to study municipalities in a country context where—in the absence of a national campaign, program or mandate—the aforementioned top-down forces are practically non-existent in terms of mainstreaming principles of sustainability in local development planning and decision-making practices. Hence, the bottom-up effects are expected to be more pronounced. Secondly, little empirical research has been reported on local governments and governance for sustainability in Hungary, and none has worked with a sample size as big as this current research.

1.4 LIMITATIONS AND POTENTIAL EXTENSIONS

As in any type of empirical research, certain necessary trade-offs had to be recognized designing the research project. Probably the greatest limitation of this study is that it is cross-sectional in nature, while its central theme, learning, is an inherently dynamic phenomena. Ideally, data collection could have been extended to cover a longer period of time. Unfortunately, gathering panel data—which requires the participation of the same respondents (departments) over several years—would have been unrealistic due to resource constraints.

The study incorporates various aspects of the advice-related social interactions of municipal departments as explanatory variables. The second shortcoming relates to the measurement of these relationships. The capturing of the advice network of each department is operationalized as a star-shaped ego-network, which represents a sample of the "real" whole network of their interactions. Measurement could have been potentially expanded to include whole network data for each department. This would have enabled the exploration of the network-level implications of the structures and social influence processes around municipal departments. Gathering such data in good quality necessitates high response (ideally close to 100%) rates and extensive validation. Both are resource intensive tasks, so a simple egocentric approach seemed a workable option.

A third possible extension closely relates to the former, although less in a methodological and more in a substantive sense. Whole network data could be used to more fully consider the role of all actors in local governance networks instead of just focusing on local governments, as this current study does. Concentrating on the local government side of the problem can be justified on the grounds that they are effectively the actors that have a legal mandate for

managing development and ensuring the common good, so their involvement is pivotal. Yet, accounting for the learning capacity of other actors, including for instance politicians, and how they gain from and contribute to the knowledge processes in a city would be a desirable extension of this current research project.

1.5 THESIS ROADMAP

The thesis follows a rather conventional structure and logic of research, also often referred to as the focus-down model (Dunleavy 2003):

- *Chapter 2* reviews the literature relevant to the key themes of the research problem. It considers the theoretical approaches that are used and deemed applicable in studying the research problem. It also highlights the major empirical findings related to the research questions. The first part of the chapter sets the scene for the study by reviewing the major shifts in thought on the role of government and its contemporary challenges. The second part of the chapter focuses on how the concept of learning is related to the analysis of public policy. Then, the chapter proceeds by taking an organizational direction and discusses aspects of organizational learning and knowledge relevant in a public sector context. The last section is devoted to surveying how the interdisciplinary concept of network relates the public policy and organizational phenomena.
- *Chapter 3* presents the theoretical framework, which provides the backbone of the empirical part of my research project. The chapter is divided into sections based on the concepts I identified as being relevant for addressing my research problem. It explains the content of these key constructs as defined for the purpose of my study and also how they are hypothesized to be related to each other.
- *Chapter 4* describes the choices made regarding the research design. It details how the unit of analysis was defined for the purpose of the research and what sampling approach was adopted to obtain data. It explains what method of data collection was used and how the process of gathering data was managed. It also covers aspects of instrumentation, that is, the design of instruments that were used to measure relevant variables.
- *Chapter 5* presents the results of the preliminary analysis of the empirical data. It starts out with results of the exploratory data analysis which serves as a first step in learning about the sample and determining if it is well-suited in subsequent statistical analyses. As the foundation of all responsible

data analysis, the chapter also presents the measurement theory underlying the study and the evaluation of the validity and reliability of constructs involved in the study.

- *Chapter 6* concentrates on the advice seeking behavior of municipal departments by looking at relational data they provided. The chapter explores why departments turn to other actors for advice, how they structure their advice relationships and what implications these patterns have for sustainability-oriented learning.
- Chapter 7 focuses on how the organizational context of municipal departments shapes the opportunities for learning, how it influences their advice relationships and how these relate to developing knowledge relevant for governing local sustainability.
- *Chapter 8* wraps up the thesis by presenting the conclusions, discussing practical implications, revisiting the limitations of the study and suggesting avenues for further research.

CHAPTER 2

Literature review

This chapter provides a review of those areas of academic literature which are relevant to the framing of my research problem. As I noted in the introduction, my approach interprets sustainability as a mode of problem treatment which is responsive to the challenges governments face today, including the increasing complexity of social, economic and ecological development and the increasing complexity of coordinated action among actors toward the collective good.

The first part of this chapter reviews the political science and public policy literature on the conceptual shift from government to governance, with special attention to the field of the natural environment and sustainability. Based on the argument that this shift in practice necessitates learning on behalf of government entities, the second part of the chapter focuses on the literature on learning and knowledge generation in organizations. This is done in an effort to emphasize the organizational rather than the political science perspective of learning, which I will adopt in addressing the research problem. Following the other sensitizing concept of the new governance literature and my thesis, networks, the third section of the chapter surveys how the concept has been applied to policy analysis and what implications it has for organizations and learning.

2.1 SHIFTING INTERPRETATION OF POLICY AND GOVERNMENT

Over the past few decades the perceived role of government and its agencies in delivering policies has gone through several changes, which also shaped the discourse on the public policy aspects of sustainable development. These two streams of thought echo very similar observations about this process and the challenges associated with this change. Both recognize major shifts in the understanding of the relationship between government and society and the dominant desirable intervention modus (Lenschow 1999).

These dominant ideas are often recognized as different prevailing paradigm. For instance, it is often suggested that sustainability or sustainable development requires a transition to a new, qualitatively different "policy regime" (Geels, Elzen, & Green 2004). Similarly, Mazmanian and Kraft (1999)

distinguish a sustainability "epoch" following two earlier paradigms in environmental policy. These paradigms are not merely defining in the repertoire of policy instruments, but also in the way the substance of policy making is conceptualized including problem identification, implementation philosophy and points of intervention (Mazmanian & Kraft 1999). This includes new theories on how societal actors behave and how the government can interfere with social processes to achieve intended outcomes. These policy paradigms, however, never entirely phase out each other, they coexist with varying degree of emphasis on each of them (Geels, Elzen, & Green 2004).

The classic steering or command-and-control paradigm is usually identified as the point of departure. The central underlying assumption of this paradigm is that policy objectives may be successfully achieved by imposing rules and procedures upon societal actors (citizens and businesses). So this policy style is characterized by simple error-correction mechanisms: detecting deviations and correcting them (Dunsire 1990). Hierarchical structures, top-down steering and regulatory policy instruments are the 'weapons of choice'. The prevailing attitude is that government functions should be left to experts, who can most effectively do the job. Neither citizens nor administrators are encouraged to get involved in formulating policy (Callahan 2007).

The second paradigm is closely associated with the idea of markets and is associated with a de-emphasis of the top-down logic and a call for instruments triggering self-regulatory processes via incentives and the market. In line with this logic, market-based instruments are advocated, which foster 'self-regulation through negative feedback' (Dunsire 1990). In this paradigm, new expectations also arose toward the 'running' of the government sector and its internal organization. The internal logic of the government sector is still dominated by centralized resource allocation and hierarchical forms of authority (Stacey 2006), but 'managerialism' advocates the adoption of private sector business models on the assumption that they can be applied in the public sector for greater sectoral efficiency (Palmer & Dunford 2001). Government intervention is advocated under terms of efficiency which involve internal re-organization and decentralization to promote transparency, accountability, flexibility and innovation (Baron 2008; Kemp & Hoogma 1998).

The most recent paradigm identifies several new challenges for the government sector, which also provide the backdrop for the 'crisis of the state' debate (Schön 1973). Mol (2008) argues that "with globalisation and fundamental uncertainties of knowledge and information, ideas of governance are also different." Similarly, Kooiman (1993) points out that as real world problems are becoming more dynamic, complex and set in a diverse society,

policy responses and "government techniques" must be adapted to the changing context. Trends such as internationalization of economic life, increased social complexity and the information revolution are considered to be the major forces which require a new "integrative logic" in policy and public management where traditional solutions do not work (Meadowcroft 1997).

Decision-makers face increased uncertainty and institutional fragmentation. The uncertainty stems from substantive doubt regarding the nature of policy problems and also from the game-like nature of policy making involving strategic actors representing different sectors and various levels of authority (Feiock 2008). Policy failure in this context is generally attributed to the diminishing problem-solving capacities of the government sector (Geels, Elzen, & Green 2004). This loss of potential is relative to the perceived changes in the decision-making context, which is being re-interpreted in more systemic ways leading to observations that it is growing in complexity and therefore posing challenges to traditional policy approaches building on relatively simplified assumptions (Reschenthaler & Thompson 1998).

If the government lacks the capacity—as the argument goes—governing shall largely be about mobilizing and co-ordinating the social and political governing capabilities embodied in the numerous interdependent and interacting organizations outside the government sector. This is represented by moving from thinking in terms of *government* more to *governance*.

Governance is used to convey the array of mechanisms for structuring collective action, whether by government, by business associations or by associations arising from within civil society (Bovens, t' Hart, & Peters 2001; Healey 2007; Rhodes 1997). Chhotray and Stoker (2009) provide the following description:

> Governance is about the rules of collective decision-making in settings where there are a plurality of actors or organisations and where no formal control system can dictate the terms of the relationship between these actors and organisations.

Laws (2006) points out that the interest in this "fluid interorganizational" or ''cross-boundary'' character of policy making dates back to at least to Heclo (1978), and is a persistent concern in the study of public policy.

Discussing urban governance Newman (1996) highlights the growing importance of informal institutions also in the government of cities and concludes that the concept of governance captures this broader perspective. The practical implications are that governments at any level are encouraged to seek interactive solutions. Informational and communicative instruments are emphasized as a way of influencing the behavior of actors and coordinating

action in the policy arena which leads to open and fluid patterns of association between actors in the policy arena (Lenschow 1999). Stroker (1998) illustrates the distinction between government and governance as follows:

> From a systemic point of view the concept of governance is wider than that of government which conventionally refers to the formal institutional structure and location of authoritative decision-making in the modern state. Governance, on the other hand, refers to a looser and wider distribution of both internal and external political and economic power. In this broad sense, governance denotes the structures of political and crucially, economic relationships and rules by which the productive and distributive life of a society is governed. (Stoker 1998)

Governance as a general notion, thus, refers to the reframing of relationships between ideal-types of social order represented by the state, the market, and civil society in realizing governing effects (Gualini 2005). It entails the reconfiguration of institutional capacities and designs, formal changes in law and organizational structure, mobilizations of actors.

2.2 'WICKED' POLICY PROBLEMS

In a more encompassing sense, governance is also associated with a more profound transformation of the frames of reference (problem formulation) and practices (routines) which structure actors' making sense of collective problems (cognition) and their modes of engagement in collective action (Healey 2007). The collective problems faced by decision-makers are often "wicked" or "messy" problems (Ackoff 1974).

Wicked problems are characterized by both a hotly contested knowledge base and ethical support. Parties involved in the problem situation are not in agreement about the nature of the problem. Disagreement arises because of the non-triviality (complexity) of the situation, which gives way to alternative explanations and perceptions by different actors. There is uncertainty as to which disciplines, specializations, experts, and skills to mobilize, there are conflicts over values and diverse opinions involved (Hoppe 2007). This may be partly due to the fact that there may be insufficient scientific knowledge available but another important factor is that actors' value systems support different—often competing—problem frames (Koppenjan & Klijn 2004). Of course, this almost inevitably leads to a disagreement regarding appropriate solutions and 'clear-cut' policy implementation (Owens & Cowell 2002; Weber & Khademian 2008).

Uncertainty also arises as parties are confronted with problem situations in which the effects of their efforts (strategies) to resolve the situation are difficult to foresee. Under such circumstances, preserving traditional patterns of problem-solving may seriously limit decision-makers' capacity to deal with these complex problems at an acceptable level of success.

Standard government responses to such problem situations (or policy issues) may include information collection, such as carrying out or commissioning research or involving experts. Such responses assume that uncertainty can be reduced as it principally stems from the lack of information and knowledge. However research can not resolve the discrepancy between different opinions regarding a problem. In most cases the complexity of the problem situation can not be resolved, but learning to work with the inherent complexity may improve outcomes even in the uncertain decision environment (Koppenjan & Klijn 2004). Laws (2006) phrased this challenge for the case of natural resources in particular as follows:

> In these settings questions about knowledge become centrally questions about the relationship between different ways of knowing, the shadow cast by not knowing, and the organization of the settings in which these questions can be analysed, debated, and provisional decisions and judgements can be reached. A primary response to this is either to make the negotiation of knowledge explicit or to build a "vital social discourse" around the employment of knowledge in policy practice . (Laws & Hajer 2006)

Vatn (2005) argues that policy regime choice needs to consider three dimensions (Figure 2.1). Based on this, policy systems facing complex problems such as challenges posed by sustainability are expected to be more effective using strategies that put an emphasis on the communicative interactions among actors. Complex problems as opposed to simple problems call for an emphasis on strategies in policy making which facilitate learning (generating knowledge) and coordinated action via these interactions between actors (Voss, Bauknecht, & Kemp, Rene 2006). The government sector is still expected to play a central role in driving this learning process, because they facilitate and manage the institutional fragmentation (John & Cole 2000).

Knowledge is to broadly encompasses substantive knowledge (e.g., scientific or technical knowledge on the nature of a problem situation), but just as importantly tacit knowledge (e.g., underlying problem frames, values, rules of interaction etc.). Plural perspectives—which may be encouraged by a collective learning process—help meaningfully address complex problems as opposed to instrumental rationality, which seems to provide efficient responses, but trades off the realism of complexity for efficiency.

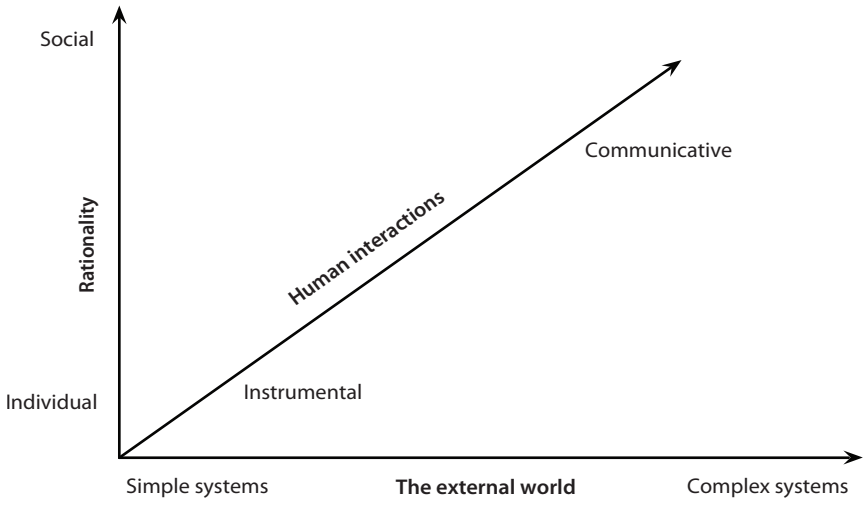

FIGURE 2.1 • The three dimensions of choosing regimes. Source: Vatn (2005).

Similar ideas have appeared in planning thought. Recent conceptions suggest a richer understanding of planning, shifting the attention from system-maintaining to system transforming roles, that is, how planning may trigger the establishment of new practices as opposed to reinforcing or maintaining old ones (Healey 2007). Healey (2003), speaking of urban governance capacity, points out that it is no longer located in the municipal office, but it is distributed and is a challenged by power sources outside the municipal office.

Alexander (2006) notes that the rational planning paradigm—the legacy of the command-and-control welfare state and rooted in positivist science—which dominates the conventional perspective of public planning is being eroded by other paradigms associated with more contemporary images of planning.

> [P]lanners (and others) have to recognize that they are embedded in this intricate web of relationships. They have to construct understandings of the web, recognize that the point of view from which they construct their understandings depends on their locations in the web, and know that their challenge is to persuade others to consider/accept their constructions. But they also have to accept the fact that people tell diverse and often conflicting stories. That means planners must also find ways to set these contestable stories side by side, let them interact with one another, and thereby let them influence judgments about how particular nodes and links in the web should change, are likely to change, and why.

In line with literature on governance, the new planning thought conveys the idea that planning is more than just the application of technical expertise and the individual activity of a single actor, but it involves a community of actors in

an inter-organizational setting (Albrechts & Denayer 2001; Alexander 2006; Balducci & Calvaresi 2005; Newman & Thornley 1996).

Repositioning the government sector in the face of these new challenges as more of a facilitator rather than a sole top-down controller means that directionality and coordination at the systems level is expected to be a result of emergence through self-organization (Dunsire 1990). Public authorities can try to influence this emergent order, but cannot steer it directly, hence the emphasis on interaction and learning processes between actors (Geels, Elzen, & Green 2004; Laws & Hajer 2006). In addition, the governance paradigm is also closely associated with the network concept (Bevir & Rhodes 2007). Networks represent the idea of non-hierarchical, decentralized structures as an alternative to hierarchical steering by the state. For this reason they are seen as the organizational mode that best matches the requirements of modern governance and therefore it can serve as one of its possible "theoretical underpinnings" (Klijn 2007). Newig et al. (Newig, Günther, & Pahl-Wostl 2010) argue that the main reason for the proliferation of the idea of networks stems from their potential integrate and make available different sources of knowledge and competences to foster learning. Networks are also seen as vehicles of the blurring of the boundaries between the governmental and non-governmental sector, policies are created and implemented in networks (Arnouts & Arts 2009).

2.3 NOTIONS OF LEARNING AND GOVERNMENT

Despite contextual differences between private and public sector organizations, the notion of learning has also been relevant in studying public policy and government for some time. It is a recurring theme in theories of the policy process and also in prescriptive writings. As noted earlier, the capacity to learn is considered desirable as it is regarded a source of policy improvement and innovation on the one hand, and also a way of harnessing collective action problems (Swartling, Nilsson, Engström, & Hagberg 2007).

The view of government as the expert in identifying problems and developing solutions and then pulling society to follow adoption has been overshadowed by an ideal of government which has the responsibility of detecting policy innovations and changes taking place in the 'periphery' (non-government actors): identifying new emerging ideas and advancing broader adoption of innovation by induction (Schön 1973). Based on this view, the government functions best as an internal facilitator of this learning process rather than as a controller.

There are several dimensions in the literature in which different types of learning are distinguished. Some of the categories developed by different authors are overlapping conceptually. Applied to the evolution of environmental policy in the Netherlands and the U.S. respectively, Glasbergen (1996) and Fiorino (2001) for instance distinguish *technical*, *conceptual*, and *social learning*. Bennett and Howlett (1992) develop their learning concepts by asking *who* learns, *what* is learned, and *how* learning has an impact on emerging policies. Based on this they identify three forms of learning: government learning, lesson drawing, and social learning. Elaborating on Bennet and Howlett's categories, Connor and Dovers (2004) recognizes lesson drawing as instrumental learning and adds a fourth type of policy relevant learning, also called political learning.

Meadowcroft (1997) notes that learning outcomes may range from policy and organizational change to epistemic shifts. Wolman and Page (2002) also suggest that policy learning can refer to a change in: (a) process-related or institutional design, (b) instruments and tools, (c) ideas and goals. These outcomes map quite nicely over Bennett and Howlett's learning categories and also some of Glasbergen's. The notions of lesson drawing, instrumental and technical learning all refer to a change in the choice of or improvement in policy instruments and tools while policy goals are left unchanged. Meadowcroft (1997) in his discussion of technical learning in environmental policy also adds that it may lead to the identification of new issue areas, the extension of regulatory control, and efforts to improve enforcement. Government learning refers to a change in organizational arrangements and design—usually in the delivery systems—for greater effectiveness or efficiency. It often supports the introduction of a new policy instrument, but can also take place independently. It is officials who learn about processes which leads to organizational change. It can represent a "sophistication of thought", but it tends to remain within the logic of policy approach being implemented (Connor & Dovers 2004).

The process of instrumental or technical learning is considered implicitly by many diffusion studies when they examine how different jurisdictions adopt a particular policy instrument (Freeman 2006). Diffusion refers to the pattern of successive adoption or transfer of a practice, policy, or program. In the sociological tradition of diffusion research, the primarily emphasis is the take-up of information in a network of peers. As opposed to harmonization or imposition, where interest and power are the dominant driving forces, diffusion is driven by knowledge and is a non-obligatory form of implementing policy practices (Jörgens 2004). The underlying idea often is that one peer

(policy actor) communicates knowledge and information about a new practice, procedure, or policy to a peer who may learn, which is manifested in adoption.

Some authors point out that not all policy innovations that diffuse are the result of 'genuine' learning, that is, improved understanding of policy problems. Pressure on organizations to demonstrate that they are acting on collectively valued purposes in collectively valued ways leads them to copy ideas and practices from each other. So diffusion also happens by way of imitation, mimicry, copying, blind obedience or even mass hysteria, while no substantial change takes place in underlying goals and assumptions (Hartley & Benington 2006; Holden 2008). Success, besides many other factors, depends on whether the adopted ideas or practice (tools, procedures) fit into the host organizational and broader social context (2005).

DiMaggio and Powell (1983) studied the pressures and processes that lead to the homogenization of "organizational fields". Similar structural arrangements, cultures, and output in organizational fields, isomorphisms in their terminology, are induced to a large extent by the state and the professions. Isomorphism is a constraining process in the sense that it drives one organization in a population to resemble others facing the same set of conditions. They constrain bottom-up learning processes and the diversity which facilitate innovative policy initiatives. Formal pressures may be created by the existence of a common legal environment, technical requirements, budget cycles, reporting requirements or grant schemes supporting specific policy goals.

2.3.1 Learning as changing problem representation

Some notions of policy relevant learning, such as conceptual and social learning, put emphasis on recasting the policy problematique including the problem itself, the scope of policy and policy goals (Connor & Dovers 2004; Fiorino 2001). In Koppenjan and Klijn's (2004) terms this is called cognitive learning and it implies a refined cognitive representation of causal relationships between social and natural systems and improved insight into how policies can be designed to be efficient and effective. Similarly, Common (2004) argues that "policy learning implies an improved understanding on the part of decision-makers about a particular problem" which is strongly connected to "the ability to draw lessons about policy problems, objectives or interventions."

Meadowcroft (1997) observes that the preoccupation with the conceptual categories in which political argument is conducted implies that ideas and not

just power conflicts matter in determining directions in policy. Sabatier and Jenkins-Smith's (1993) discussion of advocacy coalitions also suggests that while there are many causes of policy change, change triggered by learning does occur via an exchange of views and interpretations of both problems and solutions across coalitions in a policy subsystem. potentially leading to a shift in shared understanding in the long run. Rein and Schön (1996) also prescribe a critical shared reconstruction of "frames" of social problems and advocate system-level learning to find solutions for "intractable policy controversies."

Changing problem representations are attributed, to a large extent, to interaction between policy actors. Holden (2008) interprets social learning as "a public, collective process of innovation, communication and common understanding plus value-based judgement that learning has occurred." Spreading knowledge beyond a particular community is critical for system-wide learning. In terms of policy making for the environment for instance, the values and principles associated with sustainability need to be diffused across sectors and agencies. Holden (2008) also points out that the policy effects of a policy initiative from a social learning standpoint can be determined based on evidence that "growth and coherence of knowledge within a particular community of inquirers has diffused outward to other communities, towards the formation of a new system of policy practice."

Meadowcroft (1997) describes social learning as being about "adaptive adjustment among a network of participants, who together learn to define and redefine problems and to co-design and co-implement solutions." In his seminal book, Heclo (1974) refers to policy making as a form of "collective puzzlement" which entails both deciding and knowing and the interaction between actors in the policy process constitutes a process of 'social learning' which is expressed through policy.

The constructionist perspective treats policy as an emergent phenomenon. Policy does not exist in a finished form that can be diffused, transfered or implemented, but is produced in the act of learning as problem interpretations are being communicated in interaction (Freeman 2006). Hartley (2006) suggests that organizations involved in policy can be understood as being primarily concerned with producing debate, policies and services, all of which are more intangible, interactive and relational. The discursive view of policy making also underscores the role of telling stories, exchanging ideas, theories and thus developing a common sense of the nature and origins of and solutions to problems. It also highlights the role of strategic learning, which represents growing consciousness of the mutual interdependencies of actors and an increased capacity to deal with conflicts of interests in 'policy games' (Koppenjan & Klijn 2004). The need for actors' reflection upon their own

position and role in being part of the collective learning process is crucial. Myers (2005) discussing contemporary planning notes that:

> Even though bounded by space and time, the present place constitutes the strategic site within which residents and elected officials are self-conscious of changes that confront them and which they wish to control. These local actors may be less conscious of how the social networks in which they participate shape development of shared meaning, valued conceptions of the local identity, and the multiple, conflicting place identities that are socially constructed.

The facilitation of reflection calls for a new forms of management which recognize the importance of collective learning by all parties. Emphasis is put on lifting barriers to communication to encourage interaction among all parties involved within formal and informal institutional arrangements (Meadowcroft 1997). Ideally, in the longer run, relations, rules, meanings, languages and trust which facilitate more predictable interactions and cooperation will develop as a result of institutional learning (Koppenjan & Klijn 2004).

The 'collective sense-making' process blurs the boundary between policy formation and implementation. Anderson (1975), cited in Hill and Hupe (2002), contends that '[p]olicy is made as it is being administered and administered as it is being made'. Freeman (2006) notes that little is known about how 'bureaucrats' and 'administrators' think and learn as they are doing their job, although civil servants are believed to contribute to the development of policy as they gather, code, store and interpret policy experience.

2.4 LEARNING IN ORGANIZATIONS

2.4.1 Learning in public sector organizations

The social (collective) nature of changing values, improved understanding of problems, and application of knowledge in policy making (Freeman 2006; Schön 1973), planning (Innes & Booher 1999), or settling collective action problems (Dolšak & Ostrom 2003; Ostrom 1990) has directed attention to a more detailed, micro-level consideration of factors of learning and also how these factors play out in inter-organizational arrangements. Explaining their organization theory view of the public sector, Christensen et al. (2007) argue that:

> An organization theory approach to the public sector assumes that it is impossible to understand the content of public policy and public decision-making without analysing the way political-administrative systems are organized and their modes of operation. The relations between individuals and organizations, as well as between organizations themselves, will be central to our approach. It is the interplay between individual factors and organizational conditions that must be analysed, for we are faced with organizations consisting of people and with people in an organizational context. The internal features of an individual public organization will influence how it identifies problems and how it solves them, which consequences it emphasizes and what evaluation criteria it uses. At the same time, a public organization's mode of operation will be influenced by other formal organizations in the public and private sectors, in civil society and abroad.

The conceptual link between organizational learning and learning in public organizations and government is that both are concerned with the use of information and learning sources from outside the organization (Common 2004). The organizational learning perspective suggests that organizational change is at least a partially purposeful organizational adjustment that depends on the ability of creating and utilizing new knowledge through experience (Alegre & Chiva 2008; Fenwick & McMillan 2005; Gherardi 2006). Knowledge provides the basis of action in a social context, both within and across the boundaries of the organization. Discussing similar pressures in the private and public sector Hartley and Benington (2006) note that:

> Both sectors have to respond to rapid and continuous changes in patterns of need and demand and consumer expectations...there is an increased premium on the discovery, development and use of innovative services, and methods for doing more with less resources. In many cases (as in the private sector too), there is an emphasis on new knowledge and new technologies as the route to innovation and improvement.

Organizations which are capable of learning can better adapt to changes in their operational environment. Learning is therefore seen as the integral part of survival and also closely related to improved performance and innovation (Alegre & Chiva 2008; Argyris 2004; Beyerlein, Beyerlein, & Kennedy 2006; Shani & Docherty 2003), although the positive relationship between learning and performance gains are not always verified in empirical studies (Tsang 1997). In business, learning and knowledge creation are considered crucial in creating opportunities to maintain a firm's competitive advantage. As for the public sector, Fenwick (2005) notes that the public service modernization agenda has also directed attention to how public sector organizations learn, what they learn, and how they fail to learn. Common (2004) and Vatn (2005) argue that the pressure to learn comes from the need to minimize sanctions from a wide range of stakeholders and to gain legitimacy.

Learning in a public policy context is considerably more complex than learning in a single organization (Ebrahim 2008). As opposed to the private sector learning takes place in an openly contested environment with competing and often conflicting interests, which are internalized and not externalized as market competition (Hartley & Benington 2006). Public sector organizations are involved with often diverging interests and perspectives, which are difficult to balance. At the same time this allows flexibility, influence and individual use of judgement (Christensen, Lægreid, Roness, & Røvik 2007).

In addition, causal relations between policy choices and impacts are difficult to determine or predict, partly because of the time lag and the number of variables involved. As a result of multiple different perspectives on the substance of problems, there are also contrasting and contested views about how performance and outcomes should be interpreted (Hartley & Benington 2006). Compared to goals in the market, the goals of a policy program or initiative may be vague or not clearly stated. Performance gaps—deviation from desired levels of performance or goals—are difficult to measure in the public sector compared to private organizations (Freeman 2006; Kim & Lee 2006; Sabatier & Jenkins-Smith 1993). Accordingly, experimentation and learning may be inhibited by the fact that decision-makers will tend to shy away from policies which do not have clearly defined parameters, which do not guarantee final solutions, and which allow failures to be revealed transparently and immediately by their design (Meadowcroft 1997). The assessment of such performance gaps, however, would be crucial as it provides feedback to the organizations involved and enables the adjustment strategies. Argyris (2004) points out that the failure to detect and correct error in policies, practices and behavior has the second-order consequence of inhibiting problem-solving and decision-making, and eventually the third-order consequence of less effective organizational performance.

Despite differences between the two sectors, drawing on the business oriented literature of organizational learning helps emphasizes cognitive aspects of organizational learning. This perspective can be applied in the public sector as well and it essentially connects policy studies and organizational science (Busenberg 2001). At the level of organizations, learning in the public sector can be interpreted as the ability of the organization to demonstrate that it can apply new knowledge to the policy process. It also implies that the organization is capable of developing structures and procedures which improve the problem-solving capacity and lead to improved policy outcomes. (Common 2004; Hartley & Benington 2006).

But actors are not operating in a vacuum. Their learning is not random, but is shaped by individuals, organizations and the relationships between them

(Freeman 2006). Organizational learning processes permeate formal organizational boundaries and therefore the application of knowledge in the policy process is also dependent on other actor's organizational properties, and formal and informal inter-organizational arrangement.

2.4.2 Conceptual aspects of organizational learning

Schulz (2002) describes theories of organizational learning as attempts "to understand the processes that lead to (or prevent) changes in organizational knowledge, as well as the effects of learning and knowledge on behaviors and organizational outcomes." The notion of learning, however, poses several analytical challenges. Un (2004) points out that learning and learning capacity can not be directly observed, it can only be inferred from studying its outcomes.

Learning outcomes are typically conceptionalized as either cognitive or behavioral changes (Knight 2002). Studying these changes empirically poses several challenges to the researcher. On the hand, shifts in the knowledge base and the resulting change in behavior may be distant in terms of time. Furthermore, establishing the linkage between what has been learned and organizational action is problematic, as action is the product of a complex decision-making process and knowledge is just one factor influencing decisions (Tsang 1997). Given the 'ghostly' nature of knowledge, it is always troublesome to empirically derive specific actions and decisions from internal (invisible) representations of organizational actors (Patriotta 2003).

In the cognitive view, organizational knowledge resides in mental structures such as frames, cognitive maps, and interpretative schemes which account for how organizations make sense of their activity and perform in the face of environmental changes. Allen (2003) interprets knowledge as the internal models that people construct to guide appropriate behavioral responses in different situations. Making sense of organizational life also depends on whether decision-makers come to share beliefs, goals and values which underlie mental models (Palmer & Dunford 2001; Stata 1996).

Davenport and Prusak (1998) describe knowledge as "a fluid mix of framed experiences, values, contextual information, and expert insights that provide a framework for evaluating and incorporating new experiences and information." Accordingly, learning can refer to the individual and organizational processes of updating the internal models and relating possible actions, strategies, and policies to their success criteria. For this reason, an important part of learning is critical reflection through refining modes of

perception and the interpretation of what is perceived. Learning takes place if knowledge is enriched, insights are gained and understanding has developed within the organization.

If problem-solving procedures rely on selective searches through a problem space defined by 'old' problem representations only single-loop learning may take place, which implies a simple 'error correction mechanism' (Argyris & Schön 1974; Argyris & Schön 1978; Dooley 1997). As a result of double-loop learning problem representations also evolve. Stacey (Stacey 2001) comments that "double loop learning is a process of bringing into awareness, that is, making explicit, mental models that are below the level of awareness, that is implicit or tacit, and changing them by a conscious act of choice." Hence, Simon et. al. (1992) argue, the primary task for researchers of organizational learning is to understand how new problem representations are acquired for dealing with new problems.

Nissen (2006) refers to learning as knowledge in motion, characterizing the creation or acquisition of new knowledge, and also the movement of knowledge (flows) between coordinates (e.g., people, organizations, places, time). Some of this knowledge is relatively easily recoverable as it is being communicated between people either verbally or via organizational artifacts such as documents.

In their seminal work, Nonaka and Takeuchi (1995) drawing on Polanyi's (1967) notion of tacit knowing, make a conceptual distinction between explicit and tacit knowledge to account for a fundamental difference in ways of knowing within organizations. Explicit knowledge is acquired primarily through formal processes, and tacit knowledge is acquired primarily or even exclusively through informal processes (Wallace 2007).

Nonaka *et al.* (Nonaka, Toyama, & Hirata 2008) suggest that knowledge creation in an organization is essentially built on an interplay between tacit and explicit knowledge and individual and collective organizational dimensions. In their knowledge-based view of the organization, they contend that knowledge is created by individuals, although the conversion process is a social process between individuals and not confined within the individual (see Figure 2.2). Knowledge is organizationally expanded and amplified through four modes of knowledge conversion and crystallized at higher ontological levels (group, organization, and inter-organization) (Patriotta 2003).

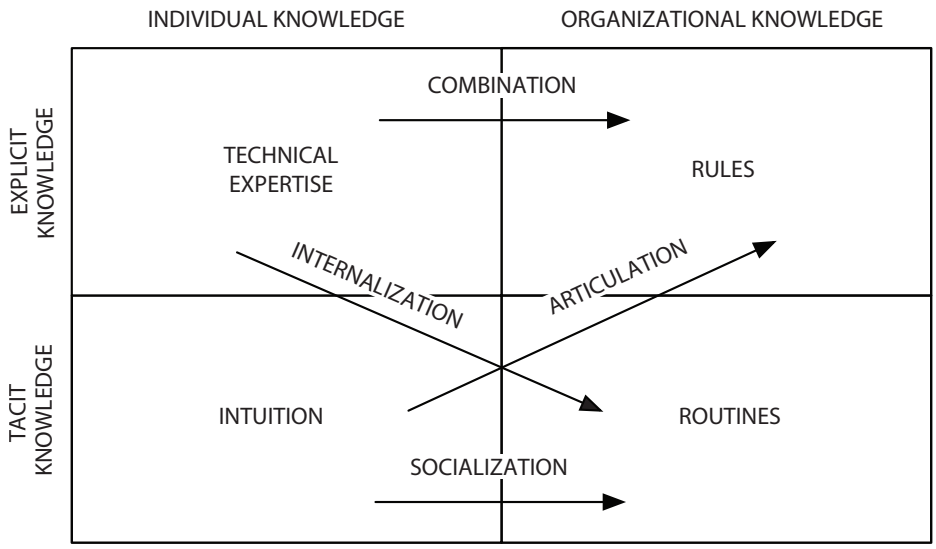

FIGURE 2.2 • Knowledge processes in organizations. Source: Holmqvist (1999).

While explicit knowledge can be codified, shared and transferred between users, tacit knowledge requires interaction between members of an organization (Chan & Liebowitz 2006; Kozlowski, Chao, & Jensen 2009). Nonaka and Takeuchi (1995) propose that a combination of formal and non-hierarchical or self-organizing organizational structures serves to improve knowledge creation and sharing.

The behavioral view suggests that learning should be understood as (and inferred from) changes in the behavior of the organization (Cyert & March 1963; Greve 2003). At the same time, some authors propose to think of learning as implying an expansion of the range of potential behavior and not necessarily actual behavior (Fenwick & McMillan 2005). The intuition behind this is that better knowledge improves decision-making capacities and the organization does take advantage of this this in practice.

Holmqvist (Holmqvist 1999) describes organizations to be learning when their knowledge in the form of rules and standard operating procedures are changed. This definition suggests that knowledge and action are closely intertwined and ideally both cognitive and behavioral changes take place in the organization. This is what Knight (2002) labels as "integrative learning." Nonaka and Takeuchi (1995) contend that knowledge is always (1) a function of a particular perspective, intention, or stance taken by individuals (beliefs and commitment), (2) it is always about an end (action), (3) it is context specific and relational, and therefore it is about meaning. Levitt and March's (1988) suggest that lessons of experience are maintained and accumulated within organizational routines, which become reinforced or altered as feedback

becomes available from action outcomes. Routines include forms, rules, procedures, conventions, strategies, and technologies around which organization are constructed. It also includes beliefs, frameworks, paradigms, codes, cultures, and knowledge which interact with the formal routines, sometimes reinforcing, sometimes contradicting them. In this view, organizational routines function as the primary carriers of organizational knowledge (Baum & Rowley 2002).

March (1991) distinguishes between incremental learning (exploitation) and fast learning (exploration). Exploitation refers to the reinforcement of successful procedures relying on feedback in regard to performance gains. This incremental learning based on experience tends to lead to stability extinguishing experimentation with potentially superior procedures. The reason is that exploitation has higher certainty, speed, proximity, and clarity of feedback, making it more attractive to decision makers than the slow, imprecise, and uncertain feedback from exploration (Schulz 2002). Nooteboom and Went (2008) highlight the interpretive dimension of exploration. Similarly, Lester and Piore (2004) see the difference between exploitation and exploration in that the former is aimed at solving problems, whereas the latter is essentially about discovering new meanings.

2.4.3 Levels of learning

The majority of literature on organizational learning treats the individual and the collective such as the group, the organization, or a population of organizations as two distinct phenomenal levels requiring different explanations of knowledge creation and learning. These two levels are usually understood to be connected by the interaction of individuals to create the collective, which then constitutes the context (by way of routines, cultures, norms) for individual learning and the interactions taking place between them (Holmqvist 1999; Stacey 2000; Stacey 2001). This circular interaction between the two levels is considered to be important to the possibility of learning and knowledge creation. Simon (1991) states that learning takes place in individuals, but this (human) learning is influenced by the organizational context and has consequences for the organization. However, at the same time he points to the emergent nature of organizational learning by highlighting that individual learning produces phenomena at the organizational level that can not be inferred by observing learning processes in isolated individuals. Skeptics, however, question whether it is possible to claim that an organization as a 'whole' learns. In their seminal work, Argyris and Schön (1974) note that it

is not clear what it means for an organization to learn and it is not clear either whether this capacity can be enhanced. On the other hand, Tsang (1997) argues that organizational learning is a metaphor which does not necessary imply the transfer of all defining characteristics of the original object in the source domain (individual learning) to the target domain.

Based on reviewing the literature on organizational learning, Knight (2002) concludes that learning can in fact meaningfully be applied at different levels of organization, provided that we accept that certain constructs associated with learning are not identical across the levels (e.g., memory). She goes on to argue that "the key characteristic of organizational learning that differentiates it from individual learning is not that it is homogeneous or undifferentiated across the organization, but that learning results in changes to organizational properties."

The concept of organizational learning is used to encompass several 'system' levels above the individual including the group, the organization (as a legal entity), and a collection of organizations. Knight and Pye (2005) distinguish interorganizational and network learning. Interorganizational learning is defined as learning by an organization in a network context, that is learning leading to changes to organizational-level properties. Network learning processes would result in changes to network-level properties: patterns such as interaction processes, structures and shared narratives among organizations.

2.4.4 The social nature of learning and knowledge

The social perspective on learning emphasizes that learning occurs by participating in the social world (Hrastinski 2009). Social constructivism places the experience with social actors in the centre who, through interaction commonly mediated through language, enact their reality (Hernes 2008). Stacey (Stacey 2000) emphasizes a communicative perspective and argues that "knowledge is always a process of responsive relating, which cannot be located simply in an individual head, then to be extracted and shared as an organizational asset." In his view, knowledge is the act of conversing and new knowledge is created when ways of talking, and therefore patterns of relationship, change. Hence, he suggests that organizational learning and knowledge creation are the same as change in communicative interaction and therefore conversation is a crucial factor of knowledge creation. Knowledge is not only shared but also generated in social interactions through the constant conversations and practices on which its (re)production depends (Argote & Ingram 2000; Garcia-Lorenzo, Mitleton-Kelly, & Galliers 2003). Through

dialogue conflicting interpretations and action possibilities are negotiated among the members of a collective (Garcia-Lorenzo, Mitleton-Kelly, & Galliers 2003). These interactions become meaningful if they rely on some form of common knowledge, which can be seen as 'rules' of 'how to act', largely remaining in the tacit, inarticulated domain (Holmqvist 1999). These implicit organizational knowledge structures provide coherence in the self-organizing system of informal interactions. Tsoukas and Mylonopoulos (2004), citing Focault, argue that knowledge is the outcome of social practices that have come to be established and through which the world is represented to those who are involved in those social practices.

While some forms of organizational knowledge can be conceptualized as socially constructed and collectively "held", knowledge is also often portrayed as being patterned in its distribution across constituents of the organization. Organizations can be thought of as distributed knowledge systems, which means that they are composed of knowledge embodied in entities (e.g., individuals) (2004). This view suggests that the creation of knowledge in such a distributed knowledge system depends on the interactions among the individuals situated in various parts of the system. The role of interactions is at least two fold. First, they enable knowledge to emerge as discussed above. Second, interactions integrate locally held knowledge into a larger knowledge system (such as an organization). Holmqvist (1999) dubs organizations "enduring alliances between independently knowledge-creating entities." As 'knowledge ties' connecting individuals or groups often cross formal organizational boundaries, studying organizational knowledge processes also implies that the analysis needs to rely more on a 'fuzzy' notion of organization where boundaries are permeable and are defined by the patterns of the interactions themselves.

Gherardi (Gherardi 2006) contends that knowledge is also a 'cultural' competence, which influences the style and manner in which meaning and value are attributed to events and to determine the use to which the resources, technologies, artifacts and knowledge of a group or organization are put. Knowledge becomes a bond among members of a community, connecting actors and therefore it is reasonable to be treated as a collective phenomenon, which both patterns social interactions and at the same time is patterned by them.

2.5 NETWORKS IN GOVERNANCE AND POLICY

The role of policy actors and their interactions, the fluid cross-boundary character of policy making and practice are a major concern in the study of contemporary public policy (Laws & Hajer 2006). This has led to a 'network ethos' in which network organizing is seen as a good way of both conducting business and public affairs (Knight & Pye 2006). This interest towards networks in policy and public administration has not developed in isolation, it has been inspired by research on networks in economics, sociology, and business. In these streams of research, network is a conceptual device that is used to capture the horizontal linkages that tie together actors and it expresses the idea that all social action and outcomes are affected by actors' relations and the structure of the overall network of relations (Laws & Hajer 2006; Scarborough & Somers 2006). These relations may include the exchange of resources (including information, advice, or personnel etc.) and also non-resource type exchanges such as trust (Walker, O'Toole, & Meier 2007).

Knight and Pye (2006) observe that the concept of network has taken up several meanings. It can refer to a logic of organizing, an entity in the organizational domain, or an analytic perspective. Network as a logic of organizing is recognized as an alternative to markets and hierarchies, lying somewhere between bureaucracy and market, enabling flexibility, yet fostering cooperative behavior among agents in turbulent environments (Castells 2004). The second meaning of network—as applied to a collection of organizations—suggests that interconnected agents can be seen as a single new entity above the level of organizations. This perspective can provide insight about the way constituent organizations function together as a unit, that is the network (2006).

As an analytical lens, network emphasizes the recursive influences between actors and their context and address both structure and agency. Borgatti and Foster (2003) write of networks as a new paradigm that help analyze established subjects in new ways that balance traditionally 'under-socialized' economic perspectives (focusing on individual agents) and 'over-socialized' sociological perspectives, which emphasizing aggregate outcomes and social structures (Granovetter 1992). Not all network scholar's use the term network *per se.* Many discuss partnerships, alliances, coalitions, or more generally interorganizational relationships (Provan, Fish, & Sydow 2007).

The network concept in studying public policy and public management helps to illuminate government links with, and dependence on other state and societal actors (Maloney, Smith, & Stoker 2000; Rhodes 2006). Bressers (1998) defines a policy network as "a social system in which actors develop

comparatively durable patterns of interaction and communication aimed at policy problems or policy programs." Policy networks are therefore considered an essential ingredient of governance because they connect together fragmented political institutions and provide coordination in complex decision-making environments (Chhotray & Stoker 2009; John & Cole 2000; Klijn 2007). In addition to a stronger emphasis on the complexity of the interactions and interdependencies between actors, the network perspective also directs more attention to the difference in perceptions, institutional context, and organizational arrangements such as coordination and management strategies applied in the networked polity (Klijn 2007).

The emergence of the policy network concept is claimed, on the one hand, to signal the weakening position of the state, and on the other hand an increased responsiveness to the heightened complexity of governing and the growing consensus needs in modern societies (Knight & Pye 2006; Parker 2007). Within a wide-ranging policy network literature, Rhodes (2006) distinguishes three different ways the term policy network is used in the literature: as a descriptive category, a theory of government policy making and also a prescriptive narrative for reforming public management with a "strong managerial flavor" (Klijn 2007).

Policy network studies have covered different parts of policy action (Bressers & O'Toole 1998). The application of the network concept to policy formulation goes back at least to the mid 1970s. Classical studies have been primarily concerned with interest mediation, that is, how different actors can influence policy formation by exercising power via their relationships (Klijn 2007). The two most often cited network ideal types recognized in the literature have been policy community (Richardson & Jordan 1979) and issue network (Heclo 1978). Policy communities are configurations involving close relationships, whereas issue networks are connected by loose relationships (Marsh & Rhodes 1992). Policy communities are characterized by high-quality interaction between community members, consistency in values, and broad policy preferences being shared by all participants. Issue networks, on the other hands, have many participants, fluctuating membership and interaction.

Studies have also focused on policy implementation or (local) service delivery. Instead of power as the main variable, most of these studies look at how actors including government agencies, businesses and the voluntary sector cooperate and how this translates to different levels of performance in complex policy programs and projects. This interest largely stems from the fact that performance is considered the "hallmark of new public management" (Agranoff 2007). The primary questions lying at the heart of this stream of literature is how to organize policy implementation and service delivery with a

fragmented set of organizations and whether collaborative efforts add value to the public undertaking (Klijn 2007). These studies assume that the character of a policy network determines the practice of policy (Bressers & O'Toole 1998; John & Cole 2000). This means that outcomes should be explainable by studying the structural properties and behavior of networks. Local service delivery networks have received considerable attention ranging from health systems (Greenaway, Salter, & Hart 2007; Provan & Milward 1995), emergency management networks (Choi & Kim 2007; Kapucu 2005), e-government initiatives (Cotterill & King 2007), to local economic development strategies (Crowe 2007). Describing these policy networks is often implemented by applying an interorganizational perspective in the analysis of interactions among actors. In doing so, authors draw more extensively on theories of public administration and organizational science rather than pure political science (Klijn 2007).

Rhodes (2006) notes critically that inter-organizational studies often lack explanatory power and merely describe network structures and characteristics. Another recognized shortcoming of many inter-organizational analyses is that issues of network-level outcomes are largely ignored by research as it primarily focuses on organizational outcomes such as increased organizational efficiency (Provan & Milward 1995), and therefore explanations are not substantially different from non-network accounts (Klijn 2007). Dowding's (Dowding 1995) critique, cited by John and Cole (2000), argue that network models fail as they tend to use characteristics of components within networks as explanatory variables rather than network characteristics per se. They go on by saying that researchers conceive the network as an independent variable although it is really what needs to be explained. Marsh and Smith (2000), however, propose in their dialectical model a two-way relationship: not only do networks affect policy outcomes but policy outcomes feed back and affect networks. This suggests that network characteristics can be used both as explanatory and dependent variables following the demands of the research question posed.

When policy network is used in the sense of a theory, it aims to give an explanation for the network forming behavior of actors and also how it leads to changes in policy. Rhodes (2006) suggests that there are two broad schools. The power dependence approach interprets relationships as "games" through which actors maneuver seeking advantage (influencing outcome) by deploying their constitutional-legal, financial, political, or informational resources. Via interactions actors negotiate the rules of the game which in turn regulate further cooperation between actors. The rational choice school combines rational choice and the new institutionalism. Networks are seen as the institutional setting in which actors representing different sectors and fields

interact based on trust and reciprocity. Whereas the power dependence school emphasizes a deductive positivistic approach relying on quantitative methods, the institutionalist approach favors an inductive-interpretive stance largely using qualitative methods (Rhodes 2006).

