

**BRIDGING AND BONDING IN HEI RESEARCH CENTRES:
EXPLORING THE MODERATING INFLUENCE OF SOCIAL CAPITAL ON
PERFORMANCE OUTCOMES UNDER NPM-DRIVEN MACSs**

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Dedication Page

To my family and friends, I could not have done this research endeavour without your support. You were there without fail to offer love, encouragement, and support. I will be ever grateful.

Abstract

The impact of social connectedness on the effectiveness of management accounting and control systems (MACSs) is little understood. The purpose of this study is to examine the importance of the theory of social capital for the challenges of European research centres of higher education institutions (HEIs). Based on a comparative case study design of research centres in a European NPM (New Public Management) forerunner and latecomer country, I explore how social capital can enrich our understanding in the field of management accounting and control while highlighting its implications for HEIs' practitioners. Applying the work of Chenhall, Hall and Smith (2010) to the higher education context, I draw on Simons' (1995) Levers of Control (LOC) framework to study how research directors proactively shape the MACSs-social capital relationship and observe contradictory effects on research performance across different research centre missions (Schubert, 2009).

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List of Abbreviations

Anon.	anonymous
CUDOS	Communalism, Universalism, Disinterestedness, Organized Scepticism
ERC	European Research Council
FTE	Full-time Equivalent
HEI	Higher Education Institution
e.g.	exempli gratia
et al.	et alii/alia
etc.	et cetera
i.e.	id est
ICT	Information and Communication Technology
ISI	Institute for Scientific Information (Thomson Reuters)
LOC	Levers of Control
MACS	Management Accounting and Control System
n.a.	Not Available
NGO	Non-Governmental Organization
NPM	New Public Management
KPI	Key Performance Indicator
Ph.D.	Philosophiae Doctor
PMS	Project Management System
Post-doc	Post doctoral researcher
RC	Research Centre
R&D	Research and Development
Resp.	Response
s.d.	Standard Deviation
sic	intentionally so written
SRO	Strategic Research Orientation
TPF	Third Party Fund
UK	United Kingdom

1 Introduction

Today's global knowledge economy and its implications for contemporary organizations, i.e., the continuous pressure to innovate, impose various challenges for their managers. Understanding how organizations can use management accounting and control systems (MACSs) to support their research and development (R&D) outcomes has therefore emerged as an important research question (Shields, 1997). Not surprisingly, contingency-based as well as strategic management accounting research has paid enormous attention to the role and design of MACSs in order to balance the need for innovation and growth while remaining efficient in the current business operations (Ahrens & Chapman, 2004; Chenhall, 2003; Ittner & Kogut, 1995; Langfield-Smith, 1997; Tucker, Thorne, & Gurd, 2009). Particularly, management accounting scholars have studied the nature of MACSs in manufacturing firms because financial indicators are considered to be well-suited for the management of production processes (Abernethy & Brownell, 1997, 1999). However, their relevance in uncertain settings is still inconclusive (for an overview see Davila, Foster, & Oyon, 2009).

This study is particularly concerned with MACSs and how they can be used in order to assist managers in knowledge-intensive organizations. Typically, knowledge intensive organizations face various kinds of uncertainty and are different to the physical production of goods in terms of the individuals who produce intangible outputs mainly on the basis of their knowledge. Management, engineering and computer consultancies as well as accounting and law firms or research centres are often cited as examples of these kinds of organizations (Ditillo, 2004). One topic that has received little attention in the management accounting and control literature and that is of special interest in this paper

is the management of R&D activities in research centres of higher education institutions (HEIs). In essence, this research seeks to investigate the interplay between formal and informal MACSs and to explore its impact on the development and maintenance of social ties under uncertainty. MACSs are interpreted in this study according to Simons, who defines them as “formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activities” (1995, p. 5). His strategic levers of control (LOC) framework is used to link MACSs to social connectedness in (bonding) and between (bridging) research centres of higher education institutions. The main research question to be explored in this study is whether the successful management of social capital is conducive to better research performance and, consequently, how directors of HEI research centres can employ MACSs in order to satisfy the imperatives of NPM (New Public Management) without compromising their research centre’s mission. Further questions under examination relate to the suitability of Simons’ (1995) LOC in the HEI context to obtain and manage the potential benefits of social capital. The high degree of uncertainty and complexity, the reliance on professional networks to coordinate effort as well as the academic culture grounded in the Mertonian norms of science (Merton, 1942) are decisive characteristics of higher education research centres and, thus, promise valuable settings to explore the research questions of this study. HEIs are often referred to as loosely coupled organizations (Weick, 1976) with complex processes that are characterized by an ambiguous causal relationship between inputs and outputs, making them difficult to describe and consequently, allowing only for limited rationalization (Musselin, forthcoming). The customary form of control has been found to

be of more informal nature (Musselin, forthcoming) best described by Bourdieu's (1986) forms of cultural and symbolic capital.

However, steering regimes in European higher education are formulated based on the belief that the delivery of HEIs' missions do not occur in a vacuum and, thus, need to be managed deliberately. One reason for this development is perhaps the important role of research conducted in HEIs and their research institutes, which is widely acknowledged by governments and industries all over the world. Research institutes in higher education assume a central role in basic research, teaching and in technology transfer with the latter usually referred to as the "third mission" of the university (Krücken, 2003; Schubert, 2009). With the advent of new public management (NPM) reforms during the last three decades, public institutions, such as HEIs, have been subjected to transformations into formal organizations. In general, the NPM narrative is aimed at higher levels of efficiency and accountability of research activities, transparent resource allocation processes, decentralization and enhanced power of university leadership (Bleiklie, Enders, Lepori, & Musselin, 2011; Ferlie, Musselin, & Andresani, 2008; Hood, 1995). As a result of the increased competition, there is some evidence that public institutions have adopted management accounting technologies such as budgets, key performance indicators, or performance measurement systems to comply with the NPM requirements (Berry, Coad, Harris, Otley, & Stringer, 2009). Consequently, NPM initiatives force individuals in research centres to embrace the focus on NPM ideals, indicating that MACSs need to consider both functions. This leads to an inherent tension: production processes in mission-oriented and more knowledge-intensive organizations are usually dominated by professionals who are organized in interest groups that allow

for the pursuit of non-congruent or even conflicting organizational aims (Abernethy & Stoelwinder, 1991). Here, accounting and management control seem to be rather superfluous as the academic culture is said to be grounded in the idea of organized scepticism and collective criticism (Krücken & Meier, 2006). As a result, the ultimate challenge of research centres in the current higher education landscape is to create an identity to deliver their research mission and, as accentuated by NPM reforms, to attract sufficient funding for their research activities. Clearly, these two functions compete with each other and, might therefore be in tension sometimes.

Although NPM has been and still is promoted as an efficiency enhancing agenda among European policy-makers, and despite the widespread belief among scientists that their work escapes the vague interpretation of efficiency in their operating environment, research that has approached this problem empirically is sparse, but not completely lacking. A survey based study conducted in German HEI research centres, for example, found that NPM initiatives increase performance incentives and resource allocation efficiency after controlling for the different research centres' missions (Schubert, 2009). While Schubert (2009) performs a powerful econometric efficiency analysis, the study's theoretical underpinning builds on property rights theory (Demsetz, 1967) and principal agent theory (Jensen & Meckling, 1976), limiting its explanatory power as these models are grounded in dyadic relationships. They provide limited insight into the process that drives the adoption, use and development of management accounting techniques in HEIs research centres. Yet, at the same time, Schubert's (2009) study substantiates the relevance of MACSs in HEI's research centres that warrants further investigations into MACSs and their potential advantages for these organizations.

This paper argues that the analysis of MACSs in uncertain environments would significantly benefit from the inclusion of the concept of social capital (Adler & Kwon, 2002; Bourdieu, 1986; Burt, 1997). Broadly speaking, social capital can be understood as the value of networks associated with norms of reciprocity that is concerned with bonding similar individuals and bridging between a diverse set of organizational actors (P. Dekker & Uslander, 2001). Similar to Chenhall et al. (2010), this paper uses Bourdieu's (1986) classifications of capitals and the work of Oakes, Townley, and Cooper (1998) to describe the balancing act between scientists' work ideals based on academic autonomy (their cultural capital) with the requirements imposed by the NPM paradigm, e.g. attracting sufficient funds for their research activities on a completely competitive basis (economic capital). To help understand how academic networks in research centers coordinate effort facilitating the effective delivery of their research mission and how general reciprocity generating mutually beneficial actions is ensured, the paper follows a body of social capital research that has conceptualized social capital into a structural component, i.e. "bridging" (Burt, 1997; 2000) and a relational component, i.e. "bonding" (Coleman, 1990; Granovetter, 1992). In order to establish the link between the social capital- MACSs relationship on research performance, the network social capital literature is used to discuss its potential advantages and disadvantages (Adler & Kwon, 2002; Gabbay & Leenders, 1999; Gabbay & Zuckerman, 1998; Hansen, 1999; Nahapiet & Ghoshal, 1998) at the organizational level (Coleman, 1990).

Extending the findings of Chenhall et al. (2010) to the HEI context, this paper examines whether MACSs can be employed in ways that attract research funding without

threatening the delivery of the mission across different research centres. Analogously, social capital shows a considerable potential to satisfy both functions and to serve as means for mitigating the inherent tension between the two (Chenhall et al., 2010). Understanding the relationship between MACSs and social capital is essential for directors of HEI research centres to employ formal controls in more enabling ways. The paper of Chenhall et al. (2010) ranks among the first studies in management accounting research that are concerned with the interrelationships between social capital and MACSs. Based on different MACSs conceptualizations, the authors document their mixed effects on an NGO's (non-governmental organization) ability to deliver their humanitarian services.

In synthesizing the insights from the studies of Schubert (2009) and Chenhall et al. (2010), the particular interest in this study is to show that research centres are predisposed to a certain social capital dimension (bridging or bonding) as a function of their research mission, and more importantly, to explore their moderating impact on research performance under different NPM intensities. Although the replacement of direct State control has pioneered the way for more arms-lengths impulses in Western Europe, the degree of intensity to which NPM reforms have been adopted are not homogenous (Ferlie et al., 2008). The research questions are analysed in the realm of a NPM forerunner and latecomer country, because the degree to which NPM reforms have been disseminated are assumed to reflect the relative emphasis placed on either "hard" or "soft" controls within Simons (1995) LOC framework. NPM forerunner countries are expected to emphasise the hard levers of the LOC framework (diagnostic and interactive controls), whereas NPM latecomer countries may place more focus on the soft levers

(beliefs and boundary system). In doing so, the moderating effects of social ties on MACSs effectiveness, that are expected to vary with the intensity of the different control levers, will be analysed to draw first conclusions about the relative research performance of individual research centres in terms of their corresponding output bundles.

The current study responds to the call from Henri (2006) who advocates qualitative research approaches for research into the moderating influence of the organizational and environmental context on the relationship between the combinations of the control levers and organizational performance. It contributes to a continuously growing stream of research on the LOC framework (Bisbe, Batista-Foguet, & Chenhall, 2007; Bisbe & Malagueno, 2009; Henri, 2006; Mundy, 2010; Widener, 2007) and gives ideas about its applicability in the higher education sector, which is quite different to the top management level of a private institution where the LOC framework has its roots. In this vein, the study highlights the problems associated with introducing the managerial narrative into the public sector, where the individual resistance to formal controls imposes a big challenge. Furthermore, the current research is concerned with the reciprocal effects of the different control levers and how this may affect the management of research centres. Figure 1 illustrates the theoretical framework of the study.

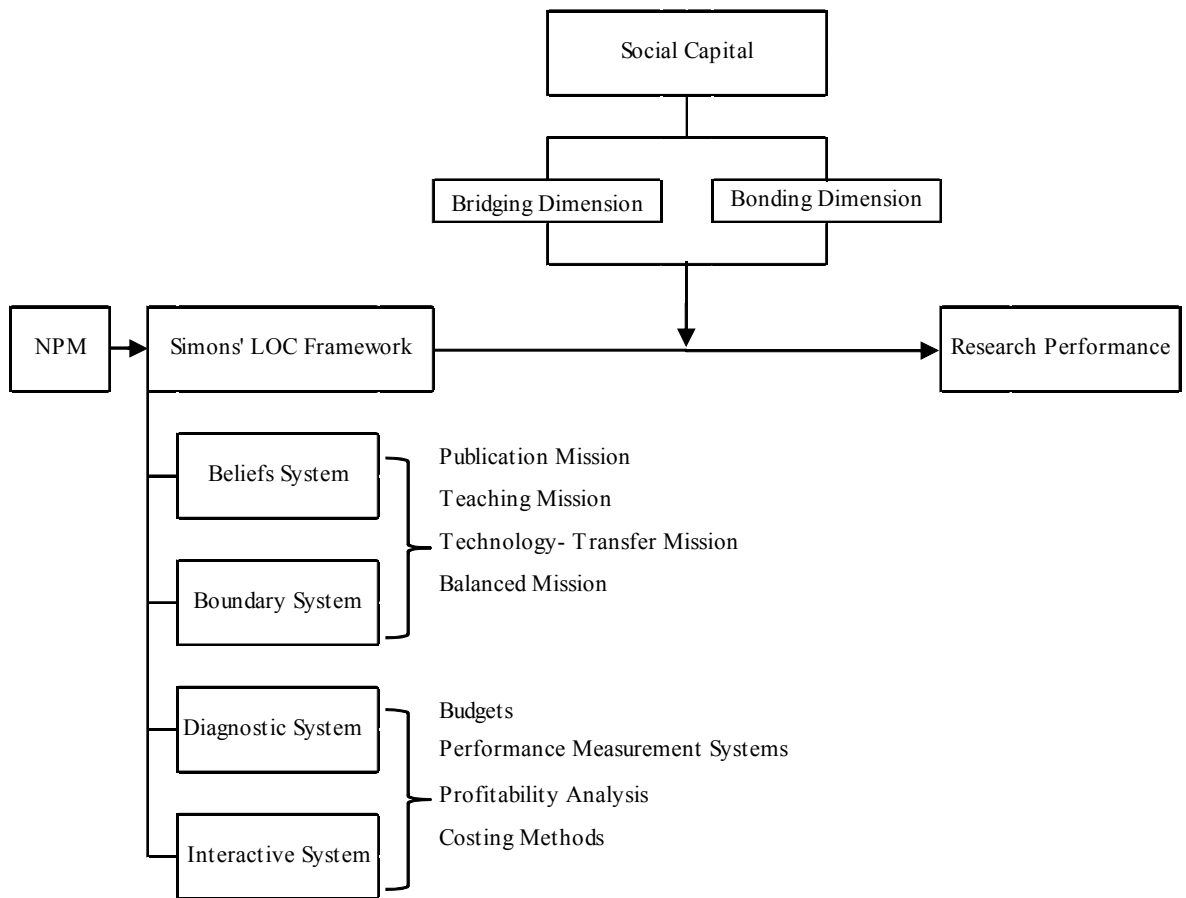


Figure 1: Theoretical framework

2 Literature Review

The literature review is organized as follows. The first section briefly reviews the institutional context of European research centres in HEIs and describes the level of analysis. To inform the current research by existing empirical evidence as much as possible, I start my exploration of the research questions by reviewing the management control literature on the interface between social capital and MACSs. In the following section, I present a discussion of the concept of social capital relevant to this study. Based on the presented current knowledge, the study develops a framework that guides my understanding of how social capital and MACSs in research centre of HEIs might interplay.

2.1 Institutional context: The catalyst of NPM in HEI's research centres

There is a significant body of research that elaborates on HEIs as specific organizations, highlighting their complex and multifaceted nature (Fumasoli & Lepori, 2011; Musselin, forthcoming; Weick, 1976). Further, it is well-recognized that individual HEIs differ considerably in their organizational forms, history and environmental conditions (Musselin, forthcoming). In most cases, HEIs show different organizational structures for teaching (e.g. faculties) and research (e.g. research institutes). Research institutes are composed of research centres that have been defined as collective knowledge production units with an incentive to develop their own missions and profiles as triggered by the NPM movement. Following the definition of Lepori et al. (in press), research institutes are (1) embedded in a HEI as a budgetary unit, (2) clearly visible for outsiders, (3) characterized by a representative, (4) composed of at least two members holding a doctoral degree where at least one of them is a professor and can be (5)

identified by individuals who work on a common thematic area (p. 7). In this study, research centres are understood as the smallest organizational unit that create their own identity, determine their key research topics and their relations to other research centres and strategic actors autonomously. Notwithstanding the fact that research centres may have some control over their tangible and intangible resources, they are likely to be restricted to, or at least influenced by, their institutional context, e.g. with respect to the mission of their research institute or the overarching HEI. However, there is a general belief that the heads of the research institutes have certain strategic competencies as to research directions, alliances or fund-seeking strategies (Lepori et al., in press; Montauti, Lepori, & Usher, 2011; Seeber, forthcoming). Given their institutional integration, higher education research centres are also subject to the university's external environment, which has been shaped by NPM reforms in European countries during the last three decades (Bleiklie et al., 2011; Eurydice 2000, 2008; Ferlie et al., 2008; Kuhlmann, 2010). In addition to the focus on financial accountability, NPM reforms, particularly in the HEI context, represent the movement towards "managerialism" and away from "professionalism" (e.g. towards transparency over academic achievements, university regulations for departments, and target agreements). Besides these objectives, the adoption of market approaches while minimizing central planning regimes (e.g. additional funding based on local and/or national competitive performance) as well as state regulations (e.g. public policy regulations for departments such as a certain ratio of foreign Ph.D. students in a programme) also receive top priority on the NPM agenda (Schneider & Sadowski, 2009). The desired outcomes of the described initiatives are discussed in the literature under terms such as efficiency, accountability, the delegation of

responsibility to decentralized units, or the need for more transparency (Hood, 1995). The HEI literature has elaborated on several indicators that point to the trend that HEIs imitate formal structures and planning procedures in consequence of NPM initiatives (Musselin, forthcoming). It is therefore reasonable to assume that the degree to which NPM instruments have been introduced in the countries' higher education sector parallel the extent to which their research centres have adopted MACSs in order to comply with external pressures.

Halligan (2011) and Kuhlmann (2010) have argued that the observed differences in NPM adoption are deeply rooted in the country's unique history and culture. As an example, the United Kingdom, with its strong institutional Westminster model ranks among the forerunners of NPM implementers (Halligan, 2011). The Netherlands are also considered as one of the European countries with the longest experience in NPM dissemination, whereas other continental European countries such as Italy or Germany are referred to as NPM latecomers (Kuhlmann, 2010). Correspondingly, HEIs in European countries vary significantly in the pace with which changes have been, and still are, disseminated (Schneider & Sadowski, 2009) as illustrated in Table 1:

Table 1: European Countries according to the degree of NPM reform implementation

NPM in European Countries	
<i>NPM forerunners</i>	<i>NPM latecomers</i>
United Kingdom (Halligan, 2011)	France, Italy, Germany (Kuhlmann, 2010)
The Netherlands (Bleiklie et al., 2011)	Switzerland, Norway (Bleiklie et al., 2011)

For example, in the UK, survey-based research suggests that MACSs are existent in HEIs and therefore also in their research centres as reflected in terms of profitability analysis, costing methods such as activity based costing (ABC), budgetary controls,

performance reporting and capital investment appraisals (Cropper & Drury, 1996). More than a decade later in Germany, a considerable dataset of HEI research centres revealed that almost all HEI have adopted some MACSs, e.g. in terms of resource control and feedback systems etc. (Schubert, 2009). The aims, instruments and respective accounting techniques with respect to the NPM movement in HEIs are summarized in Table 2.

