A capability perspective on performance deficiencies in utility firms

Hagen Worch a,*, Bernhard Truffer a, Mundia Kabinga b, Anton Eberhard b, Jochen Markard c

a Eawag – Swiss Federal Institute of Aquatic Science and Technology, Environmental Social Sciences (ESS), Cirrus – Innovation Research in Utility Sectors, Überlandstrasse 133, P.O. Box 611, 8600 Dübendorf, Switzerland
b University of Cape Town, Graduate School of Business, Management Programme in Infrastructure Reform & Regulation Breakwater Campus, Portswood Road, Cape Town, South Africa
c Swiss Federal Institute of Technology Zurich, Department of Management, Technology and Economics, Chair of Sustainability and Technology, Weinbergstrasse 56/58, 8092 Zurich, Switzerland

ABSTRACT

This paper proposes a capability-based framework to explain performance deficiencies in utility firms as a result of policy and regulatory changes. The framework complements conventional explanations such as transaction cost and agency approaches, which suggest that appropriate incentives and regulations increase the performance of public utilities after relatively short adaptation processes. In contrast, we argue that capability gaps — understood as an inadequate availability of competences, skills and experiences — tend to have long-lasting effects on firm performance. A crucial implication of the capability perspective is that regulatory interventions that create capability gaps at the firm level may affect utility performance and the ability of infrastructure sectors to provide adequate services more severely than expected by traditional approaches.

1. Introduction

Infrastructure services such as electricity, water supply, sanitation and transportation are crucially important in all economies. Despite this importance and a large set of literature focusing on infrastructure regulation (e.g., Finger et al., 2005; Armstrong and Sappington, 2006; Guthrie, 2006; Gratwick and Eberhard, 2008; Joskow, 2008; Delmas et al., 2009; Ménard, 2009; Künneke et al., 2010; Markard, 2011), research on the management of utility firms has received much less attention so far. This is surprising because the lack of adequate organizational structures, skills and specialized managerial know-how is an emergent issue in different infrastructure sectors and a main challenge for many utility organizations worldwide (OECD, 2006, 2007; Urban Land Institute and Ernst and Young, 2007, 2011). Utilities are confronted with substantial challenges in both, operating and managing the built infrastructure and strategic planning to maintain, renew and expand infrastructure assets to meet future demands (Gil and Beckman, 2009; Domínguez et al., 2009). In addition, utilities need to develop and implement new strategies to meet the changing requirements of de- and re-regulation policies, deal with novel technologies, address sustainability concerns and adapt to climate change (e.g., Markard and Truffer, 2006; Stenzel and Frenzel, 2008; Schmidt et al., 2011).

Traditional explanations of performance deficiencies in infrastructure sectors have mainly applied principal-agent approaches and transaction cost economics. They have identified regulatory and contractual issues as main causes for inefficiencies and suggested changes in the incentive structures and institutional frameworks to improve performance (e.g., Joskow, 2002; Gómez-Ibáñez, 2003, 2007; Irwin and Yamamoto, 2004; Armstrong and Sappington, 2006; Guthrie, 2006; von Hirschhausen et al., 2011).

One of the underlying assumptions in the two approaches is that if appropriate incentives and regulatory structures are implemented, performance increases immediately or after a short
adoption process. An immediate organizational response can be expected because there would be no advantage to divert from an adequate incentive structure. However, the experiences with regulatory reforms over the past couple of decades have shown that in many countries infrastructure sector reforms have remained incomplete, have been implemented much slower than expected, experienced resistance from sector players, and even caused the reversal of the reform process (OECD, 2006; Joskow, 2008; Gratwick and Eberhard, 2008). Consequently, the performance of utilities often declined further and led in some cases to substantial failures in providing infrastructure services (e.g., repeated electricity black outs) (von Hirschhausen et al., 2011; Worch et al., submitted for publication). Thus, performance problems tend to become more severe and last for significantly longer time periods than expected by traditional approaches.