Provan and Milward (1995), in addition to resource dependence, recognize transaction cost economics as an important theoretical backdrop for policy networks. These two perspectives both find reduced transactions costs (efficiency), control over resources and power to be the basic rationale for engaging in cooperative, interorganizational integration of activities. Policy actors can improve their individual policy outcomes by collaborating on policies, programs, and projects. Collaboration can help mitigate the negative externalities stemming from the interdependent formal authority structure, as well as secure benefits of positive externalities (e.g., cost saving, information sharing, expertise) (Feiock 2008; Scholz, Berardo, & Kile 2008).

In their general review of inter-organizational network literature, Barringer and Harrison (2000) place theories of inter-organizational relationships on a conceptual continuum which spreads from a reliance on an economic rationale to a reliance on a behavioral rationale. Transaction costs economics and resource dependence represent economic explanations for interorganizational relationship formation, while institutional theory falls on the behavioral end of the continuum. Organizational learning as a theoretical framework was positioned closer to the behavioral end of the spectrum, noting that while largely a behavioral discipline, it has economic undertones stemming from the ability of an organization to use acquired knowledge to reduce costs or in other ways enhance revenues and profitability.

2.5.1 Networks in good governance

Network is often used in policy literature as a way of describing governance via sharing power between public and private actors (Rhodes 2006). This theme is particularly strong in writing on public administration in Europe (Greenaway, Salter, & Hart 2007). This stream focuses on the question of how the multiplicity of interdependent actors can be coordinated and what sort of management strategies are desirable. This view challenges conventional public policy and administration which strongly relies on political decision making. The ‘good’ governance narrative emphasizes the role of dialogue with societal actors and also advocates participatory decision making practices (Evans, Joas, Sundback, & Theobald 2005). In this transformation from an authoritative to a negotiating society characterized by value pluralism and horizontal relations,

managers (in public and private organizations) need to develop new skills to navigate in the networked polity (Koppenjan & Klijn 2004). These skills are related to being able to frame problems in a new way which captures the complexities of decision-making, on the other hand, they need to be able to coordinate action by effectively nurturing relationships with actors they are dependent on. A substantial part of this literature is prescriptive and it has permeated the environmental policy and natural resource management literature.

2.5.2 A network perspective on organizations

Baum and Rowley (2002) argue that "[b]uilding on the basic insight that much of organizational behavior takes place within dense networks of ties among organizations and their members, research has made great headway, particularly over the last decade, in explaining how the structural and informational properties of networks and network positions can predict organizational behavior.

Borgatti and Foster (2003) in their review of the organizational network literature cross-classify empirical studies based on their explanatory goals and explanatory mechanisms. In terms of goals, they distinguish two streams of organizational network research. One seeks to explain variation of performance as a function of social ties, the other (diffusion or social influence studies) seek to explain homogeneity in actor attitudes, beliefs and practices, also as a function of social ties. As for explanatory mechanisms, they also identify two major groups. The structuralist approach tries to relate the behavior or performance of a node (actor) in the network to its position within the network, whereas the connectionist view emphasizes the role of relational ties between nodes, through which information or influence "flows".

Popular diffusion or contagion studies for instance seek to explore how interaction between networked social actors leads to similar (shared) attitudes, culture, or practice. Convergence studies on the other hand seek to explain common attitudes and practices in terms of similar network environments. No direct ties are necessary as the mechanism generating similarity between two entities is driven by sharing similar environments or the recognition of being appropriate role models for each other (Borgatti & Foster 2003).

The majority of network studies typically focus on how individual nodes (individuals or collective actors) benefit or change as a result of the network environment (Provan & Milward 1995). In the case of some research problems, however, network-level outcomes are also relevant as a complimentary view in

addition to what takes place at the level of individual nodes. In this vein, Galaskiewicz (1994) distinguishes between a micro-level and a macro-level network view. The adoption of the latter, the 'whole network' perspective, can also be relevant in the public sector (Kenis, Provan, & Kruyen 2009; Provan, Fish, & Sydow 2007). Actors in a policy arena or municipal departments in a city can be conceptualized to contribute to collective (network level) outcomes. For such research subjects, the focus is on dependent variables which capture network level outcomes.

Research on empirical networks is by and large motivated by the question of whether certain network structures are more effective than others. In public policy, evaluating network effectiveness is critical for understanding whether the network form of organizing is a preferable in delivering services or implementing policy in general (Provan & Milward 1995; Provan & Milward 2001). Network structure is often hypothesized to have an impact on performance as it determines who has access to what resources or information. What are there features of networks that facilitate or hinder the adoption of certain practices and which structural properties are critical for overall network effectiveness? The relationship between network configuration and network performance is not evident. Depending on what the function of the network is, which relations are taken into account, what the measures of performance are, what the time-scale for assessing performance is, different network configurations may be more effective.

Densely clustered networks can foster shared interests, norms, and beliefs which in turn can support cooperative activity within clusters (John & Cole 2000). It is hypothesized that densely connected actors are seen more credible by alters and thus, all other things kept equal, will demonstrate more active collaboration with other actors as compared with less densely connected ones (Putnam, Leonardi, & Nanetti 1993; Scholz, Berardo, & Kile 2008). It may, however, lead to homophily. Homophily refers to the tendency of social actors (people or organizations) to interact with actors similar to them and exclude others, which increases the danger of closedness and group-think (Klijn 2007). On the one hand, strong ties facilitate the transmission of tacit knowledge, simplifies coordination and avoids potential conflicts, but at the same—by limiting communication with dissimilar actors—prevents benefitting from the diversity of information or other resources held by dissimilar actors (Borgatti & Foster 2003; White 2008).

In practice, maintaining diverse relationships with partners puts great demand on actors in terms of resources and efforts (time, staff, skills etc.) (Klijn 2007). Actors, therefore, will tend to prioritize their relationships and manage their interaction patterns accordingly. The importance of indirect ties

("strength of weak ties") was highlighted by Granovetter (1973) suggesting their importance in community organization integrating cohesive sub-groups. Similarly, the "bonding" and "bridging" social capital captures the distinction between 'tightly woven' or 'loosely connected' network configurations (Putnam 2000), and they were for instance found to be associated with different economic development strategies (Crowe 2007).

Beckman and Haunschild (2002) reach similar conclusions in their study of corporate acquisitions. They found that very close and long-term relationships are likely to result in network homogeneity and the reduction of the diversity of experiences in the network. However, empirical studies of knowledge networks often find that even diverse communities may become more homogenous in their membership over time, and less likely to embrace changes.

Empirical results indicate that information diversity has demonstrable positive influence on the dynamics of network learning at the population level, regardless of whether actors have access to 'bad' or 'good' examples through their ties. Innovation is facilitated by sparser and clumpier networks, where innovator-type actors are not "swamped by the prevailing wisdom" (Borgatti 2008). Also, policy entrepreneurs or change agents are often marginal in the formal administration and the community they work in (Heclo 1978). In the policy network literature, special network positions have been recognized to have crucial roles in the functioning of the network. Brokers and boundary spanners for instance are centrally located actors who bridge otherwise unconnected organizational clusters and thus increase the heterogeneity of information available within the network.

Some other results, however, illustrate that centralization may have a positive impact on system performance in the case of interorganizational networks. While density indicates overall network cohesion, centralization describes how much cohesion is centered around a particular actor. Choi and Brower's (2006) study on local emergency management concludes that a network with a central actor that exhibits clear leadership is most desirable for effective response. A clear perception of communication patterns on behalf of network participants—collective cognitive accuracy—is also decisive (Choi & Kim 2007). Similarly, Provan and Milward (1995) find that network centralization facilitates both integration and coordination and positively affect effectiveness in service delivery in community health systems.

Centralized networks are believed to be more appropriate for coordinating relatively simple problems characterized by little uncertainty and goal ambiguity, whereas decentralized networks for complex ones. Speaking in terms of time scales, centralized networks may be productive for short-term

tasks under relatively static circumstances, wheres in the long-run—almost certainly implying changes in critical conditions—decentralized configurations may be more favorable. When it is not action that is coordinated through a network, but less tangible social activities such as collective problem-solving, knowledge generation, or learning, centralization may be differently related to system performance. Scholz et. al. (2008) speculate that stable policy arenas, particularly those dealing with policy implementation, are more in favor for dense networks, whereas in unstructured arenas degree and centrality may be more important. Walker et. al. (2007) point out that the majority of the literature focuses on exploring structural aspects of networked organizations in delivering public services, while neglecting the behavioral dimension of interactions between networked actors. Moreover, the emphasis on structural investigations has also led prior research to downplay the importance of differences between organizational attributes.

2.5.3 The implications of networks for organizing

The concept of network implies taking a bottom-up perspective in research focusing on the effects of voluntary associational activity on the attitudes and norms within social, political and economic institutions (Maloney, Smith, & Stoker 2000). There are several features associated with the concept of network which make it particularly appealing and useful as a master concept in studying policy problems. The next section highlights the ones which closely correspond to the conceptual perspective adopted by this research project.

Informal relations and lateral coordination

The first important feature of the network concept is that it puts informal relations among actors more into focus (Kilduff & Krackhardt 2008; Lusthaus, Adrien, Anderson, Carden, & Montalván 2002). Network can refer to informal ties among individuals, groups, organizations that work across functions and maneuver through bureaucracy (Shani & Docherty 2003). A structured interaction (network) view of policy recognizes that the process of policy-making and delivery involves actors who do not have a formal or officially recognized role in the process (Kay 2006).

According to the network view, the emphasis is not on formal structures of organizing, but on the processes of negotiation and influence, the patterns of the relating activities of different bodies to one another (Stacey & Griffin 2008). The question of interest is how these interactions serve to stabilize practice and

expectations across organizations and to deal with "challenge, contest and uncertainty" (Kay 2006). In multi-organizational systems, informal channels of communication provide coordination among functionally interdependent, but formally disjunct organizations (Chisholm 1992). This focus on informal relations becomes especially important if one wishes to understand the role of knowledge in policy processes (Rydin 2006). Informal interactions in networks offer a highly feasible means of utilizing and enhancing such intangible assets as tacit knowledge and innovation (Powell 1990). Knowledge processes represent a form of exchange among actors which is more social and less guided by a formal structure of authority.

Informal communication and cooperation is much dependent on other informal ways of relating such as trust, shared norms and perceived mutual interests—often wrapped up under the term "social capital" (Putnam, Leonardi, & Nanetti 1993). The role of social capital has been studied in numerous public problem-solving settings and it is argued that the existence of social capital contributes to effectiveness in achieving collective objectives, and therefore maintaining social capital is an important implementation tool (Rydin & Pennington 2000).

The New Institutional literature underlines the importance of institutions, which—being in part informal social and cultural rules of behavior—provide "the fundamental infrastructure of coordinated social action" by shaping interactions (Connor & Dovers 2004). Sørensen and Torfing (2007) elaborate the idea as follows:

> The institutionalized framework consists of more or less sedimented rules, norms, cognitive paradigms, and social imaginaries that are constructed in and through negotiated interaction. The fact that governance networks are stabilized by the contingent and tentative formation of rules, norms, etc. does not turn governance networks into organizations in the sense of relatively formal and unified institutional actors. (Sørensen & Torfing 2007)

The coherence introduced by institutions-as-rules allow members of a network to solve collective action problems more easily with less fear of failure and free riding (Ostrom 1990). Rydin (2006) argues that institutionalism is particularly useful for studying "situations of governance, where policy implementation and formulation involves a wide range of actors." She goes on by pointing out that the emphasis on the informal in addition to the formal is important because it sheds light on "how actors within organizational networks learn how to operate within those networks."

Tichy et al. (1979) argue that informal relations play a crucial role when complex or highly variable tasks are to be accomplished by an organizations.

Such “organic” organizing is most effective in handling tasks which cannot be preprogrammed or planned. Scholz et. al. (2008) consider informal relationships as a “resource” in approaching collective action problems and they hypothesize that policy networks provide self-organizing solutions to collective action problems characterized by fragmented formal authority.

Walker et al. (2007) identify governance systems as self-organizing interorganizational networks of interdependent organizations that are connected through continuing interactions. In the absence of central design, order is created from the bottom-up as a result of autonomous and spontaneous relations between agents in the network (Lewis 2009). Self-organization is expressed in orderly patterns of behavior such as communication, advice networks or knowledge sharing among organizations (Roy, Nair, & Venema 2009; Smith 1997). They help create "shared heuristics" in collective action situations (Innes & Booher 2004). Interactions can be regarded as complex responsive processes (Stacey & Griffin 2008), crossing boundaries of organizations, networks, and coalitions (Koppenjan & Klijn 2004). A practical interpretation of self-organization is related to the open-ended nature of membership in networks. Kapucu (2005) for instance defines a network as “a group of individuals or organizations who, on a voluntary basis, exchange information and undertake joint activities and who organize themselves in such a way that their individual autonomy remains intact.” Powell (1990) argues that this ‘‘open-ended quality of networks is most useful when resources are variable and the environment is uncertain.’’

Connecting to resources

In industries, where no single organization has the skills or knowledge to “stay on top of all areas of progress”, there is growing need to pool resources (Child, Faulkner, & Tallman 2005; Powell & Grodal 2005). Similar arguments can be made in regard to governance. In the public sector, there is a growing number of networks of actors who, operating interdependently, co-produce public programs and services (Walker, O'Toole, & Meier 2007). Mutual dependencies emerge because actors do not posses all the recourses themselves that are necessary for the achievement of their goals (Klijn 2007). Public and private sector resources may blend in a variety of ways, which permits the mutual leveraging of resources and the combination of public and private attributes in ways that might not be possible in more traditional structural arrangements. The interrelationships between the two sectors provide public sector managers with more exposure to private sector practices, but also the opportunity to

expand their professional networks into the private sector (Palmer & Dunford 2001).

Access to information and a context for learning

One of the main reasons why networks are regarded as a more effective means of governance, as opposed to purely hierarchical or market-based governance, is its potential to foster learning both on an individual and on a collective level (Newig, Günther, & Pahl-Wostl 2010). Learning by a unit or a whole organization is rarely entirely internal and direct. Through the interaction and communication, knowledge and information can be transmitted among the actors, which is a prerequisite of the learning of actor groups. Actors get connected through the diffusion of their experience and the effects of their actions on each other (Knight & Pye 2005; Provan, Fish, & Sydow 2007). Networks, within and between bureaucratic hierarchies, can operate both horizontally and vertically, enriching communication and diffusing the thinking capacity of the organization, but participants tend to work by "mutual adjustment" rather than command (Low 2005). Networks also reduce asymmetries of information (Kapucu 2005).

Organizations with broader networks can access a wide stock of knowledge and are exposed to more experiences, diverse perspectives and opportunities, which fosters learning (Powell & Grodal 2005). For public policy, John and Cole (2000) argue that networks facilitate learning and cooperation by developing habits of association and shared norms and understandings about public affairs. Different organizations including local authorities, non-governmental and private sector organizations jointly learn about the nature of the problem situation, the opportunities for action, and the context within which problem solving develops (1993; Koppenjan & Klijn 2004; Sabatier & Jenkins-Smith 1993). These interactions are particularly important in addressing very complex problem situations, in which most individuals or organizations are knowledgeable about only a small portion of the entire picture (Weible & Sabatier 2005). Along this line of thought, Creech and Willard (2001) emphasize the increasing importance of meta-knowledge organizations need to develop in order to effectively contribute to and benefit from participating in knowledge networks. They point out that "there is a need to be more strategic in the choice of partners and in the management of the way they work together to keep the network focused on [...] its messages to decision-makers."

Experimentation for a community of organizations is also more feasible than for a single experimenting organization, which may not benefit directly, but its experience is used by other organizations and the system may benefit as a whole. Hartley and Benington (2006) recognize further benefits of learning within a population of actors:

> [S]ocial interactions between organizations and individuals which occur for the purpose of knowledge sharing may act as catalysts for accelerating existing plans for change, either by mobilizing and reinforcing the required political and managerial commitment, or because knowledge sharing generates enthusiasm and confidence through comparison with other practitioners in similar situations.

A network perspective in studying public policy and public management draws on and integrates insights of theories of organizational theories of learning (Klijn 2007), which emphasize cognitive aspects of strategic interactions in policy contexts and problem solving. Koppenjan (2004) also highlights the knowledge aspects as the essence of the 'policy network perspective':

> To achieve mutually satisfactory outcomes, actors must cooperate. After all, problem solving and decision making occur in the tension between dependency and a variety of objectives and interests. Given the substantive, strategic and institutional uncertainties at stake in dealing with wicked problems, these cooperation processes can be regarded as learning processes. Interaction processes are considered to be searches wherein public and private parties from different organizations, (levels of) government and networks jointly learn about the nature of the problem, look at the possibility of doing something about it, and identify the characteristics of the strategic and institutional context within which the problem solving develops. (Koppenjan & Klijn 2004)

Koppenjan and Klijn (Koppenjan & Klijn 2004) argue that networks can be distinguished from each other in terms of the degree to which actors more or less share certain perceptions. The element of cognitive changes also appear in other theories: e.g., emphasizing the phenomenon of shared perceptions and converging perceptions (Termeer & Koppenjan 1997), of policy belief systems (Sabatier 1988), and of 'reframing of frames' (Rein & Schön 1986).

CHAPTER 3

Theoretical framework

After reviewing the literature on the key themes and issues identified as the relevant context for my research problem, this chapter elaborates a conceptual model for studying the research questions empirically. In doing so, I follow what Black (1999) calls the 'logical approach' to instrumentation. This is a process in which the rather abstract concepts of a theory are translated into constructs, then constructs are further broken down into observed variables.

The theoretical framework describes the constructs that are used in this study and also outlines the hypothesized relationships between them. Constructs aim at grasping dimensions of typically complex concepts (Antonius 2003). They are unobserved and theoretical, therefore they are not directly measurable (Harrington 2009), and they can only be inferred from measured manifest variables. Therefore, the theoretical framework also guides research by determining how the constructs are operationalized in empirical terms ready for data collection (Payne & Payne 2004), and hence statistical relationships one will look for between constructs and their observed counterparts.

This chapter proceeds by first presenting in detail the constructs used in the study. It highlights their significance in the model and how they are expected to be related to each other. Based on these stylized relationships, testable hypotheses are formulated, the validity of which will be investigated via quantitative methods.

An overview of the theoretical framework

The focus of this study is municipal departments' sustainability-oriented learning in their respective organizational contexts (the municipal administration). The learning process is assumed to be influenced by organizational factors including organizational structure and organizational culture. These factors create the milieu in which people in local authorities interact with each other and people or groups outside the municipal administration. These organizational factors may foster or hinder effective information exchange and knowledge sharing between different departments

and bodies of the municipality and also between municipal departments and other social actors. Interaction (social network) patterns of local authorities, in turn, are expected to be related to the outcomes of learning that takes place within the local authorities. Information exchange and knowledge development can also be catalyzed by knowledge management practices. Ideally organizational culture and knowledge management practices reinforce each other's effects and contribute to improved learning outcomes. However, they may also weaken each other's application and act as substitutes (Michailova & Foss 2009). Given their potential impact, organizational structure, organizational culture and knowledge management practices are included as important aspects of the theoretical framework. The graphic representation of the theoretical framework is presented in Figure 3.3.

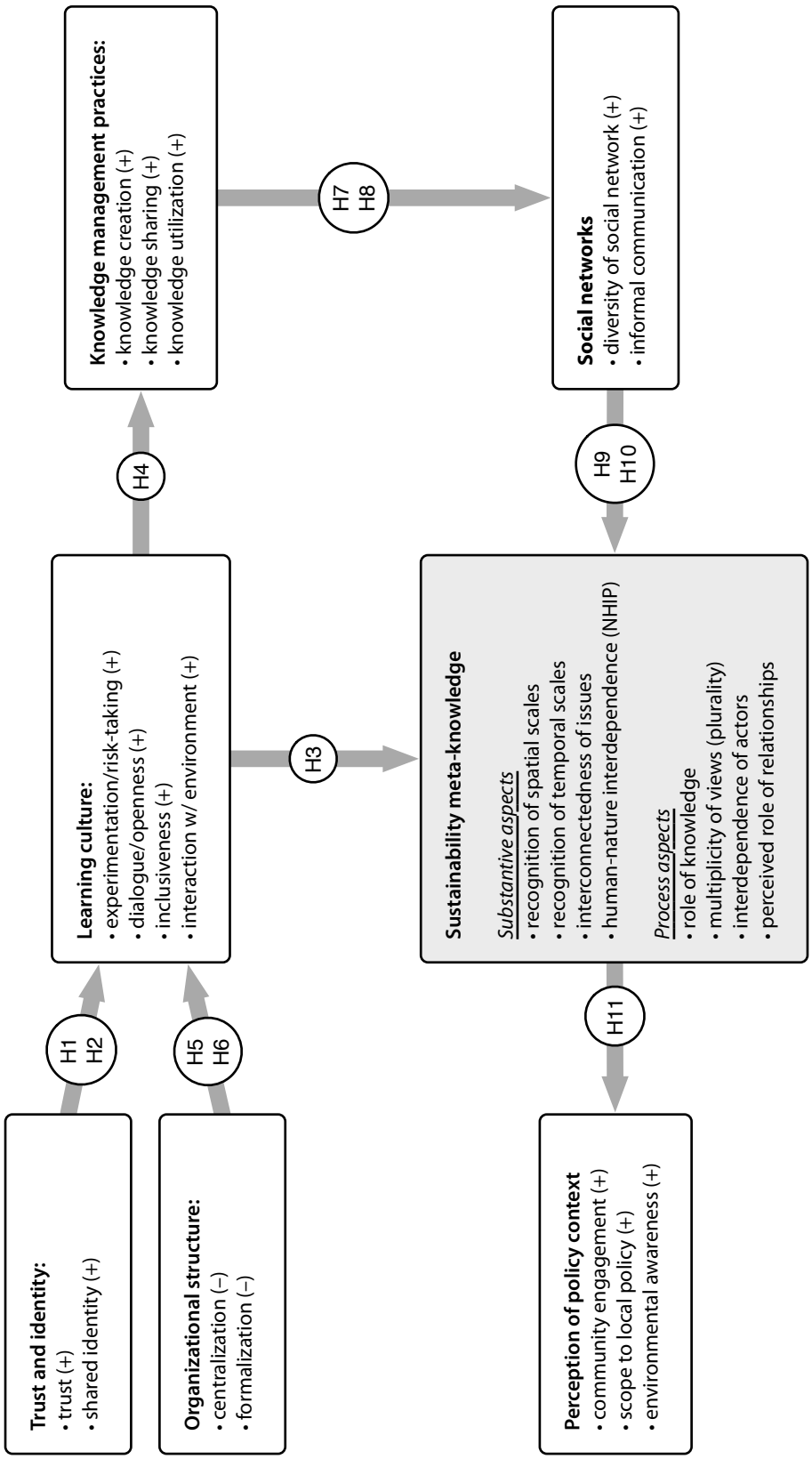

Figure 3.3: An overview of the theoretical model.

3.1 SUSTAINABILITY META-KNOWLEDGE AND LEARNING

The policy *problematique* raised by the notion of sustainability is characterized by complexity and uncertainty (Berkes, Colding, & Folke 2003). Instead of interpreting it as a set of desired policy goals and objectives, the stance (and underlying) assumption this thesis takes is that sustainability can be meaningfully understood as a "meta-objective"(Meadowcroft 1997). This suggests that sustainability is not about implementing a particular program or achieving a clearly specified policy outcome.

Instead of focusing on the sustainability of any particular physical urban system (e.g., transport infrastructure, water), this thesis concentrates on the epistemological aspects of sustainability, a special body of knowledge to be used in the process of urban decision making in regards to development. Sustainability is interpreted as a qualitatively different way of looking at and managing ecological, economic and social systems. This shift in understanding is a learning process which results and becomes reflected in *the accumulation of knowledge in local government to conceptualize and treat problems in more complex, systemic terms*.

This is consistent with what Nilsson et al. (Nilsson, Eckerberg, & Persson 2007) termed as the "policy learning approach." However it is defined, "sustainability stands as a critique, it is a challenge to prevailing assumptions, institutions and practices" (Gibson, Hassan, Holtz, Tansey, & Whitelaw 2005). While conventional thinking tended to treat the environment as an isolated policy domain, it is argued that sustainability implies an epistemic shift (Jensen 2007), toward a more sophisticated framing of problems that is capable of harnessing the inherent complexity facing government (Jessop 2009; Kiel 1994). Berry and Nelson (2007) argue that:

> Policy makers need to recognize the constraints placed on their capacity to influence events by the long time horizons over which effects unfold, the paucity of workable models and relevant data, and the sensitivity of outcomes to the initial conditions prevailing in any specific context. Such constraints are magnified by weaknesses in institutional systems. Most policy systems with which we are familiar are poorly placed to deal with either the lack of knowledge of likely outcomes over the longer term and the 'back-end loading' of many of those events.

As the complexity can never be grasped in its entirety, an inductive mode of inquiry is considered to be crucial for exploring potential solutions and policy alternatives (Meppem & Gill 1998). In such problem situations, the emphasis shifts from purely rational planning to allowing emergent strategies to come up. Organizations need to "learn their way into the future" (Stacey & Griffin 2008). Jorna et al. (Jorna, Hadders, & Faber 2009) argues that such learning is

essential for the sustainability of systems involving human-nature interdependencies. As the causality of events are often difficult to untangle, the difference between success and failure is not always clear (Cilliers 2004). Illuminating the role of causal models in public policy Kay (2006) argues as follows:

> If 'dysfunction' is to explain change, agents need not only percieve the problem but also correctly identify cause. When the outcome, but not the cause of dysfunction is perceived, as is often the case with complex problem situations with protracted causal chains, no pressure for change should be expected. On the other hand, if there is pressure for change, no successful solution to the problem can be expected.

People in local authorities (and organizations in general) form interpretations of events, build mental models and classify events and actions as favorable or unfortunate, desirable or undesirable. When interpreting observations, humans tend to use simple linear and functional rules, associate causality with spatial and temporal contiguity, and assume that big effects must have big causes. These mental representations are not valid for many complex real-world phenomena and lead to systematic biases in interpretation and they are often not compatible with the integrated view associated with sustainability.

Learning becomes important as it improves the quality of problem solving processes by allowing mental models to evolve as a result of interaction between policy actors (Koppenjan & Klijn 2004). If the learning process is managed adequately, decision-making practices will be more capable of integrating and synthesizing all relevant dimensions and views of a sustainable urban future (Brandon & Lombardi 2005). Nilsson (Nilsson 2007) explains the preconditions of successful environmental policy integration, believed to be the key element of the transition to sustainability (Jordan & Lenschow 2008), as follows:

> [P]eople first need to recognize that sustainability is a complex problem that requires a complex response, and a 'wicked' one since responses tend to create new problems elsewhere. Under the right conditions, through efforts where participants start to entangle these issues and share the dilemmas and trade-offs that emerge, joint problem perceptions across actors and trust in each other's intentions can start to surface. Eventually, this can propel into breakthroughs in understanding between people from traditionally opposing organizations.

Jensen (2007) argues that policy integration must happen because we know we are interdependent and suggests that it is also a matter of a "system of cognition and knowledge." The awareness encapsulated in this system of knowledge becomes "a constitutive structural framework for developing the

rationality of discourse and action for upholding the biosphere as a necessary condition for human development."

On the one hand, a sustainability view of environmental issues appreciates the interdependence between ecological and human systems (Costanza, Low, Ostrom, & Wilson 2001). On the other hand—and as a consequence of the former—it appreciates that there are multiple actors involved in addressing these issues. They work as a complex system of actors as there is interdependence between them in achieving synergistic outcomes. Accordingly, I identify two major dimensions of knowledge that is relevant to learning for sustainability: a substantive (content) and a strategic (process) one. Collectively, I refer to them as *sustainability meta-knowledge*. It is *meta* as it refers to general underlying principles associated with thinking *sustainably* about urban problems as opposed to particular professional or technical knowledge.

3.1.1 Substantive meta-knowledge

In a restrictive sense, the substantive dimension of sustainability meta-knowledge refers to the way how policy issues are put into context. Edwards (2005) argues that although sustainability is often marked by environmental causes, its values and core ideas represent a broad context of issues that transcend into all sectors. He further argues that the "Sustainability Revolution" is a new social ethos emphasizing the web of relationships that link the challenges the world faces today. In my thesis, I use the substantive aspect of sustainability meta-knowledge to refer to the extent to which interdependencies among various urban policy domains are made explicit. Local governments have to identify the critical relations among many factors such as economic, social, political and environmental quality (Strange & Bayley 2008):

> Just about every aspect of the economy, society, and the physical resources on which they ultimately depend, influences sustainability. Outcomes depend on an infinite number of interactions working on different timescales of varying importance. No model, however robust, no foresight, however penetrating, can tell us everything we'd like to know. Governments attempting to implement sustainability have to deal with this uncertainty. Not only their goals, but the strategies and instruments used to achieve them must be sustainable, too. They must be rigorous enough to be effective, but flexible enough to adapt as circumstances and priorities evolve. In the face of uncertainty, governance itself has to be sustainable.

Müller and Siebenhüner (2007) emphasize that problems addressed in the area of sustainable development are characterized by their inter-connectedness and often inevitable trade-offs. Goldman and Gorham (2006) point out that:

> Every problem has an 'environment,' to which it is inextricably united. If you stop x from growing (or declining), you will make other things grow (or decline), and these changes you have created may very well be as serious, and as disastrous, as the growth of x.

Capturing complex interactions among physical and human systems demands analytical and problem-solving skills beyond those of a single discipline or profession (Clayton & Radcliffe 1996; Martin 2008; Parker, Letcher, & Jakeman 2002). Traditional reductionist analytical strategies may not be appropriate so, it is suggested that problems need to be approached in systems terms (Córdoba & Campbell 2008; e.g., Jackson 2003; Voinov 2008), holistically (e.g., Cullingworth & Nadin 2002; Espinosa, Harnden, & Walker 2008), or in an integrated fashion (Blackmore 2007; e.g., Vogler & Jordan 2003; Gibson, Hassan, Holtz, Tansey, & Whitelaw 2005; Pickett, Cadenasso, & Grove 2004). Jorna *et al.* (Jorna, Hadders, & Faber 2009) suggests that sustainability essentially refers to an attribute of a system, so dealing with sustainability naturally requires a "system's perspective." Similarly, the "principle of ecosystems thinking" is also reflected in policy documents such as the European Sustainable Cities report (European Commission 1996):

> Ecosystems thinking emphasizes the city as a complex system that is characterized by flows as continuous processes of change and development. It incorporates aspects such as energy, natural resources, and waste production as chains of activities that require maintenance, restoration, stimulation, and closure in order to contribute to sustainable development. The regulation of traffic and transport is another element of ecosystems thinking. The dual network approach, which provides a framework for urban development at the regional or local level, is based on the principles of ecosystems thinking. Ecosystems thinking also includes a social dimension, which considers each city as a social ecosystem.

The systemic perspective represents a more ecocentric position on the worldview continuum described by Pearce and Turner (1990). Newman and Jennings (2008) suggest that it may offer "a better chance of finding ways to live sustainably." It is a way of thinking that helps us identify "root causes of problems and see new opportunities" (Meadows 2009). Verma (1998) comments on the epistemological consequences of a systems perspective as follows:

> Systemic reasoning [...] is teleological; it promotes integration and denies the quest for rigor when that rigor is achieved by partitioning our terrain. The defining characteristic of this tradition is its recognition of the epistemological necessity of comprehensiveness. It recognizes, for instance, that we can formulate planning or management problems in many different ways. But the possibility of making some formulations more rigorously than others is no license to worry about some formulations and not worry about others.

Similarly, Costanza *et al.* (2007) also highlight the challenges of straight problem formulations concerning natural resource and environmental issues:

> There is a general movement away from simple cause-and-effect paradigms as a credible explanatory framework. There is a strong consensus that we are dealing with complex, adaptive, integrated socioecological systems that often defy simple cause–effect logic in their behavior. Complex systems may exhibit multiple interactions between apparent drivers and responses where the direction and strength of interaction are not necessarily explicable in terms of simple, direct, and linear causative links; there may be internal dynamics that drive system changes.

Multi-scale phenomena are particularly prevalent in many natural resource systems and many human institutions. Hence, environmental impacts, social concerns and economic conditions are to be addressed simultaneously and on different levels ranging from local to global. Costanza *et al.* argue (2002) that a multiscale approach to understanding, modeling, and managing these systems needs to be the norm and analytic failure to recognize this fact leads to persistent problems (2001).

Cognitive learning effects are visible when there is a refinement of problem definitions and solutions in order to capture the complexities involved in urban sustainability. Based on the systemic view of sustainability, the theoretical framework of my thesis distinguishes the following aspects of substantive meta-knowledge:

- *interconnectedness*. This refers to the extent problems and issues are sought not to be treated in isolation from other problem areas by different municipal departments. “Various dimensions of social life” (economy, environment, equity) need to be taken into account in decision making (Meadowcroft 1997). It also refers to how much trade-offs are recognized in dealing with multiple issues and problem areas (Hopkins 2001). The recognition of interconnectedness constitutes the cognitive background to cross-sectoral policy integration. To tap this aspect of substantive meta-knowledge, a composite measure of perceived interconnectedness is calculated based on 22 questionnaire items. Respondents were asked to reveal how closely they associate their departments with being responsible for a set of urban issues. The items represented a selection of economic,

social and environmental themes in line with the cross-sectoral nature of sustainable development. They also included overarching themes such as quality of life or informing citizens.

- *spatial scales*. This aspect of substantive meta-knowledge concerns the perception of relevant territorial scales in decision-making. Processes in the natural environment operate at certain spatial scales and are greatly impacted by the joint distribution of their environmental factors (Zhu 2009). Similarly, social, economic, and political processes unfold at various scales simultaneously. Considering different spatial scales, therefore, is a crucial part of grasping the hierarchies involved in putting sustainability into practice or when one judges the level of sustainability of existing systems (Bell & Morse 2008). Mol and van den Berg (2004) argue that environmental problems and governance is no longer defined as a place-bound activity, so the "local environmental state" also needs to open up its place-boundedness. Sustainability has an element of thinking beyond what is deemed local and including regional, national and global social and ecological scales (Meadowcroft 1997). Accordingly, respondents were asked to identify how important it was for their departments to think in local, regional, national and global terms when addressing urban affairs delegated to them. These were indicators were used to calculate a composite spatial scale measure (See Section 5.3.1 for more details.)
- *temporal scales*. The time horizons adopted in decision-making should be long enough to capture both human and ecosystem time scales (Bell & Morse 2008; Devuyst 2001). Some of the joint dynamics (change and causal relationships) of human and ecological systems may not be recognizable if the time scales chosen for analysis, planning and decisions are not adequate. In addition, the ethical (intergenerational) principle of sustainability also calls for a commitment to work with problems in a time frame extending over 3 or more generations (Lafferty & Eckerberg 1998). To items tapped into the importance attached to long-term time horizon in decision-making and planning: one specifically asking participants to specify how far ahead in time planning is necessary when resolving issues and another item asking about the relative importance of short-term and long-term impacts.
- *human-nature interdependence.* Change in environmental attitudes has an important part to play in policy learning for sustainability. Normative change involves shifts in individual beliefs and consensus over fundamental values (Connor & Dovers 2004). Corral-Verdugo et al. (2008) suggest that "global values" can be a major driver of pro-environmental behavior. I use their proposed New Human Interdependence Paradigm

(NHIP) scale. As the integration of ecocentric and anthropocentric belief systems, the scale captures awareness of "the mutual dynamic interdependences linking the well-being of current and future human societies to the ability to care for a proper renewal and restoration—from human needs and impacts—of natural resources in the biosphere" (Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha 2008). Understanding the indispensability of ecosystems for the viability of human existence and the concept of built-in limits to the human impact that ecosystems can sustain are both critical to the idea of sustainability (Edwards 2005).

3.1.2 Process meta-knowledge

In addition to substantive interconnectedness and uncertainties, the operational complexities of urban sustainable development are also challenging because of the number of involved actors and agendas implicated (Riddell 2004). Public managers may find themselves simultaneously involved in managing across organizational, governmental and sectoral boundaries (O'Leary, Gazley, McGuire, & Bingham 2009). This creates strategic uncertainty and game-like situations in local policy and shifts the emphasis from the rational design in policy-making more towards the social interaction process between parties (individuals, groups, organizations) (Koppenjan & Klijn 2004). The success of this social interaction process will also depend on how local governments see their role and position in developing solutions for their communities. O'Toole (1997) describes the challenges public administrators face in dense "policy spaces" as follows:

> Managers in networked settings do not supervise most of those on whom their own performance relies, monitoring channels are typically diffuse and unreliable, and common organizational culture exercises a limited and indirect influence. In network arrays, several sets of organizational needs must somehow be incorporated into streams of action without compromising programs to the point of incoherence. Perhaps most important, networks themselves are sufficiently complex that their impact on performance is somewhat unpredictable for all involved. Managing in this world implies significant adjustment of the conventional wisdom.

Healey (2007) argues that a strategic approach to such a "transformative enterprise" would focus on "a careful prior assessment of the array of actors, networks and stakeholders, the evolution of the discourses and practices through which issues are identified and solutions proposed and the knowledge resources, relational resources and mobilization capacity embodied in these discourses and practices." For the purpose of this study, these aspects are

understood to constitute process meta-knowledge. Municipal departments develop notions about their strategic environment, the nature of the issues they deal with and respond to these by changing their choices in the process of decision-making and planning. Process meta-knowledge is operationalized via for related dimensions (subconstructs): perceived *role of knowledge*, tolerance to a *multiplicity of views*, the recognition of the *interdependence of actors* (distributed control capacities) in local development, and the appreciation of *external relationships* (need for coordination).

Role of knowledge

Traditionally the input that research and science provided was central for governments in many problem situations, but scientific knowledge no longer provides unequivocal and authoritative solutions for dealing with problems (Koppenjan & Klijn 2004). Discussing the transformation of the planning profession, Riddell (2004) argues that it is important that "practitioners comprehend the theory which underpins the service they provide, because if there is no theory-logic, then their service will be judged wholly technical." This is equally valid for other professions involved in developing urban policies. Connor and Dovers (2004) argues that:

> Perhaps one of the most significant currently incipient normative changes involves the dethroning of science and technology as exclusive providers of solutions to environmental problems. This is bringing more attention to institutional aspects of problem solving, and hence to the institutional construction of problem definitions, with a resulting extension of peer communities and broadening of the range of inputs to policy." (Connor & Dovers 2004)

This suggests beyond professional expertise multiple forms of knowledge should be valued by local authorities accepting local and external knowledge as well (Healey 2007). Koppenjan (2004) argues that substantive uncertainty in policy situations often stems from the fact that there may be lack of (scientific) knowledge available and also from the fact that there is no agreement on how to interpret whatever knowledge is available and what exactly the problem *is*. A situation may not even be recognized as a *problem* if there is no perceived gap between an existing and a desired situation. When there is a general consensus about a problem formulation and there is great certainty about what kind of knowledge to apply, the problem is simply 'technical'. On the other hand, 'wicked' problems—such as the problematique of urban sustainability—involves greater uncertainty in both dimensions. Given these deficiencies, the

role of new information is crucial. When actors close themselves from substantive debate with others and do not reflect upon their own problem perceptions and limits of knowledge, a cognitive fixation may occur. Self-reflection and the recognition of ambiguity helps overcome this closedness and is a source of learning.

Multiplicity of views

Learning for sustainability as a strategy for managing complexity involves uncertainty reduction. Due to inherent ambiguity stemming from diverging problem frames is not solely an intellectual but also a social activity. When there is ambiguity the joint production of meaning is the adequate response (Koppenjan & Klijn 2004). This necessitates the recognition of the fact that there are many different (and potentially conflicting) views of the same set of urban issues. Porta and Romice (2007) explain it as follows:

> Urban sustainability implies new visions that cannot leave technical analysis as it has always been: setting new goals for city planning and design, sustainability requires different analysis, because analysis is never objective but is rather, at least in part, the product of the same visions for which it sets the stage. But sustainability also requires the deep interaction between points of view coming from diverse fields and disciplines, as well as non-disciplinary areas and modes of understanding and experiencing the real world.

In particular, the diversity of values and interests may provide special context for knowledge processes in the public sector. Thinking outside the silos—managing and integrating multiple perspectives and competing viewpoints in decision making—is understood as an important part of problem solving, policy formation and action for sustainability and also in modern governance in general (Glasbergen 2007). O'Neill et al. (2008) argues that standard approaches to public decision-making maintain that a good decision is one that best improves the well-being of affected agents. The existence of plural and incommensurable values and views, however, is incompatible with the assumption that there is a measure of value by which policy options can be judged. Conflict of interests within a municipality may spawn conflicting interpretations in terms of attributing causality between events. Advocates of a particular policy are likely to interpret failures differently as compared to their opponents. Different groups have different targets based on their interpretations of causality and they also tend to interpret the same outcomes divergently (Levitt & March 1988). Only when parties are aware of that different frames of reference are involved, will it be possible to explore the real

substantive questions posed by the sustainability challenge (Koppenjan & Klijn 2004).

Interdependence of actors

Policy issues related to urban sustainability necessitate the involvement of a variety of parties including individuals, groups and organizations from both the public and the private sector with highly varying norms, interests and powers to act. (Saglie 2006). These parties depend upon one another in achieving collective goals related to the sustainability of their cities. Koppenjan (2004) explain the source of dependency as follows:

> Given the complexity that characterizes contemporary network societies, actors seldom have the knowledge and resources to resolve problems on their own. In so far as they believe that they can, this mostly stems from an underestimation of their external dependencies and a limited view of the nature of the problem situation and the interests involved. To the extent that they succeed in pushing through their favorite solution, the result is often a suboptimal solution.

Mutual dependencies partly arise as a result of fragmentation within the government sector—internal interdependence—and also an increased engagement of external stakeholders (Alexander 2006). A *fragmented system* refers to the fragmentation of the formal organizational arrangements between many different operating entities in a single geographic area (Chisholm 1992). Generally speaking, any undertaking that is too complex for one social unit to complete on its own involves "functional interdependence" (Alexander 2006). Agencies therefore are functionally related and the alteration of one aspect will affect the others to a significant degree. This dependence can occur horizontally across sectors and agencies in a particular jurisdiction, and also vertically between tiers of government (Brown 2008; Saglie 2006). As fragmentation increases, the mutual dependency between actors also increases whether actors are aware of this or not. Owens and Cowell (2002) comment as follows on the complications arising from the multiplicity of actors involved in managing sustainability:

> Conflicting interests at different scales and in different locations have long presented planning with some of its most intractable dilemmas, to which sustainability adds a new dimension. It is difficult enough to hold meaningful dialogue about the complex issues involved even in one self-contained area; all the more so when the dialogue must take place across administrative boundaries and different levels of governance.

Specialization, professionalization, decentralization and informatization are suggested to be reasons for increasing fragmentation as decisions are made in a number of places in regard to a particular problem (Koppenjan & Klijn 2004). While fragmentation of policy making among multiple governmental units breaks down concentrated powers and therefore can promote competition and innovation. At the same time it imposes inefficiencies as decisions by one unit imposes positive or negative externalities on others (Feiock 2008). Interdependencies between policy actors can be represented as networks. Halme (2001) contends that "[w]orking in networks requires different skills and worldviews than working in traditional market or bureaucratic transactions." It requires more effective information transfer, reflexivity (reflection on both practice and world views), and recognition that actors are affected by the behavior of other actors (Parker 2007). Research and experience suggest that there is an association between the kinds of interdependence among actors in a social unit or members of an inter-organizational system, and how they have institutionalized their links" (Alexander 2006). From a single actor's point of view, its degree of dependence can be interpreted as the importance the actor attaches to resources possessed by other actors and the possibility of substituting these resources (Koppenjan & Klijn 2004). Policy actors, however, are not always aware of their dependencies and they sometimes overestimate their own potential or power. Thus, they will not always behave according to their dependency upon others and may choose non-cooperative strategies such as 'going alone', 'conflicting', or 'avoiding' (taking a passive stance). None of this may be desirable in bringing forth community wide change for sustainability.

The role of external relationships

Another aspect closely related to recognizing mutual dependencies is the level of importance that is attached to maintaining contact with societal actors. Actors may be the source of knowledge in the decision-making process as they express their preferences, provide insights, help reframe problems and also may have specialized professional or technical expertise that may not be available internally in local authorities. An emphasis on the involvement of societal actors can also contribute to gaining legitimacy. In general, strengthening inter-organizational cooperation and involving stakeholders in policy making and public service delivery is assumed to lead to improved policy outcomes and is also becoming a democratic norm (Callway 2005). Participatory approaches are emphasized as a critical element of putting sustainability into practice.

Horizontal relationships generate added value, however, they can be difficult to place into existing departmental, administrative and politically customary types of interaction in the local decision-making process (Koppenjan & Klijn 2004). Maintaining relationships requires dedicating resources to communication. Walker et al. (2007) for instance found that local government managers and executives allocate 25-30% of their time to maintaining "external relationships", that is, with contacts outside their department including local stakeholders and government officials.

3.2 ORGANIZATIONAL CULTURE

Martin (2008) argues that sustainability rests on the idea of exploration of issues and problems through open-ended inquiry and learning facilitated by organizational culture. Healey (2007) also notes that a critical element for the analysis of policy and planning transformation processes is "some conception of the interplay between deeper, embedded cultural practices and the conscious and visible world of routine and strategic interactions." Müller and Siebenhüner (2007) contend that organizational culture is a decisive factor for any form of learning and for sustainability-oriented learning in particular.

The literature on organizational culture is vast with enormous variation in the definitions of term. The concept has drawn attention to the subjective or 'soft' side of organizational life (Alvesson 2002). Schedler and Proeller (Schedler & Proeller 2007) interpret the concept of *culture* as an attempt to explain differences in the behavior of diverse groups of actors in situations that are objectively alike. Schein (1992) defines organizational culture as a ''pattern of shared values and beliefs that help individuals understand organizational functioning and thus provide them with the norms for behavior in the organization." Organizational culture evolves from members' interactions with the outside world and with each other (Howard-Grenville 2007).

Inside an organization, subunits such as departments, hierarchical levels, or even teams may also reflect their own unique cultures. The culture of a group, like that of a municipal department, heavily influences what is perceived as useful, important, valid and relevant knowledge and this will directly affect which knowledge that group will focus on (De Long & Fahey 2000). The cultural differences may often result in "culture clashes" and lead to difficulties in coordinating and integrating processes or organizational activities (Cameron & Quinn 2006). At the same time, each subunit in an organization also contains common elements typical of the entire organization. In assessing an organization's culture, therefore, one can focus on the entire organization as

the unit of analysis, or one can assess different cultures at the subunit level (Hofstede, Neuijen, Ohayv, & Sanders 1990). The identification and aggregation of the common dominant attributes of the subunit cultures can provide an approximation of the overall organizational culture (Cameron & Quinn 2006).

3.2.1 Implications for learning

Organizational culture is a multi-dimensional concept with broad meaning. Depending on the purpose of the empirical inquiry, different aspects may be relevant in measuring facets of organizational culture. As processes and outcomes of organizational learning are the primary interest of this current study, those aspects of organizational culture are included in the analysis which have been found critical for effective learning. This is supported by the argument that knowledge creation and learning can not be directly managed, but the conditions can be changed to create a culture in which "people can learn and are even encouraged to concentrate on learning" (Baets 2006). Prusak and Weiss (2007) find that in practice less emphasis has been placed on the social aspects of knowledge and more on technology, which is clearly a more straightforward management objective. In the private sector, however, more and more organizations are recognizing that creating a "knowledge-sharing culture required more than building a sophisticated technology system or handing out meaningless rewards" (Patriotta 2003). Stacey (2001) described facilitating factors as follows:

> It is widely held that effective learning and knowledge creation require widespread sharing of values to do with openness, trust, affirmation, dialogue and empowerment. Effectiveness of these processes is also said to require particular forms of leadership that establish values of this kind and provide a central vision to guide the learning and knowledge creation process. It is recognized that it is difficult to establish and sustain group, organizational and societal relationships of this kind, and mainstream thinking is concerned with some of the obstacles to the required leadership and value formations required.