Table 2: Summary: NPM in HEIs

Summary: NPM in HEIs		
<i>NPM aims</i>	<i>NPM instruments imposed by the State</i>	<i>HEIs' responses to NPM</i>
Replacement of Professionalism by "Managerialism"	Competition Additional funding based on local/ national competitive performance	Profitability Analysis Costing Methods
Strengthening internal hierarchy (e.g. influence of dean, chancellors, presidents)	Managerial self-governance/ hierarchy Transparency over academic achievements	Budgetary Controls Performance Reporting
Feedback and Information of academic activities	University regulations for departments Target agreements	Capital Investment Appraisals Approval and Evaluation Procedures
Efficiency	Regulations Public policy regulations for departments	
Accountability		
Transparency		
Decentralization		
(Hood, 1995)	(Schneider & Sadowski, 2009)	(Cropper & Drury, 1996)
(Schubert, 2009)		

Given the preceding discussion about the different intensities of NPM reforms, and thus, the degree of sophistication of and experience with MACSs in higher education, Europe offers a fertile place to explore how the development of social relations and

connections interrelates to a combination of MACSs under different NPM modes and how their joint effect impacts research performance.

2.2 Social Capital Theory

2.2.1 Social capital in accounting research.

Despite the long contingency tradition in MACSs research, there has been limited research concerning the relevance of MACSs in the development of social ties on an organizational level (Chenhall et al., 2010). While previous studies have elaborated on the potential benefits of social capital for an organization (Adler & Kwon, 2002), their realization has become a considerable concern in the public sector, particularly in Western countries as reflected by the NPM reforms (Andrews, 2007).

A little stream in management accounting research has examined supply-chains that model a dyadic supplier-buyer relationship (Håkansson & Lind, 2004, 2007; Mouritsen & Thrane, 2006). Most of these studies draw on certain dimensions of social capital directly related to the structure of networks and how it facilitates coordination. For example, Mouritsen and Thrane (2006) investigated the link between MACSs and social capital in private firms and presented some empirical evidence as to the capability of MACSs to establish, develop and mediate inter-organizational relationships through self-regulation and orchestration. While self-regulation ensures interaction, orchestration provides the necessary infrastructure for this information exchange. Similarly, Håkansson and Lind (2004) showed how MACSs can support a dynamic inter-organizational network by means of orchestration. The deliberate violation of the control-liability principle, e.g. through overlapping accountabilities in their research sites, forced managers to continuously negotiate with their network partner in order to act on their

behalf. Whilst MACSs were flexible enough to change and develop, they structured these interactions between the network partners.

Another small stream of studies, that have not addressed social capital theory explicitly but which worked with relevant social capital constructs, has also looked at inter-organizational relationships (Håkansson & Lind, 2004, 2007; Tomkins, 2001). In his conceptual examination of how much information is needed to facilitate bridging in the first place and that gradually develops into bonding, Tomkins (2001) stressed the importance of trust and found a rather complex relationship between trust and control. In his view, trust, understood as an experience based expectation that a partner will not engage in opportunistic actions, needs to be balanced against the information provided by MACSs. Accordingly, the implementation of MACSs in inter-organizational relationships should not only be driven by rational reasons, but should take into account their effect on trust between the alliance partners. Certainly, trust is an ambiguous issue by nature. Berry et al. (2009) summarized how research has linked the concept of trust to MACSs in various ways: (1) trust may serve as a substitute to control (H. C. Dekker, 2003), (2) effective MACSs can function as means to accumulate trust (Seal, Cullen, Dunlop, Berry, & Ahmed, 1999), (3) MACSs' infrastructures and technologies can themselves be regarded as objects of trust (Mouritsen & Thrane, 2006) and (4) trust may act as an antecedent to MACSs (Cooper & Slagmulder, 2004).

Among the more recent literature, the work of Chenhall et al. (2010) is probably most relevant for the study at hand. To the best of the authors' knowledge, their paper ranks among the first studies in management accounting research that addresses the role of MACSs and social capital in the not-for-profit sector. In their case study of a non-

governmental welfare service organization, the collected field data indicated that the adoption of MACSs had contradictory effects: On the one hand, they facilitated valuable connections to external stakeholders such as funding agencies or other clients. On the other hand, however, they introduced a threat for the commonly shared values that guided the process of mutually beneficial actions in the NGO under examination. The authors concluded that public sector managers may face the increased competition as triggered by NPM reforms in deliberately shaping the beliefs system, e.g. by integrating more financial concerns into the organizational culture.

Taking into account the findings from the management accounting and control studies, the theory of social capital offers an attractive approach to study the design of MACSs in uncertain environments. The concept provides insight into how organizational actors' embeddedness in a network of exo-institutional as well as endo-institutional ties affects organizational performance and how MACSs are implicated in these processes. While the higher education literature has also employed the concept of social capital, especially to highlight its importance for HEIs' sustainability efforts (see for example Konstantinos & Nikoleta, 2009; Thomas, 2004), the purpose of the study here is to examine how an HEI's research centre's MACSs can satisfy the imperatives of NPM reforms without sacrificing its research mission.

2.2.2 The inherent tension in HEI research centres within Bourdieu's forms of capital.

In his critical theories of class societies, Bourdieu (1986, 1993, 1998) distinguishes between economic, social and cultural forms of capital to describe how they can be employed in order to leverage and enhance individual benefits. The ultimate aim

of his work was to investigate how a repository of different forms of capital could contribute to a better understanding of the capitalist order and the reproduction of social inequality. The different conceptualizations of capital, which are not restricted to financial or monetary assets, allowed him to demonstrate how organizational units sustain a position in a society of hierarchical status and how they engage or oppose dominance in social relationships (Chenhall et al., 2010). Following Oakes et al. (1998), different forms of capital are field specific, meaning that they are prevalent in different organizations and their institutional contexts. Research centres in higher education are naturally dominated by cultural and symbolic capital. In this specific context, the education and expertise of the scientists may reflect the most important dimension of their cultural capital. These educational credentials and professional norms constitute the cultural capital that scientists utilize to “judge their own work credibly and to have some local control over their work” (Oakes et al., 1998, p. 268). These assets are regarded as valuable, distinctive and desired by the organization and thus, play a considerable role in their social reproduction as this form of capital cannot be detached from its bearer (Bourdieu, 1986). For instance, the higher education literature reports some evidence that heads of research centres employ their cultural capital for legitimacy purposes in the funding acquisition process (Montauti et al., 2011). An entity’s capabilities to define and legitimize their cultural values has been described as their symbolic capital (Oakes et al., 1998). Applying this definition to the context of research centres in higher education, the power to influence what constitutes cultural capital, e.g. the quality of the research, is derived from the scientists’ symbolic capital, e.g. their position in the academic community

which again builds on inter-subjective reflections in accordance with the concept of organized scepticism and collective criticism (Krücken & Meier, 2006; Merton, 1942).

Having said this, the concepts of economic and cultural capital are essential to understand how they determine a research centre's positions and possibilities in the knowledge market. Echoing Coleman (1990), an actor's position in a social structure and the actor's life chances are determined by social capital. Besides the already discussed organizational form and institutional context of HEIs that contribute to the label of specific organizations (Musselin, forthcoming), scientists in HEI research centres can be regarded as distinctive because they are encouraged to comply with the scientific ethos of modern science according to Merton (1942). An academic researcher's primary deliverable is conducting research rather than maximising the monetary performance of the affiliated research centre. Therefore, research centres may use their cultural capital to enhance their economic capital and not vice versa as usually observed in the corporate sector (Chenhall et al., 2010). However, as indicated by literature, NPM reforms in the higher education field have challenged the core activities of research centres fundamentally (Bleiklie et al., 2011). Significant changes in the research funding procedures have not only aggravated the competition for third-party funding, but also for institutional funding. Researchers have to invest more time in the funding application process and the documentation of the corresponding outcomes. With respect to the internal allocation of institutional funds, the funding possibilities of a single research centre are now increasingly dependent on their members' individual performance. Furthermore, it can be observed that these evaluation and reporting procedures are made publicly available to account for higher transparency in academic work. As a result,

today's directors of research institutes are expected to assume management tasks with respect to fundraising and project management since these competencies are crucial for the management of research groups based on externally funded research projects (Bleiklie et al., 2011). All these changes in academic work have shifted the focus from cultural capital to economic capital.

The effect of economic capital accumulated for legitimacy purposes in a mission-based organization is demonstrated in the study of Oakes et al. (1998) , which draws on the concept of symbolic violence (Bourdieu & Passeron, 1977). The authors observed how individuals completely absorbed the new values emerging from the implemented planning and accounting system. Consequently, while the historically grown cultural capital became insignificant, economic capital started to dominate the field. This paper simply applies the findings of Oakes (1998) and Chenhall et al. (2010) from the not for profit sector, and argues that the change in a sector's dominant form of capital might endanger the organization's identity. It is here where Chenhall et al. (2010) started their investigation of how social capital and MACSs are interrelated and how their combined effect could help a mission-based organization to balance their needs for both forms of capital. This paper ties in with Chenhall et al.'s (2010) linkage of social capital to MACSs, re-interprets it in the higher education context and takes it to the next level in proposing a moderating effect of a certain social capital dimension on the MACSs-research performance relationship. In the next section, I discuss the relevant social capital dimensions in this study.

2.2.3 Differentiating between “bridging” and “bonding” social capital and their potential outcomes.

Given the various problems with the concept of social capital, e.g. relating to its dynamics and complexity (for an overview see Adler & Kwon, 2002), this section first discusses the determinants of social capital before they are linked to possible outcomes in order to account for a more robust definition. On the organizational level, social capital has been understood as “the sum of actual and potential resources within, available through, and derived from the network of relationships possessed by an individual or social unit”, constituting an “organizational advantage” (Nahapiet & Ghoshal, 1998, p. 243). It has been argued that social capital may serve as a substitute for other forms of capital such as financial and human capital (Coleman, 1990). This becomes of paramount importance in research centres as the value of human capital is widely regarded as an indispensable asset (Bozeman, Dietz, & Gaughan, 2001) because financial resources are competitive and become more and more scarce. The definition of social capital provided by Nahapiet and Ghoshal (1998) seems to be most suitable in the higher education context because it considers both, the possible mobilization of internal social network capital and the benefits of social capital available through building external networks (Newell, Tansley, & Huang, 2004). This proposed synthesis is important to note since there are two competing schools of thought regarding the social structure that is most supportive for the achievement of an “organizational advantage” (Nahapiet & Ghoshal, 1998, p. 243).

Advocates of the “bonding” or the relational dimension of social capital have argued that cohesive and densely embedded social ties constitute the decisive social capital dimension (Ahuja, 2000; Coleman, 1990; Granovetter, 1992; Walker, Kogut, & Shan, 1997). “Bonding” social capital is usually referred to as the category that embraces

the structure as well as the content of relationships among individuals within a system (Adler & Kwon, 2002), facilitating “certain actions of individuals who are within the structure” (Coleman, 1990, p. 302). The relational dimension of social capital can be examined in terms of the extent to which values are shared (Adler & Kwon, 2002), but also how it might develop beyond the organizational boundaries (Nahapiet & Ghoshal, 1998). Coleman (1990) argued that bonding may serve as a substitute for formal controls. Furthermore, the “bonding” dimension can be equalized with strong ties and closure that have been related to characteristics such as trust, cooperation, shared values, transfer of tacit knowledge as well as in generalized reciprocity (Coleman, 1990; Hansen, 1999; Putnam, 2000). Research found that high levels of relational social capital are beneficial for organizations that rely on task cooperation, exchange of tacit or complex knowledge (Adler & Kwon, 2002; Hansen, 1999) and group contributions (Gabbay & Zuckerman, 1998).

On the other hand, scholars such as Burt (1992) have advanced a “bridging” or structural dimension of social capital, suggesting that structural holes within a sparsely connected network are the relevant drivers for “organizational advantage”. Generally perceived as the ability to access external information and resources, the structural dimension of social capital is also referred to as boundary spanning or bridging activity (Burt, 2000). Outcomes of social capital’s structural dimension include the generation of valuable and non-redundant information, skills and knowledge (Hansen, 1999) as well as leadership, authority and power in brokering connections (Burt, 1997; Coleman, 1990). Similarly, bridging social capital has also been argued to enhance the dynamic capabilities of an organization, i.e. the ability to absorb, assimilate and transfer ideas

(Andrews, 2007). Bridging is valuable for start-ups (Walker et al., 1997), organizations that require outside information (Adler & Kwon, 2002; Hansen, 1999), and in those organizations in which duties are based on shared commitment and responsibilities and where individual contributions are recognized (Gabbay & Zuckerman, 1998).

As with other forms of capital, social capital requires a certain investment of time and effort, even if not necessarily in monetary terms. The costs of development and maintenance (Hansen, 1999) as well as those of a potential inward focus (which in turn may lead to unfavourable consequences such as too much team cohesion or extended decision making) have been identified as negative outcomes of social capital that might outweigh its advantages (Gabbay & Leenders, 1999; Uzzi, 1997). The outcomes of social capital are summarized in Table 3.

In line with a rich body of literature on applied social capital (Gittell & Vidal, 1998; Newell et al., 2004; Putnam, 2000), this paper also differentiates between the bonding and bridging dimensions. It also acknowledges that Coleman's (1990) social closure and Burt's (1992) brokerage hypotheses provide additional conceptual depth regarding these two dimensions (Burt, 1997; 2000). The contingency approach also allows for a more complete investigation of MACSs' potential influences on the cultivation of both, intra- and inter-organizational social ties in HEI research centres. Analysing these two dimensions separately therefore takes into account that the bonding and bridging dimension of social capital may vary independently, but does not neglect the fact that bonding might be a precondition of bridging social capital and ,thus, that both dimensions may act in combination (Andrews, 2007, p. 7; Newell et al., 2004, p. S46).

In light of the evidence provided by Chenhall et al. (2010), the different dimensions of social capital accentuate possibilities arising from bridging structural holes between organizations which can be deliberately shaped by bonding, in, but also between, organizations (Nahapiet & Ghoshal, 1998). For instance, in research centres of HEIs, each scientist may have a unique network that facilitates the access to the knowledge of others. Here, individuals need to mobilize their social capital in order to acquire knowledge about internal research projects. Simultaneously, effective knowledge integration requires social interactions of individuals that commonly negotiate, achieve, and refine a common understanding (Inkpen & Tsang, 2005). Strong bonds between scientists of a research centre may therefore function as a necessary precondition.

Table 3: Potential Outcomes of Social Capital Dimensions

<i>Social Capital Dimension</i>	<i>Potential Advantages</i>	<i>Potential Disadvantages</i>
Bridging Social Capital = “the ability of actors to secure benefits by virtue of membership in social networks or other social structures” (Portes, 1998, p. 6)	Access to external (non-redundant) information and resources, skills, knowledge, leadership, authority, power in brokering connections (Andrews, 2007; 1997; Burt, 2000; Coleman, 1990; Hansen, 1999).	Costs of maintenance (Hansen, 1999) Opportunism of network partner that limit network opportunities (Gabbay & Zuckerman, 1998) Potential benefits not always immediately available
Bonding Social Capital = “The existence of values or norms shared by members of a group that permit cooperation among them” (Chenhall et al., 2010, p. 741)	Trust, cooperation, solidarity, shared values, tacit knowledge, general reciprocity (Adler & Kwon, 2002; Coleman, 1990; Hansen, 1999; Putnam, 2000).	Parochialism and inward focus (Uzzi, 1997)

In summary, the effects of MACSs on social connectedness will be analyzed along four main potential benefits of the social capital construct rooted in: (1) the support of the environmental screening process to take advantage of arising opportunities

(Andrews, 2007), (2) the provision of access to resources (Coleman, 1990; Hansen, 1999), (3) the realization of timing advantages (Uzzi, 1997), and (4) in the capability to signal status and credentials (Burt, 1997; 2000; Lin, 2001).

2.3 Relating social capital to MACSs in HEI research centres

2.3.1 Applying Simons' (1995) levers of control framework to research centres in HEIs.

Certainly, research can be a personal process that strongly depends on the ideas and efforts of scientists, but increasingly, successful research outcomes are dependent upon the inputs of groups of scientists (Taylor, 2006). The effective exchange of information therefore becomes a critical component in the knowledge production process. Given the information-based character of accounting and management control systems for decision-making, planning and evaluation (Merchant & Otley, 2006), studying how they can be employed by the directors of research centres in order to achieve organizational goals and to monitor progress towards these predefined objectives appears to be a promising avenue. In the corporate sector, formal controls are an important part of the "control package" (Otley, 1978), because they ensure financial viability as well as efficient and effective work processes. Similarly, NPM initiatives force HEIs to embrace more formal governance mechanisms. Previous research in management accounting has studied how the design and implementation of a combined set of formal and informal controls affect organizational outcomes (Abernethy & Lillis, 1995; Ahrens & Chapman, 2004; Simons, 1995). However, the study at hand highlights the effects of the interplay between different controls on an organization's social capital as a moderator of this relationship in the specific context of HEIs. This section therefore discusses the study's

framework, within which the interplay between different forms of control are to be analysed and related to “bonding” and “bridging” social capital. This builds upon Table 3 above which presented a summary of these dynamics and how they may create tensions in as much as they may affect the development of social relations.

In order to analyse the previously described central organizational tension in a research centre of a HEI, that is, attracting sufficient economical capital while preserving its cultural capital, the study draws on Simons’ (1995) strategic LOC framework as it has been argued to recognize and manage such tensions (Henri, 2006; Simons, 1995). In line with contemporary management accounting literature (Merchant & Otley, 2006), Simons (2000) acknowledges MACSs’ interdependent nature. In his view, MACSs do not act in isolation, but their combined power creates an effective control environment. More specifically, MACS that work in harmony and balance are capable of managing “the inherent tension between (1) unlimited opportunity vs. limited attention, (2) intended and emergent strategy and (3) self-interest and the desire to contribute” (Simons, 1995, p. 28). The resulting dynamic tension encompasses contradictory but interrelated elements (Lewis, 2000). Conflict literature posits that tensions are not necessarily associated with negative consequences but instead may be beneficial for organizations (Nicotera, 1995). Henri (2006, p. 537) elaborates on a set of reasons why dynamic tensions may affect individual and organizational performance positively, ranging from the facilitation of organizational dialogue to the stimulation of creativity and the provision of a focus for organizational attention. Simon’s (1995) proposition builds on the use of MACSs (diagnostically or interactively) as the decisive feature to create flexible controls that are simultaneously stable enough to ensure efficiency. However, survey-based evidence from

Henri's (2006) study suggests only limited support for Simons' (1995) assertion. In providing some explanations for his findings, Henri (2006) argues that only organizations that face high environmental uncertainty and those that embrace flexibility values benefit from dynamic tensions because tensions are still double-edged swords (Lewis, 2000). It is therefore feasible to investigate whether diagnostic MACSs required by the NPM reforms may have a positive effect on research performance, if directors of research institutes use these systems in a more interactive way. Additionally, the LOC framework is based on another premise: although the levers of control are nested together and act simultaneously, they are designed for different purposes. In his seminal work, Simons (1995) classifies MACSs into four systems: boundary, beliefs, diagnostic and interactive controls. Before each of these systems will be discussed in relation to HEI research centres in the following subsections, the paper briefly refers to the models' antecedents and its main focus: strategy.