In this paper, we propose a capability-based framework to explain performance deficiencies in infrastructure sectors. The framework elaborates how policy and regulatory changes may create gaps between the required and available capability structure of utilities and how this, in turn, affects performance and the quality of service delivery. Applying a capability perspective enables us to assess some underlying reasons for unintended consequences of regulatory reforms, which traditional approaches find difficult to explain.

Research on the role of capabilities in utilities and infrastructure sectors has been limited so far. There are some exceptions. Research has shown that changes in the regulatory environment drive organizational restructuring processes, which affect the resource base of established utilities and tend to result in a short-term decline of efficiency (Dyner and Larsen, 2001; Delmas and Tokat, 2005; Delmas et al., 2009). On the other hand, sector deregulations have reduced restrictions allowing utilities to adopt new strategies (Gebauer et al., 2012; Worch et al., 2012a) and build capabilities to improve environmental performance (Delmas et al., 2007, 2009). Other contributions have found that public utilities may overcome capability gaps by implementing appropriate strategic planning processes (Dominguez et al., 2009). Another stream of research has highlighted how the development of capabilities to shape the regulatory environment influences the performance of utility firms (Bonardi et al., 2006; Holburn and Vanden Bergh, 2008; Oliver and Holzinger, 2008). We extend these lines of research and advance the capability perspective to explain the emergence and persistence of performance deficits in utilities and infrastructure sectors.

In the following section, we introduce specific features that are characteristic for infrastructure sectors. In Section 3, we briefly review which of the features are of major concern in the principal-agent and transaction cost economics literature to explain performance deficiencies. Section 4 introduces the capability argument. We then reason how the capability perspective provides a different rationale to explain performance deficits in infrastructure sectors and illustrate this with examples. Section 5 discusses the implications of the framework and concludes the paper.

2. Infrastructure sector specificities

Infrastructure sectors have several characteristic features. We argue below that policy and regulatory interventions change these features in a way that it may affect the capability structure of utility firms. These features are i) high capital needs, ii) specific investments with strong interdependencies between the different components of large technical systems, iii) substantial economies of scale and scope with the networks forming a natural monopoly, and iv) basic service provision (Glachant, 2002; Dominguez et al., 2009; Spiller, 2010; Künneke et al., 2010; Markard, 2011). Far-reaching positive and negative externalities in production and consumption are another specificity of infrastructure sectors (Glachant, 2002). However, it is beyond the scope of this paper to discuss the link between (changing) externalities and the capability structure of utility firms or at the sector level.
services, and decide for other ones. This implies that they have to adjust their operations and provide services under the given market, business and regulatory environment.

Table 1 summarizes in the first two columns the features of infrastructure sectors and outlines the derived implications as presented in this section. The other three columns display how the principal-agent, transaction cost economics and capability-based approaches — as discussed in the following Sections 3 and 4 — differ in explaining performance deficiencies in utility firms.

3. Traditional theoretical approaches

Principal-agent approaches and transaction cost economics have a long tradition in analyzing infrastructure sectors and explaining performance deficiencies. The two approaches emphasize asymmetric information as underlying reasons for opportunistic behavior of utility firms with the result that service delivery is poor. While principal-agent arguments see occurring problems predominantly due to the monopolistic position of utilities, transaction cost reasoning refers mainly to two other infrastructure sector specificities, namely high uncertainty and asset specificity. The two research traditions suggest optimal incentive mechanisms and adequate contractual and institutional designs to mitigate the asymmetric information problems and therefore opportunistic behavior. The implicit assumption is that implementing the right incentives and contractual mechanisms has a direct positive impact on the utilities’ strategic behavior and ultimately on performance without a substantial time lag.