Cultural factors, inheritances, traditions are suspected to play an important role in sustaining certain practices and inhibiting others in specific, spatially situated institutional 'locales' such as a municipality (Healey 2007). A change in attitudes, routines, procedures or the questioning of values, which underpin organizational learning, therefore often demand cultural change (Hartley & Benington 2006; Moffett, McAdam, & Parkinson 2003; Müller & Siebenhüner 2007). The public management literature also makes wide use of and reference

to the importance of culture (as a shortcut for organizational culture) on public management arrangements (Schedler & Proeller 2007). Both the idea of sustainability and 'governance' imply a progressive stance that local authorities should take in their policy making and actions. Thompson and Jones (2007) highlight the the enabling or blocking role of cultures in advancing progressive practices:

> In an international context, public management arrangements differ significantly from country to country, and also regionally and locally. One reason for these differences may be different civic cultures with differing views of the state and its institutions. This may appear to be obvious, but it is highly important when public management reform models are proposed and transferred from one country to others such as was the case (and still is to some extent – especially from developed to developing nations) with, for example, the new public management. Scholars in public management, as well as international practitioners, should be aware of the impact culture has on the possibilities and limits of concept transfer between different organizations and jurisdictions.

Howard-Grenville (2007) notes that "[i]nherent in any culture is a certain amount of inertia and a certain amount of unintended consequence." The cultural differences between locales may prove to be even more enduring in the government sector, as public sector organizations are considered to be more resilient to organizational learning, because of stronger departmental cultures and bureaucratic characteristics compared to the private sector (Common 2004). Public sector organizations typically resemble the ideal-type of the *mechanistic* organizational culture characterized by Burns and Stalker (1994) as opposed to the *organic* one. When operationalizing organizational culture, an etic approach is used to account for, describe and eventually measure its aspects.

3.2.2 Collective trust and identity in the municipality

Two aspects—*trust* and *shared identity*—are identified as "soft" elements which may characterize a community of actors involved in local policy making. Trust creates an "expectation that others will not behave opportunistically even if they have both the opportunities and incentives for doing so." Trust serves as an effective social control mechanism, eliminating the need for hierarchical control mechanisms in the face of potential moral hazards (Gulati & Sytch 2008).

Trust becomes important in situations characterized by uncertainty and risk. Higher levels of trust are for instance related to reduced negotiation costs, lower levels of conflict between parties. In an organizational setting, trust is

also essential for strengthening collaboration and knowledge sharing between units of an organization and also between organizations (Koppenjan & Klijn 2004). At the same time the sharing of information and collaboration also has a positive impact on the level of trust (Chan & Liebowitz 2006). Trusting relationships have been shown to eliminate the tendency to blame others for organizational failures (Nonaka & Takeuchi 1995). This can be extended to the case of inter-organizational relationships as well. A prevailing blame culture may paralyze learning as actors are discouraged to share knowledge and this may lead to unsatisfactory outcomes (Hartley & Benington 2006; Seel 2000). In public policy where people, groups and organizations may represent very different perspectives, deadlocks can potentially arise as a result of attributing blame. Holden (2008) argues that:

> Strong trust and social capital create a situation in which members of a group can readily see the interdependence of their situations and future and then can engage productively in problem-solving discussion, action and monitoring of their efforts in a continuous learning, cooperative and stabilizing process.

This study focuses one form of interorganizational trust: dispositional trust. Dispositional trust reflects expectations about the trustworthiness of others. Two aspects of dispositional trust are considered in operationalization: (a) the trust in other municipal departments and local organizations and (b) perceived trust other actors have in the focal department.

Willingness of a group of people to engage in trust behavior in situations requiring cooperation and collective action is tied to the salience and strength of identification with a group and its members (Kramer, Hanna, Su, & Wei 2001). In this case, the extent to which municipal departments perceive that other departments and local actors identify with a common purpose and mission is believed to be closely related to trusting behavior. Kogut and Zander (1996) argued that the pivotal role of identity is that it fosters the translation of self-interest into collective interest.

Convergent expectations and shared interpretations can help create a favorable cooperative and knowledge sharing context. In their empirical study, Kim and Lee (2006) find that shared identity had a positive impact on knowledge processes within organizations. Stata (1996) also argues that organizations learn when decision-makers come to share beliefs and goals and are committed to take actions necessary for change. Compared to the private sector, in a local government setting, however, this becomes problematic due to the multiplicity of actors and the ambiguity of goals. Willingness to engage in collective learning may be inhibited if values involved are in fundamental

conflict within the policy network. Busenberg (2001) suggests that learning arrangements and policy change can be most clearly observed in contexts where members of the policy network pursue common and stable goals over long periods of time.

Both shared identity and trust is expected to contribute to the emergence of a municipal culture of continuous inquiry and dialogue into problems and solutions municipal departments deal with. Accordingly, the following two hypotheses are proposed:

Hypothesis 1: *Stronger shared identity improves the learning culture.*

Hypothesis 2: *Greater perceived trust has a positive effect on the learning culture.*

3.2.3 Dimensions of the learning culture

There are several aspects of organizational culture which may be particularly important for facilitating learning and knowledge transfer. Drawing upon Alegre and Chiva's (Alegre & Chiva 2008) conceptualization of organizational culture, I distinguish the following constructs as dimensions of an organizational culture that facilitates learning (learning culture): experimentation, dialogue (openness), inclusiveness, and interaction with the organizational environment:

- *Risk-taking* (*experimentation*) is defined as the extent to which new ideas and suggestions are attended to and treated sympathetically. Experimentation can be expressed as the "culture of curiosity" (Hartley & Benington 2006). It involves trying out new ideas, being curious about how things work, or carrying out changes in work processes. It involves the search for new solutions to problems based on the possible use of distinct methods and procedures (Alegre & Chiva 2008). It is also closely related to the degree of freedom employees (organizational units) enjoy in the pursuit of new ways of getting the job done and freedom to take *risks* (Goh & Richards 1997). Risk-taking can be understood as the tolerance of ambiguity, uncertainty, and errors.
- *Openness* (*dialogue*). Openness refers to an organizational climate in which givens can be questioned. Openness is practiced via on-going *dialogue*. Isaacs (1993) defines dialogue as "a sustained collective inquiry into the processes, assumptions, and certainties that compose everyday experiences." Dialogue can become a transformative organizational process challenging 'official ideology' and current power relations and it helps relieve the anxiety caused by misunderstanding. It is a basic process for

building a common understanding, and is thought to foster the convergence of mental models even if conflicting preferences are involved in the organization. Conversations are the way people in organizational settings discover what they know and share it with their colleagues (Moffett, McAdam, & Parkinson 2003). Stacey (2001) stresses the importance of communicative interaction and argues that "organizational change, learning and the creation of knowledge in organizations are transformations in the thematic patterning of its communicative interaction, particularly its conversational life."

- *Inlusiveness* refers to the level of engagement that departments can have in the decision-making process within the municipality (Alegre & Chiva 2008). Inclusiveness enhances involvement and commitment to organizational goals. It also facilitates building up trust among actors and is considered an essential factor of learning in intra- and inter-organizational contexts. Participative decision-making is also a constant element of the governance and planning models.
- *Interaction with the organizational environment* refers to the level of importance attributed to encouraging staff to gather information and experience outside the immediate work environment. An organizational culture that motivates staff to maintain contact with actors outside the organization facilitates learning as it exposes staff to new information and knowledge held by other actors. It enables the organization to scan the organizational environment and detect changes, which is the basis of adaptability in uncertain and turbulent decision making situations.

Based on the expected role of organizational culture in terms of developing sustainability meta-knowledge, the following hypothesis is formulated:

Hypothesis 3: *A more cultivated learning culture has a positive effect on the development of sustainability meta-knowledge.*

Hypothesis 4: *A more cultivated learning culture impacts knowledge management practices in a positive manner.*

3.3 ORGANIZATIONAL STRUCTURE

Organizational structure—formal arrangements which structure organizational interactions—may have a profound impact on how organizational culture develops over time. The utilization of information is contingent on information transfer between those who create (collect) the information and

those who (have the power to) interpret it, and the attitudes and predispositions towards learning (Holden 2008).

The degree of *centralization*[1] is one of the fundamental aspects of organizational design. It refers to the degree to which power and authority are concentrated within an organization (Pugh, Hickson, Hinings, & Turner 1968). Centralization determines whether the locus of decision-making lies in the higher or lower levels within the hierarchy of an organization. A high degree of centralization can reduce the initiatives that a unit might take in interunit or interorganizational exchange (Tsai 2002). The centralized hierarchical structure of many government organizations limits knowledge sharing activities and communication within and across organizational units. In mechanistic cultures built around hierarchical relationships influence lies with those high up in the hierarchy and communications tends to be rather vertical (Herzog 2008). Centralized decision-making can reduce the initiatives that a unit or organization might take in inter-unit or inter-organizational exchange (Tsai 2002). Key decision-makers are remote from service delivery making it "difficult [for organizations] to elicit or make use of the potentially enormous contribution of intelligence by their ordinary members" (Common 2004). Shani and Docherty (2003) note that "organizations characterized by large size, extensive division of labor, and deep-rooted culture are often difficult to change." Hence, organizational structures should be designed to promote flexibility as a means of encouraging collaboration and sharing within and across organizational boundaries (Müller & Siebenhüner 2007).

Formalization is the other aspect of organizational structure included in the study. Here, it is defined as the degree to which organizational activities are manifest in written documents regarding procedures, job descriptions, regulations, and policy manuals (Kim & Lee 2006). In government, the level of formalization tends to be higher than in the private sector. Many public decisions take the form of legislation passed by the city council and even those which are not subject to formal approval by the council (or council committee) may have to go through formal procedures. Generally, formalization is assumed to be negatively correlated with performance and innovative organizational behavior, say product development in firms. The conclusion is often that the organization of non-routine tasks, those which necessitate exploration, should be shielded from bureaucratic rationalization. However, the evidence is not unequivocal. Becker and Zirpoli (2009) for instance observe that actually many studies have found evidence to the contrary: clearly

[1] Centralization as an aspect of organizational structure is not defined here in a quantitative structural (social network analytical) sense. It is operationalized as a composite of perceptions of organizational practices and rules in decision-making.

specified work rules are rather rewarding than limiting. As this study is not concerned with measures of organizational performance our output, but "soft" learning processes, the working hypothesis is that the degree of formalization creates obstacles to the emergence of an ongoing learning oriented culture within municipalities.

Hypothesis 5: *A higher degree of centralization acts as a constraint on learning culture.*

Hypothesis 6: *The level of formalization is inversely associated with learning culture.*

3.4 KNOWLEDGE MANAGEMENT PRACTICES

From an analytical perspective, the notion of knowledge sharing is based on the observation that knowledge is continuously communicated between members of the knowledge community. In Wallace's view (Wallace 2007), the notion of knowledge sharing incorporates the transformation processes between tacit and explicit knowledge and the individual and collective level. By the separation of responsibility and authority along functional lines into organizational units (departments, divisions, or teams), the separation of knowledge has also taken place leading to what Lucier and Dyer (2005) calls the "intellectual division of labor." This compartmentalization of knowledge that tends to accompany bureaucratic organizational structures has created even greater concern for knowledge sharing and at the same time has also given rise to the political nature of knowledge within organizations through competition and cooperation across units to "own" information, expertise and knowledge. This tendency may be further amplified when knowledge sharing is supposed to cross organizational boundaries. To overcome these barriers, knowledge sharing requires active leadership, facilitation, and management (Hartley & Benington 2006).

Michailova and Foss (2009) use the term *knowledge governance* to refer to all organizational structures and mechanisms which favorably influence processes of transferring, sharing, integrating, using and creating knowledge. These structures and mechanisms play an important role in organizational-level knowledge processes because they define the incentives and coordinate the actions of organizational members in knowledge processes. Organizational culture, as discussed earlier, provides a general context within which knowledge sharing and organizational learning may take place. However, culture is typically difficult to change within a short period of time and thus in the short run it can be regarded as given. On the other hand, there are

knowledge governance mechanisms which can be managed in the short run and can potentially have an impact on the level of interaction and learning within a municipal government.

Knowledge management as a general concept refers to practices, tools, and procedures which can be purposefully used to facilitate taking advantage of data, information, and knowledge in an organization. The goal of knowledge management is to leverage and improve an organization's knowledge assets in order to improve organizational performance via better-informed decisions (King 2009). In its limited sense, knowledge management is often understood as a collection of technologies (information systems) which enable the effective use of information within an organization. In this perspective, knowledge tends to be viewed equated with information, especially digital information, in which case the interesting issue in focus is how knowledge-as-information is best stored, retrieved, transmitted, and shared (Kim & Lee 2006; Tsoukas 2005). The main limit of this view is that it puts an emphasis on explicit knowledge and neglects many aspects of knowledge that is tacit (Elia & Corallo 2009). It is assumed that problems of knowledge sharing stem from the lack of sophisticated technical solutions that would ease knowledge transfer (Treleaven 2004). This approach disregards the nature of knowledge sharing as a social process. In this study the concept of knowledge management is used to refer broadly to "any intentional and systematic process or practice of acquiring, capturing, sharing, and using productive knowledge, wherever it resides, to enhance learning and performance" (Foray 2004). This includes both *hard* systems and tools (people-to-document) based on information and communication technology (ICT) and also *soft* systems, processes which link up knowledge users (people-to-people) (McNabb 2007).

When operationalizing knowledge management practices, this study distinguishes three general dimensions that knowledge management may focus on: (1) knowledge creation, (2) knowledge sharing, and (3) knowledge utilization.

(1) *Knowledge creation* refers to the organizational processes and resources that assist gathering and generating data, information and experience to be used in decision-making. These initiatives may include the systematic collection of data and information as feedback (e.g., indicator data, performance data) and learning opportunities created (e.g., training programs).
(2) *Knowledge sharing* refers to practices that assist the transfer of knowledge or experience between actors. It is the act of sharing work-related experience, expertise, know-how, and contextual information through formal and informal interactions between and among individuals, groups and organizations (other agencies and stakeholders). This may include ways of

communicating these via organizational artifacts such as periodic reports, databases, newsletters, blogs etc., and also employing people-to-people tools and task management such as assigning people with diverse professional backgrounds to teams or joint projects.

(3) *Knowledge utilization* refers to putting available data, information, and knowledge to use. They may be available and accessible, but still not used in decision-making and for improving performance. This aspects assesses whether departments perceive themselves to act on the knowledge resources they have generated or have access to.

Knowledge management practices are expected to improve the connectivity of and the interaction between municipal departments and also between departments and actors outside the municipal organization. The following hypotheses are formulated:

HYPOTHESIS 7: *More sophisticated knowledge management practices have a positive effect on the diversity of the social contacts.*

HYPOTHESIS 8: *More sophisticated knowledge management practices have an effect on the form of communication with social contacts.*

3.5 ADVICE NETWORKS

Cities and their public managers operate in a complex intergovernmental and interorganizational environment (Agranoff & McGuire 2003; Agranoff & McGuire 2003). Therefore, interaction and coordination of activities among parties involved in shaping urban policy is crucial. Social contact facilitates exchange of information, learning about policy problems and also the coordination of action of mutually dependent actors (Nahapiet & Ghoshal 2000; Nooteboom 2009). While some of the knowledge can be captured in technical systems such as databases or in reports, the bulk of knowledge is tacit. To utilize this knowledge in the solution of problems and the creation of new knowledge, people in local authorities must have an understanding of who knows what, and interact with each other within the organization and also across organizational boundaries in order to utilize and combine knowledge (Cross, Borgatti, & Parker 2001). Informal networks are considered to be better fit for such knowledge sharing (Willem & Buelens 2007). By taking actual social interactions into account, one can determine whether the pattern of network ties in a particular social world is related to other important patterns such as the pattern of problem perceptions and decision-making (Kilduff & Tsai 2003).

In this study, local government departments are the focal point of interest. Units of an organization can have their own unique perceptions and practices which may not be in alignment with those of other units in the organization. It is reasonable to treat departments as separate entities with their own views, beliefs, professional values that they bring to problem solving (Schedler & Proeller 2007). The collection of department level data seeks to capture these differences.

3.5.1 Frequency and diversity of contacts

The two main aspects of tapping into the interaction patterns of municipal departments are frequency and diversity. The first concerns how often the department maintains contact with an actor, either an other department or some actor external to the local authority in order to share knowledge. Frequency can indicates the "bandwidth" of the communication channel. Actors that communicate more frequently can potentially exchange more information and also tend to be more "important" to each other in terms of delivering benefits through sharing knowledge. Actors which rarely engage in advice relationships with local authorities may be 'socially' distant and their voice less heard in and they are less likely to affect problem representations and decision processes in municipal departments.

The diversity of the advice network concerns the variety of actors that departments of a municipality maintain contact with. As noted earlier in the literature review, the diversity of views and knowledge represented by different parties is assumed to be lucrative for learning between actors and within departments. Although it is possible for departments to learn from their own experience, in many instances that experience is limited. Advice networks channel information among professionals likely to influence their understanding of problems and their professional values as well (Gibbons 2004). Diverse social ties enable departments to draw from a wider and more heterogeneous pool of experience (Beckman & Haunschild 2002; Walker 2006). For this reason, an important aspect of maintaining a network of ties is the diversity among network partners.

Diversity here primarily refers to the composition of actors that a municipal department reaches out to and not the number of contacts it has. As opposed to the quantitative aspect (size) of ego's network, diversity is more indicative of the quality of social ties that a department has and is also indicative of its social capital (Van Der Gaag & Snijders 2005). Although the inclusion of diversity in the theoretical model is motivated by analytical reasons, the diversity of

contact also has a normative aspect. The principles of good governance for sustainability imply that diverse interests represented by different societal actors should be respected in decision-making processes and also that decisions should be coordinated between different hierarchical levels.

Social interactions among departments and other actors can be manifold, but this study considers social contact which specifically aim at seeking work-related knowledge in the form of advice. There are many possible channels through which advice can be communicated including public hearings and forums, various committee meetings, formal correspondence etc., but interaction can also happen by way of informal channels including ad hoc meetings, e-mail, telephone calls.

The study chose to employ an ego-centric sampling approach to collecting data on the advice relationships of individual departments. Ego-centric star data describes the social connections of a focal actor (*ego*) and their alters, but not the connections between alters (Marsden 2005). In this study egos are the municipal departments and alters are other departments or organizations they have social ties with to exchange work-related knowledge.

Two strategies are used to capture interactions. Both intend to reveal the qualitative aspects of social contact (diversity and frequency) as opposed to estimating the size of ego's social network. First, instead of identifying specific alters, connections with different generic types of actors are considered. These types include (1) local citizen or citizen group, (2) local business, (3) business advocacy organization, (4) non-profit organization, (5) member of local council, (6) local government official, (7) official representing other local or regional authorities, (8) central government official, (9) member of parliament, and (10) non-governmental professional (e.g., consultant). These actor types were chosen to represent different layers of multi-level governance structures (Walker, O'Toole, & Meier 2007). Local government officials and elected local council members are the closest to the daily operations of the local authority, whereas central government officials and members of parliament (although representing local interests) are the most removed. The relationships with these actor types were only measured in terms of frequency. Departments with more diverse social networking patterns will tend to have more frequent contact with more of these actor types.

In addition to generic types of alters, information on specific alters can be used to assess the knowledge sharing relationships of municipal departments. Contact can be motivated by various benefits representing different support functions. By giving advice contacts can provide: (1) solutions; (2) meta-knowledge; (3) problem reformulation; (4) validation and (5) legitimation (Cross, Borgatti, & Parker 2001). In the case of solutions, the information that is

exchanged helps generate solutions in specific situations. It is usually explicit procedural knowledge which helps accomplish tasks in an effective and timely manner. When the information received is not an answer but rather a pointer to where further information or help may be found, meta-knowledge is passed on. Informants can also help to explore new dimensions of a problem and redefine how the problem could potentially be approached. In this case advice functions as a vehicle of problem reformulation. An interaction may also be valuable in that it can validate a proposed solution. A municipal department may want to seek affirmation of an idea from other departments or organizations. Discussing initiatives with other actors and having their word on it can increase confidence that the solution is not to be discarded. Legitimation means that the purpose of interaction is to gain credibility by being able to cite sources who reviewed an idea or proposed solution. In a governance style which appreciates horizontal relationships, a municipal department would ideally solicit legitimation from contacts not having formal authority or oversight over them.

The awareness of potentially conflicting views of and multiple perspectives on a problem only carries benefits if in practice public administrators do 'listen' and 'talk' to actors who may not completely share their views. In debates where problem frames clash, searching for opportunities to mutually adapt problem formulations may help break the asymmetric nature of debates: cross-frame reflection takes place (Koppenjan & Klijn 2004). An 'outsider' who becomes involved in a problem situation can confront the parties involved in the debate and illuminate the limitations of their own approaches (Rein & Schön 1996). For this reason, the perceived epistemic distance (the similarity in thinking) between each alter and the focal department becomes important. A municipal department that is inclined to turn for advice even to actors that do not share their views is expected to be more capable of reflection and learning about the complexity urban affairs: it is and indicator of the propensity to explore new ways of dealing with problems and issues. Based on the expected influence of advice network variables, the following hypotheses are formulated:

Hypothesis 9: *The diversity of a departments advice network has a positive effect on the development of sustainability meta-knowledge.*

Hypothesis 10: *The form of communication has a positive effect on the development of sustainability meta-knowledge.*

3.6 PERCEPTIONS OF THE POLICY CONTEXT

The problem frames municipal departments develop regarding urban issues help identify gaps between what is desirable and what the actual situation is, cause-and-effect relationships, priorities and potential solutions. Based on their interpretation of problems, departments also assume a position and role for themselves in regards to opportunities for policy action.

Given the complex nature of urban issues, it may be *tenable* for municipal departments to distance themselves from problems by framing them 'non-local' and delegate responsibility to higher levels of government or other actors (von Borgstede, Zannakis, & Lundqvist 2007). If departments perceive their action space limited by constraints both internal and external to their communities, the intention to take local initiative may also be curbed. From a local government perspective, the following five aspects of the perceived policy context are considered in the study:

- *Scope (embeddedness) of local policy.* This aspect refers to the degree of embeddedness that departments recognize in terms of shaping the development of the city. This 'external awareness' is recognized as a core competency for policy makers (Eggers 2009). It shapes perceptions of the scope of local policy. Perceptions may differ in how much higher levels of government are seen to limit local policy and how much local development processes are seen to be driven by regional, national, or supranational trends local authorities do not have control over.
- *Local conflict.* Governance for urban sustainability requires cooperation within and across the boundaries of the local government. Effective policy making and the management of local issues may be hampered by perceived conflict between actors including authorities, the private and non-profit sector. This dimension captures the perceived level of hostility resulting from entrenched positions or disagreement between local stakeholders.
- *Environmental awareness.* Different departments may develop different perceptions of societal awareness of environmental issues and demand for action at the local level. Departments with a more systems-oriented view of issues and policy action are expected to be sensitized to demand for considering environmental aspects of decision making.
- *Community engagement.* Similarly to the aspect above, departments may be encouraged to enter into dialogue with local stakeholders if the community they serve can be easily mobilized for participating in collective processes of decision making, implementing project or delivering services. On the other hand, if there apathy is widespread among citizens and local groups, departments may become less inclined to take initiative (Hatzopoulou &

Miller 2008). This aspect measures the perception of the level of community engagement in local action.

- *Administrative uncertainty*. Departments may also hesitate to take action, start new initiatives, try new ideas and venture into new fields of policy if they perceive legal, political and professional circumstances to be constantly changing and therefore action to be riskier. This aspect taps into the perceived changeability of the administrative context departments experience during the course of their operations.

It is proposed that a more systemic view of problems helps to identify potential and necessary leverage points to respond to issues locally. In other words, sustainability meta-knowledge facilitates local action by enabling municipal departments to see a more actionable policy context and room for action. This leads to the following hypothesis:

HYPOTHESIS 11: *Departments with more sophisticated sustainability meta-knowledge perceive a more actionable policy context.*

3.7 UNOBSERVED RELATIONSHIPS

The theoretical framework considers several direct and indirect explanatory factors for predicting the level of sustainability meta-knowledge accumulated by municipal departments. These factors are all hypothesized to have a reasonable and quantitatively measurable influence on both substantive and process meta-knowledge for sustainability. Accordingly, the primary focus of this study is to observe and analyze these relationships explicitly. At the same time, the researcher must always be careful in making causal inferences when there are potentially confounding effects at play as well: unanalyzed relationship that may account at least partially for the observed phenomena. In order to remove such effects, one must identify potential sources of confounding effects, if possible.

One source of confounding may be created by the fact that data come from individuals, who respond on behalf of their department. Accordingly their perceptions may not always be objective. Their answers may depend on their personal demographics. For this reason, the study collected data on the age, field of education, tenure and the position of the respondents to control for their potential effect. Age may reasonably affect attitudes and thus responses in two contrasting ways that may actually cancel each other out. Elderly department heads may have had more life and professional experience

compared to younger counterparts. On the other hand, younger respondents may have received different professional education than people were educated several decades ago. Respondents' field of education, such as planning, civil engineering, law, business, economics etc., may also cause variation in their responses, which latently stems from their internalized professional values and norm. Similarly to age, tenure in the department (local administration) can potentially lead to biased responses. People new in office may for instance be less critical or than those who have served longer periods of time in office.

Confounding effects may also be caused by theoretically important omitted variables. For instance, the hypothesized relationship between learning culture and sustainability meta-knowledge may turn out to be statistically significant due to spurious correlation. That is, an omitted variable may be a *common cause* for both (Spirtes, Glymour, & Scheines 2000), so they appear to be in a positive statistical relationship even though there is no plausible causal relationship between the two. For instance, the diversity of the professional background of the departmental staff may lead to a more open culture and at the same time the department may be more familiar with interconnected issues (substantive meta-knowledge) and be exposed to more domains of knowledge and professional relationships (process meta-knowledge). So on the surface, it is learning culture that leads to the generation of sustainability meta-knowledge, while it is due to theoretically unspecified and statistically unanalyzed effect of professional versatility present in the department. To account for this potential effect, the staff's professional diversity will also be measured and controlled for. Additionally, the size of the department will also be used as a control variable. Size in this case is taken as a proxy for organizational effects that may emerge as a result of the organizational complexity and dynamics scaled up with size. For instance, in larger departments, the perceived level of openness and risk-taking may also be different due to the changed sociodynamics of the staff, even if attitudes and values are practically comparable to a smaller department.

3.8 SUMMARY

This chapter discussed the theoretical framework that guided the empirical study of the research questions presented at the beginning of the thesis. The chapter reviewed key concepts and their hypothesized relationships. Shared identity and trust in a municipality are expected to have a positive influence on learning culture, whereas the perceived level of centralization and formalization have a negative one. A more learning-oriented culture experienced by municipal departments is assumed to facilitate knowledge

management practices, which then leads to more effective networking between departments and their partners. The characteristics of the advice relationships (advice network) are hypothesized to be related to the development of sustainability meta-knowledge. Finally, sustainability meta-knowledge is expected to influence the perceptions of the policy context.

CHAPTER 4

Research design & methods

This chapter describes and explains the choices made regarding the design and methods of inquiry into the research questions raised in this thesis. In that pursuit, the study adopts an explanatory research strategy. It is explanatory in the sense that the key aspects of the research problem were identified in advance. These aspects were then translated into key constructs and hypothesized relationships between them. By way of studying how and why these relationships work, the study seeks to contribute to the understanding of the research problem (Brewerton & Millward 2001). In terms of research methods, the study relies on cross-sectional quantitative data collected via a survey instrument on a sampled population of Hungarian municipal departments and subsequent statistical analysis including both confirmatory and exploratory techniques.

4.1 INSTRUMENTATION

The constructs of the theoretical model introduced in the previous sections correspond to aspects of multidimensional concepts. Therefore, multiple indicators were used for operationalizing these conceptual domains. Multi-item scales are more accurate and reliable for measuring complex latent constructs than single-item scales (Gray, Williamson, Karp, & Dalphin 2007; Herzog 2008). Some of the items were adopted from earlier studies, these items are marked in the appendix. For other constructs, scale items were developed specifically for this current study based on the review of literature to ensure more robust face and content validity. All items were worded so that they are not country specific and therefore they could be used in other geopolitical settings and therefore keeping the future opportunity of external validation of the research findings. For an exhaustive list of actual questionnaire items, please refer to Appendix B.

4.1.1 Levels of measurement

Several different measurement scales were used. Most authors suggest that at least 5 ordered levels or scores are desirable (Leech, Barrett, & Morgan 2005). If these conditions are met, the variables can be practically considered continuous variables and thus be analyzed with standard statistical methods, if scores also approximate a normal distribution. On the other hand, too many levels or scores may be difficult for respondents to interpret. Relying on widely used and shared conventions I used 5 and 7-point scales for the majority of observed variables. For a small group of items 4-level and 6-level scales were employed. All scales are formed by ordered scores or levels. The purpose of using different scales for different groups of items was to avoid potential response fatigue. Due to the relatively large number of survey questions, respondents may have lost interest and started giving similar (autocorrelated) responses. For this reason both questions types and measurement scales were shuffled in the survey to avoid response-set bias.

A full-anchored 5-point Likert-type scale was employed for items which were phrased as statements with which respondents could either agree or disagree. The five levels were 'strongly agree', 'rather agree', 'neutral', 'rather disagree' and 'strongly disagree'. A 5-point fully-anchored intensity scale was used for one group of questions where respondents had to evaluate impacts of certain factors on local policy (“. The low end (1) signified 'no impact at all', whereas the high end (5) indicates 'great impact'.

A 7-point endpoint-anchored scale was used for items where respondents had to evaluate how much a statement characterizes their job, department or municipality. The low end of the scale (1) signifies that the particular statement is not characteristic at all, while the high end (7) means that it gives perfect description.

A 6-level fully-anchored scale was used for questions concerning temporal frequency of action. The six levels correspond to 'on a daily basis', '2-3 times weekly', 'once a week', 'once in every two weeks, 'once a month' and 'less than once a month' respectively. These levels constitute a pseudo-logarithmic scale[2] (Dekker 2005).

A 4-level scale was used for one group of items, namely *forms of contact with alter*. These items measured the frequency of reliance on four different means of contact with each named alter. The four levels were 'never', 'occasionally', 'often', 'all the time'.

[2] The scale is pseudo-logarithmic in the sense that it can be coded so that the values of this variable are approximately proportional to the logarithm of $n+1$, where n is the number of days per month in which a certain event takes place (e.g., communication between actors). Pseudo-logarithmic coding suits the recall of the frequency of communication by most respondents.

4.2 SAMPLING DECISIONS

4.2.1 Municipalities as primary sampling units

This geographical scope of this study is limited to Hungary, the fundamental unit of analysis being a single municipal department. Before explaining sampling decisions, I briefly explain what the term *municipality* refers to in the Hungarian context.

Territorially, Hungary is partitioned into settlements (villages, towns, cities), counties and the capital. With a major modification of the constitution in 1990 after the fall of the socialist system, all of these have the fundamental right to have local governments. In Hungarian legal terminology, county governments are also considered local governments although they are regional in a geographic sense. In contrast, I use the term local government in my thesis in a limited sense to refer only to municipalities, that is, settlement-level governments. The reason is that I only focus on settlements.

Currently, there are 3125 municipalities in Hungary, each having its own democratically elected representative leadership including a mayor and a local council. In terms of size, only 124 of the municipalities have more than 10 thousand inhabitants, whereas the population of more than half of these muncipalities is less than 1000 people. Out of the 217 cities, 23 are *cities with county rights*, which means that they can fulfill functions of a county government. Out of these 18 are county seats as well.

County governments do not have supervisory authority over municipalities. The difference between them lies in the administrative and service provision tasks delegated to each type of government. Counties have a subsidiary role in providing public services that individual municipalities are not obliged to perform because they are more of a regional character (Ruttkay 2010). Only major cities with a population of more then 50 thousand people can be granted country rights.

The responsibilities of municipal governments are specified by the 1990 Act on Local Governments. Mandatory services for instance include water and sewage, development planning, the protection of the natural and built environment, kindergarten and elementary education, basic health and welfare services, public lighting, maintenance of local public roads, local public transport. Municipalities can also assume any voluntary service provision or administrative responsibilites that is not delegated to other authorities by law (Temesi 2000). Local government can enact bylaws via the local council to govern local affairs not addressed by central government legislation.

In terms of sampling, the theoretical population of all departments in every Hungarian municipality had to be restricted by two considerations and the sampling took a purposive non-probability approach (Dattalo 2010; Northrop & Arsneault 2008). On the one hand, villages and small town local governments typically do not have the size of staff, organizational structure or the array of actors in the locality that would allow a meaningful study of the organizational phenomena this study focuses on. For this reason, at the primary level of sampling, only cities with large enough administration and similar jurisdiction were considered. Accordingly, the original sampling frame included only the largest cities in Hungary. These are the 18 county seats and 5 additional cities with county rights. These municipalities (not considering the capital, Budapest) and collectively represent approximately one fifth of the country's total population. Budapest, being a special case in terms of its administration with its many boroughs and outstanding size, was not considered in the study. Four cities did not have a publicly available staff e-mail directory on their official website to administer the survey and they also refused to disclose such information for the purpose of the research.

4.2.2 Municipal departments as secondary sampling units

Municipal departments served as the secondary sampling units (SSU) within the selected cities. Departments are organizational units in the municipal administration representing the division of labor in the municipal organization. In Hungary, local governments can autonomously decide on its internal organization and rules of procedure (Temesi 2000). The division of the office into departments is established in a statute by the local council. The logic of division may be administrative (e.g., education, local economy, welfare), functional (e.g., finance, labor) and their combination.

Using department as the fundamental unit of analysis is a reasonable approach in studying organizational phenomena such as openness to inquiry, risk-taking, shared identity, networking practices or learning. While from a normative perspective, thinking of an organization (in this case a municipal administration) as a single consistent and coherent entity may be desirable to promote employee commitment and performance. However, it is often an unrealistic representation of organizational life (Boisnier & Chatman 2003). Units (such as municipal departments) within an organizations may produce their own subculture and social milieu: a group-specific set of shared norms, beliefs and "way of doing things."

Subcultures may provide a mechanism in bringing forth change in the values and practices of the overall organization. Supportive and innovative subcultures have also been found to have a stronger positive influence on knowledge sharing than overall organizational culture (Egan 2008). In municipalities, departments may reasonably develop their own subculture as a byproduct of association with the the particular function they represent, the professional composition of staff or leadership style. Department level organizational dynamics can be the source of or barrier to the organizational flexibility and learning capacity needed for reflexive governance. These dynamics and capacities may vary from department to department. Also, as departments individually play a key role in shaping local government policies via formal (and informal) decision support mechanisms in their respective field of local affairs, analysis is meaningful at the departmental level.

In terms of departments as secondary sampling units, random sampling would not have been appropriate given the relatively small number of departments in each municipality and also because of conceptual reasons. Only departments with a role in local planning and policy formation were considered including public works, parks, education, housing and welfare, economic development, building, tourism etc. Departments with internal administrative and support functions were excluded (e.g., IT, accounting, human resources, financial controlling). As noted earlier, local governments enjoy liberty as to how they organize internally. In spite of this, the departmental structure of individual municipalities considered in this study highly resemble each other. Primary differences arise from population size. Larger cities typically have larger administration and may divide certain departments into subunits corresponding for instance to the territorial division of the city. The staff size of individual departments may also increase with local population size. Overall, the functional and administrative coverage of the departmental structure across the cities in the sample are comparable, although formally they may be grouped under different department names.

In summary, the above primary and secondary level sampling considerations lead to a sampling frame of 326 departments in the 19 cities. Data was collected at one single time point, therefore the sample is cross-sectional.

4.3 METHOD OF DATA COLLECTION

4.3.1 Negotiating entry

I approached every municipality by addressing a letter to the mayor detailing the purpose of my research project and asking for assistance in my data collection effort. More specifically, I suggested to mayors as key officials to promote the research project within the office beforehand, so that when individual invitations are delivered in email, department heads had already heard of the research project internally and thus would be more inclined to fill in the questionnaire than when only directly approached by an outsider.

Only six local authorities responded. In two cases, I received an email from an officer appointed by the mayor to coordinate my research within the municipality. In one case, the vice mayor contacted me in email to offer assistance during my research. In two other cases, I was contacted on telephone by the vice mayor and an officer respectively who also offered assistance in my efforts. In one case, I was notified in email that due to capacity constraints ("we are busy with projects and proposals"), the municipality can not provide active support in the research project. As none of the municipalities expressed concerns in any form regarding my data collection, I kept all cities in the sampling pool and administered the survey on all sites, leaving response at the discretion of individual department heads.

4.3.2 The web survey

Data was collected via a web-based self-administered survey. The survey contained the questions in groups, the order of which was pre-determined. At the same time, the order of questions within certain groups were randomized to minimize potential autocorrelation (Kalof, Dan, & Dietz 2008). The survey was piloted at one of the sites (Eger) with 15 respondents. Based on the feedback from these respondents regarding the questionnaire, some minor changes were made to the order of question blocks, the wording of instructions and the phrasing of questions. This latter was made necessary to pretest that the vocabulary used in the survey would be familiar to my informants and thus they interpret questions unambiguously and as expected(De Munck 2009). As these changes did not affect the conceptual aspects of the questionnaire, the data from the pilot site were kept in the sample. After the pilot, the final version of the questionnaire was deployed as a Web-based questionnaire to capitalize on the benefits of the internet. This meant that questionnaire resided on the

internet, executed on a web server, and respondents could access it via a standard Web browser (Baker, Crawford, & Swinehart 2004).

Although from a methodological point of view there are essential trade-offs involved in administering a web-based survey, the following benefits were considered decisive for this mode of data collection. First, an on-line survey is a low cost alternative to most other forms of collecting data. As my research project was unfunded, this aspect was decisive. The second advantage is that web-based surveys offer a less cumbersome method of systematic data collection in terms of reaching potential respondents, following up on their progress with the survey, and eventually getting back to non-respondents to improve response rates. A web-based questionnaire is also probably more attractive for respondents in that 'returning' does not require extra effort compared to paper-based surveys. As all targeted respondents had e-mail, it was reasonable to assume that they would have the necessary skills to use computers and fill out the online survey. From a technical point of view, an electronic survey also allows for real-time validation of answers or checking for missing values, that is, non-response to questions.

I used LimeSurvey©—an open-source PHP web application—to build the questionnaire. LimeSurvey© offers the feature of *tokens*, which makes it possible to identify respondents and track responses. An on-line database was set up which contained the name of each target respondent, their e-mail address, their city, the municipal department they represented and a unique token generated by the software.

The invitation e-mail each respondent received contained a cover letter and a link to the on-line survey based on their token. Neither the cover letter nor the front page of the web survey mentioned the key concepts of the research project for the participants. On the one hand, defining or just directly referencing for instance "learning" or "sustainability" was not necessary for respondents to be able to relate to the questions and answer adequately. Also, the proper measurement of the constructs was not jeopardized as their content was defined (determined) internally, independent of the notions held by respondents. These concepts were also purposefully left unmentioned to avoid an potential misunderstanding, bias or aversion stemming from divergent understandings of these elusive concepts. Accordingly, questions and instructions were also worded in a straight-to-the-point fashion using terms which were most likely to be familiar to and similarly interpreted by all respondents..

The unique link automatically generated for each respondent made it possible to track who completed the survey and who did not or only partially. A reminder e-mail was sent out to people who did not fill out the questionnaire in

two weeks. Both e-mails contained contact information (e-mail, telephone number, fax number). As non-response can ruin any sample regardless of the sampling strategy (Gray, Williamson, Karp, & Dalphin 2007), my e-mails also offered assistance with the survey in an effort to ensure the cooperation of people who encounter difficulties and therefore who are to become potential non-respondents.

This also worked with some sceptic respondents who had doubts about the purpose and the methods of the survey. For instance, there were several people who felt offended by the fact that their opinion was asked about their organization. Others were upset by and suspicious of me for contacting them at their office e-mail. Although all email addresses were publicly listed on the local government websites, some people surprisingly felt that their privacy was abused and they reacted with mannerless rejection. This happened in spite of careful attention being given to describing and explaining the aim of the research project both in the invitation e-mails and also on the front page of the Web survey. I managed to placate such feelings by responding to their messages or discussing these issues over the telephone. In one special case, I had to respond in detail to the research methodological concerns of one respondent.

The survey was set up so that each question was mandatory. Respondents could only turn to the next group of questions if they completed every question in any single group. This ensured that all finished and submitted surveys had complete answers as well. While this arrangement may have had an adverse effect on response rates, this inflexibility helped to completely eliminate missing values. For the convenience of respondents, the survey was set up so that answers were saved automatically and respondents could abort and resume filling out the questionnaire until they completed all questions.

4.3.3 Respondent and case descriptive statistics

Unit-level data was provided by the person in charge of each department. Directors (heads of departments, managing officers) were asked to provide answers on behalf of the municipal department they supervised. The demographic statistics of the responding individuals are presented in Table 4.1. Respondents are typically middle aged, although almost one quarter of them belongs to the 30-39 year age bracket. On average, the typical officer has spent almost 12 years within local administration, although there is rather big dispersions in tenure, ranging from 1 to 40 years. In terms of the executive hierarchy, respondents are typically ranked middle-level managers (roughly two thirds). The remaining one third of the sample is divided between top-tier

officers and team leaders. Team leader is the lowest level of supervisory position in municipal organizational structures with larger departmental units subdivided into teams rather then establishing separate departments. In these cities teams represent an additional tier of hierarchy in contrast to flatter municipal structures. (For the sake of simplicity in discussion, I will refer to all respondents as 'department heads', irrespective of their formal title and the level of hierarchy they represent in their respective municipality.)

TABLE 4.1 • Demographic characteristics of the responding department heads

Age		*Tenure*		*Position*		*Field of Education*	
20–29 yrs.	3%	Mean	11.8 yrs.	Top-level exec.	17%	Law	12%
30–39 yrs.	24%	S.D.	8.4 yrs.	Middle executive	66%	Public administration	7%
40–49 yrs.	31%	Min.	1 yr.	Team leader	17%	Business/economics	16%
50–59 yrs.	39%	Max.	40 yrs.			Engineering	27%
60– yrs.	3%					Humanities	10%
						Social sciences	6%
						Natural sciences	5%
						Other	17%

In terms of the formal education respondents received, the sample is naturally diverse as departments represent various domains of urban affairs. More than one quarter of department heads were trained in an engineering field. This is typically civil engineering (e.g., in planning, building inspection, public works or land development departments). There is a relatively high number of people who were educated in business or economics, and law. Interestingly enough, only 7% of the participants studied public administration. *Other* fields of education include for instance agricultural management, education management, sports management, just to name a few.

The average size of staff in a department is 17 people, although there is quite a lot of dispersion (standard deviation is 14.4). The smallest department has as few as 4 people, while the largest in the sample has 42. In terms of the professional diversity of departmental staff, about half of the departments (49.2%) reported that their staff has a background in 2-3 professional fields. Roughly 14% reported high diversity, where practically everyone had a different professional education. A somewhat smaller share of departments (9.4%) have homogeneous staff, where people share the same educational background. A little more than one forth (27.3%) of the participating departments employs people predominantly with the same professional education. Overall, municipal departments in the sample seem to be

reasonably diverse in terms of educational background, a factor that may be conducive to be beneficial for creating a fertile organizational atmosphere.
There are both drawbacks and advantages to using department heads as respondents. Newig *et al.* (2010) for instance notes the problematic nature of equating individuals who actually communicate in professional situation with the corporate or collective actors they represent, for one may question whether individuals necessarily identify completely with their respective organization and act accordingly. Also, individuals in executive positions may be more inclined to give responses which are deemed appropriate (or socially desirable)

My study rests on the assumption that executives can indeed serve as reasonable proxies for the municipal unit they represent. They can be expected to be reliable respondents, when time and resource limitations do not allow multiple responses from the same organizational unit (Real 2005). As public officials in local authorities are permanent employees, they are likely to influence the management of an organization and play a role in establishing culture and motivating staff. As single respondents, they are well positioned to have an overall view of 'how things go' both at the level of their department and in the municipality and this minimizes the error of misunderstanding or ignorance. This later is important as some survey questions require and understanding of processes that are external to the department.

4.3.4 Response rates and the final sample

Overall, 326 invitations were mailed out during a 5 month period. Potential respondents were contacted in waves site by site. Two to three weeks after the first invitation was sent out, a reminder was sent to those not having completed the survey upon the first invitation. In the end, 161 complete responses were received, while there were an additional 86 unfinished (saved at some point but never completed) responses. Unfinished responses were dropped from the sample. This resulted in a 52% overall response rate, varying between a low of 31% and a high of 93%, depending on the city. The response rates broken down by city (site) are presented in Table 4.2. As a general guideline, Ruane (2005) suggests that for a population of this size, a 50% sampling ratio suffices. Accordingly, the overall response rate is considered satisfactory.

TABLE 4.2 • Response rates broken down by city

City	Cases (*n*)	Response rate
Békéscsaba	4	31%
Debrecen	8	52%
Dunaújváros	3	50%
Eger	14	78%
Győr	4	50%
Kaposvár	10	53%
Kecskemét	8	36%
Miskolc	14	64%
Nyíregyháza	8	44%
Pécs	6	35%
Salgótarján	5	38%
Sopron	12	57%
Szeged	9	36%
Székesfehérvár	8	57%
Szolnok	6	55%
Szombathely	16	50%
Tatabánya	13	93%
Veszprém	5	33%
Zalaegerszeg	8	53%
Total	161	52%

CHAPTER 5

Preliminary data analysis

Before engaging in multivariate statistical analysis in search of evidence for the plausibility of my hypotheses and thus answers to my research questions, this chapter presents the results of the preliminary data analysis. This will be done in three steps outlined in Figure 5.4.

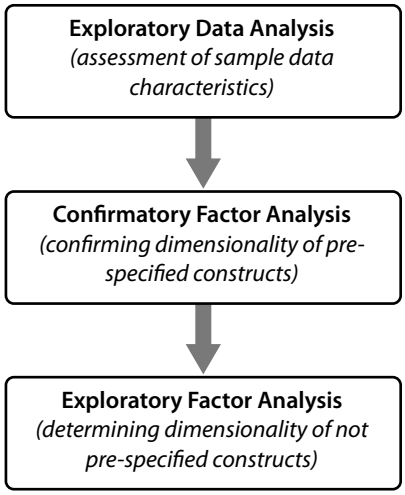

FIGURE 5.4 • Steps of the preliminary data analysis

First, exploratory data analysis (EDA) is conducted in order to assess whether the survey data (the sample) possesses desirable statistical properties which makes it suitable for meaningful statistical analysis. Then, the chapter proceeds with establishing construct validity and reliability via CFA. In this step, the empirical measures (indicators) of hypothetical variables are critically evaluated in order to see if they do a 'good job' tapping into the latent constructs they were intended to capture (Ruane 2005). As a last step, the chapter also presents the exploratory analysis of measured variables with no a priori presumed dimensionality. In addition, the metrics of deriving the indices (composite variables) used in subsequent analysis are also presented.

5.1 EXPLORATORY DATA ANALYSIS

Before actually estimating substantive statistical models, exploratory data analysis can help determine whether the data meet the expectations of the researcher and the assumptions upon which subsequent statistical techniques are based (Lee & Forthofer 2006). One of the benefits of using a Web survey is that it made data screening (checking for coding errors and missing values) very simple and automatic. The questionnaire almost exclusively contained only questions with pre-determined selectable (clickable) answers. Such close-ended questions prevented univariate outliers and invalid responses. Respondents were also required to answer every question in the survey. Should they have missed a questions (either intentionally or not), they were warned to provide an answer before they could move on to the next group of questions. This setup ensured that none of the cases in the sample had missing values on any of the items.

As for statistical assumptions, most methods require normal variables (although some are fairly robust to violations of this assumption). This means that scales of measurement should be continuous (or *scale* in SPSS terminology), and also that scores on observed variables should be at least approximately normally distributed. As a minimum, five levels for Liker-type items are generally required to be considered continuous (Leech, Barrett, & Morgan 2005). To satisfy this requirements most items in the survey were deliberately designed to have 5–7 levels that were ordered from low to high. Variables not having at least 5 levels of ordered values were only used in nonparametric methods.

5.1.1 Normality

Multivariate normality is assumed for confirmatory factor analysis (CFA), structural equation modeling (SEM), and principal component analysis (PCA) estimation methods. It requires that all variables are univariate normally distributed, the distribution of any pair of variables is bivariate normal, and all pairs of variables have linear and homoscedastic scatterplots (Harrington 2009). Although it is difficult and impractical to assess all aspects of multivariate normality, checking for univariate normality and outliers will detect most cases of multivariate non-normality (Harrington 2009; Kline 2005).

Univariate normality means that variables individually are distributed normally having an approximately symmetric distribution. Univariate normality may be detected by checking for significant skew or kurtosis in the distribution of the observed variables. Appendix C lists the descriptive

statistics—including the skewness and kurtosis indices—of all observed scale variables. One option of detecting serious non-normality is to interpret the absolute values of standardized skew or kurtosis indexes, although there is no general consensus on the guidelines of doing so (Kline 2005). Harrington (2009) suggests—as a rule of thumb—that variables with absolute values of the skewness index greater than 3.0 indicate that the distribution is extremely skewed, whereas kurtosis values greater than 10.0 should be of concern. Using these criteria, all observed variables pass the 'acid test'. None of them is seriously non-normal to the degree that they would jeopardize the reliability of the statistical models.