2.3.2 Strategy.

In the HEI context, a research mission specifies a research centres' key competences and differentiates the organization from its competitors in the knowledge market. The successful delivery of the research mission is contingent on understanding the constructs that shape the centre's purpose, highlighting the importance of social interactions for the centre's strategic direction and achieving alignment with its environment (Simons, 1995, p. 6). Strategic uncertainty and risk are regarded as the antecedents of the LOC framework that influence the choice of the MACS, which in turn affects the organization in terms of organizational learning and the efficient use of management attention (Simons, 1995; Widener, 2007). Strategic uncertainty has been

described as changes in the competitive dynamics or internal competencies (Widener, 2007, p. 763). Applying this definition to the higher education context, research directors may be faced with considerable competition in the funding process, e.g. due to a strong collaborative formation of competing research groups. With respect to the internal competencies that are subject to strategic uncertainty, research directors always face the risk that a scientist decides to discontinue his or her research in the centre. Furthermore, strategic risk, understood as “an unexpected event or set of conditions that significantly reduces the ability of managers to implement their intended business strategy” (Simons, 2000, p. 255), may result from operations as well as external factors, e.g. changes in the higher education policy. Both antecedents of the LOC framework require an increased amount of information processing in order to alleviate information asymmetry (Simons, 2000). Simultaneously, it highlights the potential role of MACSs in order to monitor and manage strategic uncertainty and risk (Simons, 2000).

To implement and shape strategy, managers use “soft” MACSs, i.e. the boundary and beliefs system, and “hard” MACSs, i.e. the diagnostic and interactive system. However, strategy is not an entirely uncontested issue in the higher education literature (Fumasoli & Lepori, 2011). Given the university as specific organization (e.g. its complex and loosely coupled nature that does not generate organization-specific problem-solving routines and knowledge), scholars have doubted the university’s capability to become a full strategic actor (Musselin, forthcoming; Whitley, 2008). Higher education literature suggests that universities pursue instead rather adaptive modes of strategy as they react to environmental pressures, e.g. with respect to their planning activities required by national authorities (Keller, 1983). On the contrary, HEIs

are encouraged to position themselves in the knowledge market, set long- term goals and align their organizational behaviour (Bonaccorsi & Daraio, 2007). Fumasoli and Lepori (2011) therefore suggest that HEIs' strategy components are limited to planning, compliance with the environment, and the development of a common frame of reference for internal as well as external stakeholders. The latter highlights the importance of the "soft" steering levers within Simons' (1995) LOC framework, because the academic understructure has traditionally been characterized by a high degree of autonomy, and consequently, favours a shared mission statement before command and control (Fumasoli & Lepori, 2011).

2.3.3 "Soft" levers of control.

As denoted by Simons, the beliefs system is "the explicit set of organizational definitions that senior managers communicate formally and reinforce systematically to provide basic values, purpose, and direction for the organization" (1995, p. 34). Managers may use the beliefs system to deliberately enhance and shape core values related to the organization's mission and to inspire individuals to search for new opportunities, i.e. to bridge structural holes to reach other networks that are in line with these values. As a counteracting mechanism, the boundary system "delineates the acceptable domain of strategic activity for organizational participants" (Simons, 1995, p. 39), and therefore reduces risk by constraining strategically undesired behaviour. For instance, a research director might want the scientific staff to search for important future research directions, but only within the boundary of the institute's (e.g. discipline) or university's (e.g. positioning in the knowledge market) mission. This example illustrates that both systems are aimed at motivating organizational actors to search for new

opportunities with the boundary system attaining this goal in a negative way by constraining behaviour and the beliefs system acting in a positive way given its inspiring character (Simons, 1995). Research centres usually communicate beliefs through a mission statement. One has to keep in mind that these organizational units are embedded in the larger institutional context, meaning that their research mission is certainly influenced by, but may also well differ from, those of the research institute or overarching HEI. Boundary systems are usually formalized in code of conducts such as those of academic integrity. These formalized values may provide accountability, responsibility and trust to the scientists that the profession serves with considerable consequences for bonding social capital. For example, tensions might emerge due to the fact that these values are formalized, suggesting to scientists that the boundary system is superfluous or even that colleagues cannot be trusted and consequently pose a threat for bonding social capital. Furthermore, the boundary system that is regularly adjusted according to the strategic research orientations of the research institute, may meet with oppositions from individual researchers. For example, since universities are urged to specialize and find their niche in the knowledge market, not all research interests presented to research directors might receive top priority, because they are concerned about producing a coherent body of research in favour of the overall mission of the institute and/ or HEI. As a result, this could significantly hamper the motivation of individuals whose research interests are not being empowered in the same way as those of their colleagues. Again, implications for social capital dimensions can be derived. Bonding social capital is threatened, because the perceived equality among the scientists is reduced. Scientists may be less willing to cooperate with their colleagues inside the

research centre as they might tend to look for participation opportunities in external research projects that may better suit their research interests and thus, enhance the potential for bridging social capital. At worst, however, they may leave the institution in consequence of incompatible research interests. However, one should keep in mind that the presented arguments do not equate to the demise of academic freedom to select and shape research themes, even though they demonstrate how NPM pressures on HEIs to demonstrate clear strategic direction at the university level that have the potential to produce considerable tension with the research agendas of individual researchers.

2.3.4 “Hard” levers of control.

Throughout the remaining discussion with respect to the “hard” levers of control, i.e. the diagnostic and interactive system, possible tensions with respect to individual responses in terms of their social connectedness will be identified. Diagnostic controls are employed to monitor organizational outcomes and to correct deviations from preset standards of performance (Simons, 1995, pp. 63, 70). Thus, critical success factors of an organization are embedded in these diagnostic control systems that are usually used to inform organizational actors and direct their attention to these priorities. Managers may use diagnostic controls to benchmark against preset standards. The purpose of the diagnostic lever is to motivate individuals to perform and align their behaviour with the organization’s objectives. Information provided by the diagnostic lever enables research directors to make more informed decisions based on the organizational driver to be monitored for a successful implementation of the research mission. In this way, diagnostic systems act as negative forces, because they constrain the individual’s behaviour similar to boundary systems (Widener, 2007). However, academic work such

as teaching and research are regarded as uncertain technologies with a vague relationship between inputs and outputs (Musselin, forthcoming). Thus, the obtained performance measures are more likely to lack validity and reliability, resulting in dysfunctional behaviours (Simons, 1995). Ball and Wilkinson (1994) discuss how performance indicators meet with resistance in HEIs because they are considered to reflect academic tasks to an unsatisfactory degree and therefore find only limited application. The possibility to set a goal, measure outputs and compute variances depict the necessary preconditions for using performance indicators diagnostically (Simons, 2000). Neither of these preconditions can be satisfied in an academic research environment. Given the high degree of uncertainty in research activities, the properties of the obtained performance measures are associated with instability, high noise and variations, and thus do not lend themselves to be used diagnostically (Widener, 2007). As an example, diagnostic controls might encourage opportunistic behaviour among researchers due to performance-based compensation and transparent evaluation processes. This is critical, as it jeopardizes perceived equality among the researchers and therefore potentially erodes commitment and shared responsibilities among them (Simons, 1995). In summary, the introduction of more bureaucratic controls as triggered by NPM instruments in HEIs' research centres are likely to clash with the informal mode of control and consequently may damage the relational dimension of social capital (bonding). On the other hand, diagnostic controls might enhance the structural dimension of social capital (bridging) by demonstrating the research centre's capabilities to funding bodies and alliance partners (Cooper & Slagmulder, 2004; Mouritsen & Thrane, 2006). Scholars found that the representation of more efficient work processes are capable of polishing an organization's reputation,

which might develop into relational signalling (Lindenberg, 2000) or goodwill trust (Tomkins, 2001). Generally, individual social ties are often regarded as certificates of social authority by external agents (Lin, 2001). Social networks in the academic peer review process provide feedback effects and generate legitimacy. For example, a funding agency might be more inclined to invest in a project submitted by a highly reputed scholar as it mitigates information asymmetry. Analogously, MACSs may help to generate legitimacy in signalling compliance and rationality to external agents, and thus, act as an enabling mechanism to bridge structural holes. Abernethy and Chua (1996) for example, have studied the factors influencing the choice of MACSs in a large Australian hospital and produced some evidence that the compliance with the state funding authority played a considerable role in this process. Again, this study accentuates the critical role of legitimacy in mission-based organizations, which can be easily transferred to research centres in higher education. Furthermore, the continuous pressure to acquire sufficient funds for their research might strengthen the academics' dependency on their research centre, which would offer a potential to accumulate bonding social capital. However, this hypothesis might not hold across all disciplines as indicated by Bleiklie et.al. (2011): researchers predominantly operating in inter-institutional, international research groups may actually become more decoupled to their research centres as each member individually seeks for third party funds and becomes involved in partnerships that would support the development of their own group's research agenda. In this vein, diagnostic controls would help to bridge structural holes in order to maximize research funding.

As a fourth lever of control, the interactive control system seeks to enhance discussion about strategic uncertainties and to learn new strategies in order to adapt to

new environmental situations (Simons, 1995). Simons (1995) further highlights the interactive system as mechanism for managers to involve themselves in subordinates' decision activities personally and regularly. The interactive system serves as a means for the organization to search for new possibilities to position itself in a dynamic market place and intends to enhance the manager's ability to anticipate and manage future uncertainties (Simons, 2000). As communication is encouraged, a research centre's strategic uncertainties, e.g. with respect to funding, can be identified and mitigated, e.g. in cooperating with another institute in terms of a joint project and thus, extending networks (bridging). Face-to face communication and debates on values as initiated by the interactive system are also more likely to enhance bonding among individuals. According to Henri (2006), interactive MACSs can be compared to informal controls as they reflect two common features: (1) norms of cooperation, communication and emphasis on coordination and (2) open channels of communication that ensure a free flow of information throughout the organization. They have also been associated with rather relaxed views of rationality (Tuomela, 2005, p. 301).

In summary, the different control levers do not show uniform effects on bridging and bonding social capital. Given the move from professional modes to more managerial approaches under NPM that is also central to the study of Chenhall et al. (2010), this paper reinterprets the often contradictory effects of MACSs on social capital dimensions in research centres of HEIs (see Table 4).

2.4 The moderating effect of social capital on HEI research centre performance

The preceding discussion of emerging tensions between a research centre's social capital and MACSs builds the foundation for the contingency framework developed in

this study. As such, the framework seeks to map the interplay of both concepts and hypothesises their combined effect on the organizational performance of HEIs' research centres as a function of their research mission. This section therefore seeks to highlight and reconcile previous streams of research in order to develop the theoretical model for the proposed study.

In doing so, I first discuss how NPM instruments, which are usually of diagnostic nature, relate to research performance by drawing on the work of Schubert (2009). Based on a solid data set of German HEI research centres, he analyses the effects of NPM instruments on centre efficiency and concludes that the impact of formal governance mechanisms are sensitive to the centre's mission. Table 5 provides an overview of which NPM instruments have been found to impact research efficiency across three of the missions analyzed by Schubert (2009). These missions can be categorized into publication, teaching and transfer orientation as well as a balanced set of all three output bundles. Given the fact that research centres specialize in certain activities as derived from their mission, research evaluations should also align with these differences as outlined in Table 6. However, the specialization of research activities does not mean that other research output dimensions are insignificant.

Table 4: Emerging tensions between Simons' (1995) LOC framework and social capital dimensions (following Chenhall et al., 2010, p. 743).

<i>Definition of control lever</i>	<i>Focus of control</i>	<i>Importance to bonding/ bridging social capital</i>	<i>Possible tension</i>
Belief System the explicit set of organizational definitions that senior managers use to communicate and reinforce the values, purposes, and directions for the organization	Clarify, reinforce and communicate research centre's values To strengthen financial values related to stakeholders' interest (e.g. funding agencies)	Enhance bonding by clarifying core values when creating a research team and reinforcing values between existing employees Enhance bridging by helping researchers from another HEI/institution/company to understand the research centre's core values and purposes, particularly when creating a new research project	Belief system promotes and reinforces values, boundary system might be perceived as unnecessary or even suggest that the researchers within the centre cannot be trusted, which could harm bonding. The more concrete the beliefs system, the higher the need to protect the own values and the higher the risk for an inward focus (inertia) that stresses bonding but neglects bridging social capital.
Boundary System used by top managers to establish explicit limits and rules within which member can operate	Delineate the undesired domains of research activities to address strategic risk	Enhance bonding by clarifying unacceptable areas of activity	Strategic Research Orientations might interfere with research interests of individual researchers and thus may serve as a anti-trust mechanism that hampers bonding
Interactive Control System formal systems managers use to involve themselves regularly and personally in subordinates'	Use of different formal controls to focus attention and force dialogue throughout the research centre in order to capture the whole breadth of	Enhance bonding by encouraging debate on values and future directions of the centre Enhance bridging by helping directors to identify strategic uncertainties (e.g. funding) that might create the potential to establish alliances/ cooperative research	The formality of the interactive use of MACSs might be inconsistent with the customary clan culture in research centre, which might inhibit bonding

decision activities	uncertainties	projects thus extending networks in order to neutralize competition	
Table 4 (cont.): Emerging tensions between Simons' (1995) LOC framework and social capital dimensions (following Chenhall et al., 2010, p. 743)			
<i>Definition of control Lever</i>	<i>Focus of control</i>	<i>Importance to bonding/ bridging social capital</i>	<i>Possible tension</i>
Diagnostic Control System formal systems used to monitor organizational outcomes and correct deviations from preset standards of performance	Used to describe research centre's activities in formal plans and budgets To control that performance in the critical success factors of the mission is acceptable	Enhance bonding by clarifying goals and cascading expectations throughout the organization Enhance bridging by: 1) demonstrating capabilities (reputation, distinctiveness, prestige) to engage in network activities (Cooper & Slagmulder, 2004) which may develop into relational signalling (Lindenberg, 2000) and goodwill trust (Tomkins, 2001) 2) identifying areas of joint interest thereby reinforcing parts of network (Mouritsen & Thrane, 2006) 3) Gaining legitimacy through the adoption of a MACSs more similar to the ones employed by external constituents e.g. funding agencies and corporate cooperation partners (Abernethy & Chua, 1996)	Diagnostic controls provide information to manage research centres in a more efficient way. When invalid and unreliable performance measures are employed due to the unclear relationship between inputs and outputs, dysfunctional behaviours are likely that hamper bonding. Diagnostic controls might encourage opportunistic behaviour among researchers due to performance-based compensation that jeopardize the perceived equality and thus potentially erode commitment and shared responsibilities (Simons, 1995, p. 218f). The introduction of more bureaucratic controls as driven by NPM might clash with the organic mode of control and thus damage bonding.

For example, a transfer-oriented research centre may also be urged to translate the new knowledge acquired in a joint industry project into scientific publications in order to generate legitimacy and reputation in the knowledge market. Schubert (2009) therefore measures a research centre's performance based on several dimensions: the output bundle is composed of a performance indicator of each of the remaining research missions whereas the indicators with respect to the identified research mission of the centre under examination carry more weight and, thus, dominate the output bundle.

Table 5: NPM instruments and their impact on research performance (Schubert, 2009)

NPM instrument	<i>Publication-oriented Mission</i>	<i>Graduate Teaching-oriented Mission</i>	<i>Transfer-oriented Mission</i>
Strategy			
Research councils		X	X
Evaluations	X		
Accountability			
Strong presidents	X	X	X
Goal agreements			X

The current study omits, to limit analytical complexity, the possibility that a research centre's mission specifies a balanced mix of publications, teaching and technology transfers. However, since HEIs under NPM are advised to develop unique agendas and profiles (Enders, 2001; Schmoch, Schubert, Jansen, Heidler, & von Görtz, 2010), the remaining research missions (publication, graduate teaching and transfer orientation) allow for a more direct link between a research centre's beliefs and boundary system. Moreover, it is widely acknowledged that scientific production is a multi-dimensional construct that transforms various inputs (e.g. capital equipment, trained academics) to various outputs (publications, patents, knowledge transfer) (Johnes, 2006; Nagpaul & Roy, 2003; Schmoch et al., 2010).

Table 6: Research centre missions and their output bundles (Schubert, 2009)

	<i>Publication-oriented Mission</i>	<i>Graduate Teaching-oriented Mission</i>	<i>Transfer-oriented Mission</i>
Dominant Output Dimension	Knowledge and reputation generation (Basic research)	Maintenance (Education and Qualification)	Interaction with companies and governmental bodies
Output Bundle			
<i>1st dimension</i>	Number of publications	Number of conferred doctoral degrees	Number of advisory services for companies/ governmental bodies
<i>2nd dimension</i>	Citations per publication as a measure for impact	Number of conferred state doctoral degrees	Number of co-operations with companies/ governmental bodies
<i>3rd dimension</i>	Number of co-operations with and advisory services for companies/ governmental bodies	Number of co-operations with and advisory services for companies/ governmental bodies	Number of conferred doctoral and state doctoral degrees
<i>4th dimension</i>	Number of conferred doctoral and state doctoral degrees	Fraction of time spend on third party research as a proxy for third party funds	Fraction of time spend on third party research as a proxy for third party funds

The literature also reports several flaws in measuring the performance of HEI research centres, but progress is being made (Lepori et al., in press). Additionally, Schmoch et al. (2010) notes that the returns of the scientific output are not always completely amortized by the producing research collaboration. To define the limits of this investigation, the current study does not explore these ascription problems and also does not take into account that scientific outputs such as graduate teaching might be the input for another knowledge production process. Thus, measuring the multidimensional scientific performance of each research centre is beyond the purpose of this paper. However, collected bibliometric data ought to allow for first directions as to the

moderating impact of social capital on the effectiveness of MACSs as reflected in research performance.

In essence, the intensity of the diagnostic and interactive control system (as determined by NPM reform dissemination) and its consequences for the research centre's social capital across the three missions are considered to represent the crucial scenarios to address the research questions. To illustrate how social capital is expected to accentuate or diminish the proposed tensions in Table 3, the paper also draws on a stream of HEI literature in order to classify research centres in the higher education sector according to their special features. In more detail, the paper adopts contingency models as developed by Whitley (2000) and Seeber (forthcoming). Whitley (2000) highlights task uncertainty and the degree of mutual dependence as key elements of academic work. Whereas task uncertainty might be found in every research centre, its magnitude may also depend on the research centre's mission. Whitley's contingency arguments also find expression in Seeber's (forthcoming) work on the extent to which the scientific discipline of a research centre influences the steering capability of university leadership under NPM controls. In the long run, LOC belief and boundary systems can be seen to influence and shape both missions and disciplines. However, the more pragmatic focus in this study is on the extent to which proactive research centre directors might assess and attempt to optimize the interaction between LOC interactive and diagnostic systems arising from NPM and key mission deliverables where this interaction is thought to be moderated by social capital effects.

To summarize prior to introducing the central propositions of this study, I first reiterate that the purpose of the current study is to examine how an HEI's research

centre's MACSs can satisfy the imperatives of NPM reforms without sacrificing its research mission. I then note that current research as summarized above demonstrates two clear sets of linkages as follows: 1) from NPM to Mission to Performance in HEI Research Centres (Schubert, 2009) and 2) from NPM to Levers of Control to Social Capital enhancement / inhibition to performance 'tensions' in an NGO (Chenhall et al., 2010). Synthesizing these two sets of linkages (see Figure 2), I formulate proposals regarding the likely impact of the LOC arising from NPM on the performance of research centres as moderated by the effects of social capital. The actual performance propositions are summarized in Table 7 and will be developed during the next sections. In Table 8, I recapitulate the interplay between social capital and a research centre's MACSs which in turn affects the research performance when controlling for the mission of the different research centers.