3.1. Principal-agent approaches

Traditional principal-agent approaches play a prominent role in analyzing infrastructure sectors (e.g., Baron and Myerson, 1982; Joskow and Schmalensee, 1986; Laffont and Tirole, 1993; Armstrong and Sappington, 2007). A main concern is the natural monopoly situation (cf. Table 1). Since monopolies set prices too high, utilities need to be regulated. The need for regulation infers a principal-agent problem because of the prevailing asymmetric information between the regulator and the utility. The regulator tends to be less informed than the regulated monopolist about the demand of the sector and improve efficiency. The implicit assumption is that implementing the right incentives and contractual mechanisms has a direct positive impact on the utilities’ strategic behavior and ultimately on performance without a substantial time lag.

3.2. Transaction cost economics

The transaction cost economics literature has extensively researched phenomena in infrastructure sectors particularly in electricity sectors (e.g., Joskow, 2002; Spiller and Tommasi, 2005). Transaction cost reasoning assumes — similarly to principal-agent arguments — that asymmetric information generates problems, which lead to suboptimal performance outcomes. Main concerns of the transaction cost approach are uncertainty and high asset specificity, which are both typical features of infrastructure sectors (cf. Table 1). High uncertainty and asset specificity induce hold-up problems. Hold-up problems occur in interactions between different players in infrastructure sectors (e.g., between generators and coal suppliers, utilities and the regulator, and/or the regulator and policymakers). Adequate contractual and institutional designs are assumed to have a direct impact and be effective immediately.

A key area of transaction cost economics inspired research in utility sectors is to analyze the trade-off between mitigating hold-up problems through contracts that are as detailed as possible, and at the same time leave enough space for contract partners to adjust to changes caused by the high uncertainty in the sector (Tadelis, 2009). For example, the procurement problem refers to the situation in which a utility has to balance the incentive to reduce costs and improve efficiency versus the incentive to remain flexible enough to adopt to changes and therefore avoid costly renegotiations under uncertainty. In this sense, the transaction cost approach addresses the trade-off between static efficiency and dynamic efficiency. Established regulatory frameworks address often only one side of the trade-off. Competitive bidding tends to solve the efficiency problem but fails to respond optimally to ex post adaptation. In contrast, cost-plus approaches tend to respond to emerging changes after signing the contract but efficiency losses occur.

Similar contractual issues occur in various functional areas of utility management. This includes, for example, implementing investment contracts, contracting out organizational processes, and supervising the operation of utilities. For all these functions apply that contract partners may approach these issues by choosing between different contract options (see Gómez-Ibáñez, 2003, p. 33).

Recent contributions have also applied transaction cost arguments to address the infrastructure sector feature that utilities provide basic services and have therefore often to pursue multiple objectives (Spiller, 2010). The concern in this line of research is that governments through regulatory agencies can hold-up utilities by threatening them to change the regulatory framework. Similarly, informed third parties tend to influence the regulatory framework by shaping the policy process to their advantage by exploiting the asymmetric information situation. In contrast to the most principal agent and some of the more traditional transaction cost
### Table 1
Features of infrastructure sectors and explanations for performance deficiencies from different theoretical perspectives.

<table>
<thead>
<tr>
<th>Infrastructure sector specific features</th>
<th>Implications</th>
<th>Explanations for performance deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High investment needs with long time frames</strong></td>
<td>High uncertainty about - Recovering investment costs - Continued applicability of established technologies</td>
<td>Hold-up problems between contract partners (Joskow, 2002; Spiller and Tommasi, 2005)</td>
</tr>
<tr>
<td><strong>Highly specific investments with strong interdependencies</strong></td>
<td>- High asset specificity - Path dependencies</td>
<td>Hold-up problems between contract partners (Joskow, 2002; Spiller and Tommasi, 2005)</td>
</tr>
<tr>
<td><strong>Economies of scale and scope, and physical networks</strong></td>
<td>- Natural monopoly in networks - Advantages of large utilities - Long life cycles</td>
<td>Principal-agent problems due to the natural monopoly situation with an impact on: - Price setting - Investments - Procurement (Baron and Myerson, 1982; Armstrong and Sappington, 2006; Guthrie, 2006; Michaels, 2006; Puller, 2007)</td>
</tr>
<tr>
<td><strong>Provide basic services</strong></td>
<td>Multiple objectives</td>
<td>Principal-agent problems because of management contracts between shareholders and utilities (Gómez-Ibáñez, 2003, 2007)</td>
</tr>
<tr>
<td><strong>Limited options for strategic reorientation and specialization</strong></td>
<td></td>
<td>Hold-up problems as governments and/or interested third parties may threaten to change regulations (Spiller, 2010)</td>
</tr>
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**Transaction cost economics approach**