Correlation, least-squares regression, factor analysis, and related linear techniques are relatively robust against non-extreme deviations from normality provided errors are not severely asymmetric. It should be noted, however, that some of the observed variables (e.g., ACTOR8) have skewness values larger than 2.0. By some more conservative standards, skewness should be below 2.0 in absolute value, and an even more stringent criterion is that it should be below 1.0 (Leech, Barrett, & Morgan 2005). This should be less of a concern as the variables not meeting these more conservative criteria are not going to be used as individual variables, but will be combined into composite variables before using inferential statistics. In terms of kurtosis, all variables satisfy the conservative criterion of 10.0 (Kline 2005). Accordingly, no transformations were applied to the observed variables to treat univariate non-normality and prepare them for statistical procedures.

5.1.2 Outliers

The Likert scales limited the range of possible scores, so none of the individual scores may be considered extreme. However, an atypical pattern of scores on a number of variables may suggest that a particular case is a multivariate outlier (Kline 2005). In the absence of individual extreme scores, the detection of multivariate outliers is more difficult than checking frequency distributions. Based on the Mahalanobis distance statistic measuring the distance between the sample means and scores for an individual case, two cases were dropped (Cases #54 and #69) from the sample during confirmatory factor analysis (CFA).

5.2 CONFIRMATORY FACTOR ANALYSIS

The theoretical framework used in my empirical study is built around hypothetical constructs which can not be directly measured empirically. They

were operationalized via a number of items in the survey and thus each have multiple indicators. Before moving on to test particular hypotheses about the relationships of constructs, first the plausibility of hypothetical assertions about their relationships to their respective measures need to be evaluated (Raykov & Marcoulides 2006). Such relationships between constructs and their indicators are expressed in a measurement model (Diamantopoulos, Riefler, & Roth 2008). There are two ways of specifying measurement relationships: (1) reflective measurement is based on the assumption that indicators are caused by the underlying latent construct, whereas in the case of (2) formative measurement it is assumed the other way around: measured variables cause the latent factor (Diamantopoulos & Winklhofer 2001; Hair, Black, Babin, & Anderson 2009). The implications of this are summarized in Table 5.3, which contrasts the two measurement models.

TABLE 5.3 • Differences between reflective and formative measurement models

	Reflective model	*Formative model*
Nature of construct	Latent construct exist independent of the measures used (scale)	Latent construct is defined by its indicators (index)
Indicators	Indicators share a common theme and are interchangeable (sample the construct domain)	Indicators do not need to share a common theme and are not interchangeable (define the construct domain)
Causality	Variation in indicators does not cause variation in the construct	Variation in indicators causes variation in the construct
Item intercorrelation	Items should have high intercorrelation	Items should not have high intercorrelation
Error term	Error term identified at the indicator level representing measurement error	Error term identified at the latent variable level representing disturbance
Assessment of quality	internal consistency measures	*n.a.*

Note: Based on Coltman *et al.* (Coltman, Devinney, Midgley, & Venaik 2008).

Most constructs in this study are multi-dimensional, which means that they are operationalized as having more than one conceptually related facets or unidimensional sub-constructs (Diamantopoulos, Riefler, & Roth 2008). In terms of measurement theory this implies two levels of abstraction, that is, two layers of latent factors. Measured variables (indicators) are related to first-order constructs (factors), whereas first-order factors become indicators of the second-order construct at the second layer of abstraction (Hair, Black, Babin, & Anderson 2009). Second-order measurement models foster parsimony in that the hypothesized relationships between unidimensional first-order constructs are not modeled separately on a one-to-one basis, but are expressed through

the relationships between their respective second-order factor. This, of course, is based on the assumption that the dimensions of a second-order construct relate similarly to other constructs (or variables) in the model (Diamantopoulos & Winklhofer 2001).

From an empirical point of view, two closely related aspects are particularly important in validating reflective measurement models: assessing item intercorrelations and measurement errors. Based on item intercorrelations, this section concentrates on appraising construct validity and assessing the reliability of the measurement scales. Construct validity of measurement means that the manner used by the researcher to capture the concept under investigation truly captures that concept (Elliott 2005; Hu & Racherla 2008), whereas reliability refers to the consistency of measurement. The evaluation of two types of validity—convergent and discriminant—is a common part of confirmatory factor analysis (CFA), which can provide compelling evidence of both types of construct validity (Brown 2006). CFA is a special application of structural equation modeling (SEM). Generally speaking, SEM models are usually conceived in terms of not directly measurable constructs and corresponding observed variables. In addition, models also take explicitly into account potential errors of measurement in all observed variables, which is usually unavoidable in the social sciences.

By applying CFA, the researcher attempts to determine whether observed variables share common variance-covariance characteristics that define theoretical constructs called factors in statistical models (Schumacker & Lomax 2004). In the case of reflective constructs, the researcher can identify and eliminate measurement error by using factor scores which contain that part of the indicators that is shared with other indicators and excludes the errors in the underlying items (Coltman, Devinney, Midgley, & Venaik 2008). In other words, CFA seeks to statistically test the significance of a hypothesized factor model, that is, whether the sample data confirm the model. It is *confirmatory*, because a measurement model is specified beforehand, as opposed to an exploratory approach (e.g., exploratory factor analysis, or EFA), where the primary goal is to reveal the pattern of relationships between latent factors and observed variables not specified in advance. When the measurement models get confirmed, the researcher can conclude that the measurements scales in fact provide a good approximation of capturing the presence of the theoretical constructs and statistical analysis may proceed. Most often observed variables of a scale are used to define a composite score by summation or averaging.

Estimation was carried out using Amos™ 17 (Arbuckle 2008). The initial sample size had 161 cases. This can be considered a medium size sample (Harrington 2009). Measurement errors in every forthcoming model were

assigned a scale through a unit loading identification[3] (ULI) constraint according to common practice in CFA (Kline 2005). All latent variables were scaled by setting a unit loading constraint on one of their indicator variables. In every case, the maximum likelihood (ML) estimator was used on the sample variance-covariance matrix to estimate all model parameters as the observed data satisfies the requirement of multivariate normality.

TABLE 5.4 • Type of measurement used for each construct

Construct (2nd order)	*Measurement*	*Sub-constructs (1st order)*	*Measurement*
Organizational structure	Formative	Formalization Centralization	Reflective
Organizational culture	Reflective	Trust Identity	Reflective
Learning culture	Reflective	Openness Interaction with organizational environment Risk-taking Inclusiveness	Reflective
Knowledge management	Reflective	Knowledge creation Knowledge sharing Knowledge utilization	Reflective
Perceptions of policy context	Formative	Embeddedness Local conflict Environmental awareness Uncertainty	Reflective
Advice networks	Formative	Diversity of advice network Forms of communication	Formative
Substantive meta-knowledge	Reflective	Interconnectedness Spatial scales Temporal scales Human-nature interdependence	Reflective
Process meta-knowledge	Reflective	Role of knowledge Multiplicity of views Interdependence of actors External relationships	Reflective

[3] ULI fixes the unstandardized residual path coefficient for the direct effect of measurement error on the corresponding indicator to 1.0. This assigns a scale to the measurement error which corresponds to that of the unique variance of its indicator (Kline 2005).

5.2.1 Organizational structure

Organizational structure is hypothesized to have two factors (dimensions): *formalization* and *centralization*.[4] Formalization was assessed by 4 items, while *centralization* had 7 related items in the questionnaire. The initial model related all items to their latent factors. This model, however, fit very poorly with chi-square (χ^2) being 163.3, $df = 43$ and $p < .001$.[5] Several of the standardized residual covariances of `CENTR7` exceeded 3.00, which implied serious strains in the model. The variable had a non-significant and low loading on centralization, so this variable was dropped from the model.[6] In the modified model, the modification index (MI) suggested adding a covariance between the error terms of `CENTR3` and `CENTR4`. As the corresponding two items assess a quite similar aspect of centralization and `CENTR4` had a lower loading, it was dropped. Item `CENTR3` was dropped in the next step as it cross-loaded on formalization. The final model with standardized estimates of factor loadings is displayed in Figure 5.5.

The model produced the following fit indices: $\chi^2 = 25.2$, $df = 19$, $p = .155$, which means that the model-implied covariance matrix is not significantly different from the sample covariance matrix. Further fit indices are: CFI = .979, TLI = .969, RMSEA = .051. Based on the rules of thumb described in Brown (2006), the model can be considered to give a close fit.[7] All factor loadings are significant at $p < .001$ with the exception of `CENTR2`, which is significant at $p = .001$. Three variables (`FORM3`, `FORM4`, and `CENTR1`) load poorly on their respective factor. Four variables (`FORM1`, `FORM2`, `CENTR5`, and `CENTR6`) have excellent loadings and one (`CENTR2`) has a fair coefficient.[8] Based on this, it can be concluded that convergent validity has been established. The correlation between the two factors formalization and centralization is very low (–.11) and is not significant. In applied research, a factor correlation that equals or exceeds .85 is often used as the cutoff criterion for problematic discriminant validity (Brown 2006). Here, the low correlation estimate suggests the opposite: the two latent variables are statistically unrelated, although they were believed to be

[4] Variable names are typeset in Courier typeface.

[5] Waltz (2005) suggests that the χ^2/df ratio can also be used for the evaluation of model fit as χ^2 can often easily turn out significant in the presence of multivariate skewness. As a general guideline, a ratio below 3.0 indicates acceptable fit.

[6] As the models are based on reflective indicators (as opposed to formative ones), indicators can be thought of as samples of the construct domain. Accordingly, the elimination of an observed variable would not alter the meaning of the latent variable (Brown 2006; Franke, Preacher, & Rigdon 2008).

[7] RMSEA close to .06 or less, CFI close to .95 or greater, and TLI close to .95 or greater indicate good fit. At the same time Meyers et al. (2006) describe more liberal thresholds for RMSEA: .08–1.00 indicates moderate fit and less than .08 indicates good fit.

[8] Harrington (2009) provides the following general guidelines for evaluating factor loadings: loadings above .71 are excellent, .63 very good, .55 good, .45 fair, and .32 poor.

correlated facets of organizational structure. This finding suggests that when modeling organizational structure as a second-order construct, these sub-constructs can be more properly specified as formative rather than reflective indicators (Coltman, Devinney, Midgley, & Venaik 2008).

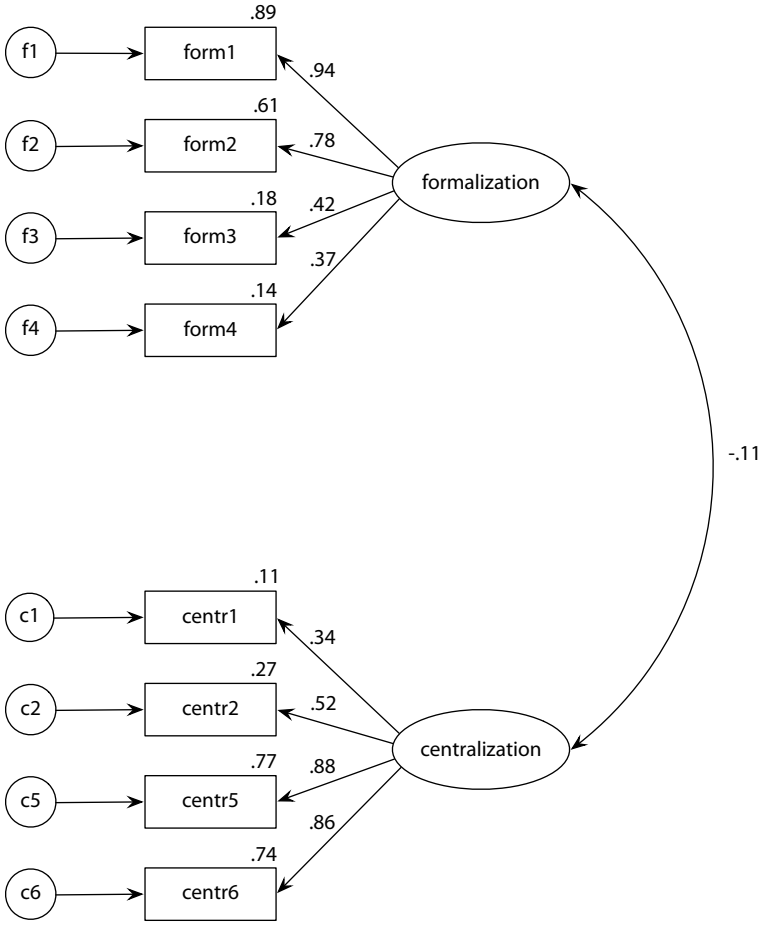

FIGURE 5.5 • CFA model of organizational structure with standardized estimates

5.2.2 Organizational culture

Six dimensions of organizational culture were measured in this study. *Trust* and *identity* represent two general dimensions, while *risk-taking*, *dialogue*, *inclusiveness* and *interaction* (with the organizational environment) are hypothesized to be closely related to the hypothetical construct of learning culture. Testing the reliability of the measurement scales proceeded in two steps. First, the measurement models of the general organizational culture aspects (trust and identity) and the learning culture aspect were assessed

independently. Then the two were joined together and the combined model was assessed.

Trust and identity

Both *trust* and *identity* have 4 indicators. The model was estimated as displayed in Figure 5.6. All observed variables load significantly ($p < 0.001$) on their respective factors. Loadings range from .68 to .80 for *trust*, and .73 to .93 for *identity*, which means that their variances are explained either well or excellently by their corresponding underlying construct. This supports the convergent validity of both constructs. The correlation of the two factors is .46 and it is significant at $p < .001$. This suggests that the two latent variables are somewhat related as would be expected given that they are hypothesized to measure two related dimensions of organizational culture, but the correlation is only moderate so they can be considered two distinct aspects and hence discriminant validity is warranted. The model fit is acceptable with $\chi^2 = 29.2$, $df = 19$, and $p = .063$. Further fit indices are: CFI = .979, TLI = .970, and RMSEA = .065.

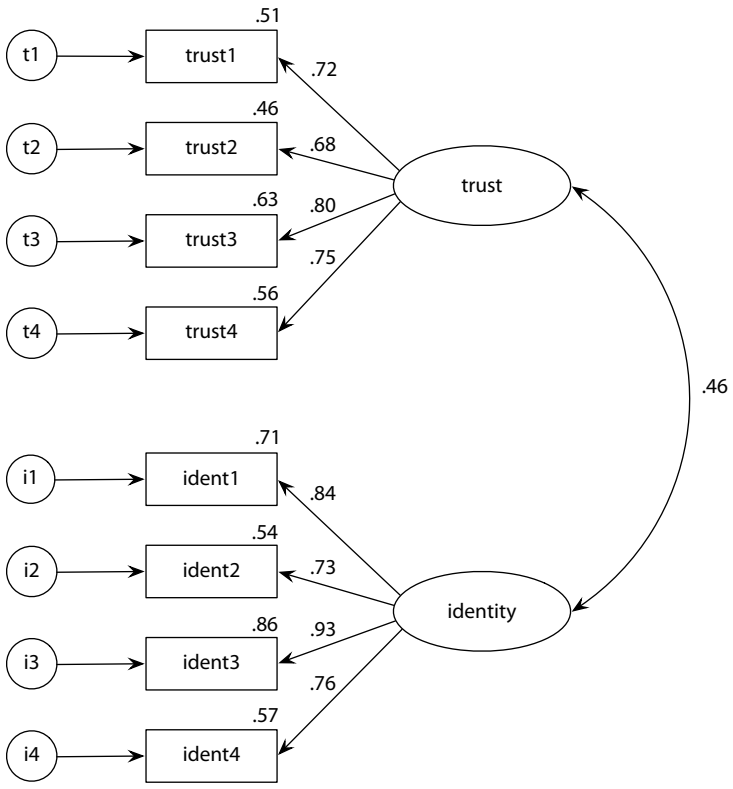

FIGURE 5.6 • CFA model of the trust/identity dimensions of culture with standardized estimates

5.2.3 Learning culture

In the initial CFA model *risk-taking* and *openness* had six indicators each, while *inclusiveness* and *interaction* had three and four respectively. Although all indicators loaded significantly ($p < .001$) on their corresponding underlying factor, the overall fit of the baseline model was poor ($\chi^2 = 341.4$, $df = 146$, $p < .001$; CFI = .836; TLI = .808; RMSEA = .103).

In the course of the specification search[9], first `RISK5` was dropped from the risk taking subscale as its error term was significantly correlated with that of risk6. Next, `OPEN1` was dropped as some of its standardized residual covariances[10] exceeded 2. Having a large unexplained variance, risk6 was also omitted. Dropping risk1 also improved model fit. In the next step, the error terms of `OPEN3` and `OPEN2` were allowed to be systematically related by adding a covariance. The measurement error correlation reflects the assumption that the two indicators measure something in common that is not explicitly represented in the model. The correlation between the two items turned out to be significant ($p < .001$), suggesting that they violate the local independence assumption (Kline 2005). This may be serial correlation resulting from the fact that these two items were placed immediately after each other in the questionnaire, so respondents tended to answer these items similarly. Items were kept in the analysis nevertheless as having them in the model significantly improved model fit.

Finally, `OPEN5` was dropped which improved model fit significantly: $\chi 2 = 96.2$, $df = 70$, $p = .021$; CFI = .967; TLI = .958; RMSEA = .054. In the final model, all loadings and covariances are significant at $p < .001$. Parameter estimates are presented in Table 5.5. The correlations between the factors suggest that the latent variables are somewhat related, but they are not so high as to infer that they are all measuring the same construct. Thus, there is support for the discriminant validity of the constructs. Standardized regression weights fall in the range of .58–.94 meaning that indicators have good and excellent loadings on their respective latent variables. This finding provides evidence of the convergent validity of the four learning culture constructs.

[9] Although in principle a model should be fully specified before data collection and testing, specification searches are helpful for improving a model that is not fundamentally misspecified (Raykov & Marcoulides 2006).

[10] Residuals can be examined to identify localized areas of strain in a CFA model. As a rule of thumb standardized residuals should be less than 2.00 (Harrington 2009). These standardized residuals can be roughly interpreted as z scores (1.96 for $p < .05$, 2.58 for $p < .01$) (Brown 2006).

TABLE 5.5 • Parameter estimates for the 4-factor model of learning culture

Parameter	*Unstandardized estimate*	*Standard error*	*Standardized estimate*
	Factor loadings		
IACTION1 ← interaction	1.000	—	.581
IACTION2 ← interaction	1.509	.233	.782
IACTION3 ← interaction	.934	.167	.628
IACTION4 ← interaction	1.732	.255	.902
RISK2 ← risk taking	1.000	—	.870
RISK3 ← risk taking	1.123	.103	.834
RISK4 ← risk taking	.997	.100	.779
INCLUS1 ← inclusiveness	1.000	—	.695
INCLUS2 ← inclusiveness	1.266	.167	.857
INCLUS3 ← inclusiveness	.855	.121	.726
OPEN2 ← openness	1.000	—	.638
OPEN3 ← openness	.936	.129	.589
OPEN4 ← openness	1.052	.176	.675
OPEN6 ← openness	1.207	.184	.809
	Measurement error variances		
IA1	1.148	.208	
IA2	1.704	.269	
IA3	.815	.154	
IA4	.529	.164	
R2	.447	.099	
R3	.771	.143	
R4	.898	.143	
I1	.491	.076	
I2	.266	.074	
I3	.301	.50	
O2	1.518	.228	
O3	1.718	.248	
O4	1.383	.215	
O6	.803	.179	
	Factor variances and covariances		
interaction	1.109	.286	1.000
risk taking	1.392	.238	1.000
inclusiveness	.459	.112	1.000
openness	1.043	.288	1.000
interaction ↔ inclusiveness	.233	.075	.393
interaction ↔ risk taking	.652	.149	.641
inclusiveness ↔ openness	.432	.107	.626
interaction ↔ openness	.461	.131	.521
risk taking ↔ openness	.747	.171	.630
risk taking ↔ inclusiveness	.419	.102	.529
O2 ↔ O3	.699	.190	.432

Combined six-factor model

After confirming models of *trust* and *identity* and *learning culture*, these two aspects of organizational culture were combined into a second-order CFA model, each being a second-order factor with *trust, identity, risk-taking, openness, interaction* and *inclusiveness* as first-order factors. The model did not fit well (χ^2=279.1, *df*=182, *p*=.000; CFI=.929; TLI=.918; RMSEA=.065). Also, the correlation between the two second-order factors was .94 at $p<.001$, which is very high, so the two-factor second-order structure was not supported. Therefore, the six constructs were included in a standard first-order CFA model, allowing all latent variables to covary with each other (See Figure 5.7).

The baseline model fit reasonably well and produced the following fit indices: χ2=228.5, *df*=173, *p*=.003; CFI=.957; TLI=.947; RMSEA=.050. Accordingly, no further changes were made to the indicator structure. All loadings are significant at $p<.001$. Most correlations between factors are significant at $p<.001$, except for risk-taking∪identity and interaction∪inclusiveness ($p<.05$), and interaction∪identity, which is not significant (*p*=.932). Again, the correlations are not so high as to infer that the latent variables measure the same construct. This finding supports the assumption of discriminant validity of the constructs corresponding the six proposed dimensions of organizational culture.

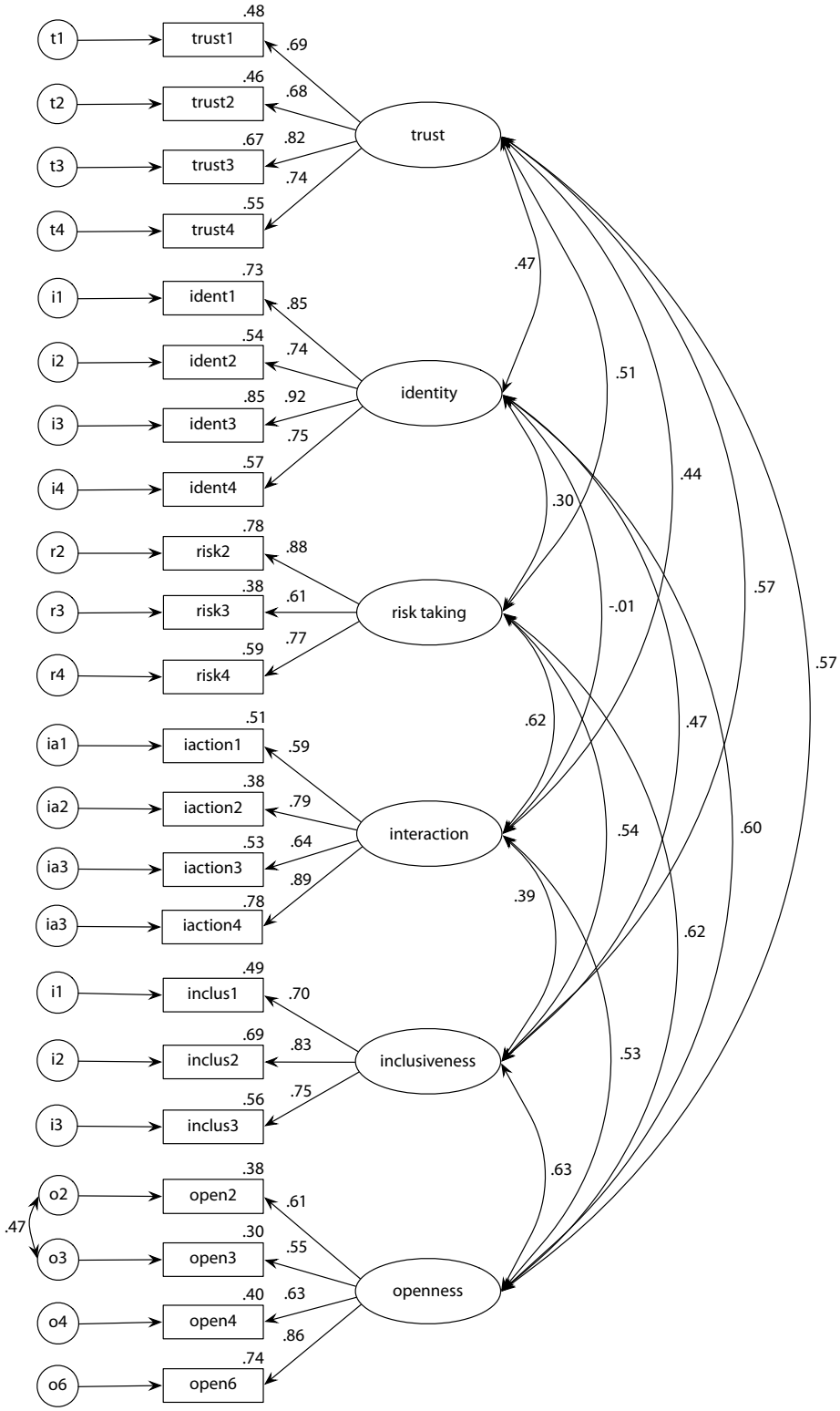

FIGURE 5.7 • CFA model of organizational culture with standardized estimates

5.2.4 Knowledge management practices

The observed variables measuring knowledge management practices were hypothesized to have three dimensions. Accordingly, a three-factor model was specified for confirmatory factor analysis. The initial model with all measured indicators connected to their presumed latent variable did not fit adequately (χ^2=202.5, df=101, p<.001; CFI=.839; TLI=.809; RMSEA=.089). The measurement errors of SHARE4 and SHARE5 were found to be correlated, so SHARE4 was dropped first. After the examination of the modification indexes in the next step, SHARE5 was also omitted for being related to the other factors as well based. Indicator SHARE7 was dropped for having a very low factor loading (λ=.29, while CREATE2 was dropped for cross-loading on *sharing*. While an indicator may actually measure more than one domain, keeping unidimensionality is useful for testing convergent and discriminant validity of factor measurement (Kline 2005).

The changes made to the original model are substantial in that they involve omitting variables, but they were necessary to secure a reasonably fitting measurement model. Also, the measurement scale for knowledge management is more exploratory than confirmatory per se, so more tolerance is given. The final model is displayed in Figure 5.8. The goodness-of-fit indices are as follows: χ^2=49.0, df=41, p=.182; CFI=.981; TLI=.975; RMSEA=.039. The indicators of sharing have loadings in the range of .60–.88, which can be considered very good overall. The indicators of the other two factors (creation and utilization) have somewhat weaker loadings between .48–.67 and .50–.73 respectively. All factor loadings are significant at p<.001. The correlations between the factors are .80, .71, and .49 (also all significant at p<.001). The relationship between knowledge creation and sharing appears particularly high, so a constrained model was also tested where the covariance between these two latent variables were set to equal 1. Such a constraint essentially implies that the hypothesized three-factor model is not correct and creation and sharing should be collapsed into one factor. The χ^2 difference test, however, indicated that the nested model did not improve model fit ($\Delta\chi^2$=–26.0, p<.001), so the three-factor structure was kept.

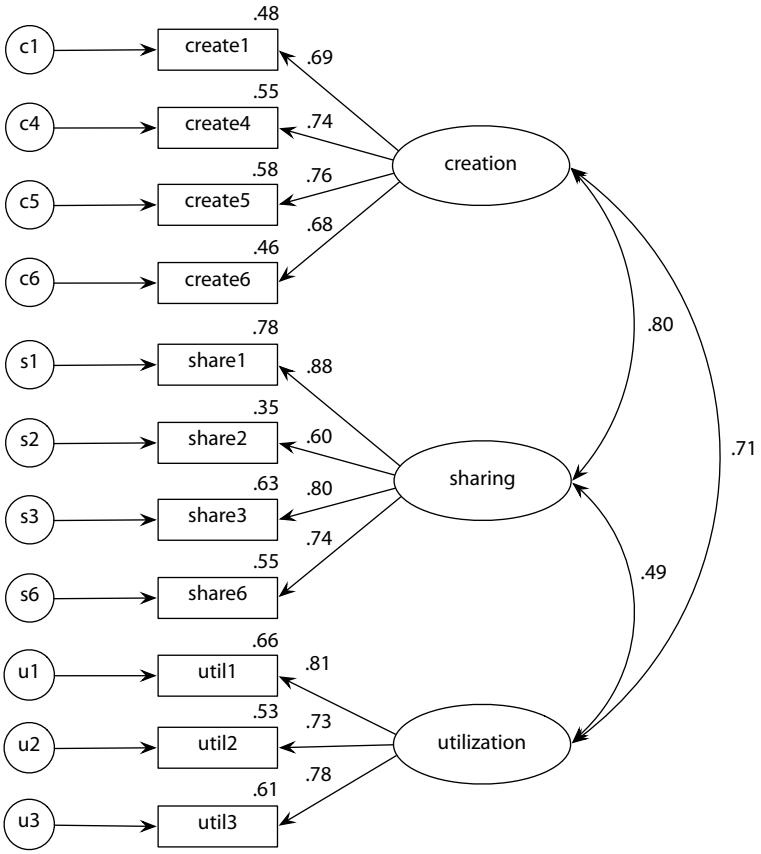

FIGURE 5.8 • CFA for knowledge management practices with standardized estimates

5.2.5 Scale reliability

Generally speaking. reliability refers to the precision or consistency of measurement (Brown 2006). When using multiple-item measures, reliability is used to capture the extent to which the different items (indicators) are consistent with one another and the extent to which each item is free from measurement error (Leech, Barrett, & Morgan 2005). Reliability is a necessary, although not sufficient condition for construct validity (Schwab 2005). In the context of this study, only one aspect of reliability was assessed, which is internal consistency.

Estimates of internal consistency address the degree of similarity of item scores obtained on a measure which has multiple items. The most commonly used evaluation statistic is Cronbach's alpha coefficient. This traditional measure, however, is often a misestimator of scale reliability (Brown 2006). Due to this limitation, it is not recommended to use in isolation (Alegre & Chiva 2008). Accordingly, two additional measures of reliability were used to

assess the consistency of item scores, namely composite reliability (CR)[11] and average variance extracted (AVE).[12] All measures are reported in Table 5.6.

TABLE 5.6 • Reliability measures of organizational constructs

Construct	*Composite reliability (CR)*	*Average variance extracted (AVE)*	*Cronbach's alpha coefficient*
1. formalization (w/o FORM4)	.74 (.78)	.45 (.56)	.70 (.73)
2. centralization (w/o CENTR1)	.76 (.81)	.47 (.60)	.70 (.79)
3. trust	.83	.55	.82
4. identity	.89	.67	.88
5. risk taking	.88	.71	.86
6. interaction	.82	.54	.82
7. inclusiveness	.81	.58	.80
8. openness (w/o OPEN2)	.76 (.80)	.45 (.49)	.77
9. knowledge creation	.66	.52	.66
10. knowledge sharing	.84	.58	.84
11. knowledge utilization	.68	.50	.67

All Cronbach's alpha coefficients reach the commonly used cut-off value of .70 with the exception of the knowledge creation and knowledge utilization scales. Lower alpha values in the .60–.69 range may be acceptable, especially if there are only a handful of items in the scale, as is the case here (Leech, Barrett, & Morgan 2005). The composite reliability values are all satisfactory except again for the knowledge knowledge creation and knowledge utilization scale, which do not reach the commonly used .70 threshold (Hair, Black, Babin, & Anderson 2009). The values are close to the common benchmark and by some author's less stringent standards they are acceptable as they exceed the threshold of .60 (Skerlavaj & Dimovski 2009). Hair *et al.* (Hair, Black, Babin, & Anderson 2009) also suggest that a CR value between .60 and .70 may be acceptable if other indicators of the model's construct validity are good. Given that the CFA model fit adequately with significant and sizable factor loadings, it is concluded that the CR values in the high .60s are acceptable.

In terms of AVE, the formalization, centralization, openness scales are somewhat below the threshold value of .50 (Hair, Black, Babin, & Anderson 2009). AVE values below .50 indicate that on average more error remains in the

[11] $CR = \left(\sum \lambda_i\right)^2 \Big/ \left[\left(\sum \lambda_i\right)^2 + \sum \theta_i\right]$, where λ_i is the standardized loading of indicator i and θi corresponds to the measurement error of indicator i.

[12] $AVE = \left(\sum \lambda_i^2\right) \Big/ \left[\left(\sum \lambda_i^2\right) + \sum (1 - \lambda_i^2)\right]$, where λ_i is the standardized loading of indicator i.

items than variance explained by the latent factor structure imposed on the measure. This indicates a slightly compromised convergence validity for the creation and utilization constructs. In the case of the formalization scale, the omission of FORM4 kicks the AVE value up to .56, whereas the omission of CENTR1 of the centralization scale increases AVE to .60. Similar gains could be made by the deletion of one further observed variable from the centralization and openness scales. The interaction scale only has three indicators so no further elimination would be plausible. Similarly, the other scales were eventually chosen to be left unchanged as gains in terms of AVE would be minimal.

Ideally, some of the scales could be refined, re-tested and confirmed on a different sample or an unrelated population to improve their reliability and validity. Nevertheless, the reliability of these constructs are considered satisfactory for the purpose of the current analysis, bearing in mind the exploratory nature of the study.

Composite variables of organizational factors

After the validation of the first-order measurement scales, factor loadings were used as weights to calculate the composite score for each construct as the weighted sum of individual indicator scores. Table 5.7 summarizes the most important descriptive statistics of these organizational composite variables. Compared to original indicator scores, the skewness and kurtosis statistics of the composite variables improved indicating approximate normality after aggregation. In terms of kurtosis, knowledge utilization sticks out from the rest of the variables by having a kurtosis of 4.0, which is still not expected to distort statistical results.

TABLE 5.7 • Descriptive statistics of the unstandardized organizational construct scores

Construct	*Mean*	*Standard deviation*	*Skewness*	*Kurtosis*
1. formalization	11.260	2.759	−0.648	−0.212
2. centralization	7.897	3.402	0.187	−0.762
3. trust	12.019	1.648	−0.512	1.025
4. identity	10.329	2.918	−0.235	−0.158
5. risk-taking	7.370	2.966	−0.339	−0.076
6. interaction w/ org. env't	8.336	2.435	−0.695	0.350
7. inclusiveness	8.657	1.804	−0.749	0.759
8. openness	9.532	3.336	−0.460	−0.281
9. knowledge creation	7.807	1.486	−0.562	.230
10. knowledge sharing	10.512	2.299	−0.368	−0.246
11. knowledge utilization	7.285	1.087	−1.349	4.002

As a final step of assessing the quality of constructs, bivariate correlations were examined to see whether there is any peculiarity in their relationships. Table 5.8 exhibits pairwise correlations between the 11 constructs. None of these correlations are so high to be considered a cause for concern from the point of view of discriminant validity. Four of the correlations are over .50: between risk taking and centralization, trust and knowledge creation, risk taking and interaction, and risk taking and openness (all significant a $p < .01$).

The moderate correlations imply that these constructs are related empirically (as proposed in the theoretical framework). This is quite common in the social sciences, where measuring dimensions of a phenomenon is always subject to some error, especially when the underlying may be close to each other conceptually. The relationships between the variables, however, are not too strong to infer that they overlap to the extent that they can not be considered distinct constructs. The square root of AVE values (displayed in the diagonal) are larger for every construct then their inter-correlation with any other construct, suggesting sound discriminant validity.

TABLE 5.8 • Inter-correlations among the organizational constructs

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. centralization	**.777**										
2. formalization	–.080	**.749**									
3. trust	–.247**	.259**	**.746**								
4. identity	–.157	.348**	.407**	**.820**							
5. risk-taking	–.501**	.243**	.412**	.261**	**.846**						
6. interaction	–.234**	.065	.347**	.007	.501**	**.740**					
7. inclusiveness	–.276**	.327**	.466**	.391**	.459**	.322**	**.766**				
8. openness	–.339**	.372**	.476**	.438**	.512**	.438**	.459**	**.701**			
9. k. creation	–.063	.328**	.506**	.365**	.399**	.326**	.463**	.420**	**.718**		
10. k. sharing	.054	.321**	.435**	.335**	.251**	.186*	.272**	.319**	.403**	**.765**	
11. k. utilization	–.192*	.240**	.484**	.297**	.361**	.377**	.361**	.438**	.483**	.382**	**.712**

*Statistically significant at $p < .05$ (2-tailed).
**Statistically significant at $p < .01$ (2-tailed).
Note: Values in the diagonal are the square root of AVEs.

5.3 EXPLORATORY FACTOR ANALYSIS

5.3.1 Sustainability meta-knowledge

Out of the 38 items related to sustainability meta-knowledge in the questionnaire, only five (those belonging to the *human-nature interdependence paradigm* (NHIP) scale) have been directly adopted from a previous study. 22

items served as the basis of computing an index of perceived inter-connectedness among urban policy issues, while 4 items were used to derive a single measure of the perceived importance of different spatial scales in local decision making. All other items were stand-alone indicators without an *a priori* confirmed factor structure.

Interconnectedness of urban issues

To measure how much municipal departments perceive their professional domain to be intertwined with various other domains they were asked to evaluate how closely they associate their department's profile with 22 common urban policy issues. These issues were chosen to represent the triple bottom-line: the economic, environmental, and social aspects of decision-making which may be addressed at the municipal level. They also represent pressure, state, and response issues in a mixed fashion, several of which will be redundant from an analytical and measurement point of view as they are expected to be closely correlated. Items that may be overlapping conceptually ensure that most respondents identify strongly with at least one of them. Respondents' raw scores (ratings) on the 22 items were submitted to principal component analysis (PCA) to reveal the underlying factorial structure (see Table 5.9).

The PCA identified four components having eigenvalues over 1.0. The four components together account for 73% of the variance. Individual components account for 39%, 14%, 10%, and 10% of variance, respectively. Not considering loadings below .30[13], ten items appear to cross-load on two components and none cross-loads on more then two. Items related to the environment and natural resource load strongly on the first component. This first component also includes items such as *transport and parking*, or *infrastructure*. Instead of labeling it as 'environment', it is probably more encompassing and accurate to conclude that these items are all related to physical urban systems. Accordingly, this component will be referred to as the physical dimension of urban policy issues. The items loading on the second component represent societal issues and social support systems. The third component captures the economic dimension with high loading items including *economic development* and *jobs and employment*.

[13] As a rule of thumb, component or factor loadings below .30 are typically considered low, so they are often omitted to offer a more readily comprehensible interpretation of the underlying data structure.

TABLE 5.9 • Component loadings of the 22 issue items

Item	*Component*			
	1	*2*	*3*	*4*
Parks and green space	.899			
Environmental quality	.895			
Urban habitats	.891			
Waste and hazardous waste	.879			
Nature conservation	.870			
Air pollution and noise	.855			
Water management, sewage	.830			
Transport and parking	.795			
Climate change	.747			
Built environment	.700		.360	
Energy efficiency	.686		.413	
Infrastructure / utilities	.663		.543	
Education		.820		
Families and children		.776		.391
Recreation	.362	.738		
Health		.675		.334
Equal opportunities		.595		.566
Economic development			.871	
Jobs and employment		.363	.701	
Social justice				.848
Information/awareness raising	.464			.588
Improvement of quality of life	.429			.519

Note: Loadings are estimated using the principal components extraction method with varimax rotation. Loadings below .30 are not displayed for clarity. KMO = .896. Bartlett's test of sphericity was significant at $p < 0.001$.

The forth dimension appears to have items which cannot be specifically related to physical, societal, and economic systems. Three items have strong loadings on this component: *information provision and awareness raising*, *social justice*, and *quality of life*. While the first is an activity without any sectorial specificity, the latter two are rather abstract concepts compared to the institutionalized policy areas represented by the other items. They refer to complex ideas that cut across policy domains. For this reason this forth component will be referred to as the integrated dimension. By taking a look at the cross-loading pattern, it appears that *information provision* and *quality of life* also cross-load on the *physical* component. Moreover, the three items tend to covary with three items on the societal component. Most notably, *equal opportunities* loads almost as strongly on *integrated* as on *societal* dimension. This suggests that this forth integrated component also has a slight societal slant.

In order to have a more illustrative overall view of how municipal departments tend to associate themselves with issues (and thus interconnect

the issues themselves), the component loadings above .30 were used to map the 22 items as a conceptual network of interlinked nodes. The two-mode graph has two subsets of nodes. The four components represent one subset (the first mode), while issues constitute another (the second mode). Accordingly, each edge has its origin in an issue node and connects into a node representing one of the four component. In this special *affiliation* network (exhibited in Figure 5.9), issues create linkages between components (representing spheres or pillars) and components create linkages between issues.

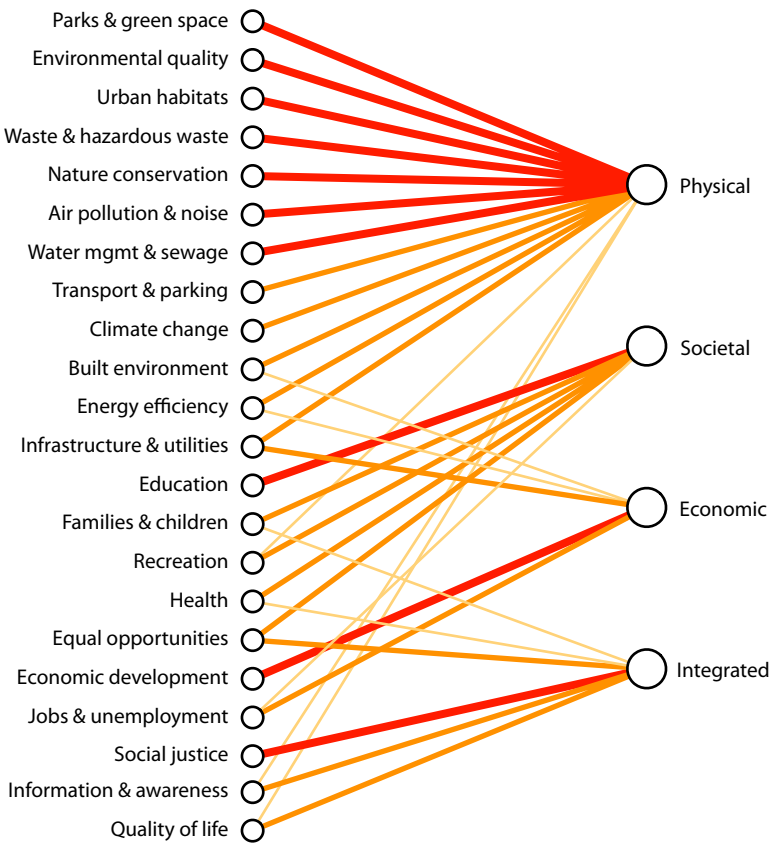

FIGURE 5.9 • Perceived interconnectedness of urban policy issues. Network is laid out using the Sugiyama algorithm available in NodeXL. Lines are color-coded: red representing the highest component loading and yellow representing the lowest.

In terms of interconnections between spheres, the physical and economic components appear to be most closely connected. Most notably, infrastructure, energy, and built environment are perceived to join these components most strongly. These three items are issues which relate to the local economy for their high investment needs (e.g., remodeling residential units for energy efficiency), yet they have clear environmental implications often endorsed by

central government programs and funding windows (e.g., 'panel' program[14]). Recreation appears to be the only link with reasonable strength between the physical and societal component. Societal is also only weakly related to the economic component via jobs. Quality of life and information and awareness raising connect the integrated and physical components, but surprisingly they are marginally related to both the economic and societal components. The overall connection pattern implies that the normatively desired balance between the three pillars of the triple bottom line is not pronounced. Environmental concerns seem to go with economic ones, but the perceived relationship between social aspects and environmental issues is quite weak.

The linking function of policy issues and components (spheres) imply that a policy issue is central in this conceptual network if it creates ties between spheres and a sphere is central if it creates ties between policy issues (Faust 1997). Table 5.10 displays common two-mode centrality measures for both policy issues and components.[15] The table includes data for two different cut-off values: the conventional .30 level and a rather liberal .10 level.

Degree centrality is one of the most intuitive centrality indices. Generally speaking, degree centrality captures the importance of a node based on the idea that more connected nodes are more central, where the level of connectedness is expressed in the number of connections the node has (degree). In the context of policy issues and components (spheres), an issue bearing more degree centrality is connected to more components. Also, a component with higher degree centrality is associated with more issues. At the .30 loading threshold, all policy issues are either connected to one or two spheres, which results in an degree centrality index of .25 or .50 (see Table 5.10). At the .10 threshold, three issues (climate change, jobs, and quality of life) are connected to all four components, thus having a degree centrality of 1. As for components, the physical component has the highest degree centrality.[16]

[14] This program hosted by the Hungarian Ministry of Local Governments opened a funding window to support the retrofitting of apartment blocks (aka tower blocks) to improve their energy efficiency. While this program explicitly addressed energy efficiency issues, it was also considered by both local governments and tenants as an opportunity to improve the quality of obsolete residential units at a more general level and not particularly for ecological/environmental reasons.

[15] For detailed discussions of the concept of centrality and its measures, see for instance Wasserman and Faust (1994) or Everett and Borgatti (2005).

[16] This fact should be interpreted with great care as issue items were arbitrarily chosen to be included in the questionnaire. The item pool therefore may have been unbalanced.

TABLE 5.10 • Two-mode centrality measures for policy issues and components

	Degree		*Closeness*		*Betweenness*	
	(a)	*(b)*	*(a)*	*(b)*	*(a)*	*(b)*
Parks and green space	.500	.250	.920	.697	.007	.000
Environmental quality	.750	.250	.958	.697	.016	.000
Urban habitats	.750	.250	.958	.697	.015	.000
Waste and hazardous waste	.250	.250	.742	.697	.000	.000
Nature conservation	.750	.250	.958	.697	.015	.000
Air pollution and noise	.750	.250	.958	.697	.015	.000
Water management, sewage	.750	.250	.958	.697	.016	.000
Transport and parking	.500	.250	.821	.697	.003	.000
Climate change	1.000	.250	1.000	.697	.032	.000
Built environment	.500	.500	.821	.767	.003	.052
Energy efficiency	.500	.500	.821	.767	.003	.052
Infrastructure / utilities	.500	.500	.821	.767	.003	.052
Education	.500	.250	.885	.548	.007	.000
Families and children	.500	.500	.742	.605	.001	.018
Recreation	.500	.500	.920	.852	.007	.167
Health	.750	.500	.920	.605	.015	.018
Equal opportunities	.500	.500	.742	.605	.001	.018
Economic development	.500	.250	.821	.511	.003	.000
Jobs and employment	1.000	.500	1.000	.622	.032	.073
Social justice	.500	.250	.742	.523	.001	.000
Information/awareness raising	.750	.500	.958	.821	.015	.115
Improvement of quality of life	1.000	.500	1.000	.821	.032	.115
Physical component	.773	.682	.737	.667	.392	.740
Societal component	.636	.273	.636	.467	.223	.208
Economic component	.545	.227	.583	.424	.164	.142
Integrated component	.591	.273	.609	.438	.174	.203

Note: Measures were calculated on the non-valued graph using UCINET 6 (Borgatti, Everett, & Freeman 2002). Column (a) and (b) contain indices corresponding to .10 and .30 cut-off points respectively.

A different measure, closeness centrality is based on the (inverse of the) average 'farness' of a node from other nodes in the network (Faust 1997). For an issue, it is a function of the minimum distances from any of its components to other issues and components. Similarly, the closeness centrality of an event is a function of the minimum distances from its issues to other issues and components. Recreation (issue15), quality of life (issue2), and information/awareness raising (issue22) have the highest closeness centrality: .852, .821, and .821 respectively. As for components, physical has the highest closeness centrality, while other components have roughly the same centrality.

Betweenness centrality, a third measure of centrality, focuses on the extent an issue or component lies on the shortest path between other pairs of issues or

components. Again, *recreation*, *quality of life*, and *information/awareness raising* have the highest centrality. In terms of components, the *physical* has the highest centrality score partly owing to the fact that it has the highest degree and also because it has all the highly connected issues.

Computing case-level interconnectedness scores

The component loadings estimated by the PCA were also used to calculate an issue-interconnectedness score for each case. This data-driven approach derives the score from information gained from the whole sample. Its structure is therefore relative and sample-specific. Interconnectedness at the case-level was operationalized in two different ways: as (1) a weighted composite of issue scores, and as (2) an index of diversity.

In the first approach, the betweenness centrality scores (at the 0.1 cut-off value) of individual issue were used as weights for calculating a mean over the 22 raw item scores for each case (`ISSUE_BETWEEN`). By this, issues associated with greater centrality (interconnectedness) are counted more heavily into the composite measure. Accordingly, a respondent which rated more central issues high will tend to have a higher overall interconnectedness score as compared to a respondent giving low ratings on those issues. The index has the following descriptive statistics: mean = 0.514, *SD* = 0.287, min = 0.000, max = 1.178, skewness = 0.197.