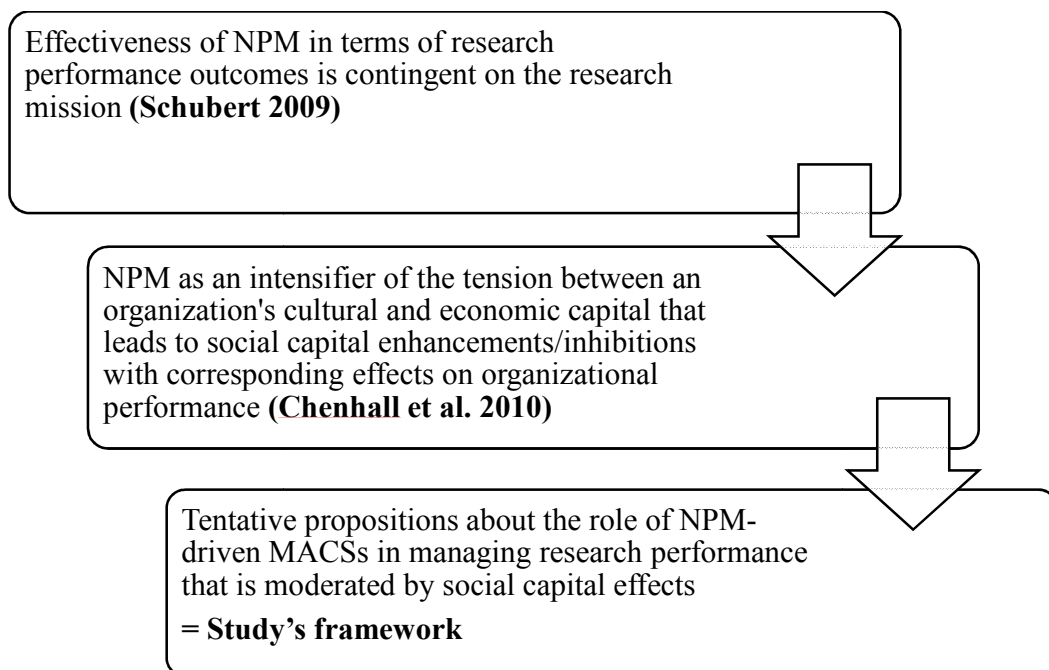


Figure 2: Developing the study's empirical framework

Table 7: The effects of MACSs on research performance including social capital as moderator

Belief and Boundary Lever of Control	Decisive dimension of social capital for research mission	Effect on decisive social capital dimension when diagnostic and interactive lever of control is used Intensively/less intensively	Expected Effect on Research Performance
Publication oriented	<i>Bridging</i>	+ / -	+ / -
Teaching oriented	<i>Bonding within</i> the research centre	- / +	-/+
Transfer oriented	<i>Bonding between</i> cooperation partners	+ / -	+ / -

2.4.1 Publication oriented research centres.

I begin my proposal development with publication oriented HEI research centres and observe that such centres encourage individuals to move beyond their organizational knowledge silos to solve complex and novel problems in a rapid manner. A series of studies measuring the degree of collaboration among scholars using co-authorships in academic journals provide evidence for this proposition across various disciplines (Acedo, Barroso, Casanueva, & Galán, 2006; Cronin, Shaw, & Barre, 2004; Laband & Tollison, 2000; Moody, 2004). Accordingly, these research centres are expected to rely more heavily on bridging social capital, as the academic tenure system requires interactive networks to coordinate and accomplish complex tasks (Simons, 1995, p. 211f). Mutual dependence among academics within a research centre is expected to decrease with the adoption of a publication mission, since the reputation of the centre is ensured by the academic peer review process. In this perspective, several studies have revealed that reputation is an important reward for scientists across various disciplines (Dasgupta & David, 1994; Viner, Powell, & Green, 2004). Therefore, reputation can best

be obtained by conducting outstanding basic research and to a lesser extent by producing intermediate outputs such as graduate teaching (Schmoch et al., 2010). Consequently, publication oriented research centres seem to require higher levels of bridging social capital in order to meet their authority, legitimacy and reputational requirements. Furthermore, where the supply of resources, e.g. in terms of research funds or appropriate project partners, is likely to be restricted in their own research centre, bridging social capital may be most beneficial to overcome these shortages.

Having elaborated on the emerging tensions between a research centre social capital and its MACSs, one would expect that a more intensive use of the diagnostic and interactive levers of control affects the number of publications positively, as their adoption signal the research centre's capabilities to potential funding agencies and co-authors. Consequently, better funding opportunities may attract individuals outside their own research centre and therefore foster bridging social capital. This should be of particular relevance for research centres pursuing a publication mission, since their ability to attract funds is largely determined by their past research publication performance (Arora, David, & Gambardella, 1998). Empirical evidence from German HEIs suggest that regular assessments of the research activities in publication-oriented research centres enhance their efficiency, e.g. in providing long term agendas that signal competencies to potential alliance partners (Schubert, 2009). Regular evaluations may also contribute to a higher visibility of research outputs, which might translate into legitimacy and reputation and, thus, should foster sustainability of the research centres.

2.4.2 Graduate teaching- oriented research centres.

This second output profile under examination might face lower levels of task uncertainty as curriculum plans are specified. Consequently, this seems to allow for a more feasible link between teaching inputs and outputs relative to research activities. Activities related to graduate teaching would therefore lend themselves more to the use of formal controls. This is in line with Schubert (2009), who argues that the intrinsic motivation of scientists may not necessarily apply to activities linked to research as it is the case with graduate teaching. He therefore suggests that formal controls as imposed by NPM may help to reduce moral hazard in academic work.

However, when considering how scientists are likely to react to these formal controls, one may conclude that the design and use of MACSs should not only be driven by rational purposes. This is because academics are more likely to benefit from higher levels of bonding social capital in delivering high quality education to graduate students since strong ties have been argued to serve as a trust-based governance mechanism (Gabbay & Zuckerman, 1998). Bonding social capital derived from enhanced levels of mutual dependence among scientists in graduate-teaching oriented research centres is also important as it may yield quality information and stimulate the sharing of tacit knowledge (Hansen, 1999). Furthermore, strong ties among graduate teachers are beneficial for teaching and its accompanied activities (e.g. the development of curriculum plans) to ensure that teaching is directed towards a common goal. A common commitment towards these strategic orientations is also likely to emerge from bonding social capital because shared values have been discussed as its potential outcomes (Adler & Kwon, 2002; Coleman, 1990).

Table 8: Linking social capital to Simons' (1995) levers of control framework

<i>Belief and Boundary Lever of Control</i>	<i>Implications of the Belief and Boundary Lever of Control for</i>		<i>Decisive Social Capital Dimension</i>	<i>Implications of Interactive and Diagnostic Lever of Control for The Decisive Social Capital Dimension</i>
	<i>Bonding Social Capital</i>	<i>Bridging Social Capital</i>		
Publication oriented	Low mutual dependence among researchers within the research centre is expected to decrease	Reputation is determined by the academic peer review network that assesses the quality of the research performance	Bridging	Bibliometric performance indicators may increase long- term strategic capabilities that may help to boost legitimacy and reputation and thus, stimulate bridging social capital
	High task Uncertainty	Needed to acquire unique, project-relevant knowledge (Hansen, 1999)		Enhances bridging by demonstrating the research centre's competencies to funding bodies/ alliance partners (generation of legitimacy and reputation)
Teaching oriented	Higher mutual dependence among academics within research centre	Graduate-teaching as partly driven by market forces, but curriculum plans need to be developed and agreed upon internally that requires higher levels of internal social capital	Bonding within research centres	Invalid and unreliable performance measure are likely to hamper bonding (cultural clash)
	Low task uncertainty			Might encourage opportunistic behaviour among researchers due to performance-based compensation that jeopardize the perceived equality and thus potentially erode commitment and shared responsibilities (Simons, 1995, p. 218f).
Transfer oriented	Higher mutual dependence among academics / partners	Academics are heavily reliant on personalized and informal patterns of transfer (Krücken, 2003), crucial role of shared values between alliance partners	Bonding between research centres/ partners	May foster bonding between collaboration partners in: <ul style="list-style-type: none"> - Reducing institutional gaps - Promoting higher levels of efficiency in clarifying objectives, providing focus and reducing uncertainty
	Moderate task uncertainty			

Assuming that coherence in beliefs and common values are a precondition for effective graduate teaching, “hard” levers of control such as budgets and performance indicators may threaten the equality among the researchers and thus, erode common commitment. Given the previous line of arguments that accentuate these centres’ inward focus, a more intensive use of MACSs would therefore suggest detrimental effects for these kinds of research centre in terms of their research performance.

2.4.3 Technology transfer oriented research centres.

These centres usually operate based on a common scientific paradigm that allow a replication of the experimental results and their formalization, e.g. with mathematical models (Gagliardini, Gourieroux, & Renaut, forthcoming). Thus, the extent to which scientists are mutually dependent within these research centres is expected to be enhanced, indicating the need for bonding social capital. Here, an argument could also be made with respect to the importance of bonding social capital between the collaboration partners. This is because technology transfer- oriented research centres must successfully collaborate with various external stakeholders, such as scientists of private organizations. Similarly, Krücken (2003, p. 27) argues that academic researchers operating in a technology transfer-oriented research centre are heavily reliant on personalized and informal patterns of transfer. Based on the author’s field data collected in transfer-oriented research centers in Germany, the estimated ratio of nine informal projects to every formal one being mediated via transfer offices clearly indicates the importance of bonding social capital between the collaboration partners. Hence, research centres that seek to maximize the number of patents and spin-offs as their primary output objective must demonstrate their capabilities to potential alliance partners and funding agencies.

MACSs could assume an important role in this process as they have been found to increase long-term strategic capabilities as well as short and mid-term accountability in transfer-oriented centres (Schubert, 2009).

Krücken (2003) also found that successful technology transfer builds on high degrees of trust between the involved parties. Taking into account that previous research in the corporate field view MACSs as adequate means to establish trust in providing durability and predictability (Langfield-Smith & Smith, 2003; Mouritsen & Thrane, 2006; Tomkins, 2001), they may help to overcome the institutional gaps between academics and researchers in private organizations. As a consequence, they may affect the number of produced patents, number of cooperations and the number of advisory service projects positively. In Schubert's (2009) study of German HEIs, empirical findings suggest that the formalization of goals, e.g. with the aid of management by objectives, augment the performance of transfer oriented research centres. Since activities are more routine when collaborating with private firms vis-à-vis other research missions, MACSs may promote higher levels of efficiency in clarifying objectives, providing focus and reducing uncertainty. In conclusion, I expect that a more extensive use of the diagnostic and interactive control levers fosters bonding between collaboration alliances which would subsequently result in superior research performance of technology-transfer oriented research centres.

3 Research Design

In this section, I will delineate the research methodology, including the underlying philosophy behind this study, as well as the research methods and procedures used.

3.1 Research Methodology

A qualitative approach was employed in order to understand how individuals in knowledge-intensive settings react to different components of MACSs and how, in this regard, social capital theory may inform management accounting theory and practice. In general, qualitative research approaches are concerned with the understanding of the social phenomena through the perception and interpretation of individuals in their natural settings (Eriksson & Kovalainen, 2008). Particularly, the interpretivist paradigm, which builds on the idea that reality is socially constructed and in continuous flux, offers a solid foundation for a qualitative study of an exploratory nature. Exploration can be understood as a “more naturalistic mode of inquiry” ...[that]...”involves flexibility and shifting points of observation and lines of inquiry in order to gain a clear understanding of how to pose the problem, what data are relevant and how to identify significant lines of relationships for closer inspections” (Tomkins & Groves, 1983, p. 363). A gradual deepening of the explorative inquiry is then achieved by inspection, which Tomkins and Groves describe as the investigation of an “analytical element of the study from different perspectives [...] checking out, for example, how different people view events which occurred or are occurring and, indeed, gradually deepening one’s understanding of what views each person holds” (1983, p. 363).

From the perspective of an explanatory study, a case study design was considered as a feasible research strategy. Since there is little existing research on the role of MACSs in the development of social ties in and between knowledge-intensive organizations, a comparative case study design was regarded as most appropriate to provide context and a deeper, more enriched understanding about the phenomenon (Gibbert, Ruigrok, & Wicki, 2008; Yin, 1988). According to Yin (2003), a comparative case study enables the exploration of differences within and between cases that aims to replicate findings across cases. In this study, however, the main benefit of using a comparative case study is not predominantly obtained by its generalizability- enhancing character, but rather from its potential to increase the rigour in the qualitative understanding in each of the cases, e.g. through drawing contrasts between them. Applying a case study methodology is also in accordance with recommendations from higher education researchers calling for rigorous case studies of HEI research centres (Seeber, forthcoming). This is because HEIs are highly fragmented and idiosyncratic organizations- a characteristic that considerably complicates a quantitative approach (Musselin, forthcoming). The inclusion of the concept of social capital to understand the interplay between different levers of control and their combined effect on a research centre's performance is regarded as the novel contribution of the study at hand. Hence, case study design was chosen as it is a predestined methodology to answer "how?" and "why?" questions and to conduct a holistic, in-depth investigation rather than identifying simple frequencies and incidences (Yin, 1988, 2009). As outlined in Table 8, it would be interesting to examine how social ties develop in HEI research centres where research directors are more or less experienced with MACSs. Applying the LOC framework in a diverse set of research

centres has the potential to validate relationships within the framework and, thus, to develop management accounting theory (Eisenhardt, 1989). Comparative case studies are suited to address predefined research interests and to extent emergent theory (Eriksson & Kovalainen, 2008). In the regional economic literature, comparative case studies are regarded as a valuable strategy for the investigation of complex socio-economic systems (Doloreux, 2002), that are particularly suitable to examine causal links and underlying mechanisms (Markusen, 1999). Hence, the developed theoretical framework as summarized in Table 8 serves as an anchor for the study to enter the field, but it was not examined in a systematic and rigorous way due to the study's exploratory nature.

Furthermore, this research does not claim final knowledge; rather it seeks to provide a starting point for exploring the moderating impact of social capital on the MACSs - research performance relationship, and thus, allows me to assess the empirical usefulness of the proposed framework. Clearly, the study's objective is to extend and synthesize the existing literature on MACSs and social capital in the special setting of higher education, instead of developing a completely new theory. Thus, the current research reinterprets Simons' (1995) LOC framework in the HEI context, which serves as the main conjecture of how MACSs and social capital might interplay (see Table 8). Following Yin (2009, p. 130f), the overarching propositions help to focus attention on certain issues, to organize the case study and to formulate alternative explanations that need to be analyzed.

3.2 Sampling

Networking in academic work is not a new occurrence, but a well-established coordination instrument that has even grown in importance with the introduction of the

new managerial logic as triggered by NPM reforms. Research organizations in higher education therefore provide a powerful setting to explore the dynamics of the interplay between social capital and MACSs. Since research centres within a single research institute may well differ in terms of their research mission, I chose research centres as the unit of analysis. Beside this consideration, the greatest problems with knowledge production and control are likely to occur in research centres where the research mission needs to be delivered, making another strong point to narrow down the level of analysis as much as possible.

Drawing on data from two different national NPM contexts was intended to highlight the role of the levers more transparently. The two European HEIs were selected according to their institutional context, which literature has identified as significantly different in terms of their NPM instrument dissemination. Because the HEIs chosen for this study belong to different national contexts, maximal variation was obtained in contrasting market-oriented systems (NPM forerunner country) to state-oriented systems (NPM latecomer country). Selecting an HEI in an NPM forerunner and in an NPM latecomer country ought to reflect the interviewee's degree of experience with managerial approaches (i.e. MACSs). Limiting the examinations to research centres that belong to a single HEI in each NPM setting was hoped to provide some power to the research design.

The two selected HEIs for this study are widely considered to be prestigious research universities within their country and have an international reputation. Although the gathered data provide distinct pictures of the selected HEIs, they may not necessarily be representative of the national higher education system in these countries. Contrasts

may also be ascribed to the fact that one of the research sites follows an entrepreneurial mission, whereas the other one leans more towards the traditional model of the university being an education and research provider. However, in the long term, these differences are likely to be a consequence of their institutional context, i.e. the degree to which NPM reforms have been disseminated. This argument is supported by institutional theory, arguing that the need for legitimacy and survival may prompt a convergence or even a homogenization in organizational customs and structures within a common institutional context (DiMaggio & Powell, 1991). To develop a deeper understanding of the selected research sites, it is necessary to elaborate on the status quo of the NPM reforms and how quality is defined and assessed in the respective research centres.

3.2.1 NPM forerunner country.

Beginning more than two decades ago, the country selected as a representative of NPM forerunners has experienced major shifts in the governance of public organizations, with direct and indirect effects on the academic profession. Most penetrating reforms in the HEI sector occurred during the 1990s and were accompanied by the following changes: (1) from ex ante steering and planning to a focus on bottom line results that grant single HEIs more autonomy, (2) a shift in academic power relations from collegial and horizontal structures to a top-down management approach that empowered the positions of deans and presidents, (3) governmental interventions as to performance mandates and a decreasing share of basic allocation in favour of research funding that is partly performance driven.

As a consequence of the mentioned key reforms, HEIs are autonomous to organize their internal organization to the greatest possible extent. Within this

institutional context, the study investigates Research Centres (Cases A to C) of an HEI (designated Alpha in the following) that perceives itself as an entrepreneurial university. Knowledge transfer activities, multidisciplinary research and more business-like organizational structures are decisive features of the selected HEI. Research centres A to C are embedded within Alpha's matrix structure to facilitate research in an interdisciplinary environment. Generally, research is less focused on theory building as an end itself but on producing scientific results with societal relevance and utility. This is also reflected in Alpha's quality assessment criteria used when it is examined by an external, independent institution: quality, productivity, relevance and vitality and feasibility.

Furthermore, Alpha shows a complex funding structure: direct funding provided by the national government consists of a teaching-related part, which is calculated based on the number of entering students and graduates, and a share intended to be used for research activities. Bibliometric indicators as well as an historical lump sum build the basis of a mild performance-based formula used to compute this research –related cash flow. Moreover, other third parties such as government and private companies provide additional resources for applied, but also for basic research. Particularly in NPM forerunner countries, governments shifted budgets from HEIs to research councils. This change was accompanied by the fact that the Research Centres' volume of research funds has been made more dependent on their earning capacity in the different funding sources. Indeed, similar resource allocation structures could be observed inside Alpha. The university therefore followed a differentiation strategy in adopting a more managerial approach than other European HEIs in order to highlight its distinctive mission. It relies

on a number of key performance indicators (KPIs) covering a wide spectrum of teaching- and research-related deliverables to set up the budget for individual research institutes. Although target values for the research institutes may vary, some of the key performance indicators are shared university-wide, e.g. the number of PhD defenses per research full time equivalent (FTE). In order to account for disciplinary effects, e.g. in terms of publication culture, KPIs are more tailored towards the specific discipline of the Research Centre, e.g. in adopting a wider definition of the number of spin-offs.

Figure 3 illustrates the main sources of income for European research centres.