**Capability-based approach**

- Large number of potential contingencies due to changes of the market conditions and the business environment: Capability gaps because it is unfeasible to build the required capability structure for all possible contingencies
- Workforce not easily separable into different functional areas or across firm boundaries due to interdependencies: Capability gaps if functional areas are organizationally too strongly separated
- Large technical systems tend to have long life cycles with each life cycle phase requiring a specific capability structure: Capability gaps because required capability structures change continuously during the life cycle
approaches, this line of literature does not assume that governments and regulatory agencies can contribute to solve asymmetric information, high uncertainty and asset specificity. It rather argues that government agencies are one major source of problems in infrastructure sectors. The implication from a transaction cost perspective is to set up adequate institutional conditions.

4. A capability-based framework for the analysis of utility firms

In this section, we introduce a capability-based framework. We then apply the framework to explain performance deficiencies in utility firms as a result of emerging capability gaps.

4.1. Capability approach

Organizational capabilities have been extensively discussed in the management literature (e.g., Barney, 1991; Teece et al., 1997; Newbert, 2007; Barney et al., 2011). In line with this literature, we define capabilities as competences, skills and experiences to perform distinctive activities and tasks in organizations.

To explain performance deficiencies, a capability gap is an important conceptualization (Lavie, 2006; Worch et al., 2012b). It is defined as the insufficient availability of competences, skills and experiences in an organization. Capability gaps emerge, if the existing capabilities diminish while a task remains largely unaltered, or if changes in a task lead to new requirements that cannot be met with the available capabilities. A capability gap implies that a task is achieved in a quantity or quality, which is lower than necessary. As a result, the performance of the task and potentially the performance of the firm as a whole declines.

While principal-agent approaches and transaction cost economics explain performance deficits at the organizational level through insufficient contracts and inadequate institutional frameworks, the capability perspective explains deficiencies through the processes related to the loss, build-up, change and maintenance of capabilities. The key mechanism for emerging capability gaps is that policy and regulatory changes affect the existing and/or required capability structure of utilities and that these gaps cannot be closed in a short time period. External developments that may lead to capability gaps include, for example, the introduction of new public policy programs (e.g., requiring generation portfolios with more renewable energy sources), regulatory changes (e.g., requiring unbundling of the transmission grid from generation, or the liberalization of electricity wholesale markets) and technological innovations (e.g., new generation technologies, or smart meters).

Our overall argument (with a focus on regulation) goes as follows: Regulatory interventions change the tasks utilities have to fulfill, or have a direct influence on the capabilities of utility firms. If utilities do not have the capabilities to accomplish the new tasks readily available and if the build-up or adaptation of capabilities takes time, capability gaps emerge. As a result, tasks will not be fulfilled as expected and organizational performance as a whole may decline. Depending on whether all utilities under the jurisdiction of the regulation are affected in a similar way capability gaps might even have negative consequences at the sector level.

Due to the specific characteristics of infrastructure sectors, the adaptation needs much more effort and time than the conventional approaches would assume — especially when the required capabilities are based on long-term experience.

4.2. Infrastructure sector specificities and capability gaps

In this section, we discuss the implications of infrastructure sector specificities for the capabilities in utility firms, and how changes in the policy and regulatory environment may cause the emergence of capability gaps. We illustrate these relationships with examples. Then we contrast the capability-based view with the traditional approaches and describe how it provides an additional explanation for performance deficiencies in infrastructure sectors.

The last column of Table 1 summarizes the discussion of this section.