In the second approach, the issue items were divided into four subsets depending on which component they loaded most strongly on in the PCA. The four subsets were thought of as representing four distinct *taxa* of issues. Based on this, a Shannon diversity index was calculated for each case:

$$H' = -\sum_{i=1}^{S} p_i \ln p_i - \left[\left(S-1\right)/2N\right] \quad (1)$$

where the abundance (p_i) of each of the four taxa was defined as the sum of respondent ratings on each item belonging to the subset. The the term in the square brackets is a correction term, where S is the number of subsets, and N is the number of items. Upon inspection of the descriptive statistics of the scores, the index scores were raised to the third power to treat the negative skewness (–1.701) of their distribution. After transformation, descriptives for `ISSUE_DIVERSITY` are as follows: mean = 1.087, *SD* = 0.578, min = 0.000, max = 2.360, skewness = –0.174.

Spatial scales

Four survey items were deployed to tap the importance municipal departments attach to different spatial scales when thinking about problems and solutions. Instead of asking respondents to rate how relevant the global-scale was to their department, they had to assess the relevance of the local, regional, country-level, and global scales separately. This way the relative relevance of each level compared to the others contains further information. In terms of 'thinking globally', for instance, we can evaluate how far the global level is placed relative to lower spatial levels. Intuitively and quite reasonably, local government departments are expected to attach typically less importance to higher spatial levels. A summary of the relative distribution is displayed in Table 5.11, which shows the clear pattern of local tending to receive higher ratings, global getting rather low ratings, whereas regional and country are somewhere in the middle.

TABLE 5.11 • Relative frequencies of raw spatial scale item scores

	Respondent's answer				
	0 (*none*)	1 (*negligible*)	2 (*moderate*)	3 (*substantial*)	4 (*very significant*)
local	1.6	3.9	13.3	30.5	50.8
regional	8.6	17.2	43.8	25.8	4.7
country	19.5	32.0	37.5	9.4	1.6
global	43.0	32.8	17.2	6.3	0.8

Note: Rows add up to 100%.

This pattern suggests that the four items could measure a combined one-dimensional continuum. To test this intuition, the plausibility of the four items forming a Guttman scale was assessed. As all for items were measured an a 5-point scale (0 through 4), they were dichotomized first using the 4 possible scale values as cut-off points and then submitted to the Guttman scaling procedure.

TABLE 5.12 • Guttman scaling statistics for spatial scale items

Dichotomization level	*CoR*[a]	*CoS*[b]	*MMR*[c]	*Number of errors*
≥ 1	1.000	1.000	.818	0
≥ 2	.996	.985	.740	2
≥ 3	.980	.884	.832	10
= 4	.996	.972	.859	2

[a] CoR: coefficient of reproducibility.
[b] CoS: coefficient of scalability.
[c] MMR: minimum marginal reproducibility.

The results displayed in Table 5.12 suggest that the four spatial scale variables would form a reasonable cumulative scale. Although the number of errors[17] is zero at the first level of dichotomization (≥1), it is due to the fact that many respondents tended to stay away from giving zero ratings. The largest number of errors occur when values greater than or equal to 3 are set to 1, all below to 0. The 10 errors actually belong to only 5 cases out of the whole sample. In three of the five cases, the errors occur because the global level was rated higher than regional or national. In one case the local was rated lower than regional and national, whereas in one case regional was rated lower than national.

Judging by the the Guttman scaling statistics, the second level of dichotomization (≥2) is kept for further analysis (SPATIAL_SCALE). Both CoR and CoS are reasonably high, while MMR is reasonably low compared to CoS.[18] The Guttman scores calculated at this level of dichotomization are also reasonably normally distributed (mean=2.41, *SD*=1.207, skewness=–.218, kurtosis=–.987).

Human-nature interdependence

The NHIP scale was specified as a one-factor model in which all items were hypothesized to be related to one latent variable (Figure 5.10). The initial model without the covariance between the error terms of indicators NHIP4 and NHIP5 had a fair fit (χ^2=16.9, *df*=5, *p*=.005; CFI=.954; TLI=.908; RMSEA=.137, 90% CI=.069-.211). This unanalyzed relationships implies that the two items correlate for some other common reason than the latent variable they are related to in the model. Corral-Verdugo et al. (Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha 2008) did not document such a finding while assessing their models of the NHIP scale. In this current sample, it may be attributed to the fact that the two items appeared close to each other in the survey. The modified model produced better goodness-of-fit measures: χ^2=5.8, *df*=4, *p*=.215; CFI=.993; TLI=.983; RMSEA=.059, 90% CI=.000-.157. The correlation between the error terms is rather weak (.32) and is only significant at a less conservative alpha level ($p<.05$). On the other hand, all factor loadings are significant at $p<.001$. They are also quite high ranging from .56 to .83, which suggests good convergent validity.

[17] Anthropac calculates the number of scale errors using the Goodenough-Edwards method (Garson 2009).

[18] CoR should be above .90, CoS above .60 by rule of thumb (Garson 2009). Also, CoS should be appreciably higher than MMR.

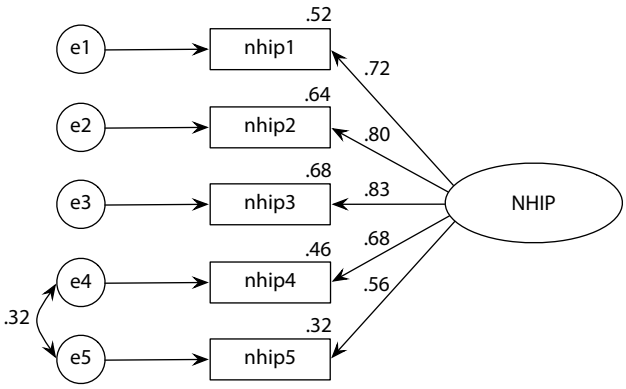

FIGURE 5.10 • CFA model of the NHIP subscale with standardized estimates

The scale's CR is .84, AVE is .52, whereas Cronbach's alpha is .83. As all exceed the critical cut-off values, it is concluded that the NHIP scale has good convergent validity and internal consistency in the current sample.

5.3.2 Strategic learning

The strategic aspects of sustainability meta-knowledge were specified as a four-factor measurement model. The initial model with all indicators included fit very poorly (χ^2=277.5, df=131, p=.000; CFI=.694; TLI=.643; RMSEA=.094). Several indicators of *relationships* had very weak loadings, namely `RELATION2` (.221), `RELATION3` (.213), `RELATION4` (.162), and `RELATION5` (–.116). Only the first two were significant at $p<.05$. This clearly suggests that although these items were proposed to be measures of the same theoretical construct, this proposed relationship was not confirmed in the current sample. Accordingly, they were omitted from the measurement model.

One indicator (`KNOW4`) of the *role of knowledge* factor had a low factor loading (.32), while it also cross-loaded on *interdependency* quite strongly (.69). It could be argued that this item ("Input from local stakeholders enriches our understanding of problem situation") indicates (measures) an interdependency aspect of opinion formation more than it does the valuation of non-expert knowledge. Ideally, indicators do not load on more than factor, but it is actually not a requirement of a well-defined factor structure, nor even a requirement of "simple structure" in which non-target loadings are small relative to target loadings but not required to be zero (Marsh, Muthén, Asparouhov, Lüdtke, Robitzsch, Morin, & Trautwein 2009). In such situations, the exclusion of significant nonzero cross-loadings can result in poor fit and can also distort observed pattern of relationship between factors. Accordingly,

KNOW4 was kept primarily as an indicator of *interdependency*, which came 'handy' as INTERDEP3 was very weakly correlated with this underlying factor (.25). Without KNOW4, the omission of INTERDEP3 would have resulted in two remaining indicators for interdependency. Although the model would have been statistically identified, throughout the literature at least three indicators per factor are generally recommended.

After these modifications, the resulting model yielded much better goodness-of-fit indices (χ^2=51.9, df=46, p=.254; CFI=.983; TLI=.976; RMSEA=.032), so this model was kept as the final (see Figure 5.11). Nevertheless, it should be pointed out that the specification search which lead to the final measurement model included substantial changes, such as dropping four proposed indicators of a single factor. After such 'item purification' (Diamantopoulos, Riefler, & Roth 2008), the model is rather an exploratory than confirmatory.

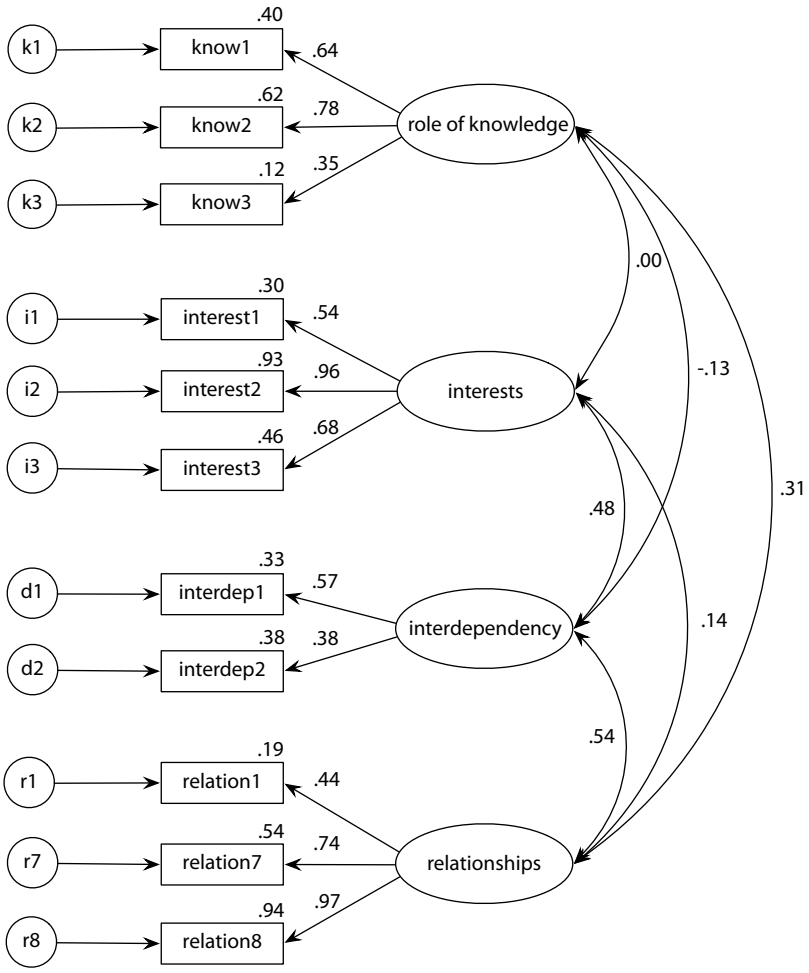

FIGURE 5.11 • CFA model of strategic learning aspects

5.4 PERCEPTIONS OF THE POLICY CONTEXT

The questionnaire contained 21 items to tap respondents' perceptions of how actionable their department's policy context is. These items focused on potential factors that may pose constraints on the strategic space of local decision-making. This set of items were factor analyzed using principal components analysis (PCA) to reveal the pattern of responses for scale construction. As opposed to CFA used for the latent variables in earlier sections, PCA was used here instead. This exploratory technique was more suitable for this set of variables as itemization was driven by key themes outlined in Section 3.6, rather then a firm, conceptually sound and confirmed underlying factorial structure.

The initial PCA with varimax rotation revealed 7 components with eigenvalues over 1.0 explaining 66% of the total variance in the variables. This structure seemed rather fragmented with several components having just one or two variables. Namely, UNCERTAINTY constituted a stand-alone component by itself. For this reason based on the 'elbow' in the eigenvalues (the break in the slope of the scree plot), the number of components to be extracted was set to 5. This modifications in the model resulted in the amount of explained variance being reduced to 55% (KMO=.643). At this point, UNCERTAINTY was omitted from the factor analysis for having very low communality (.29), however, it was used in further multivariate analyses as a separate variable. The modified model retaining 20 of the original variables explained 57% of the total variance and the detailed results are displayed in Table 5.13.[19]

The KMO measure of sampling adequacy is mediocre but is acceptable, and Bartlett's test of sphericity is significant ($p < .0001$) suggesting that the factor analysis was appropriate for this set of variables (Hair, Black, Babin, & Anderson 2009). Component loadings range from moderate to high and the pattern suggests that the rotated solution represents a desirable simple structure with almost no cross-loading. The only exception is scope1 ('influence of global forces'), which has a moderate loading on its primary component (.56) and at the same time has relatively sizable loading on one other component (.41). This, however, was not considered a deficiency serious enough to discard the factor model.[20] While some of the communalities are below .50, the size of the factor loadings are acceptable and they are all statistically significant at this sample size.[21]

[19] To assess the robustness of the orthogonal results, an oblique rotation method (OBLIMIN) was also applied. The results suggested that both rotation methods yielded the same factor structure with comparable factor loadings. The component cross-correlations after the oblique rotation were low (ranging from .08 to .22) practically representing orthogonality.

[20] In order to get further affirmation of the latent structure, a different extraction method, principal axis factoring, was also used to run the factor analysis. While there are fundamental differences between the two approaches, they often yield very similar results (Hair, Black, Babin, & Anderson 2009). This was the case here as well. The factor structure was identical with both extraction methods, only the loadings changed to a minimal extent.

[21] Significance was assessed using Hair et al.'s guidelines (Hair, Black, Babin, & Anderson 2009).

TABLE 5.13 • Varimax-rotated PCA component loadings of policy context variables

Item	*Component*					*Communality*
	1	*2*	*3*	*4*	*5*	
SCOPE3	.787					.674
SCOPE4	.764					.706
SCOPE2	.668					.575
SCOPE5	.574					.506
SCOPE1	.556			.409		.605
ENVIR3		.832				.718
ENVIR4		.756				.600
ENVIR5		.627				.442
ENVIR2		.572				.504
ENVIR1		.481				.428
SCOPE6			.813			.748
SCOPE8			.779			.637
SCOPE7			.774			.632
LIMITS3				.655		.549
LIMITS4				.649		.523
LIMITS5				.621		.423
COMMUNITY				.605		.480
LIMITS6					.683	.514
LIMITS1					.675	.565
LIMITS2					.654	.604

Note: component loadings less than .40 have been omitted and variables have been sorted by loadings on each component.

The five components correspond rather well with the organizing themes of the items. The first component with scope1 through SCOPE5 relates to supra-local forces on local development. scope6 through SCOPE8 form a distinct component which embraces local forces. The five items (envir1 through envir5) addressing the perceived importance of environmental concerns in local policy all load on a single component, so this component can be interpreted as *environmental awareness*. The forth component involves LIMITS3, LIMITS4, LIMITS5 and COMMUNITY. This component can be labeled as *complexity of local politics* as these items tap potential burdens arising from disputes between local actors. The fifth component with LIMITS1, LIMITS2, and LIMITS6 refers to *leeway for local action* as these items represent potential limitations of local policy imposed by higher levels of government.

Three different measures of validity and reliability are presented for the five scales (based on the five components) in Table 5.14.

TABLE 5.14 • Validity and reliability measures of policy context variables

Construct	*CR*	*AVE*	*Cronbach's alpha coefficient*
supra-local influences	.81	.46	.76
local influences	.83	.62	.75
environmental awareness	.79	.44	.73
complexity of local politics	.73	.40	.63
leeway for local action	.71	.45	.52

While all five composite measures have an adequate CR, in terms of AVE and Cronbach's alpha, they do not all reach the commonly suggested critical level. Only the local influences scale has an AVE over .50, while the others range between .40 and .46. As for Cronbach's alpha, the complexity of local politics scale has a score of .63, and the leeway for local action factor with .52 falls particularly short of the recommended level of .70.[22] Nevertheless, these scales are also retained for further use acknowledging their somewhat lower reliability and the need for future development of additional measures to represent these concepts.

5.5 ADVICE NETWORK VARIABLES

Alters mentioned by respondents were initially sorted into 26 different types and were coded into the variable `ALTER_TYPE`. The 26 types were distinguished to represent different sectors and spatial hierarchies they primarily operate at (please refer to Appendix D for examples of each actor type). Both dimensions are crucial in decision-making for sustainable development in terms of coordination and participation. On the one hand, governance rests on the idea of cross-sectoral coordination among governmental, non-governmental and private sector organizations. At the same time, city-level decision-making is embedded in a regional and national socioeconomic and administrative-legislative context, which suggests a need for coordination also across levels (Vogler & Jordan 2003). This requires interaction to span across these hierarchical levels as well.

Different levels of hierarchy are more or less clearly separable in government on the basis of formal jurisdictional and legislative arrangements (e.g., what is local, regional or central government). In the public sector it is

[22] It must be noted, however, that Cronbach's alpha is often criticized for underestimating true reliability. Being a direct function of the number of items, it may be especially sensitive to scales with only a few items, as is the case here.

somewhat more ambiguous. A public institution may physically be located locally, be subordinated to local government, while delivering services outside the locale. The same thing is true for businesses: a multinational corporation may be "global" but it has local operations, it may be reasonably considered local as local governments typically have to deal with the subsidiaries locally (e.g., as tax subjects). Table 5.15 shows how the 26 actor types are positioned along the sector and hierarchy dimensions.

TABLE 5.15 • Alter types by sector and hierarchy

	Local	*Regional*	*National*
Government	municipal dept. (1) senior official (12) local councillor (17) council committee (21)	regional authority (3) regional government (19) municipal dept. in other city (26)	ministry or national agency (2) Member of Parliament (24)
Public sector institutions	CSO (5) CSO cluster (7) public service company (8) public institution (10) local branch of national service delivery organization (13) local church (25)	professional association (14) research institute (16) university (23) state institutions (11)	CSO (20) professional association (18) research institute (15)
Private sector	business enterprise (22) consultancy (9)		

Note: category codes are in parentheses.

The distinction between *governmental* and *public sector* entities is not always easy to make. For the purpose of this study, the categorization is based on access, interest and agency (Willem & Buelens 2007). Government institutions act as agents for the community and access for the community. Public sector institutions provide access to facilities and work for the interest of the whole community but they do not act as agents for the community. Accordingly, for instance organizations delivering public services, while mostly founded and supervised by government, are categorized as public sector institutions.

Three peculiarities need to be mentioned with regards to categorization. First, in the local/public cell CSO (civil society organization) and CSO cluster are recognized as two different types. An CSO cluster is a form of collaboration between a group of nongovernmental organizations (NGOs). An example could be a civic roundtable or civic forum. These arrangements are often made in cities to coordinate the involvement of the voluntary sector in local decision-making processes. From a advice network point of view, such alters actually

represent a collective rather than a particular organization. Hence the distinction. Secondly, a municipal department in an other city is regarded, from the focal department's point of view, as a government actor at one step above in terms of territorial scale. It should be noted, however, that this does not imply subordination, but it is rather meant to capture the 'non-localness' of the actor. As for the third peculiarity, private sector actors (business enterprises and consultancies) are treated as spatially 'dimensionless' actors. For the purposes of this study, it is irrelevant whether these operate in local, regional or national markets. Moreover, while the jurisdictions of government and public actor are relatively easy to determine (e.g., the public space maintenance company clearly operates locally), a business enterprise may serve international markets while having premises locally.

5.5.1 Measures of alter diversity

Diversity refers to the richness and evenness characteristics of an assemblage (Magurran 2004). Here, the assemblage is a sample of actors from the advice network of each responding department. In ecology, richness indicates the number of different *species* (types) present in the assemblage, whereas evenness indicates the relative abundance of the species. By the analogy of richness, this study seeks to capture the number of different actor types contacted for advice by each department, whereas evenness is the relative proportion of a certain actor type in the sampled network of each department.

Depending on the emphasis of richness or evenness, infinite number of diversity indices can be created Magurran (2004). For my research purposes, I define two different measures of diversity. Based on `ALTER_TYPE` described in the previous section, a simple diversity index was calculated to represent the composition of the advice network of each responding department using the alter-specific data they provided. Given that each respondent was asked to list a maximum of six contacts, maximum diversity corresponds to the situation in which each named contact represents a different actor type. At the other extreme, lowest diversity corresponds to the situation in which all named alters belong to the same actor type. The diversity score was calculated for each case using the following formula:

$$D_S = \sum_{i=1}^{k} 2^{i-1} N_i \qquad (2)$$

where N_i is the (nonzero) count of alters belonging to the same type, indexed in decreasing order ($Ni > Ni+1$) and k is the number of actor types. Accordingly, a department having 6 different types of alters gets a score of 63 (1×20+1×21+1×22+1×23+1×24+1×25), while a department listing only identical alter types would get a score of 6 (6×20). This means that if two samples of the same size are compared, the diversity index is higher for the sample which contains a more even distribution of types at a specific level of richness. But if one of the samples contains more types (is richer), the diversity score is higher for that sample, although it may be less evenly distributed. In other words, richness is emphasized over evenness. This is done by rewarding every additional alter type exponentially, or equivalently, the measure reflects a diminishing rate of return to multiple alters representing the same type (Agneessens, Waege, & Lievens 2006). Moreover, the index penalizes departments which listed fewer alters than the maximum 6 possible (7% of the cases), for it decreases potential richness. Table 5.16 lists the proportion of cases corresponding to each diversity level.

TABLE 5.16 • Frequency distribution of cases on the alter diversity index

Diversity score	*Percent of cases*	*Cumulative percent*
1	3.1	3.1
2	3.1	6.3
4	1.6	7.8
5	0.8	8.6
6	4.7	13.3
7	5.5	18.8
8	4.7	23.4
9	3.1	26.6
10	10.9	37.5
11	8.6	46.1
14	2.3	48.4
15	0.8	49.2
16	1.6	50.8
17	21.1	71.9
18	12.5	84.4
31	1.6	85.9
32	10.2	96.1
63	3.9	100.0

To see if the diversity ordering is robust, another nonparametric measure of diversity is calculated for each case, widely-used and known as the Shannon information index:

$$H' = -\sum_{i=1}^{S} p_i \ln p_i \tag{3}$$

where, in our case, S is the number of actor types and p_i is the relative abundance of each actor type. A slightly modified form of this index includes a bias correction term to account for the number of types and the total number of listed actors (N):

$$H' = -\sum_{i=1}^{S} p_i \ln p_i - \left[\left(S-1\right)/2N\right] \tag{4}$$

Technically, both the Shannon and the index defined in this study can be considered continuous variables. However, given the fact that the maximum number of actors is six, the number of all possible diversity scores is finite and quite small for both indices. Yet, using these indices instead of assigning a(n ordinal) score to each level of diversity makes the measurement of diversity less arbitrary. As apparent from Table 5.16, *Ds* took 19 different values, *H*' took 21, whereas the corrected *H*' took 23 discrete values. This suggests that these indices actually correspond quite nicely to each other, although the corrected *H*' distinguishes between cases at lower levels of diversity.

It should be pointed out, however, that both diversity measures were calculated using a rather small sample of the ego-network of each department (6 alters). Thus, these measures are to be considered only approximations of the 'true' diversity of each department's advice network. Ideally, a more thorough name generator could have been used to elicit a larger sample of alters, but such instruments pose greater challenges to respondents in terms of recall and response time.

Given the fact that this current study only uses aggregated information about ego's advice relationships with its alters in the form of diversity measures and does not consider individual relationships in the analysis, this sampling approach is considered a reasonable approximation.

Diversity of contact with generic actor types

Based on the frequency scores, a simple index to represent diversity (`GEN_ACTOR_DIV`) was computed for generic actor types as the mean of the 10 scores for each case:

$$D_G = \frac{\sum_{i=1}^{10} S_i}{10} \tag{5}$$

where S_i is the frequency score corresponding to generic actor type i. The intuition behind this is that departments which tend to maintain more frequent contact with several different actor types will have a higher score on this measure. Frequency operates as weight for non-zero contacts. So instead of using a dichotomous (dummy) variable for each actor type, frequency is used to differentiate between departments reporting to have contact with a particular actor type by accounting for the strength (distance) of these relations. Figure 5.12 displays the histogram of `GEN_ACTOR_DIV`.

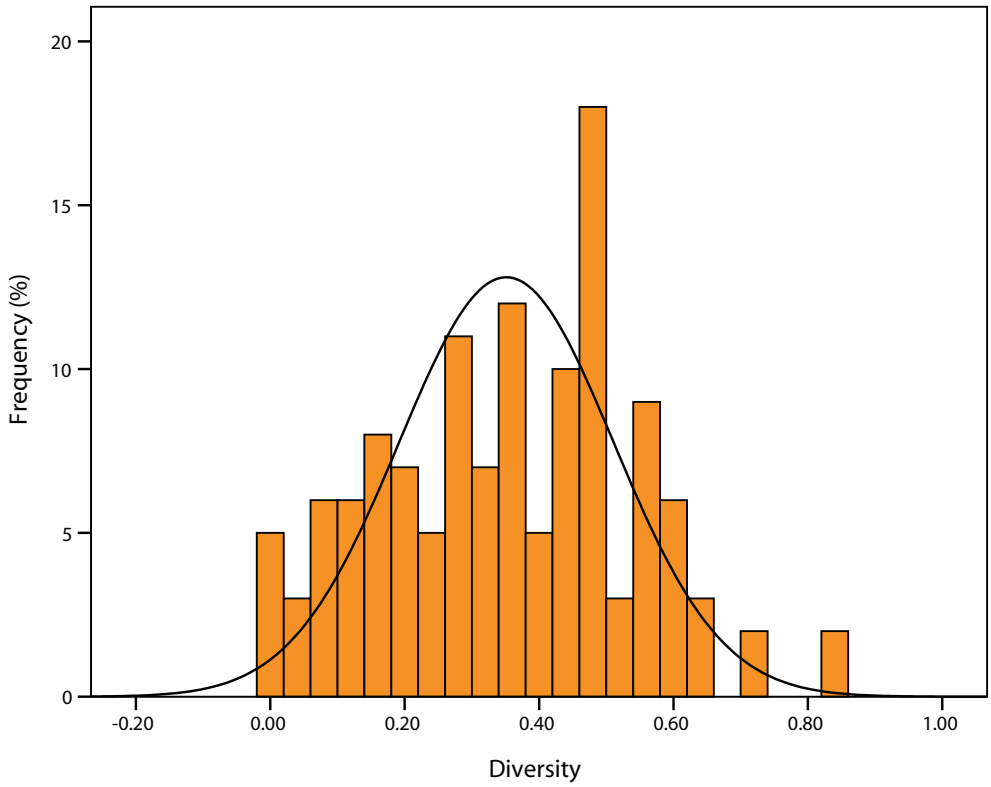

FIGURE 5.12 • Histogram of generic actor diversity

The index has a roughly normal distribution: it is not skewed, nor does it have an extreme kurtosis. Scores range from close to 0. About 5% of departments report sporadic contact with the listed general actor types. The high end of the range is 0.82 with 1.6% of the cases.

5.6 SUMMARY

This chapter presented the results of preliminary statistical analyses focusing on data quality and measurement aspects. Both were necessary steps taken to reduce the large set of original raw variables to a smaller set of variables so that they can be used parsimoniously in subsequent multivariate techniques. Reduction made sense as many of the raw variables were designed to essentially measure a common underlying construct. The statistical methods used here helped confirm (or find) that the patterns of relationship between raw variables in the sample data reflected these underlying themes so sets of variables could be meaningfully combined into composite variables (scales).

The composite measures of dimensions of organizational culture, knowledge management practices were found to be reliable and showed reasonable construct validity.

CHAPTER 6

Patterns of advice seeking

This chapter is devoted to the exploration of the patterns of advice relationships municipal departments develop within and across municipal organizational boundaries as they seek to manage interconnected urban issues. Municipalities are knowledge intensive organizations in that their core product is professional knowledge developed and applied by experts in problem situations. The division of labor via departmentalization within municipalities is a natural and unavoidable barrier to sharing knowledge and one which may prevent any particular department from benefiting from the experiences of other departments and actors (Willem & Buelens 2007). The limiting effects of such knowledge barriers may be even more pronounced from a sustainability point of view as it implies a necessity to work across professional silos, sectoral boundaries and hierarchical levels.

Data were collected on several aspects of these relationships including the frequency and form of communication, perceived similarity in opinion (epistemic distance or 'alikeness'), and the motives of advice seeking. Instead of relating these aspects to other attributes of the respondents, the focus here is to reveal general patterns of advice seeking behavior. The following two questions guide the exposition in this chapter:

- how do municipal departments structure their relationships with their contacts with respect to the expected benefits from getting advice,
- how are advice benefits delivered in terms of the frequency of contact, the form of communication, and the perceived epistemic distance to their sources of advice?

6.1 THE STRUCTURE OF BENEFITS FROM ADVICE SEEKING

A multidimensional view of advice relationships implies that municipal departments may seek advice from their alters for different reasons at the same time. As indicated in the theoretical framework, this study distinguishes five different benefits gained from getting advice from a particular actor: solution, validation, legitimation, meta-knowledge, and problem-reformulation (Cross,

Borgatti, & Parker 2001). The question that arises is how much these benefits tend to be provided by the same types of actors. In other words: *do departments tend to seek different benefits from different types of actors when they contact them for advice?* To answer the question, first, the overall pattern of relationships between these benefits are explored. Data on each advice relationship and the perceived corresponding benefits were strung out into a long form array in which each case (row) corresponded to one ego-alter relationship in the original dataset.[23] Table 6.17 summarizes the pairwise associations between the five types of benefits that respondents attributed to the alters they named in the survey.

TABLE 6.17 • Pairwise correlations and mean differences of the five advice benefit variables

	Solution	*Meta-knowledge*	*Problem reformulation*	*Validation*
Meta-knowledge	.449			
Problem reformulation	.444	.736		
Validation	.480	.616	.741	
Legitimation	.450	.545	.610	.714

Note: The diagonal has been omitted. All coefficients are significant at $p < .001$. $N = 704$.

It is apparent that all five benefits are significantly related, although the strength of the correlations range from as low as .44 to as high as .74.[24] To get a more in-depth understanding of the interrelationships among the five benefits, the correlation matrix was processed further using metric multidimensional scaling (MDS).[25] In Figure 6.13, the five different benefits were positioned in two-dimensional space using the PROXSCAL algorithm available in SPSS (SPSS 2007). The two-dimensional solution fit reasonably well (normalized raw stress = .001, stress 1 = .042, stress 2 = .1, Tucker's coefficient of congruence = .999). However, the structure (positional pattern) of the benefits was not identical with what was found by Cross et al. (2001). Their estimation resulted in a perceptual map in which the five benefits lined up along a curvilinear ('horseshoe') relationship. They argued that it could actually be

[23] Indices used in variable names to distinguish named alters and their properties were dropped in the new dataset as they are not relevant at this stage of the analysis. For instance, `BENEFIT11`, `BENEFIT21`, `BENEFIT31` etc. were all combined into the variable `BENEFIT1`.

[24] Similar results were found by Cross et al. (Cross, Borgatti, & Parker 2001). In their study, correlation coefficients ranged from .48 to .86.

[25] Multidimensional scaling is a multivariate technique which aims to create a perceptual map the proximities of research objects based on measures of similarity or dissimilarity. Correlation coefficients between variables can serve as proximity scores, where a larger coefficient implies proximity. The visual representation of objects in terms of distances can foster the interpretation of the pattern of their relationships (Scott 2000).

interpreted as a single bent dimension. Accordingly they further simplified into a one-dimensional solution in which the variables lined up in the following order: solution, meta-knowledge, problem reformulation, validation and legitimation. Cross et al. (2001) speculated that this ordering reflected a simple structure in which advice benefits ranged from tangible (concrete) solutions to less tangible ones. They also noted that validation and legitimation at the other extreme were not actual answers but primarily served political functions.

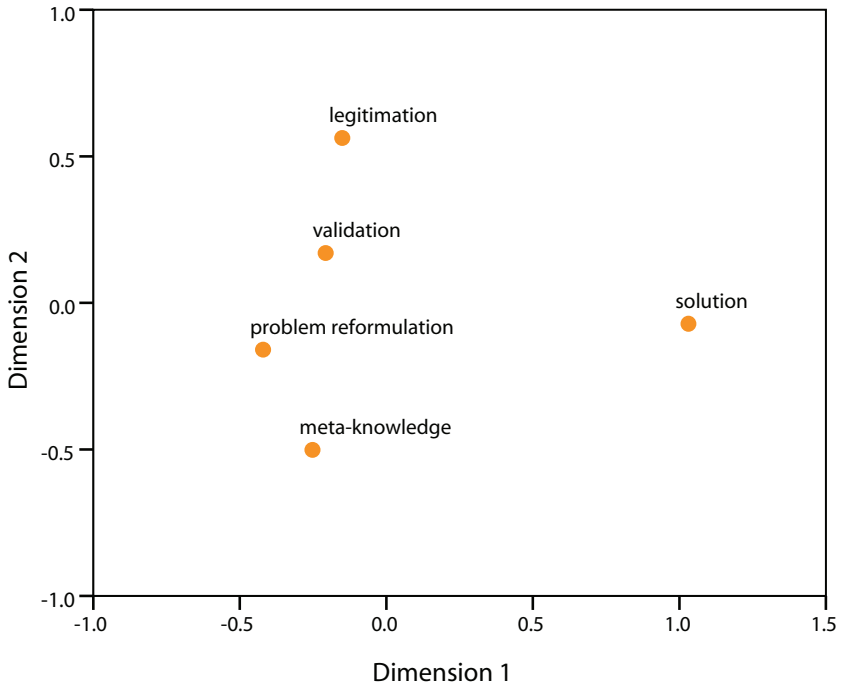

FIGURE 6.13 • Two-dimensional MDS model of contact benefits

My modeling results did not reveal the same evident curvilinear relationship. Although the ordering of meta-knowledge, problem reformulation, validation and legitimation benefits in the second dimension corresponds to the findings of Cross et al. (2001), the relative distances are different. Most notably, the solution, is positioned quite far from all the others. With some rotation and tolerance, the pattern could be interpreted as fitting into the hypothetical single curvilinear dimension, but more reasonably it seems to suggest a different structure to the five benefits. To test for a simpler structure, in the next step, a one-dimensional MDS model was also estimated (normalized raw stress = 0.040, stress 1 = .200, stress 2 = .364, Tucker's Coefficient of Congruence = .979). The model fits reasonably well, but Cross and his colleagues' one-dimensional order was not replicated. Instead, the five benefits

lined up as follows: solution, legitimation, validation, problem reformulation and meta-knowledge.

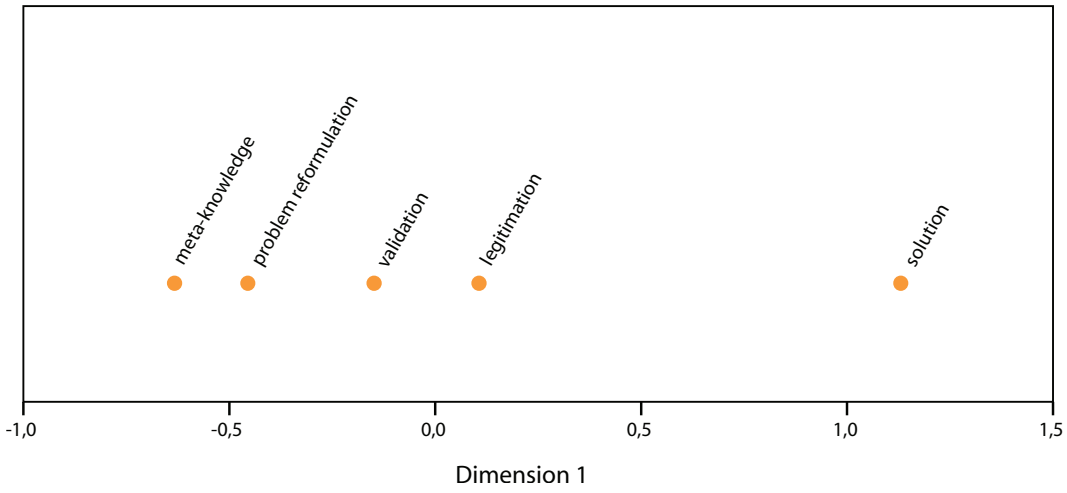

FIGURE 6.14 • One-dimensional common space of the MDS model of advice benefits

To get a different perspective on the benefits and their possible ordered entailment structure, the frequency of contact was also added to the analysis. Intuitively, contacts which provide more tangible benefits would be expected to occur on a more regular basis, while less tangible benefits would typically be sought less frequently. However, as is apparent in Figure 6.15 showing the mean scores[26] for the five benefits in the sample at each level of frequency, the order of benefits appears to be rather consistent with the one-dimensional MDS results above and not the order discovered by Cross et al. (Cross, Borgatti, & Parker 2001).

Although, the order does not correspond exactly to the MDS results, just like in the one-dimensional map, legitimation (orange line) appears to be the second most important benefit for contact at higher frequencies and it only falls to the end of the ordering with contacts less frequent than once a month. By and large, validation is the third most sought benefit. Meta-knowledge comes forth and problem reformulation occurs to be the least demanded benefit. Both meta-knowledge and problem-reformulation come behind validation and legitimation at all frequencies of contact with the exception of the lowest frequency, interaction occurring less than once a month).

[26] The importance of the five benefits was measured on a 7-point Likert scale with values ranging from 0 to 6. Respondents were asked to specify on this scale how significant each benefit was considered when contacting a particular alter.

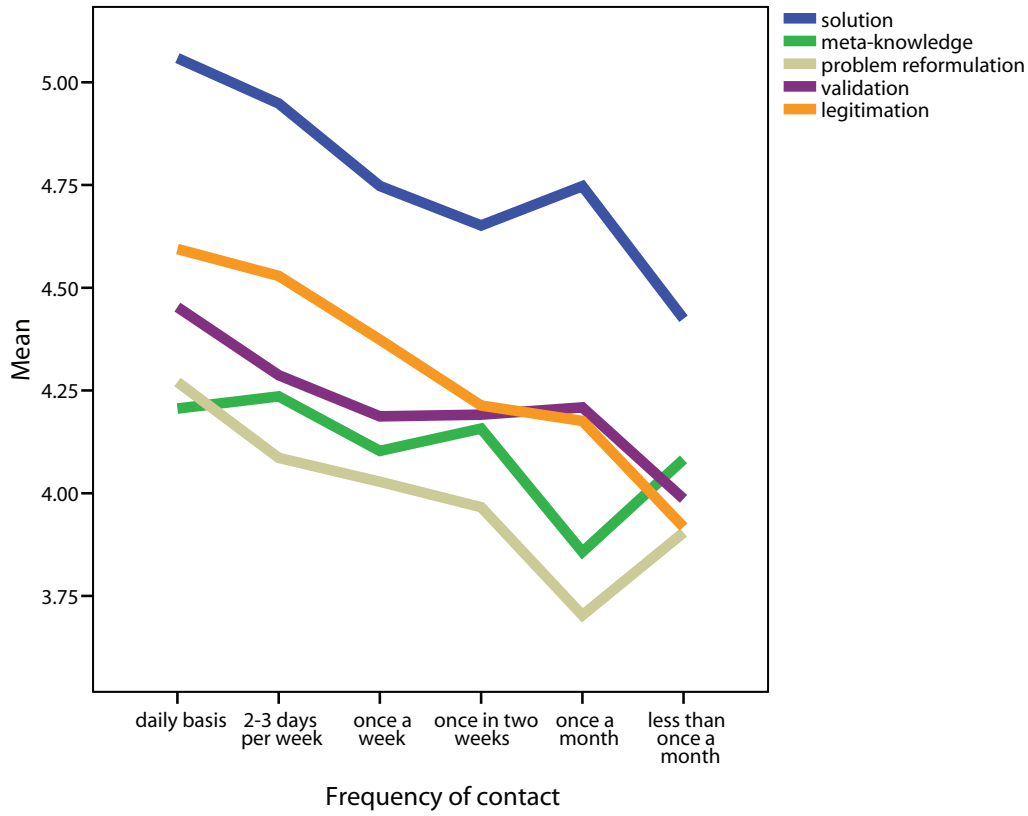

FIGURE 6.15 • Means of benefit scores by levels of contact frequency

To further investigate this peculiar entailment structure, I ran Guttman scaling procedures using Anthropac (Borgatti 1996) on the relationship data after dichotomizing benefit scores at each possible level (Gray, Williamson, Karp, & Dalphin 2007). Table 6.18 summarizes the fit statistics and also shows the ranking of benefit items. While the coefficients of reproducibility (CoR) all reach the critical value of 0.9 with the exception of the cutoff level of 5, the coefficients of scalability (CoS) tend be rather low and they only reach the threshold of 0.6 when the cutoff values is set equal to or above 4. It is also apparent that the results are not robust and the ranking of the items varies with the level of dichotomization. In order to check whether a possible two-dimensional underlying structure interferes with the result of the Guttman scaling, I excluded solution (benefit1) from the analysis and re-ran the scaling algorithm on the remaining four variables. At all levels of dichotomization, the order of benefits turned out to be legitimation, validation, problem reformulation and meta-knowledge ('5-4-3-2') . Similarly, when contacts with municipal departments (being the largest group of alters in the sample) were filtered out, the Guttman scaling procedure yielded the same ranking for all the

remaining actor types. This suggest that the ranking is not distorted by the dominant proportion of departments in the sample (43%).

One pattern is noteworthy, however, as it appears to be consistent with both the MDS results and the frequency pattern: the '1-5-4' sequence is present at four levels. Although the complete '1-5-4-2-3' ordering (the one suggested in Figure 6.15) is present only at level 6, problem reformulation does precede meta-knowledge at level 3, 4, and 5. This captures the same structure as the one-dimensional MDS.

TABLE 6.18 • Guttman scaling fit statistics and ranking of benefits

Dichotomization level	*CoR*[a]	*CoS*[b]	*MMR*[c]	*Ranking of benefits*
≥ 1	.990	.370	.985	1-4-2-3-5
≥ 2	.958	.348	.936	1-2-5-4-3
≥ 3	.928	.424	.875	1-5-4-3-2
≥ 4	.900	.600	.750	1-5-4-3-2
≥ 5	.881	.721	.572	1-5-4-3-2
= 6	.930	.693	.772	1-5-4-2-3

[a] CoR: coefficient of reproducibility.
[b] CoS: coefficient of scalability.
[c] MMR: minimum marginal reproducibility.

Based on CoR, CoS and MMR, the five benefits form an acceptable Guttman scale with dichotomization based on cutoff values 4 and 6 of the original benefit scores.

6.2 ACTOR TYPES AND CORRESPONDING ADVICE BENEFIT PROFILES

The ranking model of advice benefits revealed the overall pattern in which advice benefits are sought by municipal departments. One reason for coding named alters into groups or actor types, however, was to make it possible to adopt a between-group perspective and account for the potential heterogeneity in relationship patterns. In other words, the question is *whether different types of actors provide different benefits to municipal departments? If yes, then how similar or dissimilar are these actor types in terms of their advice benefit profile?*

Following up on the results of the previous section, Table 6.19 summarizes the mean scores for each actor type on each advice benefit in columns sorted in the order of '1-5-4-2-3', the Guttman model with the most favorable CoS and CoR statistics for the whole sample. The inspection of the means across columns reveals that scores do tend to decrease from left to right for most actor

types. The '1-5-4-2-3' ranking pattern is clear for municipal departments, ministries and other central agencies, and also regional government. As noted earlier, a substantial portion of the cases represent these actor types. It is also apparent (aided by the grey shading in the table) that the ranking pattern shows minor to quite substantial deviations for other types of actors. For instance, regional professional associations, universities and

TABLE 6.19 • Mean benefit scores for each actor type

	solution	*legitimation*	*validation*	*meta-knowledge*	*problem re-formulation*
council committee	3.71	4.50	4.00	3.07	3.29
CSO	3.75	3.88	3.71	3.63	3.67
senior local gov't official	4.97	5.22	4.93	4.52	4.64
local councillor	4.29	4.43	4.00	3.86	3.86
professional body	4.00	3.83	4.17	3.67	3.33
municipal department	4.91	4.42	4.18	4.06	4.02
ministry/central agency	4.90	4.75	4.75	4.75	3.90
regional government	4.56	4.33	4.00	3.78	3.33
public service company	4.89	4.30	4.41	4.14	4.27
consultancy	5.19	4.50	4.65	4.27	4.35
national professional assoc.	5.40	4.80	5.00	4.80	4.80
local state authority	4.71	4.14	4.24	3.67	3.62
nat'l service delivery org.	5.13	3.38	3.63	3.50	3.00
local institution	5.21	4.38	4.47	4.35	4.47
research institute	4.86	4.29	4.43	4.29	4.43
regional agency	4.94	4.12	4.07	4.49	3.85
business	5.38	2.50	2.88	3.25	2.88
regional prof. association	3.67	4.11	4.44	3.89	4.22
CSO cluster	4.17	3.33	4.00	4.50	4.33
university	3.80	3.60	3.60	4.00	4.20
(national institution)[a]	5.25	5.00	5.00	5.00	4.50
(Member of Parliament)[a]	4.50	5.00	5.00	5.00	5.50
(national CSO)[a]	3.67	4.00	4.00	3.00	3.67
(national research institute)[a]	4.50	4.00	4.50	4.00	4.00
(local church)[a]	4.00	4.00	4.00	4.00	4.00
(other city)[a]	4.00	3.00	4.00	2.00	4.00

Note: Darker background shading corresponds to lower mean across columns.
[a] Less than 5 cases in the group.

To account for the degree of heterogeneity of rankings and to reveal which actor types tend to be similar or dissimilar in terms of the benefits they offer, in

the next step, the actor type/benefit means matrix was converted into a new matrix. In each cell, instead of the mean scores, the rank order of the benefits was placed for each actor type. Actor types which had fewer then 5 cases were omitted. The rank order was calculated so that 1 represented the highest mean across each row, while 5 corresponded to the lowest. In the case of identical means (tie), the higher rank was assigned to the benefit which came first in the overall Guttman scale ('1-5-4-2-3'). This matrix was used as input for creating euclidean proximity measures in the process of multidimensional scaling. Again, the PROXSCAL procedure was used with two dimensions specified for the common space. The model resulted good fit indices: normalized raw stress = .005, stress 1 = .074, stress 2 = .138, Tucker's Coefficient of Congruence = .997.

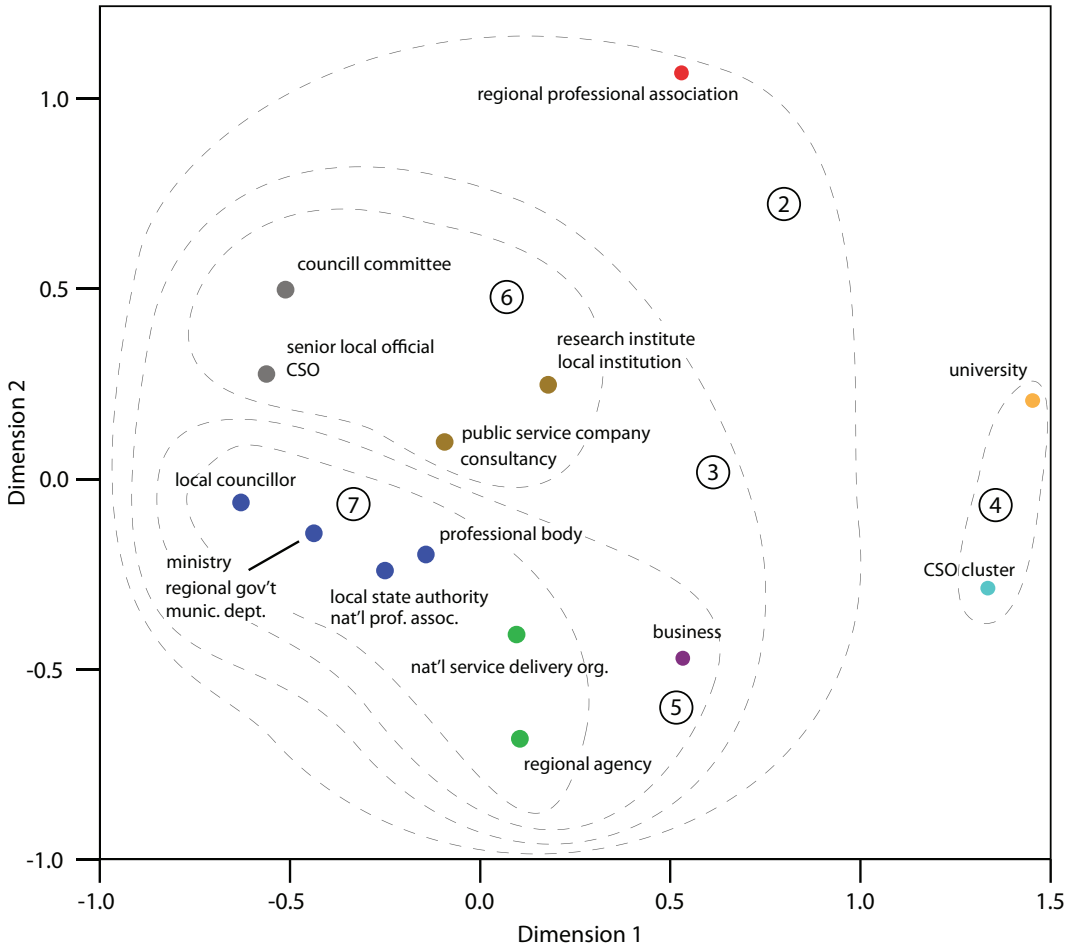

FIGURE 6.16 • Two-dimensional MDS of actor types based on contact benefits

The visual inspection of the perceptual map (Figure 6.16) indicates that the dispersion of actor types (objects) is not even across the map. Most of the actor types clump together in the lower left part of the common space. Three actor types—CSO cluster, university and regional professional association—lie furthest away from the main cluster. Business is also located somewhat away from the main cluster, but it is still closer than the other three. As it could be expected on the basis of identical ranking patterns, ministry, regional government and municipal department have the same coordinates. Similarly, the following pairs of actor types have overlapping positions as a result of identical benefit ranking: local state authority and national professional association; public service company and consultancy; senior local official and CSO; research institute and local institution. In terms of the distances between the actor types, two basic but interrelated questions can be raised: 1) *how can the two dimensions of dispersion be interpreted*, and 2) *what simpler structure can account for the dispersion?*

6.2.1 Dimensions of dispersion

MDS assures that similar objects (actor types) are located close to each other on the map and thus can offer a visual impression of conceptual distances and clusters. The axes and the orientation are arbitrary functions of the input data (Garson 2009), so care should be taken when assigning meaning to the axes as the underlying dimensions may be rotated. Instead of simply relying on the original horizontal and vertical axes, the diagonal patterns of points can also be considered to intuit the labeling of the underlying dimensions. To aid the interpretation of the two dimensions in which the actor types are dispersed, I looked at the values of the input raw data matrix as a point of reference and I also checked the correlations of object coordinates and benefit ranks (Table 6.20).