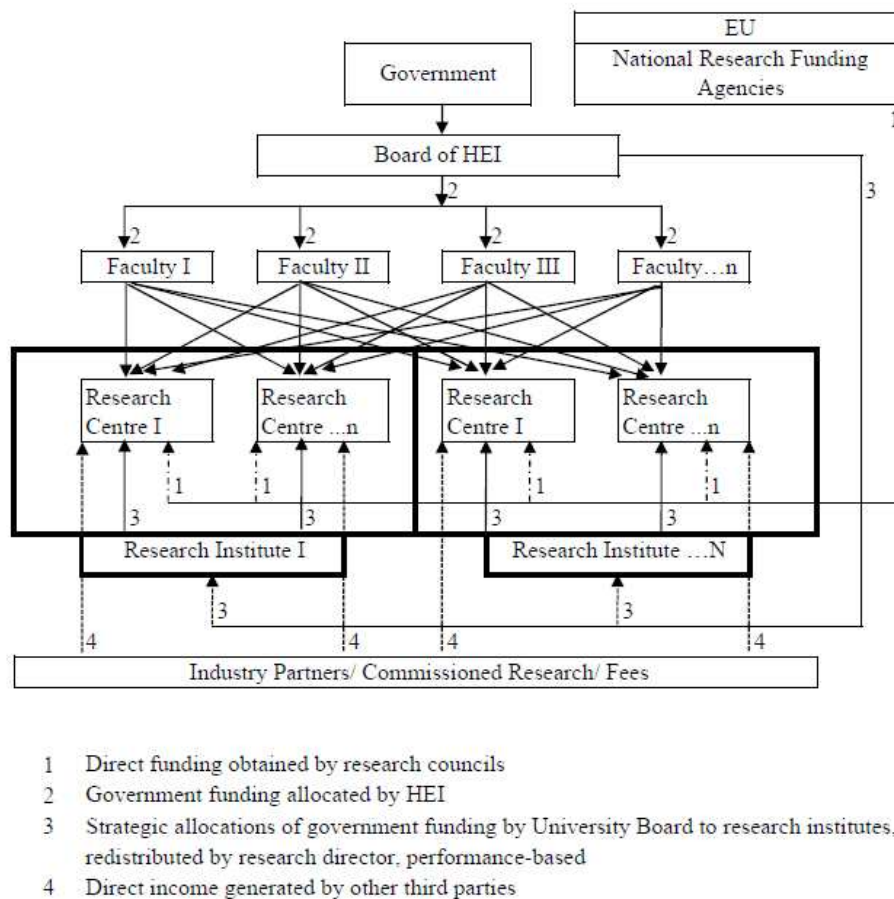


Figure 3: Streams of income in European HEIs

The main distinction between a NPM forerunner and latecomer in terms of their income is determined by the extent to which shares are allocated based on performance data. So far, external pressures in the NPM latecomer country described in the following have quite recently started to impact the funding and general management of HEI research centres. Another decisive difference between Alpha and the selected HEI in the NPM latecomer country (Beta in the following) is the power of the Research Directors. Unlike Beta, Research Directors in Alpha are members of the university's management team. Thus, directors of the institutes under the umbrella of Alpha exert direct influence on the university's strategic orientation.

3.2.2 NPM latecomer country.

The NPM narrative has a relatively young history in the country of the HEI under examination. Most pervasive reforms inspired by the NPM ideals were disseminated at the end of the 1990s. Similar to the NPM forerunner country, the new legislation focused on increased autonomy and an overhaul in values and customs of academics, but did not promote managerial approaches actively. In general, HEIs in this national context are well-endowed and private education institutions play a minor role. These factors exemplify the limits of market-based competition in this NPM mode. Reforms were aimed at ensuring quality rather than efficiency, which in fact led to increased funding combined with more soft impulses for competition. Recently, these impulses have been intensified as a considerable part of governmental grants are now calculated on the basis of third-party funds. External quality audits also found their way into HEIs in terms of regular evaluations, but can also be regarded as another soft steering mechanism as institutions and affiliated academics themselves assume responsibility for evaluations.

Again, similar patterns could be observed in the internal organization of the selected HEIs. Planning security for the individual research centres is secured to the extent that the HEIs' budget is a part of legislature and therefore shifts in allocations occur on an annual basis. For the longest time, internal resource allocation resembled the way funds were acquired externally. A recently introduced internal indicator-based allocation model, however, aims at establishing a link between performance and resource allocations to individual departments and research centres. This indicator-based allocation model resembles the one from the NPM forerunner country as to the funding stream which is composed of a fixed and a variable proportion. Nevertheless, a strong link between performance indicators and funding does not emerge from the study's dataset. Annual internal allocations to research centres are relatively stable and fundamental changes in these streams are influenced to a lesser extent by performance data.

Research activities in the Research Centres (Cases D to F) of Beta are predominantly disciplinary oriented, but not necessarily organized, e.g. research projects in centre E may involve several disciplines. The produced outputs are reflected in new knowledge claims which are continuously assessed in a peer-reviewed quality system by colleagues in the same field of expertise. Scientific relevance and excellence are the ultimate quality criteria beside the creation of new knowledge and theory building that is usually regarded as an end by itself. Research centres in this NPM mode can therefore be regarded as university research in the classical sense that is characterized by a disciplinary approach, the publication of research preferably in well-known international top journals or conferences as well as by a peer review network. Given its long tradition,

this research approach is well established and has been proven to lead to “certified, ‘unbiased’ and independent knowledge” (Ernø-Kjølhede & Hansson, 2011, p. 134). It should be emphasized, however, that this is not equitable to the absence of a peer review network ensuring the quality of the research or a lack of ambition to publish in prestigious international journals in the operating environment of Alpha. They are still resilient as in any other HEI.

3.2.3 Selecting cases.

In order to develop the comparative case study, cases were selected for theoretical reasons: Given empirical evidence that NPM-driven MACSs do not affect HEI research centres homogenously, but according to their research mission (Jansen, Wald, Franke, Schmoch, & Schubert, 2007; Schubert, 2009) and academic discipline (Seeber, forthcoming), these criteria were used to select appropriate pairs of research centres. Pairs of centres were selected in order to control for mission/discipline effects across the NPM dissemination variance by country, while providing within country variation in mission. Schubert (2009) derived four different output profiles of HEI research centres that emerged from previous work based on cluster analysis (Jansen et al., 2007): a balanced output scheme, publication oriented scheme, a graduate teaching scheme as well as a transfer oriented scheme. The current study follows a critical case sampling approach to analyse the phenomena of interest and to analyse the findings across related cases (Eriksson & Kovalainen, 2008, p. 125; Onwuegbuzie & Leech, 2007, p. 112).

Correspondingly, the balanced output scheme is neglected because the remaining three output bundles should provide the crucial scenarios to study the impact of the interplay between the different LOC and the organizations’ social capital on the research

centres' performance. Moreover, even if a certain output dimension dominates the output bundle, research centres still seek to balance their research outcomes, indicating that the measurement of their research performance should not neglect the remaining output dimensions. Overall, intermediate outputs such as graduate students or the involvement in scientific committee are important for the functioning of the overall scientific system. One would therefore expect that activities in support of the scientific infrastructure should strongly appear across all research missions. Looking at the problem from this angle, all research centres somehow pursue a balanced mission. In summary, three output profiles of research centres were selected in each of the two HEIs to develop the case study, resulting in a total of six cases. Table 9 summarizes the study's methodological approach. In retrospect, I was able to obtain three matched pairs of research centres pursuing a certain mission across the two different national contexts. Given the fact that the heterogeneity in research centres pursuing a certain mission is also attributable to the scientific discipline (Jansen et al., 2007; Schmoch et al., 2010), an attempt was made to control for this variable in the research design. With the exception of the publication oriented missions (Case A and D), the graduate oriented (Case B and E) and technology transfer oriented (Case C and F) Research Centres exhibit comparable disciplines.

Table 9: Case selection

	Theoretical reasons	Unit of Analysis	Level of Analysis
Institutional Context	NPM forerunner country NPM latecomer country	Head of research centre/ Director of research institute	Organizational level (MACSs, social capital)
Mission (Alpha, Beta)	Publication oriented (A, D) Graduate- teaching oriented (B, E) Transfer oriented (C, F)	3 per institutional context = 6 cases	

While caution needs to be paid in drawing any conclusion about differences between the two countries, even more attention needs to be devoted when comparing the publication oriented missions across the national contexts. The publication oriented centre in Alpha is positioned in natural science whereas the publication oriented Research Centre in Beta is a typical representative of a social science. By all means, it would have been more desirable to analyze a bigger sample of research centres across the two national contexts, both- quantitatively and qualitatively. This would allow for a correlation analysis between the self-reported activity profile and the centre's multi-dimensional performance data as demonstrated in the study of Schmoch et al. (2010). However, collecting a comprehensive bibliometric profile of each of the Research Centres would have introduced an incredible amount of complexity which was simply not feasible within the framework of this study involving a more exploratory character. Nevertheless, efforts were made to collect relevant output variables for each of the research missions under analysis (see Table 16 to 18). Where possible, budgets were collected to disentangle the estimates of the research directors with respect to the centres' income structure as summarized in Table 15.

3.3 Data Gathering

3.3.1 In- depth interviews.

To address the research questions of the study, the study primarily relies on in-depth interviews with the heads of each of the six Research Centres belonging to two European HEIs (i.e., Cases A through F). Given their discovery oriented nature, I regarded it as most appropriate to use in-depth interviews based on a semi-structured format. The interviews were conducted between June and August 2011 and included visits to each

University campus. To identify and find directors of appropriate research centres, I browsed the web-pages of suitable research centres to collect their contact information. Potential participants then received an e-mailed letter of invitation to participate in the study (see Appendix A). The cover letter briefly introduced the researcher and the topic of the study, and outlined the desire to interview them and administer a short online survey to the individuals affiliated to the Research Centre in which their own research activities were embedded. Additionally, the invitation letter was supplemented by a research project outline to provide further context (see Appendix B). As stated in the invitation letter, participants were contacted via telephone after one week if they did not convey their refusal or willingness to participate within this timeframe. The purpose of that telephone call was to clarify any questions and to learn about their willingness to participate. Subsequently, participants received the actual consent form (see Appendix C) and were invited to ask any additional questions they may have before agreeing to participate in the study. Once they expressed their willingness to cooperate, an interview appointment was set up via e-mail that usually involved contact with their secretaries.

With the exception of one interview that was carried out via telephone, data were collected in a single one-on-one interview with the participants. Although the telephone interview differed to the in-person interviews in terms of the absence of visual cues, using technology did not prevent an in depth discussion about the research question to be explored. On average, interviews spanned approximately 90 minutes. Another exception refers to the languages in which the interviews were conducted: I followed the wish of one interviewee to be interviewed in the participant's native language. As different languages may elicit different meanings across different cultural contexts, the collected

field data was shared with one of the project's supervisors to enhance the validity of my understanding of the reproduced interviewee's perceptions in the English language. Semi-structured interview protocols were developed in order to ensure the collection of relevant field data about the research directors' position and responsibilities, their institute and primarily their Research Centres' operational situation including its external environment, the directors' experience with and attitude towards MACSs, the management of resources and their network strategies (see Appendix D). At the beginning, interviewees were asked factual questions relating to their personal background and the activity portfolio of their Research Centre, in the style of Schubert (2009). These opening questions were followed by more open-ended questions which were developed from the existing literature on MACSs and social capital (Chenhall et al., 2010; Tomkins, 2001). Whilst the interview protocol provided a general agenda for the interviews, participants were free to elaborate on issues they regarded as important. The operationalization of the LOC variables followed measures used by Simons (1995). It is worth noting that all of the interviewees simultaneously assume the position of the research director of the affiliated research institute. This was seen as advantageous, because research directors of the institutes are direct users of MACSs who play a stronger role in terms of resource allocation and strategic capabilities, whereas the heads of the Research Centres act more as a coordinator and soundboard for the research director. Nevertheless, information concerning the specific operating environment and contents of research was best obtained by the head of a Research Centre. Additionally, the research directors in Alpha are members of the HEI's management team, which should allow for

an even more detailed overview of the research sites given the interviewees' expertise across the three levels.

3.3.2 Online survey.

Considering that these interview data are less informative with respect to the Research Centre's social capital dimensions, I regarded it as appropriate to collect this information in order to verify the proposed decisive social capital dimension as hypothesized in Table 8. Therefore, an online survey addressed to all members of the Research Centre was administered to collect egocentric network data that revealed each respondent's unique set of relationships. Egocentric network analysis was considered as appropriate because of "its capacity for including information on an actor's relations across a wide range of social settings" (Gabbay & Zuckerman, 1998, p. 201). Thereby, the study follows the approach of Cross and Cummings (2004), who apply a generator/interpreter methodology to collect and systematize respondents' social ties (Scott, 1990; Wasserman & Faust, 1994). Each member of the HEI's Research Centre was asked to list up to twenty people that provide crucial information to accomplish work-related tasks or contribute to solve complex problems imposed by the respondents' work content (see Appendix F). This method allows for a distinction between social ties within the Research Centre, the boundary-spanning ties outside to the Research Centre but inside the HEI from those that span beyond the HEI. In accordance with the interviews, I included warm up questions related to the research portfolio and type of research, to triangulate the answers provided by the research directors. To set up the online survey, the free software surveygizmo3.0 was used. This software allows for anonymous responses by hiding IP addresses, geo-location and invite data from individual responses,

reports, and exports. Initial contact with individual researchers of a research group was established through their heads, with whom interviews were conducted. The purpose of the questionnaire was discussed and an agreement to send invitation links to the individual researchers was secured. Whereas some interviewees took the initiative to send the invitation e-mails to their staff, all invitation e-mails to participate in the online survey stated explicitly that the consent from the head of the research group had been obtained (see Appendix E). E-mail invitations were sent the day of the interview to the Research Centres' scientific staff. They were given at least six weeks to complete the survey. I followed the recommendations of Dillman (2000) for the administration of an online survey. Accordingly, after a period of four weeks from the initial invitation, individuals received a friendly reminder e-mail to complete the survey. However, one of the research directors refused consent since confidentiality concerns emerged from this instrument with respect to the collection of individual names. Again, the interviewee was presented with arguments such as the Ethics review approval from the University of Lethbridge, the fact that no names will occur in reports as data will be classified into exo- and endo-institutional ties that further will only be presented in aggregate and that responses are anonymous as long as no e-mail addresses are provided voluntarily. As a result of these concerns about the rather sensitive information to be collected with the survey instrument, an overall response rate of 20.93% was obtained from a total of 86 invitations. The sensitive character of the network information to be collected and the associated concerns are also reflected in the fact that 41.86% of the individuals of the sample frame made an effort to access the online-survey, but never completed it. Since

this problem was anticipated, survey data is not used to establish any causal link between variables, but is only used in a preliminary fashion to triangulate collected field data.

3.3.3 Secondary data.

Aside from the interviews and questionnaires, other data sources were used to develop a more enhanced understanding about the Research Centres and to conduct meaningful interviews (see Table 10). These include financial reports, internal MACSs documents such as budgets, performance measurement documents, the codes of conduct and mission statements, press releases, as well as webpage information. In taking an interpretive perspective, the collected data from the e-mail survey about the HEIs social capital can be linked with the collected secondary data about the Research Centres' performance, e.g. financial reports, in order to make sense of human action and the meaning these individuals attach to it (Eriksson & Kovalainen, 2008, p. 117).

Table 10: Secondary data sources and their main use

Data	Use
Webpage information	
Mission statements	Classification of research centres
Contact information	Schedule Interviews
Bibliometric and performance data	Linking field data to research performance
MACSs documents	
Budgets	Triangulation of field data and assessment of the degree of formalisation
Staff evaluation forms	
Strategic Documents	Performance Data
Others	
Progress Reports	Triangulation of field data
Educational program booklets	
University Advertisement	
National research evaluation documents	

3.4 Data Analysis

In each case, interviews were digitally recorded and transcribed into text. Data analysis followed the three-stage approach suggested by Miles and Huberman (1994), which is more congruent with Eisenhardt's (1989) inductive-oriented strategy for case material analysis. The procedures include data reduction (selecting, focusing, simplifying, abstracting, transforming), data display (organized, compressed), and conclusion drawing coupled with verification (noting irregularities, explanations, possible configurations, propositions). Respectively, the collected field data (interviews) were coded (reduced) and then illustrated in an integrative diagram (organized), highlighting themes and concepts (patterns). Initially, data were coded according to their relation with any of the variables in the theoretical framework (see Figure 1). Next, keywords in the responses were highlighted and further disentangled into more precise categories. Finally, the relationship between the emerging themes was identified and integrated into a thematic conceptual matrix (Miles & Huberman, 1994, p. 131f). This process was accompanied by an analysis of overlapping data with the ultimate aim to identify and examine causes and relationships. Beside within-case analysis, some cross case analysis were carried out. Furthermore, this approach built the foundation for further exploration into the connections and relationships as posited in the theoretical framework, to result in a stronger analysis of the data in relation to literature substantiating the research questions.

3.5 Validity and Reliability

The comparative case study at hand will be evaluated according to whether the collected data can be meaningfully subsumed under the pre-established framework in

regard to general criteria such as parsimonious, testable and logically coherent theory (Eisenhardt, 1989, p. 548) and particularly to which extent competing explanations can be ruled out in the MACSs-research performance relationship as moderated by social capital. Since the current study adopts a constructive- interpretive approach in order to understand how participants attach meaning to the role of social capital in the research centre's MACSs, attention needs to be paid to potential researcher bias. Thus, criticism of the interpretivist paradigm mostly relates to the lack of rigour (Denscombe, 2002). Yet, it has been argued that a high degree of rigour can be maintained within constructive-interpretivist research by employing a systematic research approach (Denscombe, 2002). I considered the data analysis technique by Miles and Huberman (1994) as one example of such an approach, because this strategy seeks to provide a more complete and impartial approach in the data analysis and display by (1) presenting an auditable trail from transcripts to the findings of the analysis, (2) considering all cases when evaluating the data against the proposed framework, and (3) offering an analytical procedure suitable for assessing the tentative propositions that is simultaneously flexible enough to allow for the formation of new propositions that emerge from the empirical data (Lillis, 1999, p. 87f).

In this study, I used five verification strategies as suggested by Morse et al. (2002) to ensure reliability and validity, and, thus, rigour. Criteria are listed in Table 11 and relate to (1) methodological coherence, (2) sampling sufficiency, (3) developing a dynamic relationship between sampling, data collection and analysis, (4) thinking theoretically, and (5) theory development (Morse et al., 2002).

By definition, methodological coherence means that there should be a fit between research questions and components of the method. Interviews were seen as an appropriate method to explore the interplay between social capital and MACSs. However, it was considered as necessary to collect data on the individual level in order to draw conclusions about social capital dimensions. Given the different sizes of single Research Centres, which could vary up to 30 people, collecting data with an online survey was regarded as the most efficient way. Other questions asked in the online survey were concerned with the researchers' activities and type of research in order to validate the interview data. With respect to sample sufficiency, participants were most representative and possessed sufficient knowledge to address the research questions in order to ensure the appropriateness of the sample.