4.2.1. High uncertainty

One reason for capability gaps to occur is an increasing uncertainty of the business and regulatory environment. High uncertainty about recovering investment costs and the future technological development are specifically prevalent in infrastructure sectors because the physical networks, assets and technical systems require high investments and have long amortization periods. If uncertainty is relatively low, it tends to be less difficult for a utility to identify and define the required capability structure to perform the defined tasks. Increasing uncertainty due to changes in the policy and regulatory environment makes it more difficult to determine the required capability configuration. This is because a utility has to build, implement and manage capabilities so that they cover an increasing number of contingencies that might occur. Consequently, a utility would need to establish a capability structure with substantial excess capabilities quantitatively and qualitatively. However, it is barely feasible for a utility to provide an adequate capability structure for all potential contingencies. Thus, the higher the uncertainty of the market and regulatory environment is, the higher is the possibility of a mismatch between existing and required capabilities and therefore of a capability gap.

In South Africa, for example, new policies for the electricity sector aimed at opening the market for independent power producers (IPPs) in the early 2000s. In 2001, the government ordered the incumbent national supplier Eskom to stop building new generation capacities in order to reduce its competitive advantage over new sector players. When in 2004 it turned out that the implemented policy was ineffective in attracting IPPs, the government reversed its decision and again allowed Eskom to build new power plants. By this time, however, Eskom had lost a substantial part of its engineering staff, which created a gap in the organizational capabilities related to planning and building of power plants (Worch et al., submitted for publication). One underlying reasons for this loss is that Eskom could not maintain an underemployed generation capacity building workforce over several years only to be prepared for the contingency that Eskom would be ask to build capacities again.

Another example is carbon emission policies, which gain an increasing importance in many countries (Schmidt et al., 2012). If it remains unclear whether electricity suppliers have to mandatorily build renewable generation capacities, establish carbon capture facilities or compensate emissions with tradable certificates (or a combination of these means), then there is a higher possibility for an emerging capability gap at the utility firm level compared to a situation with a policy that precisely defines the implementable means. In the latter case, utilities can specifically build the required capabilities.

From a transaction cost perspective, high uncertainty induces hold-up problems between contract partners with the
corresponding frictions, costs and performance consequences. From a capability perspective, high uncertainty implies that there are a large number of possible contingencies about how the business environment develops. A utility can hardly develop an adequate capability structure that covers all contingencies and therefore capability gaps are likely to emerge. Thus, even if the asymmetric information situation causing hold-up problems is solved through adequate institutional settings, uncertainty tends still to produce capability gaps in utilities. In other words, while the transaction cost logic identifies occurring performance problems as a result of contractual relationships, the capability approach emphasizes that increasing uncertainty causes performance deficiencies even under conditions where there are no contractual relationships. In this sense, applying a capability perspective provides an additional explanation for performance problems in infrastructure sectors. It shifts the focus from contractual concerns to considering the composition of competences and skills as drivers of firm performance.

4.2.3. Long life cycles of large technical systems

There are no contractual concerns between the organizational performance dimension. The competences, skills and asset specificity problems. This is because high uncertainty implies that there are a large number of possible contingencies about how the business environment develops. A utility can hardly develop an adequate capability structure that covers all contingencies and therefore capability gaps are likely to emerge. Thus, even if the asymmetric information situation causing hold-up problems is solved through adequate institutional settings, uncertainty tends still to produce capability gaps in utilities. In other words, while the transaction cost logic identifies occurring performance problems as a result of contractual relationships, the capability approach emphasizes that increasing uncertainty causes performance deficiencies even under conditions where there are no contractual relationships. In this sense, applying a capability perspective provides an additional explanation for performance problems in infrastructure sectors. It shifts the focus from contractual concerns to considering the composition of competences and skills as drivers of firm performance.