TABLE 6.20 • Correlations between MDS dimensions and benefits

	solution	*legitimation*	*validation*	*meta-knowledge*	*problem reformulation*
Dimension 1	.021	.928**	–.010	–.472*	–.582**
Dimension 2	.478*	–.416	–.261	.729**	–.550*

Note: All coefficients are Spearman's rhos.
* Statistically significant at $p < .05$.
** Statistically significant at $p < .01$.

The first dimension appears to be most strongly associated with legitimation, while the second dimension is most closely related to meta-knowledge. Both are positive effects. This means that higher benefit rank scores—actually corresponding to lower ranks—tend to be associated with higher coordinates. Along the first dimension this means a rightward location, while along the second dimension this means an upward location. Council committee, local councillor, senior local official, CSO are the actor types which are connected for the purpose of legitimation in the first place. Accordingly, they are located in the leftmost of the map along the first imaginary axis.

The first underlying axis can be visually best imagined as rotated roughly 10° clockwise from horizontal. Although this first dimension is most easily related to the ranking of legitimation, it is also noteworthy that the three satellites (university, CSO cluster, and regional professional association) are the ones which are associated with the highest ranking of problem reformulation. Of all the actor types, university is the only actor type which is contacted for the benefit of problem reformulation in the first place, while the other two are the only ones which have number two ranks on this benefit. The correlation between the horizontal coordinate and problem reformulation is only moderate (–0.582) because many actor types ranked problem reformulation as the least important benefit and very few evaluated it to have medium significance. This is what largely distinguished the Guttman scale found in this study from that of Cross et al. (2001).

The second dimension of dispersion is correlated most strongly with the rank of meta-knowledge, but it is just as strongly associated with problem reformulation as the first dimension. Council committee, senior local official, CSO, research institute, local institution public service company and consultancy are the actor types which have the lowest ranking on meta-knowledge. The first three appear in the upper left region of the scatter plot. On the other hand, university, CSO cluster, business and regional agency are the actor types which have high ranks on meta-knowledge. CSO cluster is the only one which tends to be contacted for meta-knowledge in the first place, while the others have number two ranks. Accordingly, the best way to picture the imaginary second dimension is going diagonally rotated 45° counter-clockwise, which makes the two revealed dimensions non-orthogonal.

If we consider ministry, regional government, and municipal department as the point of reference based on their ranking pattern (1-5-4-2-3), distances to other actors represent the degree of deviation from the general '1-5-4-2-3' order. As ranking essentially represents a trade-off between benefits, if one benefit gets more preference at least one gets less. As a general pattern, actors which are right of them tend to be less relied on for legitimation. The few actors

left of them are even more valued for the legitimation they provide. Actor types below them to the right are those who are more heavily counted on for meta-knowledge at the price of legitimation (or vice versa). At the same time, with actor types above and right of them legitimation is more traded off against validation.

6.2.2 Actor type clusters

Although, the MDS map with only 20 objects is rather easy to grasp, I explored possible group formation via hierarchical cluster analysis (HCA) using Euclidean distances between actor types as the basis of agglomeration.[27] The clustering method was within-groups linkage which tries to minimize the average distance between all pairs in the resulting cluster, so it is appropriate when the purpose is to maximize homogeneity within clusters (Garson 2009).

A range of nested groupings (2–8 clusters) is overlaid on Figure 6.16 as a contour map. Colored dots represent the starting 8-cluster solution. The clusters formed in subsequent steps are circumscribed with dashed lines. Numbers in circles denote the step in which the cluster was created. So for instance '7' indicates that cluster was formed when moving to the 7-cluster structure from the more complex 8-cluster one.

The idea behind presenting several solutions is that there is always a degree of ambiguity in trying to determine the appropriate grouping in cluster analysis. Researchers need to face an inevitable trade-off between the number of clusters generated and within-group homogeneity, that is, simpler structure comes at the price of greater dissimilarity within the clusters (Hair, Black, Babin, & Anderson 2009). As the clustering here is carried out with an exploratory purpose rather than to be used for statistical inference, displaying several solutions may be more helpful in spotting similarity patterns. The reason for only presenting cluster solutions from the 8-cluster structure toward simpler ones is that the heterogeneity measure before that stage increased moderately with the agglomeration as several actor types had identical positions (perfect identity in their benefit profiles). It is at the step of going from 8 to 7 clusters that the coefficient of heterogeneity increased substantially, which implies that relatively different groups were joined together in a cluster. While accepting a solution is also a function of whether it can be meaningfully interpreted substantively, as a rule of thumb, a greater jump in the heterogeneity coefficient can serve as an analytical aid (Garson 2009; Hair,

[27] This analytical step following the MDS is essentially what Kane and Trochim (Kane & Trochim 2007) call *concept mapping* in their exposition of analytical tools for planning.

Black, Babin, & Anderson 2009). Accordingly, my interpretation is primarily based on the 8-cluster solution accepted by the above criteria.

The three satellite (regional professional association, university, CSO cluster) identified earlier are quite distant from each other and from the bulk of other actor types to be separate clusters on their own. Business is also a separate cluster. The fact that these four actor types constitute four stand alone clusters seems reasonable as all four of them have atypical ranking patterns. Other actor types were close enough to be involved in larger groupings in the 8-cluster structure. The largest of these includes 7 of the actor types (blue dots in the scatter diagram). If we consider their relative positions, they seem to be diagonally arranged within the cluster. In terms of the latent dimensions identified above, this suggests that they can fit into one grouping as they are less varied on legitimation. As a matter of fact, they are the actor types which are strong at providing legitimation and they also ranked high on delivering solutions.

As discovered earlier, council committee, senior local official and CSO form a group, which contacted for the political functions of legitimation and also validation. Research institutes, local institutions, public service companies and consultancies belong to yet another cluster which is valued primarily for providing solutions and validation. Both local institutions and public service companies are typically managed by local governments, which makes them well situated for providing those benefits as input into decision-making processes. The relationship with consultancies is based on contractual terms. Most consultancies identified in the sample are either involved in urban planning, architecture and (environmental) engineering or are specialized in writing grant proposals to access government or EU funds. They are usually contracted to deliver specific and often standardized professional services which is beyond the capacity of the municipal administration. This is consistent with solution being the most prioritized benefit they provide and the fact that they are relatively little valued for problem reformulation in general. The 8th cluster includes national service delivery organization and regional agency, representing the government sector at higher levels of hierarchy. Accordingly, they are quite closely situated to the biggest cluster, but being higher up the hierarchy and away from local affairs, they are less important in providing legitimation in the form of advice.

6.3 FREQUENCY OF CONTACT

The MDS of contact benefits presented above helped explore how different kinds of perceived benefits stimulate contact with different actor types. Another measured aspect of contact was frequency. Generally speaking, different levels of frequency in seeking advice may be associated with qualitatively different relationships. If this assumption holds, then frequency may be also an indicator of conceptual distance. So one could assume that an actor that is contacted more often is socially closer to the municipal department. However, the relationship between frequency and the importance of an advice relationship is not that obvious. For instance, an actor which primarily delivers problem reformulation benefits to a municipal department, may not be contacted as often as an actor which provides hands-on advice during the course of day-to-day decision-making.

Means of frequency scores are plotted for each actor type in Figure 6.17. What is apparent from the plot was confirmed by the one-way ANOVA: means significantly differ overall ($F = 10.569$, $p < .001$). Variances are not displayed as Levene's test of homogeneity indicated that they are essentially the same across groups ($W = .829$, $p = .673$) Actor types seem to line up along a relatively continuous virtual line between the high end (.75) and low end (.20). Although, there appear to be breaks in the line (e.g., between local councillor and professional body, or national service delivery organization and business) suggesting that there are potential subgroups, the three homogeneous subsets identified on the basis of Tukey's HSD test overlap to a large degree. If considered sequentially from high to low, even where there is a greater gap (e.g., between local councillor and professional body), the difference in means is not statistically significant. At the same time, pairwise comparisons of means indicate that if looked further away down the rank, actor types do differ significantly in terms of mean frequency of contact. For instance it takes 8 steps down from local institution to council committee to make the difference in means statistically significant at $p = .021$.[28]

[28] Although professional body has almost the same mean as council committee on frequency, due to the difference in the size of the groups, the difference of means between professional body and local institution is not significant.

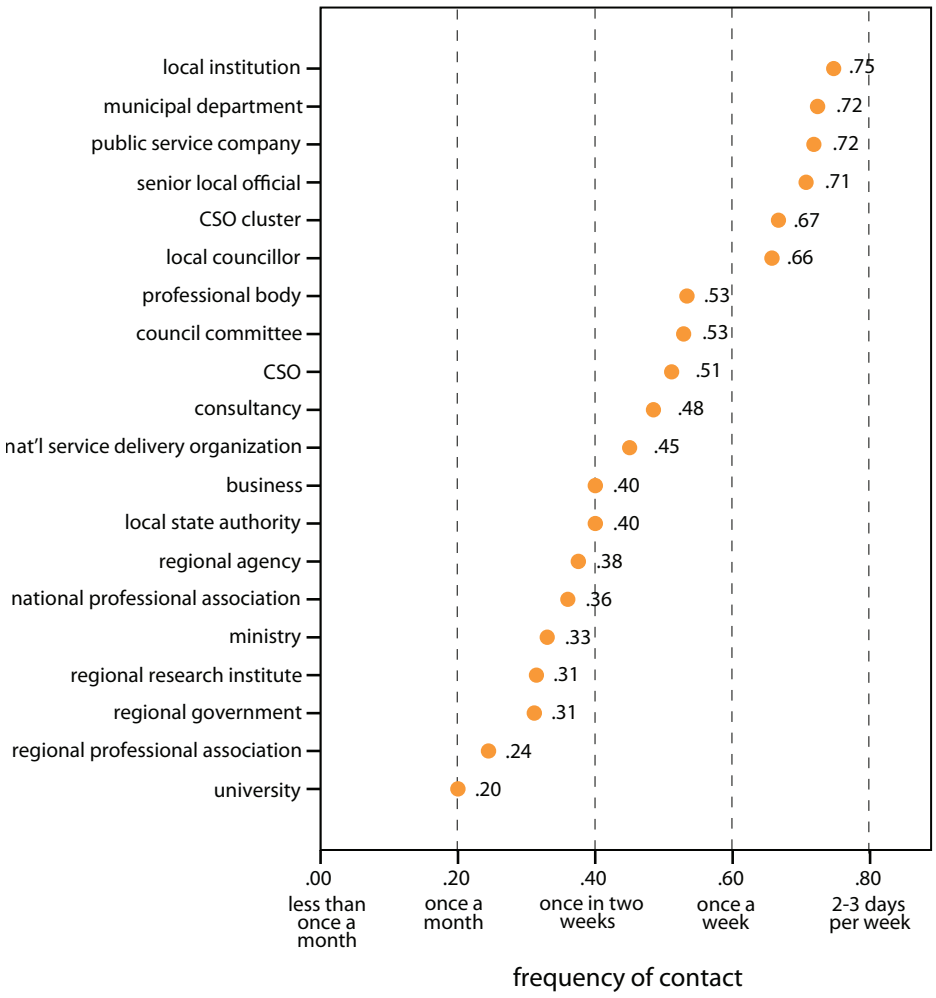

FIGURE 6.17 • Means of frequency scores by actor type

Although actor types can not be sorted into distinct groups based on the mean frequency of contact, frequency may be related to the advice benefits they provide. It is a reasonable assumption as different actor types have been shown to deliver slightly different benefit bundles via the departmental advice network and also because actor types disperse with respect to frequency scores. To investigate the potential relationship, I plotted actor types on frequency and the one-dimensional MDS scores (see Figure 6.18). By and large, actor types appear to disperse in an nonlinear pattern with one outlier (CSO cluster). Using this as a lead, I fitted an exponential model without a constant term and excluding the outlier to see if the association between the two variables is statistically significant. The model produced the following results: $R^2 = .853$, $SE = .241$. The ANOVA showed that $F = 4019.966$ was significant at $p < .001$, which indicates that benefit scores significantly predict frequency ($\beta = -0.924$, $p < .001$).

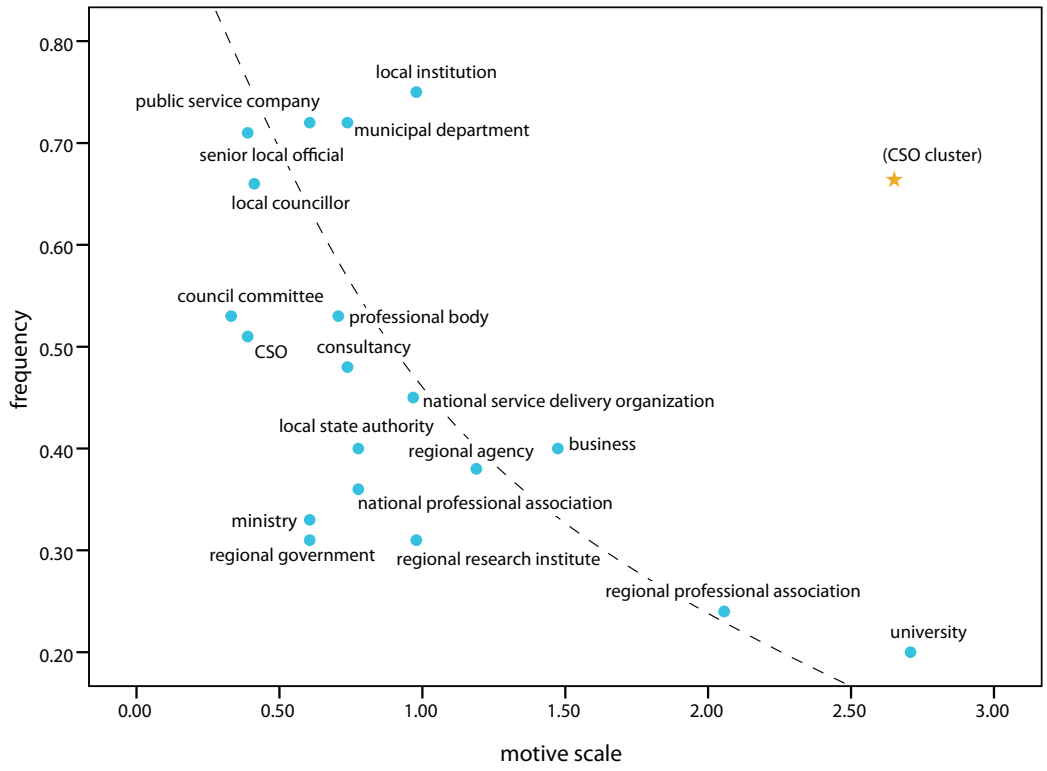

FIGURE 6.18 • Actor types in frequency-benefit space. The dashed line represents the fitted exponential model of association. CSO cluster, being an outlier, was excluded from the model.

As lower frequency scores correspond to less frequent contact, actor types closer to the origin on the vertical axis are the ones which tend to be less often contacted for advice. On the horizontal axis, being closer to the origin corresponds to offering the legitimation-dominant benefit bundle, while being further away corresponds to the more learning oriented benefit bundle.

6.3.1 Contact with generic actor types

Survey respondents were asked to estimate how often they had the opportunity to consult with certain actor types of actors on urban issues their department was primarily responsible for. This question was included to make sure frequency of contact data was available for generic actor types as well and not only the specific alters identified via the name generator questions in the survey. While the survey collected data on several aspects of advice relationships with specific alters, only frequency of contact was recorded for generic actor types. Although frequency refers to the temporal intensity of contact, it can also be interpreted as a proxy of conceptual distance from the

department (Dekker 2005). Table 6.21 displays the distribution of frequency scores for each generic actor type across all cases in the sample.

TABLE 6.21 • Frequency of seeking advice from selected generic actor types

	Frequency of contact (%)						*Total (%)*
	Daily basis	*2-3 days per week*	*Once a week*	*Once in two weeks*	*Once a month*	*Less than once a month*	
Local citizen	32.8	24.2	7.0	2.3	9.4	24.2	100
Local business	13.3	18.0	15.6	7.8	10.2	35.2	100
Business advocacy	0.8	0.0	4.7	9.4	20.3	64.8	100
CSO	7.0	10.2	12.5	7.0	24.2	39.1	100
Local councillor	17.2	25.8	21.1	14.1	10.2	11.7	100
Senior local gov't officer	42.2	24.2	14.1	6.3	3.9	9.4	100
Regional authority	1.6	6.3	14.1	14.8	17.2	46.1	100
Central gov't official	0.0	1.6	0.8	6.3	14.1	77.3	100
Member of Parliament	1.6	4.7	3.1	3.9	11.7	75.0	100
Consultant/expert	3.9	6.3	18.8	8.6	17.2	45.3	100

6.4 FORMS OF CONTACT

The last measured aspect of advice relationships is the form of contact in which departments interact with their alters. Four different forms are distinguished: formal verbal (e.g., committee meetings), formal written (e.g., reports), informal verbal (e.g., *ad-hoc* meetings), informal written (e.g., e-mail). The statistical association between the four forms are summarized in Table 6.22.

TABLE 6.22 • Pairwise correlation between forms of contact

	formal verbal	*informal verbal*	*formal written*
informal verbal	–.079*		
formal written	.141**	–.177**	
informal written	.028	.192**	.024

Note: All correlations are Spearman's rhos.
* Statistically significant at $p < .05$ (2-tailed).
** Statistically significant at $p < .01$ (2-tailed).

As it could be expected, the two formal and two informal ways of channeling advice are associated more strongly among themselves, although effect sizes are

rather small. Those departments which tend to seek advice via formal meetings also tend to rely more on formal documents in their advice relationships. Those departments which identified informal meetings as an important form of receiving advice, also reported heavier reliance on informal documents for communication (including for instance e-mail). It is interesting to note that informal verbal communication is inversely related to both forms of formal communication and the relationship is significant. This means that departments which reported that they relied more heavily on informal verbal communication seem to do this actually by cutting back on formal communication. This displacement effect does not show up between informal written contact and formal ways of contact.

In order to define composite formality and informality variables, I put the four form of contact variables through factor analysis analysis using the principal component extraction method with varimax rotation. Components with Eigenvalues greater than 1.0 were kept. Although the KMO that the model yields is rather low (.51) due to relatively low correlations among the variables, the two-component solution accounts for 60.3% of the variance. Variables FORM_CONTACT1, FORM_CONTACT3 and FORM_CONTACT2, fORM_CONTACT4 respectively load on separate components (Table 6.23).

TABLE 6.23 • Component loadings of forms of contact

	Component 1	*Component 2*
formal verbal contact (FORM_CONTACT1)		.718
informal verbal contact (FORM_CONTACT2)	.712	
formal written contact (FORM_CONTACT3)		.733
informal written contact (FORM_CONTACT4)	.819	

Note: Factor loadings below .400 are omitted.

Based on the loading pattern, FORM_CONTACT1 and FORM_CONTACT3 were used to calculate the informality score for each case. Similarly, FORM_CONTACT2 and FORM_CONTACT4 were used to define the formality score. To avoid losing roughly 40% of variance in raw (observed) variable scores, both composite scores were calculated by summing up weighted raw scores, where weights were the component loadings of the observed variables.[29]

The formality and informality scores were then evaluated on how they related to other aspects of advice relationships including the frequency of

[29] Actually, this method does not produce very different scores compared to simple summation as component loadings are roughly comparible in size.

contact, the cluster membership of the alter, and the benefits of contact. Correlations are presented in Table 6.24.

TABLE 6.24 • Bivariate correlations of contact variables with formality and informality

	frequency	*alike*	*advice benefit*				
			solution	*meta-knowledge*	*problem reform.*	*validation*	*legitimation*
formality	.117**	–.057	.077*	.093*	.079*	.102**	.161**
informality	.290**	.186**	.189**	.237**	.272**	.258**	.197**

Note: All coefficients are Pearson correlation coefficients.
* Statistically significant at $p < .05$ (2-tailed).
** Statistically significant at $p < .01$ (2-tailed).

Both formal and informal ways of contact are more typical for more frequent communications between municipal departments and their contacts. The difference between effect sizes suggests that frequency is more strongly related to informal ways of contact. Intuitively, informal ways of communication are less burdensome and not restricted by administrative procedures, so they may take place more frequently. The perceived epistemic distance ('thinking alike') between the department and its contact is also significantly related to informal ways of communication, but not to formal communications.

If we focus on the relationship between the level of formality and informality and the five advice benefits, we can see that all pairwise correlations are statistically significant, although effect sizes are quite modest ranging from .077 to .272. The greatest contrast between formality and informality appears in the case of problem reformulation. Problem reformulation is more than twice as much likely to happen via informal ways of communication. Similarly, validation tends to take place more via informal communication. The smallest difference between informal and formal communications appears in the case of legitimation.

6.5 DISCUSSION

The purpose of this part of the study was to reveal how municipal departments seek to gain benefits from contacting other departments or actors outside the municipality for advice. Heads of department were asked to "identify the key contacts they preferred to turn to when [they needed] advice, expertise or opinion to address the problems they were in charge of." They also provided

details about some key aspects of these advice relationships: the perceived benefits of contacting each alter they named, the frequency of interaction, the form of contact and the similarity of opinion their alters represented with respect to them.

The analysis of the benefits from information and advice seeking confirmed the multiplex nature of advice relationships among municipal departments and their working environment. This means that contacts in the advice network typically deliver a mixed bundle of benefits to departments by sharing information and advice. Although municipal departments do tend to turn to different alters for different bundles of benefits, the typical content of the bundle is often based on a special kind of ranking among sought benefits: solution, legitimation, validation, problem reformulation, and meta-knowledge.

Typically, if an alter is expected to provide a benefit at the end of the ranking (either problem reformulation or meta-knowledge), then this contact also tends to be used for intermediate benefits (legitimation and validation), and also 'simple' answers (solution) as well. While the statistical results are not as compelling, the findings do indicate that the the ranking order of the benefits of contact is clearly not consistent with the simple tangible—less tangible dimension Cross et al. (2001) found in a business context. This, however, is not odd if we take into consideration that the sectoral context here is governmental.

While practical solution ('what needs to be done') is probably the single most important advice that an alter can provide in both in government and private business, it is quite reasonable to see that in a highly politicized organizational context (such as local government), legitimation and validation are more highly valued than meta-knowledge and problem reformulation. One plausible explanation is that the prioritizing of benefits corresponds to the value they provide in terms of being able to back up and support valid decisions in a rather procedural politico-bureaucratic organizational context.

As one department head explained for instance she would approach the mayor directly with an idea and seek feedback as a first step in developing a proposal for the local council, although approval is not needed formally. Proposals could be submitted to the appropriate council committee, which then could be forwarded to deliberation by the local council. Rather than seeking feedback from council members, the department head prefers consulting the mayor and even convince him to submit the proposal under his own name to bypass council committee members.

The above example highlights very well the political motives behind talking to certain actors. At the same time, *not* turning to expert actors for the

validation of ideas can also have adverse consequences as well. As one interviewed person representing the national park service in the close proximity of one of the surveyed cities explained through a specific example, a local authority started a public park remodeling project without consulting the expert agency (the directorate of the national park service) believing there were no environmental or ecological concerns that should have been considered. The local authority had no knowledge of (or simply disregarded) the fact that the park served as habitat for several protected bird species. In this case, the benefit of validation provided by the national park service could have also been coupled with concrete input going into the planning of the particular project in a more sustainable way.

Solutions to problems provide the clear tangible inputs (content) in the process of decision making, while legitimation and validation are sought because decisions need to be approved. These latter two benefits are not as much based on a history of trust, but on either strategic considerations. This is supported by the fact that the perceived benefits of legitimation and validation are not statistically related to the duration of the relationship with whoever provides these benefits, while other benefits are. In other words, the alters serving as idea legitimators and validators are sought based on their formal role in the hierarchy, regardless of the length of the relationship. Exactly for this reason it is unsurprising that actors providing legitimation are not expected to be have closely matching epistemic stance ('similarity in thinking'). The three other benefits, solution, meta-knowledge and problem reformulation typically require trustful relationships and a more common epistemic ground. This is reflected in the fact that these benefits are more likely to come from actors with whom department have been familiar for a longer period of time.

Legitimation and validation are not only valued more as benefits but they are also sought more often than meta-knowledge and problem-reformulation. The fact that municipal departments do not heavily rely on their alters as pointers or gateways to a more diffuse body of information indicates that departments prefer to depend on the information and knowledge of their well-known partners in the knowledge ecosystem. Either they may not have realized the value of a more extended knowledge network, or they may not trust information coming from two degrees away from them. Moreover, using the pointers to track down further information takes additional efforts and time, both of which may be a scarce resource for municipal departments.

Similarly to meta-knowledge, the ability of an alter to help put a problem into new perspective also turned out to be a relatively unvalued benefit for municipal departments compared to the legitimation and validation their alters offer. This again indicates that outreach to alters is less motivated by the

potential extension of the department's knowledge base, as by the logic of bureaucratic benefits. This, however, has serious implications from an organizational learning point of view. While solutions shared by alters may provide opportunities for single-loop learning, problem reformulation would be essential for creating opportunities for double-loop learning. Not seeing their alters as potential sources of new ideas, municipal departments risk locking themselves in their own current problem frames defined by professional silos and their own experience. The extended space for experimentation and learning that would be required to address the ill-defined complex issues raised by sustainability is much constrained by this lack of importance attached to questioning the status quo.

Actor types and advice benefits

An overall look at the advice benefits municipal departments gain by contacting actors in their social networks revealed that legitimation and validation are of more importance to municipal departments than benefits that can be associated with exploration (learning or gaining new experience). This reflects the bureaucratic logic of advice relationships in municipalities, where advice seeking by departments is driven by operative and political motives. The relative importance of the advice benefits, however, depend on the type of actor they turn to for advice.

Local councilmen, senior officials and council committees are unsurprisingly the most important actors to provide feedback with the purpose of legitimation. This is a direct consequence of the setup of the local government mechanism and it also highlights to fact that advice relationships closely follow what is demanded by the formal structure: "it makes sense to turn to someone, who actually has the power to decide on the issue." The results, however, revealed that civil society organizations are also among important actors municipal departments connect to when they need approving feedback in the form of advice. CSOs serve a similar legitimation role as the other three when contacted for advice, and while it is not directly indicative of their power position in local governance, they do represent voices external to the local government. This reliance on CSOs for approving feedback is the result of the growing practice of having them routinely contribute to formal local decision-making by delegating regular representatives to council committees.

Actors with an ability to provide legitimation are also more frequently contacted for advice than actors strong on problem reformulation or meta-

knowledge. This indicates that the political functions of advice (legitimation and validation) are not only prioritized as benefits sought from many actors but they are actually 'harvested' on a more frequent basis. In terms of frequency, senior local officials, local councillors, and municipal department are apparently among the most often contacted actors. This is unsurprising as they represent the immediate in-house working environment of municipal departments, who can be reached with the smallest effort (transaction cost). Similarly to in-house officials, local institutions and public service companies are also regular contacts as they are mostly local government-run entities which are liable and accountable to local governments.

A very unfavorable pattern that emerged from the data is that government-related actors rarely serve as partners for rethinking problems and issues. Clearly, council committees are formal structures to aid decision-making, but neither a committee as a group nor committee members are not expected to facilitate generating now viewpoints of issues. The same is equally true for regional governments, regional agencies, and ministries and other central agencies, who are especially instrumental in delivering answers on a regular basis, but are very often relied on as vehicles of problem reformulation. The only example to this pattern are senior local government officials, e.g., mayors or vice-mayors. While they do not specialize as ‘problem reformulators’, if we compare their advice services to that of other actors they appear to be relatively highly valued for putting issues into new perspective. One commentator went as far as claiming that their “mayor is the single most important person in inspiring innovative thinking in the City Hall.” Several other respondents also named senior officials as champions of innovation in local government and progressive thinking on socio-ecological issues. While this may not be equally true in all municipalities, it highlights the role senior public officials' leadership plays in facilitating learning in local government. Although only five respondents mentioned Members of Parliament as an important source of advice for their department, MPs are highly valued contacts to redefine problems.

The relatively neglected role of problem reformulation may also stem from the way departments see themselves fit into the knowledge ecosystem of the municipality. One interviewed department head for instance drew a line between what she called “highflying” departments and “regular” departments in their municipality. “Highfliers” (e.g., the Strategy Department responsible for writing grant proposals) are assumed the job to be creative, innovative and have extensive relationships within the municipality, while "regulars" (e.g., Department of Social Affairs) are assumed to be more focused on operative tasks and not to have to come up with new ideas. This also indicates a potential

obstacle to learning as more transformative roles of advice are generally downplayed.

Research institutes, universities, regional professional associations and CSO clusters are the actors that are regarded primarily as the source of problem reformulation. This again reflects the fact that municipal departments have a generalized idea of the roles different actors play in the their knowledge ecosystem. Research institutes and universities 'by definition' organizations whose responsibility is to produce and disseminate knowledge. Regional professional associations, such as for instance the regional Chambers of Architects, are organizations specializing in profession-specific issues (e.g., city planning) and are originators of and also validators of new ideas, practices on professional grounds. This resonates well with the idea of professional isomorphism (DiMaggio & Powell 1983), which implies that professionals (e.g., planners) are subject to pressures to exhibit much similarity to their professional counterparts in other municipalities by establishing "a cognitive base and legitimation for their occupational autonomy." Professional associations are important hubs for developing normative rules about professional behavior. This is reflected in the fact that regional professional associations were also identified in this study as validating ideas and proposals. While national professional associations are contacted to deliver know-what and know-how type solutions in the first place, they are also well-trusted problem *reformulators* compared to other actors.

The fact that departments' key partners in redefining problems are typically professional associations and universities suggests that departments have a strong preference for professional and scientific knowledge when thinking about problems. This observation however may be slightly biased as respondents to the survey had to name specific actors they seek advice from. Accordingly, respondents were were very unlikely to identify individual citizens for instance as a source of advice. At the same time, most municipal departments reported that they had the opportunity to talk to citizens on a daily basis (33% of them), so they are potentially exposed to citizen's views and opinions. Although it may be a socially desirable response from department heads, they also reported that layman's feedback can improve their understanding of the issues they deal with. The head of one public works department for instance explained how they could effectively use informal citizen feedback on a regular basis to improve planning infrastructure. He pointed out that professional knowledge in the form of official documentation (maps, plans) they relied on often led to "suboptimal" solutions and citizens' local knowledge helped to reach better outcomes by offering additional perspectives on the same issue.

Interestingly enough, unlike professional associations, consultancies (e.g., architecture firms) are more thought of as legitimators than partners that help new ways of thinking. Of all the actors, businesses are least counted on for problem reformulation and they are also very rarely identified as important sources of advice. Actors that get in touch with municipal departments on market-based contractual terms have the sole function of delivering their services and any knowledge exchange tends to be limited to the successful delivery of those services and does not cover a deeper integration into the municipal knowledge ecosystem by offering any other of the advice benefits. While there is a growing tendency to outsource services to private businesses, these actors have peripheral role compared to their increasing role as service providers.

CSO clusters are the only actor type whose most valued advice benefit is meta-knowledge. Being umbrella associations of CSOs, municipal departments can take advantage of them in their advice network as they provide relatively easy access to an array of non-profit organizations with specialized knowledge. CSO clusters also rank high on expectations to provide assistance for rethinking and redefining problematic issues. The special umbrella arrangement among CSOs seems to fit well with the idea of getting connected to the advice network of municipal departments, although these CSO clusters have not established themselves as a source of legitimation for ideas. The same is almost equally true for universities. They are important gateways of information and knowledge, but their advice or opinion on issues does not have legitimizing value in local governance.

Although the pool of actors regarded useful by municipal departments for redefining problems is very small and these actors are the least often contacted ones (as well as problem reformulation being the least demanded advice benefit), certain aspects of departmental advice seeking behavior help identify potential leverage points to improve intra- and interorganizational learning in municipalities.

First of all, the communication between departments and their partners related to problem reformulation is far more likely to take place via informal channels than formal ones. The same is true when departments seek information or knowledge not readily available in their immediate advice network, so they need to be directed to sources (actors) they may not be familiar with yet. Both problem reformulation and meta-knowledge may be crucial in forming the basis of sustained double-loop learning—a more focused effort to interpret causal relationships underlying urban issues, typically takes place. Problem reformulation may contribute to shifts of problem representation as a result of getting exposure to how partners conceptualize

problems and necessary action. On the other hand, being redirected to new sources of information and knowledge help extend the knowledge landscape of municipal departments. The fact that municipal departments prefer to use informal means of communication when seeking advice related to these functions, highlights the importance of being able to manage these efforts effectively. Formal structures such as committee meetings may be necessary, but by far not sufficient conditions of developing knowledge useful for governing sustainability. Formal structures provide the background for effective decision-making but not effective learning. Learning takes place "behind the scenes" and mostly in informal ways.

Another interesting aspect of problem reformulation is the epistemic distance between municipal departments and their contacts providing advice. Intuitively, departments are inclined to minimize the epistemic gap to avoid disagreement and to keep ownership of problems. In the long run, they would keep contacts they perceive to share their way of thinking. While actors providing legitimation might be impractical (or even impossible) to drop from the advice network even if they represent a divergent point of view, actors delivering meta-knowledge or problem reformulation benefits may be relatively easily neglected in the presence of epistemic differences. Interestingly enough, contacts that are considered to be especially helpful in reformulating problems and offering meta-knowledge are less likely to share a common epistemic ground with the department they help with advice. At the same time, the likeliness of thinking similarly is positively related statistically to an actor's perceived value in delivering legitimation and validation, and is not related to the ability of delivering solution-type advice.

The inverse relationship between epistemic proximity and the perceived value of problem reformulation benefits suggests that municipal departments are susceptible to accept advice (learn) from their partners, even if they do not share a common knowledge platform. This actually works almost as a tautology as more fundamental changes in the way problems are conceptualized necessitate a certain gap between viewpoints to allow new interpretations to emerge. This would indicate that municipal departments have some tolerance in accommodating epistemic differences when it comes to problem reformulation. An alternative explanation is that actors with the potential to put things into new perspective are only peripheral players who are contacted for advice or feedback on an irregular basis , so they may represent different viewpoints and opinion. And this works the other way around: as they do not tend to think similarly, they remain peripheral in the departmental advice network.

Summary

Advice relationships constitute a self-organizing system of interactions between departments and their stakeholders, in which patterns emerge rather that get designed or planned from the top. Accordingly, the logic of coordination is predominantly lateral. Such a "shadow" system of interactions plays an important coordinating role by channeling critical information to and knowledge to and from municipal departments. Advice networks are instrumental in connecting the perceptions of problems, the interests and the practical knowledge of actors who have a stake in addressing urban issues in sustainable ways (Newig, Günther, & Pahl-Wostl 2010). Advice relationships may facilitate the transgression of the cognitive, evaluative and institutional boundaries which are characteristic of specialized departmental knowledge unfit for governing sustainability.

This chapter focused on one direction of advice relationships: advice coming from alters to municipal departments. The data collected on Hungarian municipal departments suggests that advice relationships are much bound to the formal relationships of their institutional context. Evidently, municipal departments are more likely to seek advice from actors in their immediate working environment. The potential problem is, however, that these actors do not necessarily deliver advice that may be useful for generating new problem-solving capacities. Advice from high ranking officials, councilmen, committee members for instance typically serve approval rather than lead to an increased understanding of the nature of problems and issues.

Problem reformulation or meta-knowledge as additional benefits available from actors is relatively neglected both in terms of perceived value and the frequency of "harvesting". This implies that municipalities in general limit their own organizational capacity to explore and learn from the experience of others. Informal channels of communication have been shown to better cater to the proliferation of meta-knowledge and problem reformulation and problem-solving capacities for sustainability. It highlights the need for nurturing a culture in which opportunities for horizontal communication both within and across municipal boundaries come to existence or additionally consciously created and rewarded.

CHAPTER 7

Organizational context and learning for sustainability

This chapter focuses on the organizational context of municipal departments and how it influences two aspects of learning for sustainability: the understanding of the complexity of urban issues (substantive meta-knowledge) and the understanding of the complexity of action (process meta-knowledge).

The chapter starts out with presenting the results of the statistical estimations to gather quantitative evidence for or against the presumed relationships between aspects of organizational context and learning for sustainability. The second part of the chapter is dedicated to the interpretation and discussion of these results.

7.1 ESTIMATION OF THE SUSTAINABILITY META-KNOWLEDGE MODEL

7.1.1 An overview of the statistical estimation technique

To estimate the relationships between the variables in the theoretical model, I relied on structural equation modeling (SEM) in the first place. SEM, also called causal modeling, is a method for representing, estimating, and testing a theoretical network of linear relations between variables, either observed or latent (Rigdon, Schumacker, & Wothke 1998). SEM is useful in that it makes the estimation of those relationships simpler than conventional multiple regression analysis as all relationships can be tested simultaneously. It comes especially handy when working with models that have several dependent and mediating variables.

I used the partial least squares (PLS) approach to SEM as implemented in SmartPLS™ (Ringle, Wende, & Will 2005). It is a component-based technique and is an alternative to the more conventional covariance-based technique used for testing CFA measurement models of latent constructs in the preceding

chapter.[30] Just as any statistical technique, PLS has both advantages and disadvantages. One important benefit that makes PLS particularly appropriate for my case is that it works with small samples relative to model complexity (Henseler, Ringle, & Sinkovics 2009). In other words, even when the structural model has plenty of parameters and there are relatively few observations, PLS will still yield a solution. Also, there is no minimum requirement on the number of indicators each underlying constructs should have. Whereas in covariance-based SEM, less than three indicators may pose problems with model identification, in PLS, identification is not a problem. Moreover, PLS is not susceptible to deviations from normality in the data.

Hair *et al.* (2009) point out—as a disadvantage—that PLS will obtain solutions when covariance-based SEM will fail. While this may seem a virtue, it should also cause concern for the researcher. Based on different statistical foundations, PLS works *well*, even if of the quality of measurement is poor. If indicator inter-correlations are low—suggesting marginal convergent validity in traditional SEM terms—PLS may still yield relatively high factor loading estimates and thus imposes less scrutiny on measurement. Using covariance-based CFA for the establishment of first-order constructs (presented as part of the preliminary analysis) and relying on PLS only at the second-order level of the analysis combines the the virtues of both techniques.

Following the guidelines of Henseler *et al.* (2009), the assessment of the PLS models will include the steps displayed in Figure 7.19.

[30] There is no consistency in terminology in the literature of these statistical techniques. Some authors use SEM to refer exclusively to the covariance-based approach, while some others use the term to refer to both covariance and component-based approaches. Here, I will use SEM in the more encompassing sense.

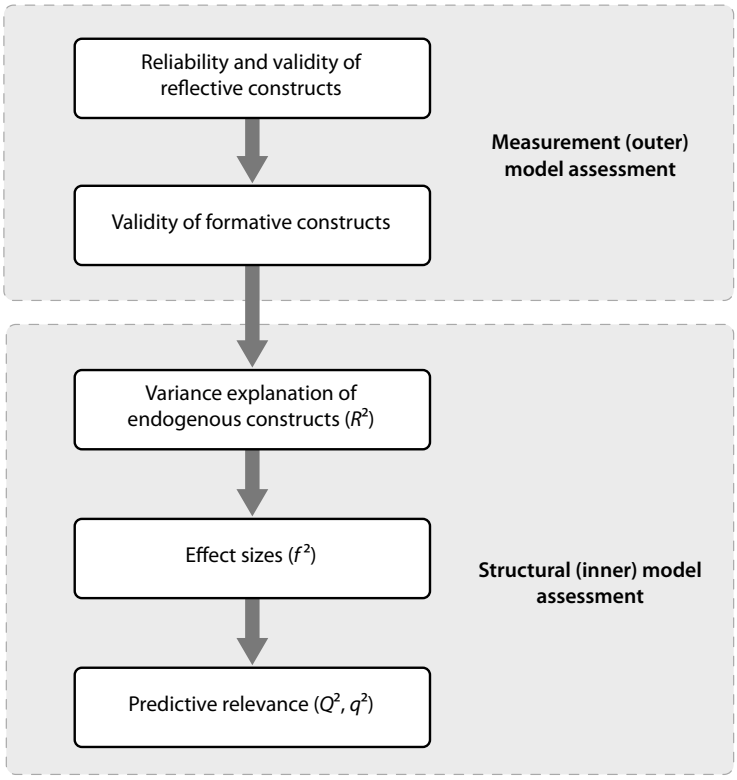

FIGURE 7.19 • Steps of PLS model assessment

7.1.2 Control variables

Before testing the baseline model, a model including the control variables was estimated. The purpose of this was to reveal if the demographic characteristics of the department heads or the size and professional diversity of the department have any influence on the dependent variables in the theoretical model. A statistically significant influence on the dependent variables would imply that some part of the variation is due to the control factors.

TABLE 7.25 • Baseline model with control variables

Control variable	*Dependent variable*	
	substantive meta- knowledge	*process meta-knowledge*
age	–.013	–.137
position	.045	–.143
profession	.104	.106
tenure	–.157	–.071
size of dept.	.067	.068
staff diversity	.009	.085
R^2	.087	.065

Notes: none of the parameters is significant at $p < .05$, testing based on bootstrap t-values with 1000 resamples.

Using the *t*-values obtained from a bootstrap procedure with 1000 resamples to assess significance[31], none of the control variables were found to be significantly related to either the substantive meta-knowledge or process meta-knowledge construct. It is therefore reasonable to infer that the measurement of these key dependent variables was not systematically biased by the respondents' personal demographic characteristics. Neither does the size of the department or diversity of staff seem to be related to sustainability meta-knowledge, so it is reasonable to say that these two organizational aspects are not the source of a confounding effect that would threaten the theoretical validity of my key hypotheses.

7.1.3 The baseline model

The baseline structural model was largely specified on the basis of the theoretical model depicted in Figure 3.3. One deviation from the theoretical model involved *organizational structure* (ORS), which was originally hypothesized to have two reflective indicators, *centralization* and *formalization*. The CFA, however, revealed that these two dimensions are not statistically associated, which means that they can not be modeled as reflective indicators of the underlying construct. For this reason they were then modeled as formative indicators of *organizational structure*. Because neither *centralization* (CENT), nor *formalization* (FORM) had a significant ($p < .05$) weight on ORS and also because the sign of their weights were different, they were instead separated and incorporated in the model as two distinct exogenous constructs. *Substantive meta-knowledge* (SUBS) and *process meta-knowledge* (SUBS) were also modeled as separate constructs to separate potential differences in their predictors and their predictive effects.

Outer model assessment

The estimates for the outer (measurement) part of the baseline model are displayed in Table 7.26. The results indicate that all reflective indicators have a significant loading on their respective construct with loadings ranging from .41 to .92.

[31] The significance testing of PLS parameter estimates presented in the rest of the study are all based on the *t*-values obtained from bootstrap procedures (Chin 1998). The reason for this is that PLS makes no distributional assumptions and therefore the traditional parametric inferential framework for significance testing is substituted with empirical confidence intervals (Vinzi, Trinchera, & Amato 2010).

TABLE 7.26 • PLS parameter estimates for the outer (measurement) part of the baseline model

Model element	*Standardized parameter estimates*	*t-value*
Reflective constructs		
Organizational culture→Shared identity	.772**	12.375
Organizational culture→Trust	.896**	30.810
Learning culture→Openness	.796**	22.883
Learning culture→Risk-taking	.817**	24.770
Learning culture→Inclusiveness	.729**	13.953
Learning culture→Interaction with org. environment	.752**	15.906
KM practices→Knowledge creation	.869**	35.013
KM practices→Knowledge sharing	.728**	10.501
KM practices→Knowledge utilization	.817**	15.681
Informal communication→FORM_CONT2	.879**	4.285
Informal communication→FORM_CONT4	.640*	1.964
Diversity of social network→ACTOR_DIV_SHANNON	.544*	2.114
Diversity of social network→GEN_ACTOR_DIV	.715**	8.677
Diversity of social network→DOMESTIC_REL	.895**	36.056
Diversity of social network→INTERNATIONAL_REL	.896**	33.997
Substantive meta-knowledge→Interconnectedness	.810**	22.096
Substantive meta-knowledge→Spatial scales	.677**	9.564
Substantive meta-knowledge→Time scale	.690**	10.259
Substantive meta-knowledge→NHIP	.775**	6.477
Process meta-knowledge→role of knowledge	.449**	3.379
Process meta-knowledge→interdependence	.656**	5.816
Process meta-knowledge→role of relationships	.908**	46.055
Process meta-knowledge→interests	.692*	2.032

(table continues on next page)

TABLE 7.26 *(continued)*

Model element	*Standardized parameter estimates*	*t-value*
Formative construct		
Perception of the policy context←Environmental awareness	.831**	3.746
Perception of the policy context←Leeway for local action	–.036	0.435
Perception of the policy context←Local forces	.080	0.775
Perception of the policy context←Supra-local forces	.408**	2.624
Perception of the policy context←Local politics	–.231*	2.099
Perception of the policy context←Uncertainty	–.187	1.170

* Statistically significant at $p < .05$ (2-tailed).
** Statistically significant at $p < .01$ (2-tailed).

The situation, however, is different for the only formatively specified construct, *perception of the policy context* (POL). Three of its six indicators, namely uncertainty, leeway for local action, and complexity of local politics have nonsignificant weights. Moreover, some of the weights have a negative sign. Given the fact that these indicators are orthogonal factors revealed by PCA,

multicollinearity cannot be the problem. Centefelli and Bassellier (2009) suggest that such a situation may have to do with the number of indicators a formative construct has. The higher the number of indicators the greater the chance that there will be indicators with low and even nonsignificant weights. Instead of dropping nonsignificant indicators, one option for the researcher is to break them into smaller groups and model them separately. Accordingly, aspects of the local policy context were modeled as individual variables in subsequent models.

Table 7.27 displays quality measures of the reflective constructs[32]. All constructs have composite reliability higher than .60 and average variance extracted above .50, which suggest reasonable reliability and convergent validity, respectively.

TABLE 7.27 • Reliability and validity measures of the reflective constructs in the baseline PLS path model

Construct	*AVE*	*CR*
Organizational culture	.698	.820
Learning culture	.599	.857
KM practices	.652	.849
Informal communication	.598	.749
Diversity of social network	.523	.750
Substantive meta-knowledge	.530	.770
Process meta-knowledge	.513	.724

For the assessment of discriminant validity, the Fornell-Larcker criterion was used first (Fornell & Larcker 1981). This criterion postulates that all reflective constructs should share more variance with their block of indicators than they share with other constructs in the model. In Table 7.28, this fact is reflected that all the square roots of AVE values are larger than construct inter-correlations (Hulland 1999).

[32] Cronbach's alpha is not included as Henseler *et al.* (Henseler, Ringle, & Sinkovics 2009) warn that it tends to provide a severe underestimation of the internal consistency reliability of latent variables in PLS path models.

TABLE 7.28 • Inter-construct correlations in the baseline Sustainability Meta-Knowledge Model.

	CENT	*ICOM*	*NDIV*	*FORM*	*KM*	*LC*	*OCUL*	*STRA*	*SUBS*	*POL*
CENT	1.000									
ICOM	–.282	.769								
NDIV	–.294	.157	.752							
FORM	–.080	.025	–.111	1.000						
KM	–.110	.073	.048	.356	.806					
LC	–.460	.196	.364	.333	.598	.774				
OCUL	–.248	.066	.121	.351	.625	.581	.835			
STRA	–.293	.388	.196	.137	.554	.568	.435	.716		
SUBS	–.281	–.021	.340	–.020	.189	.380	.196	.262	.723	
POL	–.221	.113	.385	.138	.348	.486	.309	.410	.702	n.a.