Table 11: Used verification strategies according to Morse et al. (2002)

Criteria	Current study
Methodological coherence	Interviews to account for the exploratory nature of the study Online Survey to verify the proposed decisive social capital dimension and to triangulate interview data
Sampling sufficiency	
Sampling adequacy	Ensured as participants simultaneously assumed the position of the research institute director and head of research centre under investigation
Sampling saturation	Sufficient to answer research question as revealed by pattern analysis
Developing a dynamic relationship between sampling, data collection & analysis	Collected field data were immediately transcribed (if necessary) and analysed
Thinking theoretically	New ideas were continuously subjected to an comparison with already collected data and future data to be collected
Theory development	Collected data were continuously subjected to literature surrounding the research question

As mentioned before, participants assumed both roles, the role of the research director of the entire institute as well as that of the head of the Research Centre under examination. Hence, participants were able to elaborate on the contextual and competitive influences of the research discipline, especially with respect to funding, while it simultaneously allowed an accurate discussion about the centre's operational environment and special features. Sample sufficiency also includes the need for sufficient data to ensure that all aspects of the phenomenon have been covered. I was concerned with the condition of data saturation. Arguably, the small sample size may not reflect the population to a sufficient degree, but the rich and detailed nature of the collected interview data still provide some noteworthy insight about individual responses to different components of MACSs in uncertain environments. The collected data would also benefit from the exploration of more causal relationships in the moderating impact of social capital on the interplay of MASCSs and its consequences for research performance. However, establishing a causal relationship between the LOC, social capital and research performance variables is beyond the scope of this study and would have, in fact, required a different research approach.

A dynamic relationship between sampling, data-collection and analysis was established in maintaining a certain degree of flexibility during the interviews, e.g. when the expected research mission did not match with the one suggested by its head. In these cases, additional questions were aimed at finding the reason for the discrepancy between the webpage information and the interview responses provided by its head. Besides, participants were encouraged to elaborate on topics that they regarded as crucial for the management of their Research Centre and thus, the focus of the interviews differed

without ignoring crucial research questions to be explored. Also, interviews were immediately transcribed and analyzed together with the collected internal documents in order to continuously reflect what kind of information were already collected and still needed to be collected.

A fourth strategy applied in this study was maintaining theoretical thinking. This was achieved by validating emerging themes with newly collected data as well as with already existing field evidence to ensure that ideas were still grounded in empirical data. Lastly, the continuous reconciliation of the collected field data with the relevant literature was aimed at solid theory development.

Additionally, the analysis of multiple data sources ensures data triangulation as an effort to improve the validity of the collected field data (Eisenhardt, 1989; Yin, 2009). Known as the hallmark of case studies, multiple data sources are said to contribute to data credibility. Thus, the cross-referencing of interview data against the collected secondary data were used to enhance internal validity and reliability (Yin, 2003).

3.6 Ethical Considerations

A proposal for the study was submitted to and approved by the Ethical Review Committee for Human Subjects Review of the University of Lethbridge. During all phases of research, this study strictly complied with the ethical guidelines and policies established by the Ethical Review Board. The most important ones are briefly described in the following. Firstly, informed consent was secured from subjects who had voluntarily agreed to participate based on complete and transparent information (see Appendices A to C for the interviews and E for the online survey).

As outlined in the research procedure section, a signature indicating informed consent was obtained from each interview participant. Similarly, at the beginning of the online survey, individuals were advised that they gave their informed consent when completing the questionnaire. Importantly, all participants were invited to ask questions at each contact. Consent was further obtained for audio recording the participants and for sending invitation links regarding the online survey to the members of their Research Centre.

Secondly, as a part of professional integrity, deception or other techniques to extract information from participants were rejected.

Thirdly, participants' privacy and confidentiality was respected in reporting only aggregated information that do not allow for an association with a certain individual regarding the online survey, because this information serves merely as a corroboration of the proposed decisive social capital dimension. Moreover, pseudonyms were used for research sites and interviewees to ensure their privacy. Their confidentiality was further ensured in referring to their institutional context, i.e. country of residence, instead of using the HEIs complete name.

Fourthly, the assurance of the accuracy of the data was guaranteed without any fabrication, fraudulent materials and omissions.

4 Case Study Findings

Case study findings are presented organized around key themes that emerged from the collected field data. In the first section, Bourdieu's (1986) forms of capital are used to embed the study in the current context of European research centres, which find themselves in the area of conflict between NPM conditions relating to reporting and funding requirements (economic capital), and efforts to preserve their academic values, i.e. their cultural capital embodied in the CUDOS (Communalism, Universalism, Disinterestedness, Organized Scepticism) norms (Merton, 1942). Next, a systematic analysis of how social capital is implicated in mission-specific research centres' MACSs will be provided across the two institutional contexts. In this vein, the study emphasizes the crucial role of the beliefs system in general (Chenhall et al., 2010) that finds particular expression in the centres' research missions (Schubert, 2009).

4.1 On the tension between the acquisition of research funds and the preservation of the academic culture

As outlined in the literature review, European research centres are currently confronted with increased pressures to attract research funds with direct consequences for their success. Activities required by NPM policy such as active acquisition of funds or reporting do involve a scientist's deliverables and, thus, impose a threat for their academic ideals based on the Mertonian CUDOS (Merton, 1942) principles. Writing research proposals and the documentation of activities are time consuming and do not contribute to the delivery of the research mission in the first place. This tension built the starting point in the current exploration of how MACSs are implicated in social relationships within and external to research centres.

The research centres' ability to define its organizational purpose internally, reinforces its cultural capital basis (Oakes et al., 1998). Alpha's tendency to produce scientific results that are of social relevance and applicability has provided the organization with a strong cultural capital foundation with respect to its knowledge-transfer activities (Bourdieu, 1986). In comparison to Beta, it is relatively easy for Alpha to gain general acceptance among society for their research activities as Beta's scientific output is not readily applicable or of relevance for the community. Nevertheless, Beta's history and strong research base has provided it with a solid cultural capital base with respect to its research activities. The accumulation of cultural capital in the research centres is continuously reinforced by scientists' strong identification with their discipline and the common commitment to work on a common theme corresponding to their personal scientific interests. Whereas research directors across all cases emphasized the research centres' good or even excellent reputation, I have made some efforts to collect more objective measures of each centre's reputation as discussed in the next sections. Hence, based on the collected h-indices (see Table 16) and webpage analysis, it can be concluded that all research sites also possess a certain amount of symbolic capital. In higher education, symbolic capital is built and shaped by a peer-reviewed network that ensures the quality of scientific publications. Thus, symbolic capital can be regarded as the sum of the subjective reflections of peers on the research centre's scientific performance, which builds the foundation of the ISI (Institute for Scientific Information) Web of science database. In contrast to Beta that has been subjected to external pressures only recently (e.g., with regard to justifications to funding agencies as evidenced by the introduction of evaluations and audits), Alpha has profound experience in employing a

variety of management tools to generate and manage resources effectively and efficiently. MACSs do exist in terms of key performance indicators, strategic planning and evaluations that seek to provide key information to assess not only scientific, but also managerial performance. However, in both HEIs, changes in the external environment such as governmental budget cuts and their consequences for the immediate operational environment of HEI research centres, i.e. continuous reorganizations, shifts in power relations and the growing prominence of MACSs, have aggravated the tension between cultural and economic capital.

Among others, funding was a major concern for all scientific directors and consumed a lot of time and resources to manage. The main sources of funds are generated from the government, national research councils, student fees and revenues from commissioned research with private companies or public authorities. As a general observation, research funds from government, especially those at the broader EU level, are increasingly granted for joint projects with other research groups and interdisciplinary research teams. This trend also holds for highly fragmented fields mostly prevalent in the social sciences. In the Research Centres of Alpha, for example, MACSs and external evaluations are used to assess their productivity on behalf of the HEI, reflecting the enhanced internal competition for funds. Each centre has field specific target values for the acquisition of TPFs (third party funds) which were claimed to lie well above the national average. In particular, Alpha's Research Centres in the natural science and engineering and technology science are provided with additional incentives to acquire TPFs as the university will double the amount acquired from external sources. In Beta, collected performance data is increasingly used for internal resource allocations to single

Research Centres. However, although Beta appears to use the collected performance data for their internal resource allocation, cash flows are relatively stable and provide the Research Centre with resources to cover maintenance costs. It is only recently that changes in external funding arrangements have become more result and project based.

Whereas the degree and type of collaborations vary in the Research Centres of Alpha and Beta according to their research mission, their management is critical for all research missions. Nowadays, complex research questions are best addressed by interdisciplinary research teams and governmental agencies that often consider research collaborations between different institutions as an efficient way to invest their research funds. Particularly with research centres that involve an infrastructure for conducting their research, collaboration partners are essential to share scientific facilities and to connect people with highly specialized knowledge.

The importance of collaboration partners has also been acknowledged for the graduate- teaching Research Centres since educational programs required training in various specialized fields. Research centre E, for example, initiated a joint educational program with other HEIs as single research centres often do not have the capacity to employ the required specialists. Furthermore, publication oriented Research Centres perceived external alliances as critical in the funding process.

“Well, it [consortia when applying for funds] is extremely important. You have the right industry participating in a project, then the probability is high that the project gets accepted. It’s not just quality. But this is true for the funding agency for applied research [anon.¹], but also for the agency funding basic research [anon.¹]. It is just researchers that are participating. So there is no industry and

¹ The term “funding agency for applied research” is used instead of the institution’s official name to ensure confidentiality. This approach was used consistently to present the interview data without identifiable information of the research sites.

that means that well you should have high quality researchers involved.”
(Research Director, Case A)

Furthermore, collaborations are regarded as a mean to mitigate competition as

Research Director A further elaborates:

“There are of course cases where we are in competition with other universities, but quite often it is more the case that we all together try to get this funding. Like the large project ... [that I mentioned before] ... on the national level, we did that together with a number of universities and a lot of industry. [...] In this case it was better to jointly come up with a large proposal to get the money instead of each of them [applying] separately.”

Similarly, the Research Director of the publication oriented centre (Case D) in

Beta highlights the importance of network partners to comply with the demands of funding agencies:

“I think it was very, very important to get them [funds] in the first place. I mean we worked with [collaboration partners] to fit the model. You really have to network with foreign universities, universities in our country [anon.] etc. So I think without this it would have been very difficult to get it here.”

In this regard, Research Director D acknowledges the potential role of MACSs in this process:

“Well, [...] when you look for new partners, you would certainly try to assess, what have they done, how they do their work etc.. Is it somebody who could contribute to the overall effort or not and clearly you would look into this [bibliometric indicators] when you choose partners.”

Overall, Research Centres seem to be encouraged to collaborate more intensively because governments and research councils concentrate their resources and allocate them to key research units in the higher education landscape, which has also been observed in the NPM forerunner country (Research Director, Case B):

“I have been here for quite some time now, when I have started my academic career it would still be possible to write a proposal for a million Euros as a person and get it. And nowadays that would be impossible. You would need to form a

consortium. A consortium with other partners that are interesting but also if they are in the same consortium you have neutralized the competition.”

As a consequence, being in a continuous dialogue with funding representatives

and other stakeholders consumes a considerable part of the Research Directors’ attention as evidenced by the following comments:

“Of course it [the job] requires a lot of lobbying and being involved in a lot of things to make sure that there is sufficient money for ICT [Information and Communication Technology] research”. (Research Director, Case A)

“Well, part of the job is of course to be present in our country [anon.] on the national policy.” (Research Director, Case C)

“We are a community. Scientists are a very strong lobby or community. [...] And this is based on direct knowledge, we know each other, we know what this man is doing somewhere.” (Research Director, Case F)

As a justification mechanism to government and research councils, it is of utmost importance for Research Centres in Alpha and Beta to demonstrate that the granted resources are utilised in the most effective and efficient way in order to deliver their research missions. The major difference between both HEIs is that MACSs are an integral part of the management of Alpha’s Research Centres, while Beta has just started to implement MACSs as a response to external pressures. When compared to Alpha, these forces in Beta’s institutional environment have a relatively young history. The management of research under NPM considerations such as enhanced transparency and efficiency are now becoming increasingly important for Beta’s success. In order to succeed, management can no longer rely solely on its cultural capital repository, which is shaped and accumulated by excellent delivery of its research mission, but need to devote the same effort to acquire and manage economic capital. Along the lines of Bourdieu (1986), these forms of capital can be in tension when economic capital is augmented and employed in ways that erodes cultural capital. This was partly observed in Research Centres of Beta, where the introduction of the new logic encountered resistance across

some, but not all research missions (see next section for further discussions). For instance, with the exception of the Research Director of the publication oriented Research Centre, Research Directors in the NPM late comer country seemed to perceive MACSs as an act of symbolic violence (Bourdieu & Passeron, 1977). In other words, an act of symbolic violence was observed to the extent that MACSs had replaced a set of meaning which was defined by the researchers within their scientific community, by an ethos that is driven by market forces. Consequently, the cultural and symbolic capital of the scientists is regarded as endangered because control over their own work is reduced by the fact that economic capital is now dominating their immediate environment (Chenhall et al., 2010; Oakes et al., 1998). For instance, the Research Director of the technology-transfer oriented Research Centre F stressed the secondary role of economic capital, which is merely regarded as a means to maintain cultural capital.

“We really don’t care so much about money. We just use money as a tool. Our main goal is to perform our research. So if someone gives us money for this, we are happy, but we don’t pay too much attention in. Once we get the money, we know how to use it.”

What has been observed in general is that, when applying for research funds, the centre’s cultural capital, i.e. the knowledge embodied in its scientists, is used to attract economic capital in a manner that does not trade-off its cultural capital base. This approach also becomes evident in one Research Director’s reflections on the centre’s strategy when applying for TPFs:

“Nobody will ask me how well you manage your funds. No, this is not a deliverable, this is a tool. The deliverable is science. If I produce high-level science, a good quality science, then I have more chance to get my funds. So at the end, all this are agencies, will not really ask how well you managed because I have not to make money out of this money, I have to spend it. And nobody will argue whether hiring this student or that student was a good or bad choice. This is

my decision. And nobody will say anything. [...] I only have to spend money. I do not have to become richer than before.” (Research Director, Case F)

Although scientists have to explicitly specify how their research will translate into economic capital, the previous statement exemplifies that research proposals are grounded in the centre’s cultural capital. Even in Alpha where market forces and competition are inherent to the HEIs’ overall approach, a Research Director reports how an exploitation of the business-like approach has challenged the academic ethos with subtle effects on the scientists which again seems to resemble Bourdieu’s (1977) concept of symbolic violence:

“There was a period in which we called the groups a business unit. So each chair we called it business unit because they had to make sure that they would get enough external funding to continue getting salaries for the permanent staff. [...]. We were just five, but for some of them it was really a shock. They couldn’t sleep anymore because they were responsible for the salaries of the other people [...] and some people were not quite happy with it. So now they changed it a little bit, but still we try to put the responsibility for the quality of the research and the output, so the number of Ph.D. students and number of publications, as low as possible in the organization [...]. It should be his responsibility or her responsibility to get these Ph.D. students. And that works and in that sense our university [anon.] is again more entrepreneurial and very transparent in the way we allocate the money compared to other universities.” (Research Director, Case A)

Clearly, NPM reforms impact the research centre’s ability to balance both forms of capital. According to the suggestions of Chenhall et al. (2010), stimulating more flexible internal values that are capable of integrating economic concerns would contribute to mitigate the previously described tension. As a consequence, research directors that use their research mission more actively to communicate the importance of economic concerns beside the need for scientific excellence, may meet with more acceptance among their research staff.

The extent to which this statement could be corroborated across the different research missions and institutional environments will be discussed in the next sections. In doing so, case study findings are presented in sequence of Simons' (1995) LOC variables. As mentioned earlier, the study pays particular attention to the strategy, i.e. research mission, of the Research Centres under examination. Table 12 outlines the selected research sites according to their research field and institutional context, whereas Research Centres A to C are embedded in a NPM forerunner country and Research Centres D to F in a NPM latecomer country. As the research mission lies at the heart of the study and builds the foundation for the exploration of the moderating impact of social capital on the effectiveness on MACSs, estimates for the research mission have been collected in three ways: Initially, webpage information relating to the Research Centre's mission and activity portfolio have been drawn upon to determine the research mission. Secondly, interviewees were asked to elaborate on the centre's typical activities, to classify them and specify them. Thirdly, individual scientists of the respective Research Centres were presented with identical questions at the beginning of the online survey.

Through this approach, I hoped to avoid potential measurement bias, because the Research Directors were likely to promote a more prestigious research mission such as a publication orientation beside their general tendency to achieve a good mix between the different output bundles, and thus, missions. De Boer et al. formulated this reluctance to specialize as follows: "Many of them [HEIs] follow the same route in emphasizing the excellence and pure scientific nature of their services, because they believe that this gives them their competitive edge. Applied research, knowledge transfer and valorization, or

community services do not automatically fit such a traditional and distinctive profile” (2007, p. 38).

Valorization was a common term among Research Directors in Alpha to describe the capitalization on basic research results, e.g. through knowledge transfer activities to the corporate sector. The collected self-concepts of the research director (interviews) and the self-concepts of individual researchers (online survey) in the respective centres’ may indicate what individuals claim they think about themselves, but not necessarily what they actually think about themselves. Indeed, even if self-concept and the claimed self-concept agree, it might not be a good estimate of reality as individuals tend to overestimate their performance. In conclusion, it is nearly impossible to determine a reliable estimate as the indicator based on the author’s webpage analysis is subject to potential measurement bias while interview and survey data may be afflicted with perception and expression bias (Schmoch et al., 2010, p. 11).

As presented in Table 12, research missions do not always match across the three data sources. The study therefore uses a heuristic approach that generates a sort of “summary estimate”, which is simply derived from the most often collected research mission. The response rates of the online survey are rather low across the different Research Centres (9.38-28.57%), but demonstrate another effort to classify the Research Centre’s mission.

4.2 Publication Oriented Research Centres

4.2.1 Strategy.

Scientists in Research Centre A conducted research in databases, which falls under the umbrella of natural sciences. Webpage information provided a fairly detailed

picture about the centre's research portfolio. Although a considerable part of their research seemed to be of experimental nature, no hints for a direct valorization of the produced prototypes could be found, which allowed for concluding that Research Centre A pursues a publication oriented mission.

The Research Director of A confirmed this conjecture in stressing the dominance of basic research. Scientists also maintain connections with companies for joint research, but the majority of the projects are still of a fundamental nature, which is indicative of a stronger tendency towards a publication orientation. They are also often combined with an experimental part, but results are usually not commercialized as they predominantly serve as prototypes for further research. This might explain the high percentage for applied (45%) and experimental research (41.67%) in the online survey, which would rather favour a technology-transfer mission. Nevertheless, webpage information and the Research Director's perception are considered to provide a more accurate research mission of Research Centre A.

Research centre D represents a social science discipline as scientists investigate issues in climate change from an economical law and trade perspective. The deliverables dominating the web presence were publications and working papers, and hence, a publication orientation was assumed. The online survey results as well as the comments provided by the research director are identical to the research mission arising from the internet presence. The high percentage for applied research (62.5%) in the online survey might stem from the fact that the produced scientific papers are usually translated into letters of recommendations for governments. Thus, the Research Centre is quite often

involved in advisory and counselling services to governmental bodies, whereas their main research activities are of more fundamental nature.

4.2.2 “Soft” levers of control.

In Research Centre A, there was some evidence that the beliefs system was deliberately decoupled from the actual research activities to obtain research funding. According to its Research Director, the name of the organization as well as that of the research project is increasingly important to obtain research funding:

“The challenge is to keep this visibility high, because it is something that plays an important role in the end in getting a project accepted. What I see is that there is a growing competition among disciplines. [...] The wall between the discipline allocations of money is disappeared. You have to put in more effort to make sure that sufficient money is going to computer sciences or to ICT in general and the research institute play an enormous role in that. Because if the visibility of an institute is high and you can see that there is more research money going to that- there are all kinds of objective ways of evaluating that kind of stuff- but if people say «this is a tremendous institute», it has a positive effect on evaluating the research proposals.” (Research Director, Case A)

As revealed by the comment, the name of the research project is of utmost importance to ensure visibility. Boundaries between basic and applied research can be deliberately blurred to fit the respective funding criteria, helping the Research Centre to obtain slack resources. For example, an original research project that involved a more fundamental purpose was used in later periods for a company liaison to generate revenues. A mission that reflected the Research Centre’s beliefs and values were therefore seen as embracing some flexibility to diversify the centre’s funding portfolio.