4.2.2. Strong interdependencies

Highly specific investments with strong interdependencies between the components of the large technical systems are another typical feature of infrastructure sectors. Interdependencies are most prominent between the production and network assets with joint operation creating substantial synergies. Because of these interdependencies, it is difficult to separate the workforce into different functional areas or even across firm boundaries. If changes in the regulatory framework separate hitherto integrated functional areas so that joint operations are hardly possible or even restricted, capability gaps may emerge. This is because the necessary capabilities for understanding the interdependencies to jointly operate the separated functional areas across organizational boundaries tend to get lost. This is for example the case, when integrated utilities have to unbundle the power plant and transmission grid operations. Unbundling disconnects capabilities, which tend to be critical to operate these two functions adequately. Even if the capability structure is fully available to achieve the tasks in each of the separated functional organizational units, capability gaps emerge because the specific knowledge about how to manage the interface among different firms is no longer sustained. Thus, the more a regulatory framework requires the separation of functional areas with high interdependencies, the higher is the potentially emerging capability gap.

From a transaction cost economics perspective, separation of functional areas with strong interdependencies induces hold-up problems. This is because high interdependencies imply high asset specificity. Transaction cost economics assumes that contract partners behave opportunistically and take advantage of this situation, which tend to cause frictions after the separation and therefore deficiencies and even failures in operating the separated functions. Implementing means to reduce opportunistic behavior between the contract partners imposes transaction costs. A capability approach provides an additional argument to explain performance deficiencies by focusing on the consequences of separating knowledge structures of highly interdependent functions. From this perspective, performance problems occur even if there are no contractual concerns between the organizational entities that operate the separated functions.

4.2.3. Long life cycles of large technical systems

Large technical systems tend to have long life cycles with each life cycle phase requiring a specific capability structure. For example, planning, building, operating and refurbishing power plants and physical networks are distinct phases, which typically extend from few years up to several decades. The competences, skills and experiences relevant in one phase can be hardly deployed to the full extent across all other phases. As the required capability structures change continuously during the life cycle, capability gaps potentially emerge in the shift from one to the other of these phases. Thus, the more relevant economies of scale and scope and the longer the corresponding life cycles of the technical systems, the higher is the possibility of major mismatches between the existing and required capability structure.

This is an important argument that has found little attention in the traditional literature on infrastructure sectors. From a principal-agent perspective, the main concern of having substantial economies of scale and scope and large physical networks is the occurring natural monopoly situation. This implies performance inefficiencies in the form of welfare losses because monopolistic utilities produce less goods and services at a too high price compared to a competitive market environment. Taking a capability approach shifts the focus from the monopoly problem to the implication that large technical systems have long life cycles with substantial changes in the capability requirements between the various phases. The potentially emerging problems in managing the changes of the organizational capability structures add a new explanation for performance deficiencies caused through one infrastructure sector specific feature, namely the existence of large technical systems and physical networks.

4.2.4. Multiple objectives

In addition to provide public services efficiently, policy decision-makers may define social objectives such as providing disadvantaged or poor citizens with services at a price that is below costs. They may also impose environmental objectives such as producing electricity from renewable resources, even if the generation costs are higher than with incumbent technologies. Pursuing multiple objectives is particularly problematic in infrastructure sectors, if public utilities are obliged to be financially self-sustaining but at the same time have mandatory tasks that are not cost-recovering. As a result, tensions tend to occur because the various objectives require different capability structures. For example, an electricity provider may aim at generating cheap electricity from fossil fuels to serve its power-intensive industrial customers. At the same time, the utility might pursue a strategy to establish itself as a leading renewable electricity provider. Building the required capability structure for one of the objectives tend not to cover the required capability structure of the other one. Thus, the more objectives a utility has to pursue, the more likely is that a capability gap emerges for at least one or several of the different goals.