Note: Values on the diagonal are the square root of the AVE for each construct. For discriminant validity the diagonal elements should be greater than the inter-construct correlations (off-diagonal elements). Two variables (centralization and formalization) have an AVE of 1.0 for they were modeled as single-indicator constructs.

To further assess discriminant validity, indicator cross-loadings were also checked (See the table in Appendix E). None of the indicators had a higher correlation with another latent variable than with their respective latent variable, which suggests acceptable discriminant validity.

Overall, it was concluded that all constructs show sufficient reliability and validity, with the exception of *perception of the policy context* construct. Its proposed indicators were therefore modeled as separate dependent variables.

Inner model assessment

The individual path coefficients in a PLS model can be interpreted similarly to the standardized beta coefficients in ordinary least squares regression models (Henseler, Ringle, & Sinkovics 2009). In the baseline model, several structural paths turned out to be statistically non-significant (see Table 7.29). According to the model specification, *formalization* was expected to be a significant predictor of *learning culture* (LC). Along with *centralization*, as the two dimensions of organizational structure, they were assumed to have a dampening effect on *learning culture*. Only *centralization* exhibited such a negative effect. This is not surprising as *centralization* and *formalization* were not found to be positively correlated in the CFA. In addition, none of the paths starting from *KM practices* (KM) was statistically significant. Also, the two sub-constructs capturing aspects of the departmental advice network—*diversity* (NDIV) and *informal communication* (ICOM)—had mixed influence on *substantive* and *process meta-knowledge* in terms of statistical significance.

TABLE 7.29 • PLS parameter estimates for the inner (structural) part of the baseline model

Model element	*Standardized parameter estimates*	*t-value*
Organizational culture→Learning culture	.445*	2.436
Centralization→Learning culture	–.342**	5.455
Formalization→Learning culture	.076	0.907
Learning culture→KM practices	.596**	5.146
Learning culture→Substantive meta-knowledge	.401**	3.357
Learning culture→Process meta-knowledge	.510**	6.795
KM practices→Informal communication	.074	0.574
Informal communication→Substantive meta-knowledge	–.095	1.340
Informal communication→Process meta-knowledge	.309**	3.546
KM practices→Diversity of social networks	–.048	0.148
Diversity of social networks→Substantive meta-knowledge	.255**	2.903
Diversity of social networks→Process meta-knowledge	–.025	0.148
Substantive meta-knowledge→Perception of policy context	.617**	3.683
Process meta-knowledge→Perception of policy context	.290*	2.022

* Statistically significant at $p < .05$ (2-tailed).
** Statistically significant at $p < .01$ (2-tailed).

While widely accepted overall (model-level) goodness-of-fit indices are not yet available in PLS, R^2 can be used as an indicator of predictive power (Chin 2010). Just as with regular regression models, the amount of variance explained in endogenous variables by exogenous ones indicates how well each dependent construct is predicted. The results in Table 7.30 show a moderate R^2 for *learning culture*, *KM practices*, *process meta-knowledge* (.41), *substantive meta-knowledge* (.26), and *perceptions of the policy context* (.56), although this later construct turned out to have doubtful construct validity. Due to a lack of significant explanatory factors, the two aspects of social networks had very low R^2.

TABLE 7.30 • Explained variance in the baseline model

Dependent variable (Endogenous construct)	R^2
Learning culture	.464
KM practices	.357
Informal communication	.005
Diversity of the social network	.002
Substantive meta-knowledge	.257
Process meta-knowledge	.411
Perceptions of the policy context	.557

A closer inspection of inter-construct correlations (Table 7.28) suggested that formalization is most strongly associated with KM practices, and hence adding a direct path between the two construct was a reasonable change to the model.

Also, informal communication and social network diversity appeared to be more strongly related to learning culture as well, also suggesting adding a direct path between these constructs.

7.1.4 The revised model

As any hypothesized model is only an approximation to reality in a strict sense, a certain degree of misspecification may always be present(Mueller & Hancock 2010). Therefore, upon the inspection of the construct inter-correlations, a number of revisions were made to the original model. *Formalization* was specified as a predictor of *KM practices* instead of *learning culture*, implying a direct relationship between the two constructs. Secondly, a path was added between *KM practices* and *process meta-knowledge*. Third, direct paths were added between *learning culture* and both *social network diversity* and *informal communication*.

Outer model assessment

The revised model did not incorporate any modifications in the outer part of the model other than breaking up the perceptions of the policy context construct into separate variables. They were modeled as stand-alone (single indicator) constructs, so measurement quality requirements did not apply to them any more. The rest of the measurement model yielded very similar results to the original model in terms of indicator loadings. In line with this, both AVE and CR values remained practically unchanged and cross-loadings changed only marginally. Accordingly, it was concluded that the measurement of constructs having more than one indicator was sufficently reliable and valid. It should be pointed out again, however, that the sole indicator of both *formalization* and *centralization* is in fact a factor composed of several measured variables. The same is true for the dimensions of the *perceptions of the policy context* construct. The reliability and validity of these first-order factors were assessed during the preliminary analysis.

Inner model assessment

Figure 7.20 displays the structural part of the revised path model. All paths that were found non-significant in the baseline model have been omitted for clarity and newly added paths appear in blue in the diagram. In fact, all of the newly added paths turned out significant at $p < .01$. These results suggest that

formalization has a direct effect on KM practices, rather than only via *learning culture*. As a matter of fact, *formalization* had no statistically significant effect on *learning culture*. In addition, *learning culture* has a statistically significant effect on both *social network diversity* and *informal communication*, whereas *KM practices* contribute to explaining a statistically significant portion of the variance in *process meta-knowledge*.

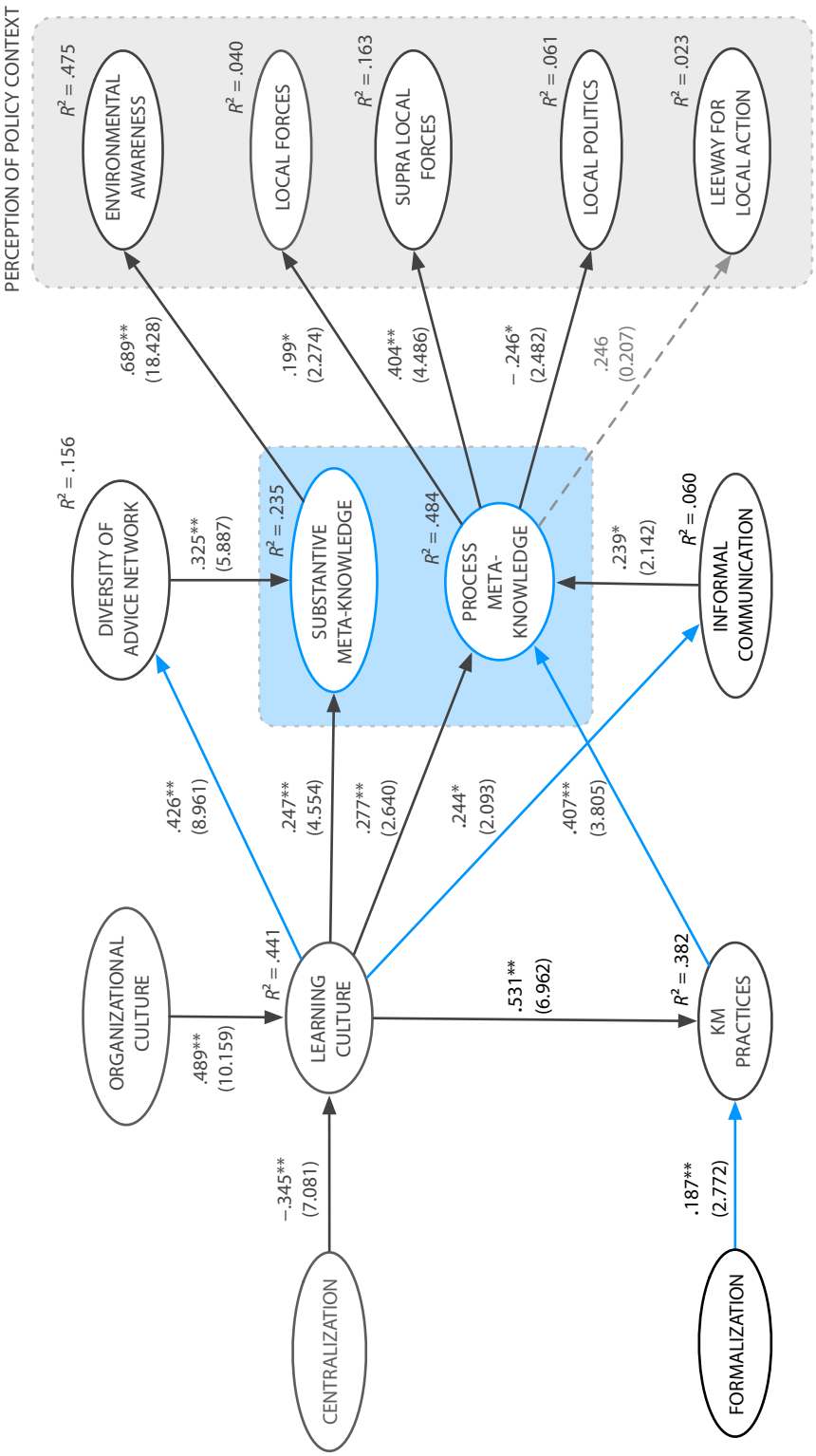

FIGURE 7.20 • The respecified path model of Sustainability Meta-knowledge. For simplicity, the measurement model is not displayed. Arrows in blue are the new paths added to the baseline model. Values in parentheses are *t* values. (*Statistically significant at $p<.05$; **statistically significant at $p<.01$)

Effect sizes

In addition to assessing the absolute magnitude of R^2, R^2 can be evaluated both in the absence and in the presence of each predictor variable. The change in R^2 can be used as an indicator to see whether a particular independent latent variable has substantive impact on a dependent latent variable in the structural model. This change is evaluated by the calculation of f^2.[33]

TABLE 7.31 • Effect sizes in the revised Sustainability Meta-Knowledge Model

Independent variable	*Dependent variable*	f^2	*Effect size*
Centralization	Learning culture	.188	medium
Trust and identity	Learning culture	.399	large
Formalization	KM practices	.045	small
Learning culture	KM practices	.409	large
Learning culture	Substantive meta-knowledge	.084	small
Diversity of social network	Substantive meta-knowledge	.081	small
Learning culture	Process meta-knowledge	.091	small
Informal communication	Process meta-knowledge	.105	medium
KM practices	Process meta-knowledge	.190	medium

Table 7.31displays effect sizes for each dependent variable. Based on Chin's (2010) guidelines, the effect sizes are categorized as small, medium and large. The relative importance of each predictor of substantive and process meta-knowledge is roughly the same, ranging from small to medium. The predictors have large effect sizes on their respective dependent variables: trust and identity on learning culture and learning culture on KM practices.

Q2 predictive relevance

Another measure for assessing the structural model is Stone-Geisser's Q^2 (Geisser 1975; Stone 1974).[34] All cross-validated redundancy Q^2s are above zero, which implies that the model has predictive relevance (Chin 2010), that is, the observed measures of the latent dependent variables are well reconstructed by the structural model (see Table 7.32). It should be noted, however, that some of

[33] The effect size f^2 is calculated as $f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$, where $R^2_{included}$ and $R^2_{excluded}$ correspond to the R-square on the dependent variable when the predictor variable is included and excluded, respectively (Chin 1998).

[34] Stone-Geisser's Q^2 can be measured using the blindfolding procedure applied to reflective endogenous variables. It is essentially a criterion which postulates that the model must be able able to provide a prediction of the endogenous latent variable's indicators (Henseler, Ringle, & Sinkovics 2009).

the Q^2 measures are quite close to zero, namely leeway for local action, local forces and local politics.

TABLE 7.32 • Predictive relevance in the revised Sustainability Meta-knowledge Model

Endogenous construct	Q^2
Learning culture	.264
KM practices	.243
Diversity of social network	.068
Informal communication	.224
Substantive meta-knowledge	.109
Process meta-knowledge	.224
Environmental awareness (Policy context)	.469
Local forces (Policy context)	.040
Supralocal forces (Policy context)	.163
Local politics (Policy context)	.061
Leeway for local action (Policy context)	.001

Note: The ommission distance in the blindfolding procedure was 7.

Similarly to the effect size (f^2) evaluation, the relative impact of the predictive relevance can be assessed by the measure q^2 (Henseler, Ringle, & Sinkovics 2009).[35]

TABLE 7.33 • Relative predictive relevance of variables in the revised structural model

Independent variable	*Dependent variable*	q^2	*Predictive relevance*
Centralization	Learning culture	.081	small
Organizational culture	Learning culture	.184	medium
Formalization	KM practices	.032	small
Learning culture	KM practices	.205	medium
Learning culture	Substantive meta-knowledge	.040	small
Diversity of social network	Substantive meta-knowledge	.040	small
Learning culture	Process meta-knowledge	.017	small
Informal communication	Process meta-knowledge	.034	small
KM practices	Process meta-knowledge	.052	small

[35] The measure is calculated as follows: $q^2 = \frac{Q^2_{included} - Q^2_{excluded}}{1 - Q^2_{included}}$.

As seen in Table 7.33, the relative predictive relevance of explanatory variables in the model all fall into the small-medium categories described by Henseler *et al.* (Henseler, Ringle, & Sinkovics 2009).

Testing for mediation

The working hypotheses only capture direct relationships between the key constructs of the study. These direct relationships "added up" to create the path model in which they were estimated. The path model, however, also involve indirect effects between these constructs. For instance, *organizational culture* is indirectly related to *substantive meta-knowledge* and *process meta-knowledge* via *learning culture*, which suggests that *organizational culture* may have an effect on *substantive meta-knowledge* via the intervining variable *learning culture*. Also, *KM practices* potentially mediates the influence of *learning culture* and *formalization* on *process meta-knowledge*. In addition, the influence of *learning culture* is potentially mediated by *diversity of social network* toward *substantive meta-knowledge*, whereas it is potentially mediated by *informal communication* toward *process meta-knowledge*.

Theoretically, a mediating construct facilitates the relationship between the other two constructs in the model (Hair, Black, Babin, & Anderson 2009). It helps to understand the process that produces the effect between the constructs (Preacher & Hayes 2004). While it seems a straightforward idea, there is still plenty of debate concerning the approaches and statistical methods used in testing for and making inferences on mediation. Mathieu and Taylor (2006) use the umbrella notion of "intervening effects" to include two ideas, which are often used interchangeably: *indirect effect* and *mediation*. An indirect effect may exist between two variables, if they are indirectly related through significant relationships with an 'in-between' variable, although there is *no* significant total[36] relationship between the two. In contrast, mediation refers to instances where there *is* a significant total relationship between the independent and dependent variables in focus and it is accounted for in part or completely by a mediator variable. Hayes *et al.* (2009) point out that investigators should entertain the plausability of indirect effects even when they do not find evidence for a significant total effect that could be mediated. In other words, this promotes the idea that indirect effects may be substantively interesting,

[36] In mediation analysis, total effect (denoted *c*) is the term used to refer to the statistical relationship between the independent variable (IV) and the dependent variable (DV) in the model that does not control for the mediator variable (M). In contrast, direct effect (*c*') is used to refer to the same relationship when involving the mediating variable as well. The indirect effect is created by the constituent paths from IV to M (denoted *a*) and M to DV (denoted *b*).

even in the abscence of a total relationship between the independent and dependent variables.

There are several strategies to evaluate mediated effects. One widely used approach is what is known as the Baron and Kenny's steps (1986), also often referred to as the causal steps approach (Hayes 2009). A major critique of this technique is that an indirect effect is inferred logically on the basis of a set of hypothesis tests regarding the individual constituent paths and not their product, the indirect path itself. For this reason, I followed Preacher and Hayes' recommendations and used asymptotic resampling strategies for the assessment of intervening effects as implemented in their SPSS macro (2008). This statistical procedure estimates *a*, *b*, *c* and *c'* and also the confidence intervals for the indirect effect *ab* for each potential mediator variable. The confidence intervals used for significance testing are determined by the bootstrapped empirical sampling distribution.

Mediators for substantive meta-knowledge

The total effect between *organizational culture* and *substantive meta-knowledge* is not significant, so there is no effect to be mediated by *learning culture* (see Table 7.34). However, the results indicate that *organizational culture* does have a significant indirect effect on *substantive meta-knowledge*, the bootstrap estimate being .159 in a 95% confidence interval that does not cross zero. *Centralization* has a significant total effect on *substantive meta-knowledge*, although the direct effect becomes non-significant once *learning culture* is introduced as a mediator between the two variables, while the indirect effect of –.085 is statistically significant. These results suggest that *learning culture* fully mediates the effect of *centralization* on *substantive meta-knowledge*. This is the way it was specified in the revised model.

Learning culture has a significant direct effect on *substantive meta-knowledge* even in the prescence of *diversity of social network* as an intervening variable. The indirect effect is statistically significant, so it can be concluded that *diversity of social network* partially mediates the effect of *learning culture* on *substantive meta-knowledge*. This finding is consistent with the way these relationships were specified in the revised path model. In addition, *learning culture* acts as a full mediator for both *organizational culture* and *centralization* on *diversity of social network*. Neither variable has a significant direct effect on the *diversity of social network*, however both indirect effects are statistically significant.

TABLE 7.34 • Bootstrapped indirect path estimates and confidence intervals

Indirect path	*Point estimate (ab)*	*Bootstrapping*			*IV to M (a path)*	*M to DV (b path)*	*Total effect (c path)*	*Direct effect (c' path)*
		Boostrap estimate	*95% lower CI*	*95% upper CI*				
LC→DIVS→SUBS	.110	.111*	.039	.204	.395**	.277**	.383**	.274**
OC→LC→SUBS	.163	.159*	.056	.285	.488**	.333**	.139	–.023
CENTR→LC→SUBS	–.087	–.085*	–.184	–.014	–.340**	.333**	–.251**	–.137
OC→LC→NDIV	.127	.128*	.027	.266	.488**	.260*	.276**	.149
CENTR→LC→NDIV	–.089	–.087*	–.188	–.016	–.340**	.260*	–.196**	–.108
LC→ICOM→STRA	.058	.059*	.013	.124	.243**	.240**	.577**	.275**
LC→KM→STRA	.243	.240*	.137	.384	.593**	.409**	.577**	.275**
CENTR→LC→STRA	–.082	–.082*	–.179	–.013	–.380**	.251**	–.139*	–.044
OC→LC→STRA	.055	.056*	.006	.153	.226**	.243*	.082	.027
FORM→KM→STRA	.080	.083*	.018	.170	.184*	.436**	–.103	–.023

Note: Confidence intervals are bias corrected and accelerated; based on 5,000 bootstrap samples.
*Significant at $p < .05$; **Significant at $p < .01$.

Mediation for process meta-knowledge

In the revised model, *learning culture* is specified to have a direct effect on *process meta-knowledge* and two specific indirect effects mediated by *informal communication* and *KM practices* respectively. Both indirect effects are statistically significant, the former being small (.059), while the latter is rather sizeable (.240). The results suggest that both *informal communication* and *KM practices* are partial mediators for *learning culture* on *process meta-knowledge*.

Learning culture has been found to fully mediate the effect of *centralization* on *process meta-knowledge* as the direct path between them turns non-significant once *learning culture* is introduced as a mediator. The indirect effect (–.082) is significant, although rather small.

No statistical evidence has been found that either *organizational culture* or *formalization* has a mediated effect on *process meta-knowledge*, although both indirect paths (OC→LC→STRA and FORM→KM→STRA) are statistically significant, so—although quite small (.056 and .080 respectively)—they do have an indirect effect on *process meta-knowledge*.

7.2 CONCLUSIONS ON THE HYPOTHESES

The standardized path estimates of the PLS path model can be used to evaluate the hypotheses that were specified between the latent variables in the

theoretical framework. Table 7.35 concisely summarizes which of these hypotheses are supported, partially supported, or not supported by the statistical results provided by the PLS path modeling approach.

TABLE 7.35 • Summarized results of the statistical evaluation of the hypotheses

	Hypothesis	*Support*
H1	Stronger shared identity improves the learning culture.	✔
H2	Greater perceived trust has a positive effect on the learning culture.	✔
H3	A more cultivated learning culture has a positive effect on the development of sustainability meta-knowledge.	✔
H4	A more cultivated learning culture impacts knowledge management practices in a positive manner.	✔
H5	A higher degree of centralization acts as a constraint on learning culture.	✔
H6	The level of formalization is inversely associated with learning culture.	✘
H7	More sophisticated knowledge management practices have a positive effect on the diversity of the professional social network of departments.	✘
H8	More sophisticated knowledge management practices have an effect on the form of communication with social contacts.	✘
H9	Higher diversity of social contacts has a positive effect on the development of sustainability meta-knowledge.	✔✘
H10	The form of communication has a positive effect on the development of sustainability meta-knowledge.	✔✘
H11	Departments with more sophisticated sustainability meta-knowledge perceive a more actionable policy context.	✔✘

No support was found for three of the hypothesized relationships in the current sample. *Formalization* did not turn out to be a significant predictor of *learning culture* (H6). However, it should be noted that as part of the exploratory post-hoc analysis, *formalization* was indeed found to have a significant effect on *KM practices*. It must also be highlighted that the effect is positive, while originally, *formalization* was hypothesized to be a constraint on *learning culture*. In addition, *KM practices* were found to have a positive direct effect on *process meta-knowledge*. This means that while the hypothesized effect of *KM practices* on sustainability meta-knowledge is not mediated by either *social network diversity* (H7) or *informal communication* (H8) for there is no statistically significant relationship between *KM practices* and the supposed mediating variables, *KM practices* do have an a direct impact on *process meta-knowledge*.

Three hypotheses (H9, H10, H11) were only partially supported by the estimated model. The partial evidence stems from the fact that the constructs involved in these hypotheses had to be broken down to the sub-construct level and their relationships were modeled at the sub-construct level. The results

then indicate that at the sub-construct level the direction and strength of these effects are not identical. H9 is partially supported by a significant path between *diversity of social network* and *substantive meta-knowledge*. However, this statistical relationship is missing between the *diversity of social network* and the measures of the other type of meta-knowledge (strategic). Similarly H10 is partially supported by a significant path between *informal communication* and *process meta-knowledge*, while no such relationship is evident from the data between *informal communication* and *substantive meta-knowledge*. As for H11, the construct *perception of policy policy context*, which was originally included in the model as a formative second-order construct, was broken up to six separate variables and led to mixed results in terms of the hypothesized relationships. *Substantive meta-knowledge* only predicts one aspect of the perceived policy context well, namely *environmental awareness*. This is actually the strongest relationship between any of the two types of *sustainability meta-knowledge* and any of the s*ix aspects of policy context* (.689). *Local forces*, *supra-local forces*, and *complexity of local politics* is significantly predicted by *process meta-knowledge*. The betas are moderate ranging from .199 to .404. *Leeway for local action* is not predicted well by either *substantive* or *process meta-knowledge*.

7.3 DISCUSSION

One often articulated principle in the literature of governance for sustainable development highlights the need to address problems at all levels of government including the lowest one as well, which is usually the community or city level. The underlying logic is that local governments are closest to their communities and have the most accurate understanding of local issues. Many of these issues, however, have implications beyond the borders of the municipality on extended geographical and time scales. At the same time some of the issues that become relevant in a municipality are at least partially rooted outside its boundaries, they may be strongly determined by ecological, social, economic or political forces operating at larger scales. Governance for sustainability at the local level is therefore a challenge of governing a system that is embedded in larger systems which are beyond local control and which produce an ever changing decision environment for local decision-makers.

Both the complexity of problems and the complexity of action require municipal governments to engage in a continuous learning effort to effectively address the challenges posed by sustainability. Solutions coming from or imposed on by higher levels of government or lessons learnt elsewhere may or may not work successfully in a particular city. The key tenet behind this study

is that this variation is at least partly due to local organizational conditions specific to each municipality or local government.

While local governments may be similarly structured and may operate in the very same legal context, they are never identical under the surface. Differences arise because the people (councilmen, elected officials, staff and citizens) in each municipality and in fact in each municipal department are different, so the way they relate to each other and the way they end up working together will be different as well. Management and planning in local government typically enjoys less decision-making autonomy because of institutional constraints, formal administrative controls and external sources of formal authority, but next to these coercive isomorphic forces, local conditions do generate variation in terms of *soft* organizational aspects, which affect the way "things are actually done" in different departments and locales.

The question, then, is how and to what degree does the organizational context influence the capacity of municipal departments to develop knowledge relevant for sustainability?

7.3.1 A learning culture in municipal departments

In my theoretical model I proposed that a culture generally more sympathetic to new ideas, questioning givens and more conscious about collecting feedback to interpret their experience and changes in their environment is one important factor of accumulating knowledge relevant for sustainability within municipalities (and their units).

In my study, this *learning* culture was conceptualized and operationalized via four closely related dimensions, openness, risk-taking behavior, interaction with the organizational environment, and inclusiveness. The results of my statistical analyses confirmed the expectation that the emergence of a learning culture is conducive to the generation of knowledge that is crucial for addressing urban issues in sustainability-oriented way. The positive direct effect of a learning culture is equally pronounced with substantive and strategic aspects of sustainability meta-knowledge.

The nurturing influence of a learning-oriented culture is also evident in more practical ways, not just as a general backdrop to the development of sustainability meta-knowledge. My modeling results indicated that a more inclusive and exploratory culture facilitates the activation of advice networks via communication with actors and stakeholders. Municipal departments experiencing a more sophisticated learning culture tend to maintain a more

diverse social network to gather information and advice useful in their daily decision-making processes, strategy setting and policy formulation. Departments placing more value on seeking feedback from their organizational environment do "walk the talk" by contacting a set of actors more varied in representing different tiers and branches of government and sectors. These departments' knowledge outreach is also reflected in more intensive participation in national and international professional events such as conferences and more membership in professional associations, both serving learning purposes on a voluntary basis.

Partial statistical evidence was found that the diversity of contacts and the 'cosmopoliteness' of municipal departments has a facilitative role in sustainability-oriented learning (Hypothesis 9). Substantive meta-knowledge was found to be positively related to the diversity of the departmental advice network, but network diversity also mediates the positive impact of learning culture on substantive meta-knowledge. This means that learning culture is a factor by providing a fertilizing intra-organizational working environment in itself, but it also beneficial to substantive learning by motivating departments to seek feedback from more diverse sources. Regular interaction with these more diverse set of actor increase the likelihood of substantive learning even further.

A more organic culture also motivates the use of informal means of keeping in touch with the departmental 'advisors'. This is in line with my earlier observation that municipal departments tend to prefer informal channels of communication to access information about the whereabouts of expertise and knowledge not available in their social network at 'arm's length' and also to gather advice leading to problem reformulation and unique insights into issues. The modeling results indicate that informal communication between departments and tends to facilitate the development of strategic aspects of sustainability meta-knowledge in particular.

These findings are particularly noteworthy. The concept of governance for sustainability implies that a heterogeneous set of actors involved in or having an interest in policy and planning need to be coordinated in shaping socio-ecological transformation. It is often (e.g.,Voss, Bauknecht, & Kemp, Rene 2006) suggested that such coordination can not solely rely on institutionalized hierarchies, but should take place more in networks. Networks highlight the idea that lateral arrangements are more appropriate for interactively aligning perceptions of problems and interests and pooling the practical (and often tacit) knowledge of stakeholders. While networked mode of governance may not always be suitable for the implementation of policies, the delivery of programs and services (Kettl 2002), my results confirm the advantage of

horizontal relationships in learning in government. The evidence suggests that openness to collective inquiry and an increased reliance on informal advice relationships with diverse actors do lead to a more relevant, systems-oriented view of urban issues, interdependencies of actors and the appreciation of interactive settings in which knowledge is co-produced by local government and and actors representing various fields of societal practice. This more inclusive learning environment informs the sense making and interpretation of the kinds of ambiguities which are inherent in a sustainability-oriented view of urban issues and policies. The more equivocal the link between problems and solutions, the more influence the culture is likely to have in shaping the course of learning.

While legal mandates maintain the domains of local government agencies and therefore it is unlikely that networks will replace the formal bureaucratic organization in government and displace its power and authority, they will probably no longer remain dominant (Callahan 2007). Complex networks may be layered on top of hierarchical organizations (Kettl 2009), for instance they may emerge by way of knowledge sharing between municipal departments and their working environment. These knowledge networks are not only crucial for learning within municipalities, as noted above, but they also have a coordinating function among different agencies and organizations. Kettl (2002) argues that public managers "need to harness their hierarchies to manage [...] networks, often side by side with traditional programs that continue to be managed through authority-driven structures." This creates management and leadership challenges within local government not only from a normative, but also a practical point of view. The normative aspect means that horizontal interaction with stakeholders is expected to become an internalized value in local government, while the practical aspect means that municipal departments will also need to develop the capacity to rely productively on inter-organizational (and interpersonal) processes as complements to authority (Callahan 2007). While it clearly requires people in local governments to develop matching skills (personal learning), my results also underscore the importance of creating an adequate organizational context in which learning also takes place at the unit (department) and municipal level.

Learning is often recognized as a critical element of processes targeted at sustainability or sustainable development. Sustainability is a multi-dimensional and dynamic concept interpreted in many different ways depending on the context it is used. From a policy or governance perspective, it can be understood as "a mode of problem treatment" (Voss, Bauknecht, & Kemp, Rene 2006). In this sense sustainability is not focused on particular outcomes in the first place, but it rather refers to the organization of processes,

the types of strategies that are applied to search for solutions to bring about more sound socioeconomic development in a finite world.

This challenge is marked with 'messiness': uncertainty about cause-and-effect relations, the ambiguity of goals and an array of actors, each of which only having limited scope, resources and understanding to contribute in addressing the issues in question. This thesis argues that such a messy *master* problem requires a special problem framing, an evolving interpretation of the world that emphasizes the interconnectedness of different specific problems, scales, as well as the long-term and indirect effects of actions. In addition, it calls for more sophisticated understanding of the interconnections and interdependence of societal actors when designing actions and strategies. This kind of reflective *meta*-knowledge for sustainability was defined to be composed of two related domains for the purpose of this study: substantive and process meta-knowledge.

Municipal departments as *agents* to address issues locally are not equally equipped with these two domains of knowledge and therefore their (and their city's) capacity to plan and implement action compatible with the sustainability principles is limited. Learning becomes important in two senses. On the one hand, decision makers need to develop a more systems-focused problem framing (as meta-knowledge), and following the epistemic implications they consciously need to learn in practice by interacting with stakeholders and their problem perceptions in particular situations.

7.3.2 The impact of organizational structure

The relationship between organizational structure and performance has been a timeless concern in public administration research (Andrews, Boyne, Law, & Walker 2007). Organizational structures provide the foundation for achieving coordination and control and they are also a fundamental tool to manage knowledge in organizations via controlling the channels of work-related information flows (Johnson 2009). Generally speaking, the purpose of such structures is to reduce uncertainty and to lend predictability to organizational activities. As much as they may be critical to the smooth functioning of day-to-day activities, they may be a constraint on intra- and inter-organizational processes, which depend heavily on informal and horizontal interaction, such as learning.

My study focused on two aspects of organizational structure within local government: centralization and formalization. Centralization refers to the the relative hierarchy of authority and the degree of participation in decision

making in an organization. It reflects the distribution of formal power. A centralized organization typically has a high degree of hierarchical authority and low levels of participation in decisions about policies and resources, whereas a decentralized organization is characterized by the opposite (Andrews, Boyne, Law, & Walker 2007). Formalization refers to the extent to which rules, procedures, instructions, and communications are written.

Municipal departments involved in the study characterized their organizations as having a relatively high degree of hierarchical authority and reported relatively low levels of staff involvement in decision-making in their respective local governments. Decisions brought at the departmental level typically need to be authorized by someone higher up in the hierarchy. Accordingly taking action without approval is also discouraged. At the same time, respondents reported more freedom in reconsidering and changing the rules they work by, if changes are expected to improve performance.

In terms of formalization, the responses to the the four survey questions indicate what could be anticipated in the public sector: typically respondents agree that rules play an important role in shaping organizational processes. Interestingly enough, there seems to be a gap between how much they feel that work is centered around compliance with the rules and the degree to which these rules are actually codified.

Both centralization and formalization were hypothesized to have a dampening effect on creating favorable conditions for learning in municipal departments and indirectly on the departments' level of understanding of substantive and strategic complexity. The statistical analysis brought mixed results in terms of their effects.

In general, empirical studies in the private sector have failed to provide consistent or substantial relationship between centralization and organizational performance (Andrews, Boyne, Law, & Walker 2007). Likewise, studies in the public sector have so far uncovered contrasting effects. These studies focused on different aspects of performance and effectiveness, often measured as perceptions of the staff and less often by hard performance criteria. Studies using employee perceptions of performance typically found a negative relationship between centralization and organizational performance (Andrews, Boyne, Law, & Walker 2007). Less tangible areas of "gains" such as the formation of knowledge or cognitive changes have not been researched.

The results of the statistical modeling in this study indicated that centralization is in fact a significant organizational aspect of learning processes for sustainability. The impact of centralization, however, is not direct, but a mediated one. The mediation effect of learning culture is practically the same for both types of sustainability meta-knowledge. This means that lower levels

of centralization indirectly facilitate an enhanced appreciation of both substantive and strategic complexity by allowing the formation of an appropriate learning culture (as stated in confirmed Hypothesis 5) conducive to a more systems-oriented thinking.

Andrews et al. (2007) suggest that centralization can have a negative or positive effect on performance, depending on the *strategic stance* of the public organization. In defending organizations (focusing on core activities and efficiency of internal procedures) centralization was found to positively affect performance, whereas in prospecting organizations (more focused on new opportunities) decentralization leads to better performance. As strategic stances were not measured in this study, the inverse relationship between performance and learning culture and sustainability-related learning should not be interpreted as a sign of most municipal departments being prospecting. Also, their study focused on "hard" service delivery performance gains in public organizations rather than "soft" knowledge-based activities such as planning, strategic decision making or policy development in government. The quality of these processes may be adversely affected by the level of centralization regardless of the strategic stance a department or municipality adopts.

Similarly to the relationship between centralization and performance, the the impact of formalization on performance is also a subject of controversy. Empirical evidence is mixed regarding the sign of the effect, if at all non-zero (Dalton, Todor, Spendolini, Fielding, & Porter 1980). For the sampled population of Hungarian municipal departments, Hypothesis 6 was discarded in the absence of any kind of relationship between formalization and learning culture. This suggests that the extent to which appropriate action and rules are described in formal documents is not perceived to be a constraint on the opportunities of inquiry and learning in municipal departments, neither does it appear to foster it.

At the same time, formalization was found to have a direct positive impact on knowledge management practices. This implies that while organizational attitudes towards new ideas and experimentation are not affected by the perceived degree of formalization, the actual practice of knowledge sharing is supported by more formalization. Similarly, Willem et al. (2007) in their study on interdepartmental knowledge sharing in public sector organizations found that formal systems in place were not at all an obstacle to communication work-related information or knowledge. Dalton et al. (1980) argues that the impact of formalization on various aspects of performance may actually be curvilinear: some level of formalization is desirable to avoid for instance role ambiguity and reduce uncertainty, but excess levels of *red tape* may prove to be counterproductive. My results suggest that explicit rules may facilitate the

reliance on practices related to knowledge creation, sharing and utilization in municipal departments. The use of officially available KM tools and processes seem to require the necessary clarity provided by articulated rules and procedures.

Formalization has indeed proved to be only a contextual condition for learning for sustainability within municipal departments. Formalization does not have an indirect effect on the development of substantive meta-knowledge or process meta-knowledge. A more systemic view of urban issues is probably more anchored in hard-to-change cognitive schemas, so they are less susceptible to be affected by regular organizational routines shaped by formal rules, either directly or indirectly.

7.3.3 Trust and shared identity

Trust and shared identity were two *soft* factors included in my study as variables potentially facilitating the emergence of a favorable learning climate in local government. Given the level of analysis, both trust and identity was interpreted at the intra- and interorganizational level. Respondents had to rate the amount of perceived trust from two perspectives: (a) trust they had for other departments and local actors, and (b) trust they believe other municipal departments and local actors have in them.

Shared identity captured the extent to which municipal departments perceived their working environment to be composed of other departments and actors with similar attachment and commitment to a single implicit mission. In a fragmented polity where municipal departments need to work across departmental and organizational boundaries, divergent goals and interests are likely to result in disagreements.

Higher levels of trust and matching identities foster the internal harmonization of conflict and provide an array of underlying norms and social processes that work to preserve relational exchange ties (Zaheer, McEvily, & Perrone 1998). Such a foundation was in fact found be beneficial in developing a learning environment within local government departments, both Hypothesis 1 and 2 were confirmed. However, it must be noted, that neither greater trust or shared identity seems to be directly related to substantive and strategic learning for sustainability. Also, I did not find statistical evidence that their influence is mediated by a more sophisticated learning culture.

In summary, while greater trust and shared identity are valuable for an open and more pioneering local environment, they do not seem to have a substantively relevant impact on the creation of sustainability-oriented

knowledge. Statistically speaking, no direct effect was found between these variables. The indirect effect is significant however: higher trust and identity is associated with an improved learning culture, which in turn is associated with more substantive and process meta-knowledge. The size of the indirect effects is small.

7.3.4 Perceptions of the policy context

Five variables capturing dimensions of the policy context were included in the model to see if substantive and process meta-knowledge influence local perceptions of the driving forces shaping the action space of local government. The results indicate that departments which appreciate the complexity of policy issues are also more sensitive to demands to integrate environmental concerns into decision making. The statistical relationship is quite strong, substantive meta-knowledge explaining almost half of the variance in environmental awareness. This implies that a more systemic representation of policy problems is beneficial for growing appreciation for the environment even in departments not formally responsible for the natural environment.

On the other hand, process meta-knowledge appears to influence how much a department perceives local issues to be embedded in a regional, country-wide and international (global) socioeconomic and political context. Departments with more process meta-knowledge tend to appreciate local forces more as well, but they are more likely to recognize supra-local processes to be at play.

CHAPTER 8

Conclusions

The overarching goal of this thesis was *to explore how organizational factors and interaction with other actors involved in policy influence the accumulation of knowledge that is relevant for governing sustainability at the unit level in local governments*. In my theoretical model, I operationalized sustainability-oriented learning by its outcomes. This is what a termed as sustainability meta-knowledge, referring to a more systems-oriented cognitive representation of interlinked urban policy issues (substantive aspect) on the one hand, and the process of interaction and coordination in a web of interlinked policy actors (process aspect) on the other. In my empirically tested model, I considered the level of trust and shared identity, the degree of formalization and centralization, a learning-oriented organizational culture, knowledge management practices, and advice seeking interactions to be key factors in contributing or constraining the learning process and thus the accumulation of sustainability meta-knowledge.

8.1 MAIN FINDINGS

I collected quantitative data on 161 municipal departments in 19 major Hungarian cities to test my theoretical model using multivariate statistical techniques. Based on the sample, I managed to identify typical patterns in the advice seeking behavior of municipal departments and also managed to test the viability of my assumptions about the role of various organizational factors in developing capacity to govern sustainability. My key results can be summarized in more detail as follows:

- Overall, I found that municipal departments tend to seek advice for a mix of benefits and from an array of partners. Compared to the business sector, municipal departments attach greater relative importance to validation and legitimation via advice seeking, which according to the logic of bureaucracy. As I discovered, knowledge-related interactions with other actors are much more frequently motivated by securing approval rather than an intention to tap into the experience, expertise and opinion of other

departments, authorities or organizations. Prospective partners that could bring new perspectives and input to local decision-making are very much tilted to the periphery. In other words, the departmental knowledge network, which would ideally serve as a vehicle of lateral coordination among actors, seems to be much layered on top of hierarchical lines of authority. This raises strong doubt whether prevailing organizational structures (relatively high degree of centralization, formal power relationships) and routines (traditions) allow room for municipal departments in Hungary to develop capacity to effectively participate in (or rather coordinate) a more loosely coupled self-organizing web of multi-sectoral relationships, a prerequisite of effective governance for sustainability (Callahan 2007).

- I have shown that municipal departments tend to rely more heavily on informal means of communication such as e-mail or personal consultation when talking to partners in their advice network that are recognized to stimulate thinking about the nature of urban affairs and potential new solutions. These actors are more likely to help put problems into new perspectives by challenging the values and beliefs held by public officials. These partners are also important in pointing to new sources of information and knowledge not available to the departments. Unfortunately, actors which are typically recognized as 'critical thinkers' by municipal departments—and thus are potential drivers of double-loop learning in local government—are stereotypically only research-related or professional organizations (e.g., universities and professional associations). This seems to suggest that the primacy of explicit knowledge prevails in local government, which means that other forms of knowing (tacit, local) are still undervalued.
- I have found evidence that the level of accumulated meta-knowledge for sustainability in municipal departments is influenced by organizational circumstances. In particular, my results suggest that this learning is significantly influenced by the aspects of organizational culture which create an atmosphere of open inquiry, dialogue, and experimentation in municipalities. While it may sound evident (or even tautological), the positive impact of a learning-oriented culture may not necessary foster all types and forms of learning. As I demonstrated in my thesis the *learning organization* ideal popularized by Senge (1990) works reasonably well in a local government setting and in relation to sustainability.
- I have found evidence that the impact of *learning culture* on developing knowledge relevant for sustainability is not only a direct one, but it is also mediated in a differentiated fashion by a more diverse departmental

network of contacts. This means that an atmosphere of open inquiry does help to overcome conventional formal lines of hierarchy when analyzed at the department level. Closely related to an earlier point, learning culture tends to increase reliance on informal communication between municipal departments and their contacts. These ties appear to be more conducive to the transition to sustainability thinking than formal ones. Also, more sophisticated knowledge management practices within municipalities help mediate. All these points confirm what has been asserted about critical aspects of effective governance for sustainability in the normative practice-oriented literature (Newig, Günther, & Pahl-Wostl 2010).

- While I did not find evidence that the two studied aspects of organizational structure are critical factors of learning for sustainability in local government, both formalization and centralization proved to be important contextual parameters. A greater degree of centralization in decision making in the municipal administration does have an adverse effect on creating a learning-oriented culture in local government. This clearly limits the possibilities of participation and curbs commitment to innovative thinking. At the same time, more formalized procedures (*red tape*) in local government neither seem to foster nor constrain openness, dialogue and propensity to explore new ides. Contrary to expectation, formalization actually turned out to be beneficial in creating more effective knowledge management practices, which in turn support the accumulation of process meta-knowledge for sustainability.
- Municipal departments that have developed a more complex understanding of interconnectedness (substantive meta-knowledge) appear to recognize greater need to integrate environmental concerns into decision-making. At the same time, process meta-knowledge does have the positive impact on the recognition of the relevance of supra-local policy levels in local decision-making.

8.2 PRACTICAL IMPLICATIONS AND RECOMMENDATIONS

The fact that advice seeking in local government is much driven by a need for approval along hierarchical lines implies that local political bodies and oversight agencies are barely considered to be a source of learning about problems and solutions. These actors specialize in the legitimation and validation of ideas and proposals almost exclusively. This tendency to downplay the benefits of new insights supplied via or generated in the interaction with other actors, points to a serious threat to the emergence of a

well-functioning "social learning system" built around local governments (Schön 2010).

Of course, this does not imply that municipal departments do not learn. They do accumulate certain forms of knowledge that they consider legitimate. They may be successful in political learning or instrumental learning for instance. But learning that potentially leads to fundamental transformations in how they approach local problems and what strategies they employ to address these problems may be hampered by a lack of horizontal focus. Municipal departments don't pursue opportunities of double-loop learning routinely, but when they do seek reflection, they expect new insights from specialized knowledge-producing actors. Their knowledge ecosystem is characterized by hard-wired categories in which actors are typically identified by their formal functions. Moreover, this suggests that scientific knowledge is considered *the* knowledge and other forms of knowledge about multidimensional complex problems (e.g., tacit or local (lay) knowledge embedded in local actors) are less valued in decision-making processes.

On a more positive note, civil society organizations are establishing their positions in formal contact mechanisms (e.g., being represented on council committees), while also delivering advice to departments via informal channels. Interestingly enough, these organizations have been more successful in establishing their place in formal decision-making processes rather than tightly integrating themselves as *problem reformulators* into the advice networks of municipal departments.

All the above and the fact that soft organizational factors such as a learning culture, knowledge management practices and informal networks has a substantial impact on developing capacity for governing sustainability highlight the importance of leadership oriented towards the rather neglected informal organizational side of local governments. Managing only through formal processes and programs reinforces the limitations of the rational and bureaucratic worldview on innovative processes in the local administration. Municipalities focus on these formal mechanisms quite understandably as they can be clearly defined, named, captured in written form and they bring precision and permanence. They provide time-tested templates that run the the machinery of the organization.

Effecting change in the organizational culture of local government to enhance sustainability-oriented learning requires leadership that looks beyond traditional control mechanisms. While programmatic change efforts driven through the formal organization of municipalities can also turn the culture more oriented to open inquiry and dialogue, they do much more slowly often with undesirable side effects and resistance to such top-down measures.

Moving from hierarchical organizations to new networked organizations and multi-sector partnerships depends on the ability of public managers and their staff to effectively communicate and coordinate a variety of internal and external stakeholders (Callahan 2007). In that effort, leaders need to focus on harnessing the *informal*, which requires a shift in leadership attitudes and also developing new skills and competencies. The informal is *not* strategic (programmable), analytical, efficient or enforceable (Katzenbach & Khan 2010).

Public managers need to tap into the underlying elements of human behavior to motivate knowledge sharing and to catalyze collaboration across the limits of their departments to get exposure to a more diverse epistemic community that can offer opportunities for learning more holistically about interconnected issues and complex action required to progress towards a more sustainable local community.

8.2.1 Public policy implications

What insights do the above findings have to offer for policy makers at the national level? First and foremost, the results highlight the important role of local organizational factors in establishing favorable conditions for building capacity to address urban sustainability issues at the local level of government. These are circumstances often assumed away when designing central government programs or legislation to promote the idea of sustainability at the local level.

National policies and programs may provide the overall legal framework, the grant priorities and funding windows for local programs to come to existence, but these may fail to create long lasting effect in terms of shifting conventional local decision-making towards a polity that genuinely embraces sustainability principles and values. In other words, the top-down efforts in mainstreaming sustainability at lower tiers of government need to be coupled with programs that focus on local government capacity building for governing sustainability.

The Integrated Urban Development Strategy[37] (IUDS) program may serve as a good Hungarian example. Cities with county rights are obliged to while other municipalities can optionally elaborate an IUDS to seek funding for its

[37] According to the official program manual of the Hungarian Ministry of Local Governments and Regional Development, *integrated urban development policy* is defined as "a process that tackles urban problems and interests in a just and coordinated fashion across spatial and temporal scales, and sectoral boundaries." Both this and "the inclusion of local actors, stakeholders and citizens" are "prerequisites of the implementation of a community-based sustainable development strategy." (MLGRD 2007)

implementation from the Hungarian National Development Agency. Both the content and the process of developing these strategy proposals are subject to strict guidelines. For example, each proposal is required to include an anti-segregation plan and the drafting of the strategy has to involve key stakeholders via various participatory processes. These criteria are often only met because they are formally required and not because there is genuine demand on behalf of the local governments and the communities. During my research, I sat in for a series of community forums held as part of the consultations processes. In all instances, the strategy document had already been completed by a non-local (!) consulting agency, which was contracted to take care of the entire strategy development process including data collection, the facilitation of forums and writing up the strategy document. Forums were pointless as citizen's input was clearly not to be utilized. The forums solely served as a venue to present the outline of the IUDS in a slideshow with no real consultation. While the IUDS program may seek to promote the idea of sustainable development planning that integrates several local issues in a synergistic fashion and also participatory processes involving local stakeholders, these objectives are only formally met at best. Bringing in external consultants may be a short-run solution, but in the long-run local governments need to develop their own portfolio of expertise.

In the absence of relevant supporting professional training programs for public administrators, leadership development programs for public sector executives and organizational development programs that contribute to create local institutional capacity, governance for sustainability may be seriously crippled in localities that are not luckily endowed with a collective of people in office that possess the skills and mindset to govern local sustainable development. These resources may be a critical precondition for driving change for sustainability at the local level (Evans, Joas, Sundback, & Theobald 2005).