Given the high degree of fragmentation in the social sciences, the beliefs system was of crucial importance for Research Centre D to continuously reinforce its values in

bridging structural holes to cooperation partners, as explained in the following quote from the interview:

Table 12: Determining the research mission of the selected research centres

Alpha/ NPM Forerunner HEI						Beta/ NPM Latecomer HEI							
R C	Research Field	Size ¹	Research Interview data	mission according to Web-page analysis	Survey data	Summary Estimate of Research Mission	R C	Research Field	Size ¹	Research Interview data	mission according to Webpage analysis	Survey data	Summary Estimate of Research Mission
A	Data-bases	16	Publica- tion	Publica- tion	Transfer	Publica- tion	D	Trade/ Internat. Relations	12	Publica- tion	Publica- tion	Publica- tion	Publica- tion
B	Political Science	17	Teaching	Teaching	Teaching	Teaching	E	Administ- ration Science/ Law	20	Publica- tion	Teaching	n.a. ²	Teaching
C	Material Science	32	Transfer	Transfer	Publica- tion	Transfer	F	Medical Physics	12	Publica- tion	Transfer	Transfer	Transfer

¹ Permanent Staff including post-docs and PhD. students

² Not available

Table 13: Activity portfolio and awareness network of research centres

R C	n	Resp. Rate in %	Research (incl. conferences)		Teaching (incl. preparation)		Project Acquisition		Other activities		Basic Research		Applied Research		Experimental Research		Awareness network ¹	
			Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.	Mean in %	s.d.
A	3	17.65	33.33	12.47	30.00	8.16	15.00	4.08	21.67	13.12	13.33	4.71	45.00	12.25	41.67	16.50	5.70	0.47
B	6	28.57	33.33	12.1	40.83	19.24	6.67	4.00	19.17	14.55	38.33	24.17	61.67	27.94	0.00	0.00	5.80	1.34
C	3	9.38	80.00	8.16	15.00	5.00	5.00	0.00	8.33	2.36	47.5	2.50	17.50	7.50	56.67	13.12	6.00	0.82
D	3	25.00	56.67	17.00	20.00	21.21	15.00	5.00	13.33	8.50	75.00	25.00	62.50	37.50	25.00	0.00	4.70	1.25
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	3	25.00	53.33	33.00	25.00	5.00	10.00	0.00	35.00	5.00	30.00	20.00	50.00	10.00	46.67	12.47	6.30	0.94

¹ Measured on a 7-point Likert scale

Table 14: Information network of research centres

RC	n ¹	Response Rate in %	Number of total ties	Ties inside the RC		Ties between HEI sub-units		Ties outside HEI	
				Number	%	Number	%	Number	%
A	3	17.65	46	19	41.30	9	19.57	18	39.12
B	6	28.57	33	15	45.45	13	39.39	5	15.15
C	2	6.25	33	4	12.12	17	51.52	12	36.36
D	2	16.67	16	2	12.50	2	12.50	12	75.00
E	-	-	-	-	-	-	-	-	-
F	3	25.00	26	6	23.08	0	0.00	20	76.92

¹ Adjusted for unusable responses

Table 15: Performance data and income sources of research sites

HEI/ Country	RC	Size ¹	Sources of Income in % ²			Number of ISI – Web of Science Publications ³	Number of citing articles Web of Science ⁴	Group h- index ⁵	h-index range of RC's member	
			HEI	Research Councils ⁶	Other TPFs ⁷				Min	Max
Alpha/ NPM forerunner	A	16	45	30	25	219	582	3.75	1	6
	B	17	75	15	10	49	182	2.11	0	5
	C	32	20	50	30	517	9.101	10.64	1	29
Beta/ NPM latecomer	D	12	16	68	16	32	73	3.00	0	4
	E	20	50	17	33	10	16	1.00	1	1
	F	12	20	60	20	333	2.969	10.00	0	28

¹ Permanent Staff including post-docs and PhD. students

² Source: Author Estimation

³ Excluding publications of Ph.D. students, enquiry period from 1950 to 10/2011, publications include articles, books, book review, book chapters, reviews, reprints, proceeding papers, editorial material, meeting abstracts, notes, letters, scripts

⁴ Excluding self-citations

⁵ h-index is “A scientist has index h if h of his or her N_p papers have at least h citations each and the other $(N_p - h)$ papers have $\leq h$ citations each” with N_p = numbers of papers published (Hirsch, 2005, p. 16569), calculated for the research centre based on Web of Science individual h-indices divided by the number of scientists with an h-index > 0 , excluding Ph.D.s

*not available

⁶ International, national and regional governmental funding agencies

⁷ Third Party Funds

“We started off with a much larger number of international partners, but as we went along we reduced the number of partners because it was quite difficult to manage a large network. I mean academics are very much wedded to their own agendas and they are not very good at cooperating, generally speaking. So, it is more difficult to keep things together. Now most of the work is being done here and we have essentially cooperation only with three other institutions in our country [anon.].” (Research Director, Case D)

Thus, concentrating on the centre’s own values allowed for a “refocusing on topics” and a re-examination of “what they [partners] want and what they are doing” as well as “whether people are doing a good job or not” (Research Director, Case D). This process illustrates a case where the beliefs system helped not only to establish scientific collaborations in the first place, but to establish sustainable networks for research activities. Establishing new collaborations includes risk, for instance with regard to the partners’ competences and commitment or the allocation of scientific credit. Returning to their own beliefs, e.g. based on the centre’s formalized mission statement, helped to preserve the Research Centres’ own values and solved the emerging tension between disobliging network partners.

4.2.3 “Hard” levers of control.

Directors within the publication oriented research mission predominantly used interactive controls, which also involved certain components of a more diagnostic nature, to ensure the quality of the scientific outcomes of the overall research institute and the provision of sufficient research funds. This balancing act has been described by Research Director D as follows:

“It’s [MACSs] used basically to encourage a positive environment so that people are able to do good work. It’s a very delicate thing. There is sort of a pressure on the one hand and on the one hand creating an environment which is encouraging, which gives people also a certain security etc. [...]. So far we really haven’t adopted a policy of sanctioning [...]. In the long run, if people wouldn’t produce

that much, then we would reduce them etc. and these things, but we try to avoid that it creates a sort of a threat. The problem is if you do this then people may produce a lot of quantity but may not really dedicate enough to the quality, so it is quite a delicate balance here. And then you have some people who are working more rapidly than others, so everybody is individually different. But if we would see that people would not show good will, not trying hard, I think then yes, [...], they would have to leave. We never had such a case so far.”

In Alpha, the strategic research orientations were translated into institute-specific performance indicators that ought to direct the scientists’ attention, as revealed by Research Director of Case A:

“Its [key performance indicator] meant to encourage quality improvements, so it’s extremely difficult to run a research institute as a company and say, «we deviate from our performance indicators, now we have to do something about that». ... [...] It’s not that I can say «now we have a deviation and now I have a particular tool and now I am going to apply that to the institute and afterwards it’s going to work». It’s not the way it is right here. But the indicators make people aware of the fact that they are not as well as the neighbours [other research centres within the institute] and that they are encouraged to improve.”

In accordance with the definition of the properties of interactive controls according to Bisbe, Batista-Foguet and Chenhall (2007, p. 797), the collected field data of Research Centre A points to a more interactive use of MACSs as (1) budgets and KPIs have been found to be used intensively by the research director; and (2) the heads of single research groups; in order to (3) tackle operational and financial challenges based on group debates; that are focused on (4) strategic uncertainties; which required an (5) involvement of the research director by expertise and empowerment rather than by control and authority.

While key performance indicators were also addressed during the regular meetings in Research Centre D, they seemed to be more diagnostic in their magnitude:

“In the main program financed by the national research council [anon.] we have our outputs defined and you have to live up to this, older research plans give you the outputs: one, two, three papers on this and this and then you basically assess

whether that has been completed or not, this is the quantitative assessment. [...] We also have to report on the publications [...]. We are basically assessed on the number of peer review journals or books we produce. Now they [funding agency] start asking what was your impact. It's not enough simply to publish, but they also ask what is the relevance of these publications. We increasingly have to, for example, report about our interaction with the government agencies or to what extent these research results were relevant in advising the government and whether it has an influence on policies [...]. It also shows utility and I think our challenge now is how to assess the impact.”

Against the expectations that more diagnostic controls would meet with opposition in Research Centre D, its Research Director regarded them as effective means:

“I think it helps to enhance the performance of a place, yes, definitely. And for managing the place it's also a tool, it's an important managing tool. Without all these reporting requirements etc., it would be much more difficult to manage the place, because people would just do what they like and it would be more difficult to bring back more coherent results, I think.”

This was surprising as individuals in NPM latecomer countries were expected to show some resistance to the implementation of managerial approaches that impose a potential threat for their scientific ethos. Its Research Director, however, asserted that the individual performance standards and measurements are not perceived as incompatible with the researchers' professional values: “I think people get accustomed to it. [...] I think they live with it and comply essentially with these requirements [...].” (Research Director, Case D).

As mentioned earlier, the general trend in European research councils converges towards funding of interdisciplinary and problem-oriented research as stated on their webpage:

“European Research Council (ERC) grants support individual researchers of any nationality and age who wish to pursue their frontier research. In particular, the ERC encourages proposals that cross disciplinary boundaries, pioneering ideas that address new and emerging fields and applications that introduce unconventional, innovative approaches.” (ERC, 2011)

Initially, Research Centre D complied with these criteria as scientists from both disciplines- law and economics, tackle problems in international trade and relations. In fact, this might have been a decisive criterion for the acquisition of a long-term national funding project. However, the interdisciplinary research approach of centre D was not in favour of bonding social capital among its scientific staff as key performance indicators, e.g. the number of publications in relevant outlets, are perceived as measures that do not value and recognize their work to a sufficient degree. Research Director D explains:

“In the first phase we encouraged interdisciplinary research between lawyers and economists and we found out that they are not really interested because they have difficulties to publish interdisciplinary research in the relevant journals. That’s why we really work on a disciplinary basis and we are just about how we design the research, we try to make it mutually supportive here. I mean the publication policies in the different disciplines - they have quite a strong influence on what people want to do and how they want to do it here.”

Thus, although embracing different disciplines within the research institutes, Research Centre D operates now on a disciplinary basis which is also important in terms of advancing the careers of Ph.D. students and professors in tenure track positions. This example demonstrates the importance of seeking internal legitimacy for a Research Centre’s employed MACSs even if bridging social ties seem to be more important to coordinate efforts through a limited number of partners embedded in an institutionalized network. Moreover, it demonstrates another example of decoupling the operational work of scientists from external requirements.

Furthermore, project management systems for research activities are formalized and define clear deliverables for each “work package”. Even if the Research Director enjoys some flexibility with regard to the adjustments of deliverables or placement of scientific staff, project management systems have changed the academics’ work mode,

e.g. with respect to time constraints and formalizations. Besides their capability to maintain and develop internal social ties, project management systems have been described to help bridging the Research Centre with its external environment. This might be of particular relevance for publication oriented research centres as the information network of A and D points to a stronger reliance on bridging social capital (see next section for discussion). As an example, ensuring the visibility of research activities ranked among the most frequently mentioned concerns expressed by the Research Directors, especially among those with a publication mission. In contrast to ex ante assumptions, the “managerialism” of the academic work was widely developed in Research Centre D. Academic support divisions and services were as least as prevalent as in Alpha. This finds expression in Research Director D comments:

“They [communication officer] have a task of entertaining a network with the press [...]. That’s quite different from normal university life that we have this active communication strategy which [...] we were required to do by our main funding agency [anon.], just to show the visibility, to enhance the visibility of the work, which is not easy to do when you deal with fundamental research because the public is not really interested in these things, but it’s a challenge and we are trying to do this.”

In a similar vein, Research Director A describes the crucial role of having a separate structure for research and teaching that together with the development of a strategic positioning in the knowledge market ought to ensure high visibility of the research results:

“I think the advantage of having the institute is that you that you have more focus and mass. [...] Let’s say sometimes sixty people working on that particular theme, not all of them are working together but it’s - they are working on a theme. And that gives high visibilities to institutes compared to just sitting in faculties and just do your own thing, and maybe sometimes you work together with another group but that doesn’t give any visibility.”

Project management systems therefore proved to be capable of satisfying the needs of the academic culture without neglecting the demands required by external stakeholders, which is necessary to legitimize the scientific work. Efforts to ensure high visibility included the division of work e.g. in terms of “work packages” or “strategic research orientations”, image booklets and progress reports as well as open days or science nights to present the Research Centres’ work to the public. While strategy meetings of the heads of each Research Centre in Alpha took place regularly to discuss and agree on strategic themes, the head of the publication oriented Research Centre (Case D) in Beta shared why they had adopted a similar approach:

“We were organized in twelve individual research projects here and then for the second phase we first tried a bottom up approach where people could make their own proposal and apply here and that was extremely difficult to manage and to get to a coherent overall proposal here. So when we came to the next stage, we then choose a top down approach, we identified the work packages and topics and then we assigned the professors and they had to start working out a coherent research agenda. So, it was no longer bottom up but rather top down.”

However, the director asserted that this process had not prompted steep hierarchies, but rather that heads of “work packages” were more involved in the coordination and guidance of their centre’s scientific staff. Given the rise in reporting obligations, the importance of brokering alliances to secure external resources has been observed to require proactive scientific leadership, which was mainly assigned to the head of the research groups, accentuating a more functional differentiation. Again, this was not described as conflicting with the reciprocal values and the collegial approach inherent to these Research Centres.

Since strategic uncertainty and risk build the antecedents of the LOC framework, interactive MACSs were predestined to screen the environment in order to seek

information with regard to funding and cooperation partners. Research proposals, for instance, allowed the establishment of ties more objectively because purpose, targets and expectations towards the collaboration partner are formalized. Especially in Research Centre A, the interview data and the information network (see Table 14) reveals that the Research Directors may take advantage of the boundary spanning ties nurtured by the Research Centre in order to ensure access to key resources. Distinguishing relevant information from less important ones imposes the biggest challenge in this regard given the information overload with respect to funding and potential network partners. Most often, however, it is the tacit knowledge that may provide the research centre with a competitive advantage. Being involved in various committees, review boards and industry clusters have been referred to as increasing the centre's visibility and legitimacy while generating useful information and some decision competences. A common rhetoric in this regard was that the generated information did not always translate into advantage for the Research Centre in terms of arising opportunities (Andrews, 2007), the provision of access to resources (Coleman, 1990; Hansen, 1999), the realization of timing advantages (Uzzi, 1997), or authority and legitimacy gains (Burt, 1997; 2000; Lin, 2001):

“If you have collaboration and it works and the relationship is established, I think it is certainly beneficial. Sometimes people try to introduce a network to get funding and to do what they want and they are not really interested in collaboration and then this is getting difficult and then the costs are higher than the benefits.” (Research Director, Case D)

4.2.4 Case study evidence in the light of the proposed framework.

As discussed before, given the incentives for interdisciplinary collaboration in basic research which arise from NPM agendas and that have been integrated in funding demands, one would expect that loose ties may benefit the delivery of this research

mission. This was grounded in the fact that basic research has been characterized by high levels of task uncertainty and a structural component indicating lower levels of mutual dependence among individuals that seek to produce scientific knowledge (Seeber, forthcoming; Whitley, 2000).

Since the NPM narrative had found its way into the management of Alpha before it was a concern in the Research Centres of Beta, I expected to observe an even stronger tendency for bridging social capital in Case A when compared to Case D. However, the information networks of these Research Centres reverse this conjecture (see Table 14). In fact, bridging social capital may not even indicate the decisive social capital dimension for Research Centre A since this centre shows a relatively balanced relationship portfolio (see also Figure 4). Nevertheless, the ties spanning beyond the own Research Centre but inside Alpha (ties between HEI subunits) together with the ties outside Alpha (58.69%) seem to tend towards bridging social capital. In comparison, the collected network data in Beta reveals a relatively strong external orientation (ties between HEI sub-units and external ties amount to 87.5%). These differences may, at least partly, be ascribed to the disciplinary difference of centre A and D. In summary, the data set seems to point to a trend towards bridging social ties being important, especially in the social sciences (Case D).

Given the hypothesized beneficial effects of bridging social capital for publication oriented Research Centres, I expected publication oriented research centres with high levels of bridging social capital to be associated with higher performance. While the measurement of a research centre's scientific performance is multidimensional and should include intermediate outputs such as the number of graduate students etc.

(Schmoch et al., 2010), I was able to collect bibliometric data of the Research Centres as illustrated in Table 16. The collected data primarily gives some information about the centre's reputation based on peer-reviewed publication measures. The so called h-index can be regarded as a more objective indicator of the "importance, significance, and broad impact of a scientist's cumulative research contributions" (Hirsch, 2005, p. 16572). For example, the highest h-index for an individual scientist in Research Centre A was 6, meaning that from 1950 to October 2011, the scientist published 6 ISI (Institute for Scientific Information) rated articles with each having 6 or more citations and the other papers have less than or exactly 6 citations each. To generate this performance metric on the group level, a group h-index was computed in simply dividing the sum of h-indices of all scientists within the Research Centre by the number of scientists.

Among other flaws of the h-index that are highly debated in the literature, the metric has been found to be sensitive to career length (see for example Alonso, Cabrerizo, Herrera-Viedma, & Herrera, 2009).

Table 16: Publication oriented output bundles

	A	D
Number of ISI- rated journal publications¹	219	32
Number of citing articles without self-citations²	582	73
Group h-index³	3.75	0.25
Number of Conference Proceedings 2010	28	n.a.
Number of books 2010	1	2
Number of Book Chapters 2010	0	2
Other publications 2010	9	10
Completed Master Thesis 2010	7	40
Completed Ph.D.s 2010	4	n.a.

¹ Excluding publications of Ph.D. students, enquiry period from 1950 to 10/2011, publications include articles, books, book review, book chapters, reviews, reprints, proceeding papers, editorial material, meeting abstracts, notes, letters, scripts

² Excluding self-citations

³ h-index is "A scientist has index h if h of his or her N_p papers have at least h citations each and the other $(N_p - h)$ papers have $\leq h$ citations each" with N_p = numbers of papers published (Hirsch, 2005, p. 16569), calculated for the research centre based on Web of Science individual h-indices divided by the number of scientists, excluding Ph.D.s

Hence, the numbers of PhDs were removed from the analysis, because they usually publish a very limited number of ISI-rated articles at the beginning of their career, which would inflate the group h-index. To prevent further distortions, the range in which the individual h-indices vary is disclosed. Interestingly, the individual h-indexes within the technology-transfer oriented research missions in both institutional contexts (Cases C and F) considerably distinguish themselves from the other research missions as revealed by Table 18.