Capability gaps also emerge, when policy makers shift objectives that public utilities have to pursue. Then, the required capability structure changes substantially. This is the case, if utilities or policy makers identify new tasks or shift and expand priorities of existing tasks. For example, in addition to provide secure and efficient infrastructure services, a newly established public policy program may demand to deliver services with a specific technology mix, which then requires a different set of capabilities. An illustration is the shift of the Japanese energy policy toward a less nuclear power dominated generation portfolio after the Fukushima disaster. This implies a massive shift in the required capabilities within the electricity sector from knowledge on nuclear power technologies toward expertise in renewable electricity generation technologies. Also a new policy that requires utilities to outsource certain activities or sub-contract with specific supplier groups may render the actual capability structures inadequate. Another example is the paradigmatic change from central municipal wastewater treatment plants to decentralized systems, which require a different set of capabilities to install, operate and maintain water utility services. Thus, the more new tasks diverge from the current ones or...
the stronger the change of the current prioritization of objectives, the more likely is a temporary mismatch between the required and existing capabilities.

Finally, pursuing multiple objectives may also lead to unclear priorities within an organization. As a result, the capability accumulation may focus on specific objectives but pay less attention to others. Consequently, the actual capability structure diverges from the required capability structure for those tasks. Thus, the higher the ambiguity of the objectives’ priorities, the more likely is the emergence of a capability gap.

Traditional approaches have identified the existence of multiple objectives in public utilities as an important cause for emerging performance deficiencies (Spiller, 2010). The principal-agent perspective sees the underlying problem primarily in the difficulties of the shareholders (i.e., the principal) to correctly incentivize and monitor the contracts with the utility management (i.e., the agent). Recent transaction cost economics based arguments have highlighted that governments and interested third parties are a potential hazard to efficient infrastructure service provision as they may force utilities to pursue specific — officially less prioritized — goals by threatening them to impose unfavorable regulations otherwise (Spiller, 2010). A capability perspective provides an additional rationale for explaining performance deficiencies. The key argument is that multiple objectives tend to simultaneously require different capability structures. Consequently, if i) there are too many objectives, ii) objectives shift substantially, or iii) there is ambiguity about the priorities of the multiple organizational objectives, capability gaps emerge and result in performance deficiencies.

4.2.5. Limited options for strategic reorientation

Finally, a last implication of providing basic services is that utilities have limited options for strategic reorientation and specialization. As a result, their freedom in responding to performance deficiencies is limited as well. In fact, improving the performance is primarily possible through building and acquiring capabilities but largely unfeasible through strategic change and employing the existing capabilities in a different way. They have to provide the services, even if they do not have the sufficient capability structure or if they have a capability structure that could be leveraged more efficiently and financially more viable in a different product, service and geographical context. Thus, the more the range of options for adjustments is limited, the higher is the possibility that a mismatch between the required and existing capability structure occurs.

Due to this strategic inflexibility, capability gaps may also occur — possibly less often — in the opposite direction, i.e. utilities have more competences and skills available than required. Consequently, the costs of performing the task tend to be too high. While companies in non-infrastructure sectors aim to fully employ the available capabilities, public utilities have limited options to leverage underemployed organizational resources and capabilities. This prevents performance improvements because capabilities remain unused to improve efficiency, for example by taking advantage of potential economies of scale and scope.

While traditional principal-agent and transaction cost economics approaches have not considered the limitations in strategic adaptation in infrastructure sectors, the capability perspective understands this restriction as an important cause for inefficiencies and performance problems. The reason for this is that public utilities are limited in the extent to which they can specialize, shift or expand their strategic focus to reflect a more efficient use of their capability structures. In this sense, the capability perspective provides an explanation for performance deficiencies in infrastructure sectors where the conventional approaches have remained quiet.

5. Conclusions

We have argued that public policy and regulatory interventions tend to cause systematic changes of the existing and required capabilities of utilities. In situations, in which the development of new or adapted capabilities is time consuming or complex, capability gaps emerge. The result is a performance decline or even complete failure of specific organizational tasks and eventually of the organization as such. This again may have repercussions at the sector level, especially if all utility firms are affected in a similar way or if very critical firms, such as single suppliers, are affected.