8.3 TO WHAT EXTENT ARE FINDINGS GENERALIZABLE?

As with any research findings, the question arises whether they have external validity, that is, whether and to what extent do findings reasonably generalize over a larger population or to settings and populations other than those studied (Lucas 2003). As noted earlier in the Research Design chapter when discussing sampling decisions, only cities with county rights were considered in the study as they have a reasonably-sized administration providing the appropriate organizational context for studying my research questions. As the sample eventually contained departments from 19 municipalities out of of the 23

largest Hungarian cities, the study can be considered—in the first place—a comprehensive study of learning for *urban* sustainability in local government in Hungary.

This has direct implications for two aspects of external validity. On the one hand, some of my findings may not *scale down* to small towns and villages with leaner public administration. More specifically, the division of municipal government into departments clearly does not apply to many settlements in Hungary (or elsewhere). Also, small towns and villages are unlikely to have the abundance of civil society and private sector actors that the 19 cities in my sample have. This does not mean that trust, organizational culture or learning for sustainability may not take place, but these factors may come to play in a qualitatively different fashion in a village administration with a handful of staff.

The other highly relevant question of external validity is whether my research findings are generalizable to country settings other than Hungary. From a methodological point of view, I argue that the theoretical framework and the research design, which served as the backbone to arriving at the results, easily lend themselves to the replication of the study in other geopolitical contexts. In particular, the theoretical constructs and their operalization can be meaningfully applied in other countries with only slight modifications necessary.

From a substantive point of view, I argue that some of my findings may not hold similarly true outside Hungary, while others do. For instance, municipal departments in an other country are unlikely to have an identical overall pattern of advice relationships with external actors. While universities in Hungary turned out to be rather peripheral in delivering knowledge to the local government sector, in some countries with a different history and culture of science-policy interactions, universities may be more closely integrated in local government knowledge networks. Regardless of such deviations, the implications translate well. Actors which are considered capable of introducing new ideas and foster policy innovations are likely to be neglected in knowledge exchange relationships. Local governments which are committed to improve their policies towards sustainability need to be aware of the roles and functions other actors in their knowledge networks have and must capitalize on those resources.

In terms of the organizational factors that foster the development of a more systems-oriented view of urban affairs and organic process of decision making for sustainability, the relationships are likely to hold equally true between key independent and dependent factors. However, the strength of these relationships and the relative importance of predictive factors may be different.

More specifically, trust, shared identity, the organizational structure of municipalities are expected to be just as important factors in explaining the emergence of a learning-oriented culture in municipal departments. Also, culture is expected to be a reasonable predictor of departments' advice seeking patterns and the generation of sustainability-relevant knowledge in other country contexts as well, although the relative weight of these effects may vary as a result of country-specific factors such as the national culture, the prevailing norms and values in public administration, professional norms, legal and political arrangements.

8.4 RESEARCH CONTRIBUTION

This research's original contribution to progressing the understanding of the problem in focus can be summarized on both theoretical, methodological and epistemological grounds:

Theoretical

- an empirical study on the neglected organizational aspects of policy-oriented learning in government (and in local government, more specifically).
- the establishment of theoretical model of developing knowledge relevant for governing sustainability in local government.
- incorporating a social aspect in understanding the barriers and facilitators of policy-oriented inquiry and sustainability-focused learning within local government (by modeling the role of informal advice relationships).

Methodological

- an empirical operationalization and measurement of sustainability-focused learning (substantive and process meta-knowledge).
- drawing conclusions based on a larger *N* sample of municipal departments quantitative analysis rather than small *N* case studies.

Epistemological

- improving the understanding of how soft organizational processes influence shifts in framing problems toward the sustainability paradigm.
- providing sampled quantitative data on Hungarian local governments' hard-to-measure organizational aspects (trust, identity, culture, learning).

8.5 AVENUES FOR FURTHER RESEARCH

As noted in the beginning of the thesis, the strategy behind my approach to the research problem—just as any scholarly inquiry—involved conceptual and methodological choices that balanced pros and cons in the light of what was feasible to carry out empirically with the means at hand. I would like to revisit these key limitations briefly here, also pointing out plausible extensions.

First of all, my research had a static cross-sectional design. Several of the key concepts used in this study, however, lend themselves to longitudinal research design. Just as sustainability, learning for sustainability is arguably best represented as a dynamic concept, a process with a time dimension. Due to the cross-sectional design, however, learning (or knowledge accumulation) could only be inferred from data that were collected at a single time point rather than several *observed* as it was unfolding over an extended period of time. Similarly, trust was inserted in the theoretical model as a 'snapshot' variable, although the trust building process could add more intricate detail to understanding sustainability-oriented learning among actors.

In addition, the study relied on survey data and constructs that were operationalized as perceptions of a single respondent from each department (each unit of analysis). Ideally, several respondents from each department could be surveyed to accommodate the variation in viewpoints and to measure if directors serve as reliable informants on behalf of the unit they supervise. Also, relying on respondent's perceptions rather than some more objective measure of the phenomena under study always raises doubts about potential bias present in the data. It must be pointed out, however, that most constructs (e.g., the dimensions of the learning culture) are closely associated with the respondents' mental representation of some aspect of organizational *reality* and therefore tapping that by a questionnaire is quite adequate. With the purpose of triangulation, on-site observation could be another source of data, but that would probably be feasible in a small *N* study and by sacrificing some external validity.

Moreover, the operationalization of learning should ideally be extended to cover behavioral and not just cognitive aspects. While many authors argue that a definition of learning in organizations should not require changes in observed behavior, essentially the rationale of studying how for instance municipal departments learn is to see if (and how) in the end cognitive changes translates into practice of decision making or planning. That would require the addition of variables to objectively measure the *output* or the *impact* of such learning processes at the departmental level. Does learning translate to tangible changes in performance? Measuring performance gains effected by

sustainability-oriented learning is a great conceptual and empirical challenge if the focus of interest is actually a quality dimension ('more sustainable' or 'more integrated' policies or planning) and not a performance one, which lends itself more readily to 'hard' quantitative measurement (e.g., number of clients served, cases processed). Even that kind of data would be difficult to gather at the level of departments in the absence of a country-wide standard reporting system. Alternatively, it could be argued that such performance gains should be conceptualized at the collective (network) level. This bring us to to the next point.

In terms of measuring social interactions, using whole network data would be another extension to studying the research problem. My research solely took advantage of information about the star ego-network of the departments and used such information in aggregated form to estimate certain attributes of the municipal departments using standard statistical techniques. In other words, my approach considered only departments as population units but not their advice providing alters. Dyadic ties between departments and their alters were not modeled in their own right, but were collapsed into variables measured on departments.

As a future extension, this research project could capitalize on the structural information among departments and their alters. The mapping of advice or information exchange relationships between all actors in a municipality would allow for another level of analysis: the network level. On the one hand this would allow the exploration of the influence of various network configurations (network-level properties) on sustainability-oriented knowledge creation and policy outcomes: Are some sustainability knowledge networks "wired" much differently in some sites than in others? If yes, is that by pure chance or a result of idiosyncratic local processes? Do these variations lead to qualitatively different learning outcomes? Do municipal departments have similar structural positions in their knowledge network across sites? Do other actors in certain network positions become influential as advisors?

Another important aspect of using whole network data as a potential future extension of this research program is that it would make it possible to model the social network of municipal departments explicitly. My current statistical modeling context was based on the assumption that observations were independent: responses from departments in a particular municipality are not biased by mutual influence processes. The essence of a genuine network analysis, however, is that it considers observations as inherently interdependent.

This dependence, however, is not only relevant from a technical statistical point of view. It means that the status of one actor (e.g., a department) on some

attribute (e.g., perception of organizational culture) is seen as dependent on the attribute status of all other actors to it is tied. Alternatively, advice ties between actors could be understood as observations of a phenomenon arising from social (influence) processes among a set of actors which eventually lead to the formation of the knowledge network sampled in each city.

One way of modeling such dependencies would be using exponential random graph (p^*) models (Wasserman & Robins 2005). ERG models would be especially useful in stochastically representing the localized social processes and structures that combine to form the global network patterns among departments and other actors in each city (Robins, Pattison, Kalish, & Lusher 2007). Dyadic data and ERG modeling could also expand the analytical possibilities of studying the role of trust and reciprocity. Whereas in my thesis, trust was operationalized by non-actor-specific items, two-way trust data on the tie between each pair of connected actors could be used to model the formation of advice relationships among departments and actors, and vice versa, the role of advice relationships in building trust. In summary, whole network data and probabilistic network modeling techniques would also help expand the analytical scope from departments only to a more collective level.

The notion of governance, in its analytical meaning, refers to the processes by which collective problems are defined and analyzed and in which action strategies are coordinated. So conceptually, a whole network approach would also be useful in that it could cover the learning that may take place outside local government among public and private sector actors. It would shift the focus from government to the community of actors and would provide insight into how policy domains are actually connected and whether that corresponds to policy integration efforts advocated by the idea of sustainability.

On a statistical methodological account, the survey included several items (scales) that were first used in this study and therefore they must be considered exploratory. Following methodological good practices, the reliability and validity of the constructs based on these items should be confirmed in other settings, as well. In addition to confirmatory studies, ideally the statistical results could/should be replicated on a different population of municipalities, preferably in a different country context. Successful replication could help establish the external validity of the conclusions I have come to in my research.

Appendixes

APPENDIX A • The front page of the Web survey and its English translation

CEU

Városi közügyek - hivatali folyamatok - önkormányzati kapcsolatok

Üdvözlöm!

Köszönöm, hogy elfogadta felkérésemet és válaszadásával segíti munkámat. A kérdőív kérdései számos helyen "szervezeti egység"-re vonatkozóan vannak megfogalmazva. Ilyenkor próbálja mindig a lehető legalacsonyabb szervezeti szintre vonatkoztatni a kérdést. Például ha Ön csoportvezető, akkor csoport szintre, ha osztályvezető, akkor osztály szintre. Ha valamely kérdés kapcsán úgy véli, hogy az Ön munkájában nem vagy nehezen értelmezhető az adott szempont, akkor ezt ki tudja fejezni a válaszokban (Például az "egyáltalán nem értek egyet" vagy "egyáltalán nem jellemző" válaszlehetőség mellet kattint.).

A kérdőív túlnyomórészt feleletválasztós kérdésekből áll, melyekre a megfelelő helyen való kattintással tud válaszolni. Néhány kérdés esetében azonban rövid szöveges válaszát be kell gépelnie.

A kérdések blokkokba vannak csoportosítva. Egy-egy blokk külön weblapon jelenik meg. Válaszadás közben visszalapozhat a lap alján lévő "Előző" gombbal, de előrelapozni csak akkor tud, ha az adott oldalon minden kérdésre válaszolt. A válaszok lapozáskor automatikusan mentésre kerülnek. Ha félbeszakítja a kitöltést, az emailben kiküldött linkre kattintva mindig visszatérhet oda, ahol abbahagyta a kitöltést. (A befejezetlen kérdőívet a "Később visszatérek" gombra kattintva is elmentheti, ilyenkor viszont email-cimet és jelszót kell megadni a későbbi visszatéréshez.)

A kérdőív kitöltését a jobb alsó sarokban lévő "Következő" feliratú gombra kattintva kezdheti meg.

Pusztai Csaba

[Kilépés és a kérdőív törlése]

A félkész kérdőív betöltése

Következő >>

APPENDIX A • *(continued)*

ENGLISH TRANSLATION:

Urban affairs —organizational processes—municipal relationships

Welcome!

Thank you for accepting my invitation and responding to my survey. Some items to follow in the questionnaire are worded to refer to "your organizational unit". In such cases, relate the answer to the hierarchical level you may be in charge of. For instance, if you supervise a unit, think in terms of the unit, if you supervise a department, think in terms of the department. If you feel that a particular question does not apply to your situation, you can respond by choosing "not characteristic at all" or "never" correspondingly.

The questionnaire mostly consists of of multiple choice questions. You can respond to these by clicking on the answer that you feel is most appropriate. However, there are some open-ended questions, which require to type in a short answer.

The questions are grouped. Each group is displayed on a separate webpage. You can always revisit earlier questions by clicking on the "previous" button, however, you will only be able to proceed to the next page by answering all questions on the current page. All answers are automatically saved once you go on to the next group of questions. If you should abort responding to the survey, you can click on the link sent to you in the invitation email to take up from where you left off. (An unfinished questionnaire can also be saved by clicking on the "finish later" button. In this case you will have to type in your email and a password.)

Click on "next page" at the bottom of the page to start the questionnaire.

Csaba Pusztai

APPENDIX B • Questionnaire items

Item	*Variable*	*Measurement scale*
ORGANIZATIONAL STRUCTURE		
Q: Please evaluate how much each of the following statements characterize your organization.		
Formalization		
"Our job is about following rules and procedures."	FORM1	7-point intensity
"Compliance with rules is continuously monitored."	FORM2	7-point intensity
"All rules are clearly stated in documents."	FORM3	7-point intensity
"Decision-making is bureaucratic."	FORM4	7-point intensity
Centralization		
"Important decisions affecting my unit are made outside it."	CENTR1	7-point intensity
"My unit can influence important policy decisions in the municipality."	CENTR2	7-point intensity (R)
"Any decision brought within the unit has to be approved by somebody external to the unit."	CENTR3	7-point intensity
"Taking action without approval is discouraged."	CENTR4	7-point intensity
"Our unit can set the rules it works by."	CENTR5	7-point intensity (R)
"Rules can be questioned and re-set, if necessary to improve performance."	CENTR6	7-point intensity (R)
"We follow directions rather than determine them."	CENTR7	7-point intensity
ORGANIZATIONAL CULTURE		
Trust		
"My unit can trustfully rely on other units in the municipality."	TRUST1	5-point agreement
"My unit can trust local organizations."	TRUST2	5-point agreement
"Other units and local organizations trust my unit."	TRUST3	5-point agreement
"Other units and local organizations have confidence in our expertise."	TRUST4	5-point agreement
Identity		
"There is a special bonding among actors involved in local policy in the city."	IDENT1	5-point agreement
"We are all like a single big family in the municipality."	IDENT2	5-point agreement
"Actors involved in local policy identify with a single common mission."	IDENT3	5-point agreement
"Local actors share common fundamental values."	IDENT4	5-point agreement
Risk-taking (experimentation)		
"People in my unit like to take the initiative and try new ideas at work."	RISK1	7-point intensity
"Experimenting with new innovative ideas is encouraged and supported by the local government."*	RISK2	7-point intensity
"New ideas are seen desirable by other units and organizations we work with."*	RISK3	7-point intensity
"New ideas are rewarded by the city management."	RISK4	7-point intensity
"The unit often ventures into unknown territory."*	RISK5	7-point intensity
"The unit is encouraged to take risks to potentially improve its performance."	RISK6	7-point intensity
Openness (dialogue)		
"Employees are encouraged to communicate in our organization."*	OPEN1	7-point intensity
"Failures are constructively discussed in our organization."	OPEN2	7-point intensity
"Commonly accepted assumptions are challenged."	OPEN3	7-point intensity
"There is opportunity to talk to other staff about successful programs or work activities in order to understand why they succeed."	OPEN4	7-point intensity
"There is free and open communication within the municipality."*	OPEN5	7-point intensity
"Managers facilitate communication."*	OPEN6	7-point intensity

APPENDIX B *(table continued)*

Item	*Variable*	*Measurement scale*
Inclusiveness		
Q: Please indicate how much you agree or disagree with the following statements.		
"The unit is frequently involved in the preparatory work for important decisions in local policy."	INCLUS1	5-point agreement
"In the process of decision making there is commitment to access the opinion of all parties impacted."	INCLUS2	5-point agreement
"The viewpoints and perspectives expressed by my unit are incorporated into decisions by other units and organizations."	INCLUS3	5-point agreement
Interaction with the organizational environment		
"It is part of the work of all staff to collect, bring back, and report information about what is going outside the unit."	IACTION1	7-point intensity
"People are encouraged to get work-related experience outside their unit."	IACTION2	7-point intensity
"Maintaining contact with other units and organizations is important for the unit."	IACTION3	7-point intensity
"People are encouraged to maintain professional relationships outside their unit."	IACTION4	7-point intensity
SUSTAINABILITY META-KNOWLEDGE — SUBSTANTIVE ASPECTS		
Identification with issues		
Q: Please indicate how much your unit relates to or has influence over the following issues.		
Economic development	ISSUE1	7-point intensity
Improvement of quality of life	ISSUE2	7-point intensity
Social justice	ISSUE3	7-point intensity
Energy management and efficiency	ISSUE4	7-point intensity
Water management, water quality, sewage	ISSUE5	7-point intensity
Air pollution and noise	ISSUE6	7-point intensity
Urban habitats	ISSUE7	7-point intensity
Transport and parking	ISSUE8	7-point intensity
Built environment	ISSUE9	7-point intensity
Waste and hazardous waste	ISSUE10	7-point intensity
Equal opportunities	ISSUE11	7-point intensity
Infrastructure development and public utilities	ISSUE12	7-point intensity
Health	ISSUE13	7-point intensity
Education	ISSUE14	7-point intensity
Recreation	ISSUE15	7-point intensity
Families and children	ISSUE16	7-point intensity
Jobs and employment	ISSUE17	7-point intensity
Nature conservation	ISSUE18	7-point intensity
Climate change	ISSUE19	7-point intensity
Parks and green space	ISSUE20	7-point intensity
Environmental quality	ISSUE21	7-point intensity
Information provision and awareness raising for local issues	ISSUE22	7-point intensity
Interconnectedness of issues		
Q: Please indicate how much you agree or disagree with the following statements.		
"The problems my unit deals with are easy to define."	INTERCON1	5-point agreement (R)
"Problems we deal with are clear-cut and can be treated in isolation from problems not in the scope of the unit."	INTERCON2	5-point agreement (R)
"The improvement in one problem area often comes at the price of worsening in an other."	INTERCON3	5-point agreement
"The interrelationships behind the problems our unit deals with do not change."	INTERCON4	5-point agreement (R)

APPENDIX B *(table continued)*

Item	*Variable*	*Measurement scale*
Scales (spatial and temporal)		
"When assessing alternatives in decision-making, short run impacts need to receive more consideration than long-run ones."	SCALE_TIME	5-point agreement (R)
"Issues that have a direct impact on the life of the city are always the most important ones."	IMPACT	5-point agreement
"Problems our unit deals with are of local relevance."	SCALE_LOCAL	5-point intensity
"Problems our unit deals with are of regional relevance."	SCALE_REG	5-point intensity
"Problems our unit deals with are of country-level relevance."	SCALE_COUNTRY	5-point intensity
"Problems our unit deals with are of global relevance."	SCALE_GLOBAL	5-point intensity
"What time scales do you think city policy-makers need to consider at most?"	FUTURE	5-item ordinal
Nature-human interdependence (NHIP)**		
"Human beings can progress only by conserving nature's resources."	NHIP1	5-point agreement
"Human beings can enjoy nature only if they make wise use of its resources."	NHIP2	5-point agreement
"Human progress can be achieved only by maintaining ecological balance."	NHIP3	5-point agreement
"Preserving nature now means ensuring the future of human beings."	NHIP4	5-point agreement
"We must reduce our consumption levels to ensure well-being of the present and future generations."	NHIP5	5-point agreement
SUSTAINABILITY META-KNOWLEDGE — STRATEGIC ASPECTS		
Role of knowledge		
Q: Please indicate how much you agree or disagree with the following statements.		
"Good decisions are based purely on professional grounds."	KNOW1	5-point agreement
"If the necessary data is available, good decisions will be made."	KNOW2	5-point agreement
"We have all the expertise that is required to manage the problems we encounter."	KNOW3	5-point agreement
"Input from local stakeholders enriches our understanding of problem situations."	KNOW4	5-point agreement
Multiplicity of views		
"The affairs our unit is responsible for are inherently characterized by controversy."	INTEREST1	5-point agreement
"It is natural that we meet conflicting opinions expressed by interest groups."	INTEREST2	5-point agreement
"It is natural that we experience conflicting opinions within the municipal administration."	INTEREST3	5-point agreement
Interdependence of actors		
"The decisions my unit takes affect decisions by other actors in the city."	INTERDEP1	5-point agreement
"My unit's success does not depend on other actors."	INTERDEP2	5-point agreement (R)
"My unit has authority over all the resources it needs to accomplish its goals."	INTERDEP3	5-point agreement (R)
Relationships		
Q: Please indicate how much you agree or disagree with the following statements.		
"We maintain organizational relationships at an appropriate level."	RELATION1	5-point agreement
"Our network of relationships rarely change."	RELATION2	5-point agreement
"We choose with whom to maintain contact with, it is not mandated by formal rules."	RELATION3	5-point agreement
"There are actors with whom it would be useful to maintain contact, but we don't."	RELATION4	5-point agreement
"Relationships are more important to us than a few years before."	RELATION5	5-point agreement
"We devote more resources to maintaining our relationships than a few years before."	RELATION6	5-point agreement
"Our relationships make it easier for us to reach our goals and carry out our tasks."	RELATION7	5-point agreement
"Our network of relationships make it easier to access new information and knowledge."	RELATION8	5-point agreement

APPENDIX B *(table continued)*

Item	*Variable*	*Measurement scale*
PERCEPTIONS OF THE POLICY CONTEXT		
"Demand for environmental protection has grown in the city."	ENVIR1	5-point agreement
"The importance of environmental issues in local policy has grown in the past few years."	ENVIR2	5-point agreement
"My unit does not have to consider environmental aspects in its work."	ENVIR3	5-point agreement (R)
"My unit has an impact on the level of environmental awareness of local citizens."	ENVIR4	5-point agreement
"There is nothing more my unit could do for the environment."	ENVIR5	5-point agreement (R)
"Local policy is constrained by higher level policies."	LIMITS1	5-point agreement
"Local interests are not in confrontation with higher level interests."	LIMITS2	5-point agreement (R)
"Local policy making is becoming more complicated due to the number of actors involved."	LIMITS3	5-point agreement
"Conflict between actors constitutes a barrier to progress in local issues."	LIMITS4	5-point agreement
"Actors' positions are entrenched in the local issues my unit is concerned with."	LIMITS5	5-point agreement
"My unit can exercise influence on the development of the city as much as it intends to."	LIMITS6	5-point agreement (R)
"My unit can implement its own ideas."	LIMITS7	5-point agreement
How much influence does globalization have on the development of the city?	SCOPE1	5-point intensity
How much influence do EU forces (financing, regulations) have on the development of the city?	SCOPE2	5-point intensity
How much influence do national legislative and political forces have on the development of the city?	SCOPE3	5-point intensity
How much influence do country-level social and economic processes have on the development of the city?	SCOPE4	5-point intensity
How much influence do regional social and economic processes have on the development of the city?	SCOPE5	5-point intensity
How much influence do local social and economic processes have on the development of the city?	SCOPE6	5-point intensity
How much influence do changing local community demands have on the development of the city?	SCOPE7	5-point intensity
How much influence do local policy decisions have on the development of the city?	SCOPE8	5-point intensity
How active are local citizens in engaging in local public issues in your city?	COMMUNITY	5-point intensity
How much uncertainty do you face in decision-making in issues your unit deals with? (How changeable are legal, political, economic, professional conditions?)	UNCERTAINTY	5-point ordinal (R)
KNOWLEDGE MANAGEMENT PRACTICES		
Knowledge creation		
"We have access to all the information we need."	CREATE1	5-point agreement
"My unit systematically collects all important data and information."	CREATE2	5-point agreement
"My unit bears more knowledge today than it did a few years ago."	CREATE3	5-point agreement
"Sufficient resources are devoted to collecting data and information."	CREATE4	5-point agreement
"My unit's performance is regularly assessed and evaluated."	CREATE5	5-point agreement
"Staff in my unit regularly participate in training programs."	CREATE6	5-point agreement
Knowledge sharing		
"My unit can access the information it needs via a formal information system."	SHARE1	5-point agreement
"My unit systematically shares information and knowledge with others."	SHARE2	5-point agreement
"Effective flow of information within the municipality is enabled by purposeful methods, procedures and systems."	SHARE3	5-point agreement
"It is common practice to work in teams of people representing other units or organizations."	SHARE4	5-point agreement
"People with diverse professional backgrounds are purposefully organized to work in joint projects."	SHARE5	5-point agreement
"The municipality allocates an adequate amount of resources to support sharig data, information and knowledge."	SHARE6	5-point agreement
"My unit informs its stakeholders about all issues they deem important."	SHARE7	5-point agreement

APPENDIX B *(table continued)*

Item	*Variable*	*Measurement scale*
Knowledge utilization		
"We can take advantage of all our knowledge in practice."	UTIL1	5-point agreement
"We put to use all the data and information we have access to."	UTIL2	5-point agreement
"We make use of knowledge created by other organizations (e.g., scientific reports, research findings etc.)."	UTIL3	5-point agreement
SOCIAL NETWORKS		
Cosmopoliteness		
Q: Please evaluate how much each of the following statements characterize your unit.		
"My unit maintains frequent contact with professional organizations in the country."	REL_DOM	7-point intensity
"My unit maintains professional contacts internationally."	REL_INT	7-point intensity
Non-specific alters		
Q: How often does your unit get in touch with the following actors?		
Local citizen or citizen group	ACTOR1	6-point frequency
Representative of local business	ACTOR2	6-point frequency
Business advocacy organization (e.g., chamber)	ACTOR3	6-point frequency
Non-profit organization	ACTOR4	6-point frequency
Member of local council	ACTOR5	6-point frequency
Officer in local government	ACTOR6	6-point frequency
Officer representing other local or regional authorities	ACTOR7	6-point frequency
Officer representing central government	ACTOR8	6-point frequency
Member of Parliament	ACTOR9	6-point frequency
Non-governmental professional (e.g., consultant)	ACTOR10	6-point frequency
Specific alters		
Frequency of contact with alter X	FREQ1–6	6-point frequency
Duration of relationship with alter X	DURATION1–6	5-point ordinal
benefit of contact with alter X		
Q: Indicate how much the following factors motivated your contact with X!		
"They provided information or expertise to fairly specific questions."	BENEFIT11/21/31/41/51/61	7-point intensity
"They provided general guidance or referrals to other sources of information."	BENEFIT12/22/32/42/52/62	7-point intensity
"They helped us think through a problem and offered new insights."	BENEFIT13/23/33/43/53/63	7-point intensity
"They expressed their opinion about our ideas/proposals which gave us self-confidence."	BENEFIT14/24/34/44/54/64	7-point intensity
"Consulting them made are ideas/proposals more justifiable."	BENEFIT15/25/35/45/55/65	7-point intensity
Form of contact with alter X		
Q: How often do you use the following forms of communication with X?		
Formal meetings, assemblies, forums	FORM11/21/31/41	4-point frequency
Informal meetings, consultations	FORM12/22/32/42	4-point frequency
Formal documents (e.g., reports, correspondence etc.)	FORM13/23/33/43	4-point frequency
Informal correspondence (e.g., e-mail)	FORM14/24/34/44	4-point frequency
Similarity of alter X's way of thinking	ALIKE1–6	5-point ordinal
DEMOGRAPHIC VARIABLES		
Position ("senior officer", "junior officer", "subordinate", "other")	POSITION	categorical
Tenure (years with the municipality)	TENURE	scale
Professional background ("law", "public administration", "business/economics", "engineering", "liberal arts", "social sciences", "natural sciences", "other")	PROF_FIELD	categorical
Age	AGE	interval
Organizational attributes		
Staff size	STAFF_SIZE	scale
Staff diversity ("all staff represent the same profession", "most staff represent the same profession", "Staff represent 2-3 different professions, "Practically all staff represent a different profession")	STAFF_DIVERSITY	categorical

Note: Reverse coded items are denoted by an 'R' in parentheses in the last column.

*Adapted from Alegre and Chiva (Alegre & Chiva 2008)

**Adapted from Corral-Verdugo et al. (Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha 2008).

APPENDIX C • Descriptive statistics of observed variables

	Min.	*Max.*	*Mean*	*Standard Deviation*	*Skewness*		*Kurtosis*	
					Statistic	*Std. Error*	*Statistic*	*Std. Error*
centr1	0	6	3.59	1.905	−.422	.214	−.930	.425
centr2	0	6	2.72	1.702	−.232	.214	−.882	.425
centr3	0	6	4.07	1.977	−.838	.214	−.516	.425
centr4	0	6	4.28	1.936	−1.022	.214	−.099	.425
centr5	0	6	2.86	1.611	−.055	.214	−1.011	.425
centr6	0	6	3.30	1.676	−.318	.214	−.795	.425
centr7	0	6	3.57	1.864	−.316	.214	−.997	.425
form1	0	6	4.73	1.428	−1.053	.214	.363	.425
form2	0	6	4.63	1.369	−.865	.214	.248	.425
form3	0	6	3.93	1.578	−.359	.214	−.765	.425
form4	0	6	4.14	1.489	−.667	.214	−.153	.425
risk1	0	6	3.41	1.514	−.303	.214	−.206	.425
risk2	0	6	3.29	1.370	−.332	.214	.023	.425
risk3	0	6	2.95	1.597	−.217	.214	−.664	.425
risk4	0	6	3.54	1.516	−.434	.214	−.275	.425
risk5	0	6	3.20	1.712	−.281	.214	−.687	.425
risk6	0	6	2.20	1.652	.180	.214	−1.088	.425
iaction1	0	6	4.16	1.531	−.790	.214	.184	.425
iaction2	0	6	3.18	1.704	−.314	.214	−.703	.425
iaction3	0	6	4.85	1.280	−1.364	.214	2.000	.425
iaction4	0	6	3.56	1.687	−.594	.214	−.381	.425
inclus1	1	5	3.84	.984	−.890	.214	.682	.425
inclus2	1	5	3.85	1.005	−.832	.214	.456	.425
inclus3	1	5	3.71	.834	−.819	.214	.979	.425
trust1	2	5	4.22	.663	−.603	.214	.720	.425
trust2	2	5	3.99	.715	−.120	.214	−.651	.425
trust3	2	5	4.03	.720	−.432	.214	.123	.425
trust4	2	5	4.21	.706	−.597	.214	.184	.425
trust5	1	5	3.26	.958	−.321	.214	.169	.425
trust6	1	5	3.45	1.049	−.332	.214	−.431	.425
trust7	1	5	3.09	1.094	−.136	.214	−.458	.425
trust8	1	5	2.91	1.146	−.037	.214	−.774	.425
open1	0	6	2.73	1.624	−.233	.214	−.655	.425
open2	0	6	3.52	1.631	−.313	.214	−.755	.425
open3	0	6	3.00	1.651	−.096	.214	−.779	.425
open4	0	6	3.84	1.611	−.590	.214	−.256	.425
open5	0	6	3.64	1.556	−.349	.214	−.516	.425
open6	0	6	3.87	1.584	−.683	.214	−.023	.425

APPENDIX C *(table continued)*

Variable	*Min.*	*Max.*	*Mean*	*Standard Deviation*	*Skewness*		*Kurtosis*	
					Statistic	*Std. Error*	*Statistic*	*Std. Error*
issue1	0	6	2.49	1.936	.263	.214	−1.113	.425
issue2	0	6	3.59	1.905	−.587	.214	−.830	.425
issue3	0	6	2.66	1.794	.019	.214	−.989	.425
issue4	0	6	2.17	2.016	.464	.214	−1.115	.425
issue5	0	6	2.16	2.088	.490	.214	−1.156	.425
issue6	0	6	2.00	2.027	.639	.214	−.911	.425
issue7	0	6	2.27	2.088	.410	.214	−1.227	.425
issue8	0	6	2.54	2.230	.233	.214	−1.427	.425
issue9	0	6	2.89	2.145	−.036	.214	−1.385	.425
issue10	0	6	2.47	2.140	.281	.214	−1.352	.425
issue11	0	6	2.84	1.951	−.011	.214	−1.176	.425
issue12	0	6	2.62	2.167	.133	.214	−1.410	.425
issue13	0	6	1.86	1.910	.782	.214	−.527	.425
issue14	0	6	2.36	1.987	.444	.214	−.947	.425
issue15	0	6	1.78	1.734	.620	.214	−.699	.425
issue16	0	6	2.64	2.140	.298	.214	−1.273	.425
issue17	0	6	1.84	1.796	.598	.214	−.838	.425
issue18	0	6	2.30	2.030	.392	.214	−1.165	.425
issue19	0	6	1.60	1.905	1.005	.214	−.178	.425
issue20	0	6	2.60	2.257	.228	.214	−1.443	.425
issue21	0	6	2.61	2.153	.144	.214	−1.352	.425
issue22	0	6	3.49	1.660	−.579	.214	−.254	.425
future	1	5	2.36	.885	.125	.214	−.041	.425
intercon1	1	5	3.58	.927	−.623	.214	−.366	.425
intercon2	1	5	2.30	.925	.584	.214	−.179	.425
intercon3	1	5	2.73	.911	.065	.214	−.465	.425
intercon4	1	5	3.30	.891	−.556	.214	−.132	.425
nhip1	2	5	4.36	.684	−.900	.214	.829	.425
nhip2	2	5	4.55	.638	−1.505	.214	2.711	.425
nhip3	2	5	4.52	.698	−1.424	.214	1.666	.425
nhip4	2	5	4.59	.692	−1.861	.214	3.422	.425
nhip5	1	5	4.27	.867	−1.522	.214	3.141	.425
scale_local	0	4	3.23	.957	−1.236	.214	1.109	.425
scale_reg	0	4	2.00	.980	−.255	.214	−.156	.425
scale_country	0	4	1.41	.960	.167	.214	−.427	.425
scale_global	0	4	.91	.959	.842	.214	−.005	.425

APPENDIX C *(table continued)*

	Min.	Max.	Mean	Standard Deviation	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
interest1	1	5	3.99	.918	−1.164	.214	1.899	.425
interest2	2	5	4.28	.639	−.509	.214	.256	.425
interest3	2	5	4.00	.732	−.612	.214	.613	.425
knowledge1	1	5	3.77	.949	−.764	.214	.460	.425
knowledge2	2	5	3.91	.788	−.322	.214	−.323	.425
knowledge3	2	5	4.04	.632	−.599	.214	1.544	.425
knowledge4	1	5	4.05	.756	−.868	.214	1.724	.425
relation1	1	5	3.77	.776	−1.123	.214	2.118	.425
relation2	1	5	3.55	.850	−.540	.214	−.088	.425
relation3	1	5	2.66	1.006	.247	.214	−.361	.425
relation4	1	5	3.18	.827	−.263	.214	−.472	.425
relation5	2	5	3.61	.776	−.321	.214	−.210	.425
relation6	1	5	3.38	.880	−.270	.214	−.215	.425
relation7	2	5	3.93	.666	−.894	.214	1.874	.425
relation8	2	5	4.05	.662	−.381	.214	.439	.425
interdep1	1	5	3.34	.933	−.663	.214	.402	.425
interdep2	1	5	2.45	1.034	.562	.214	−.349	.425
interdep3	1	5	2.41	1.046	.190	.214	−.971	.425
envir1	1	5	3.66	.778	−.535	.214	.541	.425
envir2	1	5	3.77	.776	−.918	.214	1.819	.425
envir3	1	5	2.24	1.222	.603	.214	−.726	.425
envir4	1	5	3.29	1.123	−.593	.214	−.237	.425
envir5	1	5	2.62	1.087	.308	.214	−.485	.425
uncertainty	1	4	2.16	.707	.297	.214	.093	.425
limits1	2	5	3.77	.667	−.355	.214	.330	.425
limits2	1	5	2.58	.866	.051	.214	−.323	.425
limits3	2	5	3.77	.745	−.419	.214	.132	.425
limits4	1	5	3.73	.848	−.542	.214	.591	.425
limits5	1	5	2.92	.800	.330	.214	.109	.425
limits6	1	4	2.57	.876	−.111	.214	−.646	.425
limits7	1	5	3.18	.817	−.520	.214	.069	.425
limits8	1	5	3.97	.773	−.881	.214	1.581	.425
scope1	0	4	2.52	.896	−.481	.214	.226	.425
scope2	0	4	3.03	.720	−.561	.214	1.250	.425
scope3	1	4	3.26	.631	−.455	.214	.322	.425
scope4	2	4	3.34	.608	−.340	.214	−.643	.425
scope5	0	4	3.06	.729	−.716	.214	1.577	.425
scope6	1	4	3.38	.754	−1.103	.214	.788	.425
scope7	1	4	2.88	.749	−.148	.214	−.463	.425
scope8	2	4	3.51	.602	−.801	.214	−.324	.425
community	1	5	2.99	.865	.312	.214	−.243	.425

APPENDIX C *(table continued)*

Variable	Minimum	Maximum	Mean	Standard Deviation	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
create1	1	5	3.38	.896	−.683	.214	−.261	.425
create2	2	5	4.11	.690	−.731	.214	1.253	.425
create3	2	5	4.07	.666	−.566	.214	1.002	.425
create4	1	5	3.20	.948	−.289	.214	−1.142	.425
create5	1	5	3.85	.870	−1.089	.214	1.720	.425
create6	1	5	3.29	1.066	−.404	.214	−.639	.425
share1	1	5	3.57	.928	−.479	.214	−.432	.425
share2	1	5	3.73	.894	−.708	.214	.133	.425
share3	1	5	3.45	.962	−.408	.214	−.349	.425
share4	1	5	3.55	.821	−.568	.214	.525	.425
share5	1	5	3.31	.885	−.383	.214	−.195	.425
share6	1	5	3.23	.880	−.462	.214	−.241	.425
share7	1	5	3.97	.773	−.881	.214	1.581	.425
util1	1	5	3.61	.796	−.984	.214	.595	.425
util2	1	5	4.00	.640	−1.282	.214	4.806	.425
util3	2	5	3.73	.739	−.701	.214	.474	.425
actor1	0	5	2.06	2.046	.447	.214	−1.521	.425
actor2	0	5	2.92	1.897	−.195	.214	−1.525	.425
actor3	0	5	4.45	.912	−1.976	.214	4.510	.425
actor4	0	5	3.48	1.660	−.796	.214	−.718	.425
actor5	0	5	2.10	1.577	.430	.214	−.881	.425
actor6	0	5	1.33	1.588	1.147	.214	.226	.425
actor7	0	5	3.79	1.378	−.785	.214	−.627	.425
actor8	1	5	4.67	.733	-2.811	.214	9.256	.425
actor9	0	5	4.47	1.143	-2.414	.214	5.163	.425
actor10	0	5	3.63	1.526	−.722	.214	−.776	.425
like_minded1	1	5	3.71	.824	−.786	.214	1.453	.425
like_minded2	1	5	3.66	.768	−.275	.214	.958	.425
like_minded3	1	5	3.65	.847	−.674	.214	.985	.425
alike1	0	4	2.88	.676	−.778	.214	2.292	.425
alike2	0	4	2.77	.661	−.751	.217	2.106	.431
alike3	0	4	2.75	.745	−.547	.220	.983	.437
alike4	0	4	2.63	.887	−.637	.224	.688	.444
alike5	0	4	2.58	.832	−.574	.227	1.084	.451
alike6	0	4	2.73	.823	−.811	.235	1.306	.465
duration1	1	5	4.64	.876	-2.653	.214	6.736	.425
duration2	1	5	4.52	.885	-2.083	.226	4.230	.449
duration3	1	5	4.50	.914	−1.885	.220	3.096	.437
duration4	1	5	4.50	.962	-2.148	.224	4.383	.444
duration5	1	5	4.44	.963	−1.971	.227	3.822	.451
duration6	1	5	4.45	.987	−1.987	.235	3.441	.465

APPENDIX C *(table continued)*

	Minimum	Maximum	Mean	Standard Deviation	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
form11	0	4	1.68	.988	1.082	.214	.974	.425
form12	0	4	2.41	1.153	.248	.214	–.934	.425
form13	0	4	1.96	1.030	.913	.214	.073	.425
form14	0	4	1.82	1.083	.630	.214	.195	.425
form21	0	4	1.76	1.062	.914	.217	.367	.431
form22	0	4	2.26	1.195	.415	.217	–1.065	.431
form23	0	4	2.07	1.127	.582	.217	–.461	.431
form24	0	4	1.70	1.126	.717	.217	.125	.431
form31	0	4	1.52	1.042	.979	.220	.901	.437
form32	0	4	2.07	1.233	.508	.220	–.892	.437
form33	0	4	2.04	1.091	.779	.220	–.392	.437
form34	0	4	1.57	1.094	.885	.220	.505	.437
form41	0	4	1.55	1.087	.902	.224	.583	.444
form42	0	4	2.09	1.250	.483	.224	–.960	.444
form43	0	4	1.86	1.082	.734	.224	.105	.444
form44	0	4	1.69	1.221	.786	.224	–.247	.444
form51	0	4	1.43	1.051	1.118	.227	1.128	.451
form52	0	4	1.92	1.196	.666	.227	–.530	.451
form53	0	4	2.04	1.213	.495	.227	–.724	.451
form54	0	4	1.65	1.195	.750	.227	–.088	.451
form61	0	4	1.66	1.294	.767	.235	–.462	.465
form62	0	4	1.99	1.223	.464	.235	–.633	.465
form63	0	4	2.16	1.204	.419	.235	–.848	.465
form64	0	4	1.48	1.165	.747	.235	.163	.465
freq1	0	5	1.13	1.449	1.467	.214	1.314	.425
freq2	0	5	1.64	1.640	.759	.217	–.666	.431
freq3	0	5	2.14	1.660	.406	.220	–1.065	.437
freq4	0	5	2.21	1.670	.298	.224	–1.068	.444
freq5	0	5	2.50	1.654	–.107	.227	–1.201	.451
freq6	0	5	2.46	1.663	.042	.235	–1.322	.465

APPENDIX C *(table continued)*

Variable	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*	*Skewness*		*Kurtosis*	
					Statistic	*Std. Error*	*Statistic*	*Std. Error*
benefit11	1	6	5.05	1.011	−1.536	.214	3.269	.425
benefit12	0	6	4.24	1.561	−.967	.214	.204	.425
benefit13	0	6	4.13	1.564	−.751	.214	−.272	.425
benefit14	0	6	4.50	1.397	−1.003	.214	.400	.425
benefit15	0	6	4.69	1.402	−1.430	.214	1.991	.425
benefit21	0	6	4.85	1.282	−1.780	.217	3.587	.431
benefit22	0	6	4.11	1.488	−.904	.217	.301	.431
benefit23	0	6	4.03	1.487	−.720	.217	.104	.431
benefit24	0	6	4.17	1.545	−.961	.217	.358	.431
benefit25	0	6	4.38	1.596	−1.070	.217	.533	.431
benefit31	0	6	4.74	1.296	−1.315	.220	1.866	.437
benefit32	0	6	4.12	1.423	−.592	.220	−.058	.437
benefit33	0	6	3.99	1.530	−.610	.220	−.149	.437
benefit34	0	6	4.16	1.517	−.708	.220	−.193	.437
benefit35	0	6	4.31	1.543	−1.095	.220	.683	.437
benefit41	0	6	4.74	1.353	−1.455	.224	2.099	.444
benefit42	0	6	4.03	1.545	−.814	.224	.207	.444
benefit43	0	6	3.88	1.593	−.738	.224	−.084	.444
benefit44	0	6	4.12	1.415	−.828	.224	.655	.444
benefit45	0	6	4.09	1.600	−.822	.224	−.029	.444
benefit51	0	6	4.54	1.494	−1.394	.227	1.803	.451
benefit52	0	6	3.81	1.735	−.732	.227	−.505	.451
benefit53	0	6	3.76	1.764	−.503	.227	−.754	.451
benefit54	0	6	3.96	1.765	−.765	.227	−.309	.451
benefit55	0	6	4.08	1.707	−.817	.227	−.164	.451
benefit61	0	6	4.54	1.525	−1.344	.235	1.470	.465
benefit62	0	6	4.20	1.552	−.883	.235	.124	.465
benefit63	0	6	4.17	1.564	−.972	.235	.280	.465
benefit64	0	6	4.35	1.531	−1.259	.235	1.111	.465
benefit65	0	6	4.34	1.615	−1.054	.235	.520	.465

APPENDIX D • Actor types with examples from the sample

Actor type	*Examples*
municipal department (1)	Department of Public Works, Department of Strategic Development, Department of Social Affairs etc.
ministry or agency (2)	Ministry of the Environment, National Development Agency etc.
regional agency (3)	regional branches of the Environmental Protection Agency, National Transport Agency, Water District Directorate
professional bodies (4)	Board of Building and Architecture
civil society organization (5)	non-governmental organizations embracing a diversity of institutional forms and varying in their degree of formality, e.g., environmental advocacy groups, trade unions, community groups.
local branches of state authorities (6)	police department, fire department, court
civil society organization cluster (7)	a coordinated effort of CSOs: e.g., Eger Civil Roundtable
public service company (8)	a publicly owned corporation which delivers public services at the local level: e.g., water treatment company, waste collection, public space maintenance
consultant/consultancy (9)	urban planning firm, architecture firm, law firm, ISO auditor etc.
local public institution (10)	schools, family services, shelter etc.
state institutions (11)	national park etc.
senior local government official (12)	mayor, vice mayor, notary etc.
local branch of national service delivery organization (13)	public health inspection agency
regional professional association (14)	medical association, Chamber of Architects
national research institute (15)	National Institute of Geology
regional research institute (16)	Institute of Environmental Science
local councillor (17)	elected member of the local council
national professional association (18)	Association of Hungarian County Seats
regional government (19)	county council, county councillor
CSO with national scope (20)	National Red Cross
local council committee and other local government bodies (21)	environmental committee, city development committee etc.
business enterprise (22)	*(self explanatory)*
university (23)	*(self explanatory)*
member of parliament (24)	*(self explanatory)*
local church (25)	*(self explanatory)*
municipal department in an other city (26)	*(self explanatory)*

Note: Numbers in parentheses are codes used during analysis

APPENDIX E • Indicator cross loadings in the baseline PLS path model

Indicator	*Construct*									
	CENT	FORM	OCUL	LC	KM	ICOM	NDIV	POL	SUBS	STRA
centralization	**1.000**	–.080	–.248	–.461	–.105	–.298	–.265	–.216	–.274	–.277
formalization	–.080	**1.000**	.350	.324	.358	.050	–.094	.150	–.008	.154
shared identity	–.157	.348	**.769**	.384	.407	.016	.134	.253	.220	.191
trust	–.245	.260	**.897**	.555	.613	.127	.379	.295	.130	.519
openness	–.339	.372	.545	**.787**	.494	.212	.221	.374	.223	.464
risk taking	–.501	.243	.413	**.822**	.429	.172	.370	.459	.366	.397
inclusiveness	–.276	.327	.515	**.716**	.465	.025	.204	.339	.278	.403
interaction	–.302	.072	.315	**.770**	.451	.320	.421	.389	.285	.514
knowledge creation	–.063	.328	.566	.538	**.870**	.134	.234	.342	.095	.524
knowledge sharing	.054	.321	.467	.342	**.745**	–.112	.033	.199	.049	.247
knowledge utilization	–.192	.240	.482	.515	**.806**	.127	.285	.342	.259	.566
FORM_CONT2	–.194	–.040	–.019	.075	–.011	**.773**	.128	.067	–.100	.346
FORM_CONT4	–.267	.116	.168	.296	.153	**.774**	.229	.131	.117	.196
ACTOR_DIV_SHANNON	–.196	–.180	.193	.180	.125	.026	**.544**	.142	.143	.169
GEN_ACTOR_DIV	–.170	.055	.043	.232	.000	.113	**.715**	.127	.135	.066
DOMESTIC_REL	–.157	–.032	.353	.358	.274	.176	**.845**	.325	.318	.268
INTERNATIONAL_REL	–.220	–.116	.230	.266	.207	.247	**.823**	.337	.340	.266
env'l awareness	–.184	.029	.157	.309	.182	.034	.347	**.856**	.679	.199
leeway for local action	–.024	–.053	–.153	–.018	–.254	.003	–.072	**–.065**	–.048	–.022
local forces	–.032	.070	.091	.009	.027	.147	–.044	**.087**	–.015	.198
sublocal forces	–.166	.195	.232	.363	.270	.126	.101	**.417**	.187	.403
local politics	–.029	–.101	–.257	–.282	–.256	–.097	–.156	**–.255**	–.114	–.246
uncertainty	.003	–.112	–.229	–.249	–.344	–.109	–.070	**–.369**	–.177	–.332
interconnectedness	–.299	–.067	.178	.373	.185	.016	.374	.563	**.810**	.183
spatial scales	–.172	.066	.165	.197	.104	–.008	.202	.485	**.677**	.212
time scale	–.098	.002	.079	.216	.091	.015	.214	.457	**.690**	.173
NHIP	–.111	.095	.785	.183	.206	.543	.131	.349	**.775**	.403
role of knowledge	.006	.117	.289	.206	.374	–.047	.080	.195	.064	**.449**
interdependence	–.270	–.011	.201	.347	.155	.318	.238	.309	.256	**.656**
role of relationships	–.257	.183	.434	.561	.611	.354	.280	.402	.206	**.908**
interests	–.136	–.097	.019	.039	–.060	.025	–.064	.011	.814	**.692**

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