We have particularly advanced the argument that changes in the policy and regulatory environment affect the capability structure of utilities by impacting the specific features of infrastructure sectors. For example, public policy and regulatory changes may i) increase uncertainty, ii) separate organizational functions that are strongly interdependent, iii) prolong or shorten the length of specific life cycle phases, iv) add new objectives or change the priority of objectives that utilities have to pursue, and v) limit the options for strategic adaptation and reorientation. We then discuss and illustrate how these changes possibly affect the capability structure of public utilities and contribute to the emergence of capability gaps. Finally, we argue that the capability-based approach is — due to its focus on how organizational knowledge structures are affected — a distinct logic for explaining performance deficiencies in infrastructure sectors, which complements the traditional principal-agent and transaction cost economics approaches (cf. Table 1).

A capability perspective on the performance of utility firms complements conventional approaches in two ways. First, the principal-agent and transaction cost approach have in common that they understand performance failure mainly as a result of contractual issues occurring in the interactions between utilities and their environment, i.e. customers, suppliers, regulators and governmental institutions. Agents behave opportunistically within utilities and across firm boundaries and search permanently to exploit asymmetric information to their own advantage. From this perspective, it is sufficient to implement adequate contractual and institutional structures to incentivize optimal contracts, prices and investments and therefore to improve performance.

This, however, is not sufficient from a capability perspective because capability structures can be inadequate even under optimal contractual and incentive conditions. The traditional approaches’ search for the best design structures has been at the expense of understanding the incentivized tasks themselves. Contracting, price setting and investing are tasks, which require adequate competences and skills. From a capability perspective, it is central to understand how the required composition of capabilities can be built and maintained to perform these tasks. The logic of our argument therefore differs from the traditional explanations as it resorts on the coordination problem to configure and sustain adequate capabilities. It sheds a different — though complementary — light on the management and regulation of utility firms and goes beyond the mere focus on mitigating asymmetric information and opportunistic behavior.

A second implication of a capability perspective is to explain the persistence of performance deficiencies in utilities. Principal-agent and transaction cost reasoning expect the performance to improve fast, if the implemented contractual and institutional designs are adequate. We assert that it takes — partly extensive — time and effort for a utility to respond to an emerging capability gap and accumulate the required set of skills and competences. Rebuilding and acquiring capabilities takes even more time and requires specific implementation strategies, if the capabilities are based on long-term experience and learning-by doing processes. Thus, focusing on the underlying processes of transforming capability
structures provides more adequate explanations about the existence and persistence of performance deficits even under conditions of allegedly improved incentive structures and context conditions. In this sense, we provide an explanation why utilities show persistent problems in regaining adequate performance levels for the provision of services, even if effective incentive mechanisms are promptly established.

We generally believe that the capability perspective offers a more balanced approach for understanding the causes of performance deficiencies in infrastructure sectors and the mechanisms through which they become effective. Such an understanding is a first step toward developing more effective strategies for solving inefficiencies in utilities. For example, utility managers need to build awareness of the severe impact that the loss of experience-based knowledge can have. Since the rebuilding of specific capabilities may take a long time, reorganizational measures as well as unbundling processes should be undertaken in a careful and balanced way.

The capability approach also offers important insights for policy makers and regulators. There is a need to consider more carefully the impact of institutional and regulatory reforms on capabilities at the organizational level. Otherwise, reform programs may have unintended consequences (e.g., the loss of critical capabilities or the split-up of complementary capabilities). This is particularly important, if capabilities are based on tacit knowledge and long-term experience. Losing such capabilities tends to take a long time to rebuild the required competences and skills and result in persistent performance deficiencies. The capability approach shows that a better understanding of these mechanisms is a crucial dimension to create more effective regulatory and policy frameworks to improve the performance in infrastructure sectors.

In this sense, we believe that the insights from the capability approach can be important for management practitioners, regulators and policy makers alike. However, further research will be needed to specify in detail the mechanisms and context conditions, under which capabilities are more or less difficult to build, maintain and re-configure and in which situations capability gaps leave essential traces at the sector level.

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