However, caution needs to be paid to the different publication cultures (see for example Alonso et al., 2009). As an example, Research Centre A and D, which have been classified as publication oriented research centres exhibit relatively small h-indices. The difference between the transfer-oriented (Case C and F) and publication oriented (Case A and D) research missions becomes even more evident when comparing Research Centre D with Research Centre F. Research in case D is conducted by a relatively small groups of individuals in the social science of trade and international relations, where outlets for scientific outputs usually involve letters of recommendation to governments and supranational agencies. In striking contrast, research in the natural science is usually conducted in a large team of up to twenty people. It is not unusual that scientists list the names of their team members on the produced papers, even if their specific contribution was only marginal. This custom significantly enhances the number of papers produced. Given the disciplinary differences in the data set, Research Centre A and D cannot be compared in terms of their publication performance. Despite pursuing the same mission, it would be inaccurate to conclude that Research Centre A is more productive than Research Centre D simply because of the differences in the group h- indices

($h_{group}^A 3.75 > h_{group}^D 0.25$), which would imply a fifteen times stronger impact of Research Centre A versus Research Centre D. What is regarded as a high number of citations in one discipline, may count as a moderate number of publications in another discipline or even sub-discipline. This is problematic as these differences are also reflected in the achievable h-indices. Certainly, the h-index does not capture the impact of the scientific outcomes of Research Centre D to a sufficient degree as there is hardly any measure to assess to which degree their publications influence decisions in law. Beside the differences in the research outlets, scientists in centre D usually hold a tenure track position. The fact that the majority of the scientists have started their career may offer another explanation for their relatively low performance in ISI- rated publications.

4.3 The Graduate- teaching Oriented Research Centres

4.3.1 Strategy.

Political science is the primary research field of Research Centre B and is therefore representative of a social science. Information based on the webpage reveals a high involvement in educational programs so that a graduate-teaching orientation was hypothesized. The perception of the Research Director as well as those of the individual researchers (40.83%) provided additional evidence for the graduate-teaching mission.

Case E was a Research Centre that was established to provide education and continuing education in the field of public law. Again, webpage information was used to derive a research mission. Beside the Research Centres' projects, that are usually conducted by individual scientists, several educational programs and continuing educational programs have been launched to provide training in the field. Given the original purpose of Research Centre E to train graduates and provide off-the job training,

Research Centre E was assumed to pursue a graduate-teaching mission. According to its Research Director, the Research Centre is currently transforming from a graduate-teaching orientation to a Research Centre that primarily conducts basic research. In this case, the paper cannot rely on survey data as consent was not obtained from the Research Director of Research Centre E. Thus, I draw on the income structure as illustrated in Table 15 (see also Figure 5). According to the Research Director, the Research Centre generates approximately one third of its income from research councils, which represents a rather small source of funds for conducting basic research. Given the high share of university funds and the fact that educational fees also amount to roughly one third of the total income of the Research Centre, a graduate-teaching mission has been found to be most representative for Case E.

4.3.2 “Soft” levers of control.

As triggered by the long NPM history movement, Alpha realized the importance of the beliefs system, i.e. research mission, to support research outputs and to respond to the complex and ever changing external environment. The Research Director of Case B explains:

“It’s an immediate consequence of the realization that as a small university you cannot simply do what you like or do what everyone likes. In that sense, our university [anon.] was a little bit ahead of this discussion because now it’s also official government policy in our country, but already three or four, five years ago even, our university has come to the conclusion that being a small university, you have to specialize, you have to more or less develop a profile and you have to look at your strong points and see where you are. For that purpose, all this information was seen as necessary, so we need to have an idea of how good our groups are and then the next question is what are they good in and also which groups are not so impressive. That was the justification behind the performance indicators and all the policy that have followed this.”

Individual scientists in Research Centre B are provided with incentives to support the centre's graduate oriented mission. Incentives provided by centre Alpha's management relate, for example, to the allocation of the considerable amount of governmental funds granted per successfully defended Ph.D. thesis. According to the HEI's policy, the full sum of governments' monetary reward is directly distributed to the respective Research Centre. Thus, budgets and the accompanied allocation of funds showed sufficient transparency that this did not deter the development of social ties among the scientists within Research Centre B, and also between other Research Centres within the institute. Additionally, the Research Director attempted to align the behaviour of individual scientists to the mission of the research institute, which ought to produce more coherent results under the umbrella of Alpha.

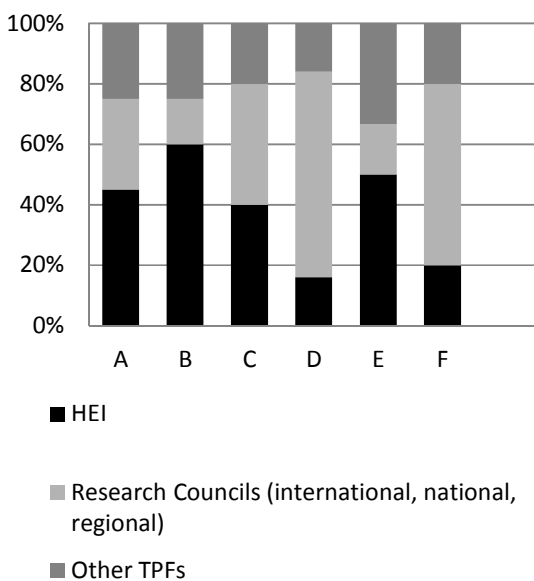


Figure 4: Research sites and their sources of income (see Table 15)

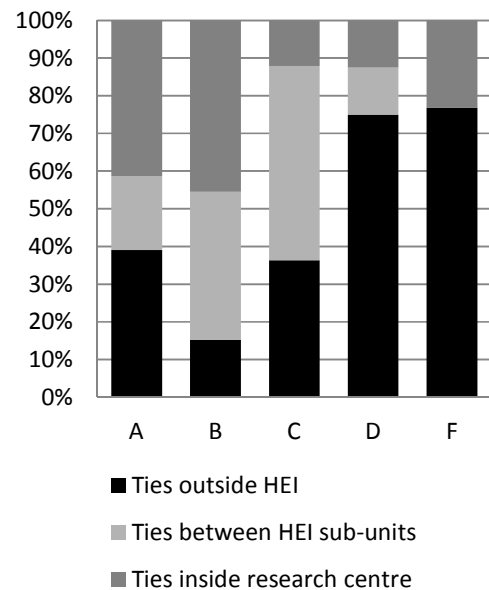


Figure 5: Information network of research centres

Scientists who seek to maintain and develop the scientific infrastructure are assured to receive financial support for their activities. In this regard, the Research Director referred to an example where a scientist of Research Centre B applied for an international conference to be held at the home institution. This undertaking received the total commitment of the Research Director, especially with respect to co-funding, as it would enhance the overall institute's reputation. As a consequence, the higher visibility of the research institute and its educational programs may attract more students and Ph.D.s, which would be most beneficial for Research Centre B's mission. In this way, commitment of the scientists is shaped and stimulated to be more in line with the overall organizational goals of the research institute.

Conclusively, the beliefs system clarified and communicated the centre's values externally but first and foremost internally, which was especially important in terms of developing bonding social capital among the scientists in Research Centre B. On the other hand, the counteracting control lever, i.e. the Research Centre's boundary system, created a tension for specifying the beliefs system to an extent where its benefits, i.e. bonding social capital, are likely to develop into its drawbacks such as inertia and inflexible social mobility (Uzzi, 1997):

“This is a bit ambiguous. The sharper the public profile of our political scientists, the less room there will be for our institute. It's a bit ambiguous in the sense, of course we should have a profile for our research centres, for our groups, but we would also like the brand of our institute [anon.] to be worldwide famous. “
(Research Director, Case B).

4.3.3 “Hard” levers of control.

Across the two national contexts, the dataset indicated that Research Directors employed project management systems for the management of their Research Centres'

activities with a high degree of transparency, flexibility and context. In other words, they serve as a means to communicate the focus and the expected outputs of the research and research-related activities such as graduate teaching, while it is up to the scientists how to organize their work. Additionally, the practiced open door policy in both centres and the formalized communication channels, such as newsletters, encouraged continuous communication beyond formal meetings. Formal contacts were used to embed the Research Centre in the overall research theme that also indicates the centre's relation to other centres within the research institute and HEI. Research Directors of the graduate-teaching mission perceived face-to-face meetings as effective means to develop trust and to share tacit knowledge, but also enabled the challenging of each others' ideas. Overall, these MACSs seemed to embrace more interactive characteristics consistent with academic values as project management systems have not been described to meet with any resistance.

In a similar vein, both Research Centres' used a management by objectives (MbO) approach to monitor Ph.D. students' progress towards predefined goals. Here, students were regularly subjected to benchmarks with their job specifications based on bibliometric indicators. Because of their interactive nature, these systems involved comparable enabling features like project management systems for research projects.

In Alpha, KPIs were developed on the institute level and translated into its different Research Centres. The following comments of the Research Director of Case B corroborate the sensitive use of KPIs:

“We have exact performance indicators, precise, but they are used in an imprecise way... [...]... Even in my discussions with the board of the university we always say that the performance indicators are the input for a conversation, they are not a final word.”

According to the same Research Director, individuals have started to acknowledge that the regular performance assessments help to acquire the means for their deliverables, which in the end, was to their own benefit in the process of the scientists' self-actualization. In line with the comments provided by the other Research Directors in Alpha, the Research Director of Research Centre B described the growing acceptance of MACSs among the researcher over time as follows:

“Not everybody likes it. The more old fashioned type of scientist would say it has nothing to do with sciences, and of course he would be right, but people are aware that that is part of the present context.”

KPIs are used to ensure that scientific results of the Research Centre contribute to the research institutions' and, therefore, to Alpha's mission.

“I have emphasized that so many times that is very self-evident for me. I have always told the groups here that the key performance indicators are half of the story. The other half of the story is focus. [...] What you are working on? [...] How does your work contribute to the mission of the institute? [...] Key performance indicators only tell you about quantitative measures [...]. They aren't focused on the content. The content is also very important. That makes life not easier for the different groups, but that's again how it is. I will never exclusively look at performance indicator in order to distribute research funding. The content of the research is also very important in my view.” (Research Director, Case B)

It is here where potential problems occurred at the operational level. Given the importance of focus, the Research Director might not support all initiatives proposed by individual scientists as resources are limited and strategic research directions are predefined. This could have enormous consequences for bonding social capital as the perceived equality is not guaranteed anymore. For instance, an individual scientist that intends to implement a research project that spans the boundaries of the institute's research orientations cannot rely on internal funds in contrast to a colleague adhering to the research priorities. Consequently, this may result in a decline of general reciprocity

and a common commitment to deliver the graduate-teaching mission. However, extensive communication seeks to counteract these developments:

“When we started with the research institute in its new format [...], I made a round of all the departments involved. For all the staff members basically I explained per department what we are doing, why we are doing it and how this department fits in the whole project and where we want to be in five years time. It's more communication than steering with hard means.” (Research Director, Case B)

At the same time, strategic research directions need to be reframed on a regular basis, requiring comprehensive debates to move scientists beyond their knowledge silos in order to explore new research directions and more importantly, to discuss new strategic directions for education. According to Research Director B, this process imposes a big challenge:

“What always strikes me is that there is a lot of consensus within the top management and what also strikes me is that it is so difficult to communicate this consensus to the level of the departments and that's what I find the greatest challenge to make sure that if you want to do something that the rest of the institute is still with you, can follow everything. That also means that you should not be too drastic in changing things because then you are sure that you lose your support. So, it calls for some prudence in what you do and you have to make sure people are still with you. Well, that happens sometimes that when I talk to assistant professors or post docs that they make me clear that they are completely unaware of what is going on at the university, that is a signal to me that we should communicate better.”

Nevertheless, individuals in the graduate-teaching oriented Research Centre claim to be aware of their colleagues' skills and competences as revealed by the awareness network (see Table 13). Whereas their awareness of colleagues' skills and competences seems to be well developed ($\bar{X} = 5.7$ measured on a 7-point Likert scale), Research Centre B also shows the highest standard deviation (s.d.= 1.34) among all groups. One may therefore assume that not all scientists are well aware of their team members' skills

and competences. Consequently, a scientist's ignorance of these competences may impose an obstacle for bonding social capital.

As mentioned before, the management of the scientific output in Research Centre E is organized slightly different in comparison to the graduate-teaching oriented Research Centre B. The centre's research activities are coordinated through a managerial board composed of four managing directors. Each of them is responsible for the acquisition of research projects, whereas the interviewee assumed the chair of the managerial board. In contrast to Research Centre B, graduate-teaching in Research Centre E is mainly coordinated in a network of corporation partners that have formed a joint organization, e.g. in order to provide assistant professorships. Research Director E states:

“I think networks play a role in the field of research centres. One cultivates contacts. We have an institutionalized network [...], which created nine new assistant professorships in the field of administrative science three years ago. Certainly, some coordination took place. We mutually agreed to create these nine assistant professorships. Together we selected the fields where to place them, which partner institution assumes responsibility for how many professorships, etc.. We represented each other in appointment committees. Hence, these networks facilitated a certain amount of coordination.”

In this regard, the Research Director stresses that it is important to avoid a “preliminary administration at the costs of the content” (Research Director, Case E). Similar to Research Centre B, Research Centre E has clear performance targets developed at Beta's management level with respect to key performance indicators, the number of research projects and target values for third party funds. However, the production of a coherent body of scientific outputs aligned with Beta's overall mission did not emerge as an important theme during the interview. In fact, Research Director B emphasized that KPIs do not affect the content of the research:

“University does not tell us that we are supposed to do research in the field of public management. That is for sure. That would also compromise basic law because it interferes with the academic freedom. I don’t want my freedom of scientific research to be influenced by a collective decision with respect to the areas I am supposed to research.”

This is in striking contrast to the graduate-teaching oriented Research Centre B, where regular strategic meetings are being conducted together with other heads of the Research Centres and the Research Director of the institute in order to discuss the strategic research directions. In many respects, strategic planning, especially at the Research Centre level, therefore assumes a more important role in the NPM forerunner HEI. For example, scientists in Alpha are urged to discuss among each other which scientist is going to apply for a certain type of project funding due to a recently introduced restriction on the number of applicants by its national funding agency.

In Beta, Research Director E does not regard performance data of the Research Centre as a helpful information tool for the management of the Research Centre. One plausible reason is the size of the Research Centre, which consists of 20 individuals who are simultaneously representative of the overall research institute. Given the small size, information provided by MACSs are considered to be redundant, and thus, do not pay off the administrative burden. To collect performance data on its Research Centres, Beta just implemented a university wide database to ease the reporting procedure. In this regard, the Research Director elaborated on the resistance to the implementation of formal MACSs and their reporting demands:

“It was certainly not easy. Problems occurred on three levels: The easiest is the technical level: A reporting tool, that doesn’t work as it supposed to work in the first place. Further problems relate to the effort associated with performance measurement and reporting tools. It requires people who know how to work with the database- that takes time. Acceptance issues are perhaps the most serious problems. That requires a lot of persuasion and discussion to motivate professors

to use these databases and to convince them that they have a personal benefit if the database is maintained. I would say that this process is not completed, yet.” (Research Director, Case E)

The value of the key performance indicators is not realized at the Research Centre level in the Research Director’s opinion, but is rather perceived as a controlling and visualization tool for Beta’s research portfolio. However, Research Director E acknowledged that the collected key performance indicators embrace a potential to visualize and legitimate the individual scientists’ work to relevant stakeholders, e.g. to potential graduate students. Since visualization channels for research outputs in the field of administrative sciences are less developed, the Research Director regards these acceptance issues, which corresponds to the need for internal legitimacy for MACSs, as a serious challenge.

4.3.4 Case study evidence in the light of the proposed framework.

Research centres that are heavily involved in graduate-teaching were assumed to take advantage from more intensive ties among scientists. Whereas this argument might be derived from common sense, the argument builds again on Whitley’s (2000) structure of scientific work. Accordingly, I regarded graduate teaching oriented research centres to be characterized by lower task uncertainty and stronger mutual dependence among scientists. Based on these features that point to a stronger inward focus, bonding social capital was considered as most supportive in the delivery of this mission. In essence, the information network of Alpha’s graduate-teaching oriented centre mirrored this conjecture as external ties amounted to merely 15.15 %. Interestingly, the centre shows a strong collaboration with individuals affiliated to other Research Centres or faculties

within Alpha (39.39%)². Plausible reasons for this observation might be that teaching activities relate to a variety of programs across different disciplines or sub-disciplines, which would require also more coordination among graduate teachers from different departments. Unfortunately, I was not able to obtain information about network data for Research Centre E. It is quite likely that Research Centre's E social network portfolio would have drawn a completely different picture. Research Centre E coordinates its educational programs to a large extent via an institutionalized network where coordination takes place within three established committees. Given Research Centre's E network approach for a variety of educational trainings, social ties outside the own Research Centre are therefore more likely to dominate. Thus, this particular Research Centre is more likely to benefit from bonding social capital not only within the own Research Centre, but also from strong social ties between its cooperation partners. Using the concept of symbolic violence (Bourdieu, 1986), I expected that diagnostic controls adopted for reasons of NPM legitimacy would erode the commitment of scientists in Alpha to a higher degree given the long history of MACSs in its Research Centres. Consequently, this was expected to hamper bonding social capital with negative consequences on the research centres' relevant output bundles.

In contrast, I found that Research Centre B shows a superior publication performance (see Table 15). When comparing the output profiles of the two graduate-teaching oriented centres (see Table 17), they both indicate a high engagement in the maintenance of the scientific infrastructure. Whereas Research Centre A provides mass education with a considerable number of graduate students (88 graduates in 2010),

² The analysis of ties between HEI sub-units did not distinguish between disciplinary and non-disciplinary ties.

Research Centre E offers specialized graduate training programs and exhibits a high involvement in scientific advisory boards (70 memberships in 2010).

Disregarding the different emphasis in the output bundles, the Research Centres' overall performance is fairly comparable, so that no specific conclusion about the moderating effect of social capital on the centres' research performance can be drawn. To offer a possible explanation for Research Centre B's comparable mission-specific performance (see Table 17) and even superior publication performance (see Table 15), the next section highlights how Research Directors employed MACSs to decouple their operational environment from external threats.

4.4 Technology-transfer Oriented Research Centres

4.4.1 Strategy.

In Research Centre C, research in the field of material science, which can be subsumed under engineering and technology science, was carried out in huge laboratories. It appeared from their webpage that individual scientists shared a common infrastructure together with a variety of cooperation partners.

Table 17: Graduate-teaching oriented output bundles

	B	E
Number of Conferred PhDs 2010	2	0
Number of Graduate Students 2010¹	88	35
Number of Current PhD students (2011)	4	6
Number of Editorships 2010	2	30
Number of Memberships in Scientific Advisory Boards 2010	2	70
Number of Teaching Activities 2010	30 ²	31
Number of Commissioned Research Projects 2010	n.a.	13

¹ Bachelors, Masters, Licenses

² Excluding external and post-graduate teaching activities

Moreover, the webpage presented different examples of applications based on the groups' work across various consortia, which argued for a technology-transfer oriented research mission. Based on the interview questions referring to the Research Centres' activities and type of research, the Research Director (Case C) confirmed the centre's technology transfer orientation. He also highlighted the significant portion of experimental research, which is reflected in the survey results (56.6 %).

Following the survey results, only a small fraction of the research activities are of applied nature (17.5%). Given the low response rate combined with the fact that subgroups within the Research Centre work on projects that vary in their degree to which results can be used for valorizations, the result may not seem surprising. Additionally, in a recent field study of HEI research centres in an NPM latecomer country (Germany), Schmoch et al. (2010) reported similar phenomena: Scientific staff and Research Directors of Research Centres classified into the technology-transfer mission based on their cluster analysis of centres' scientific outputs did not describe technology-transfer related activities as vital parts of their work. The authors therefore argue that technology-transfer is not embraced into the individual scientists' self-concept, which would offer a plausible explanation for the obtained low value for applied research (17.5%).

Furthermore, in the authors' data set of 77 research groups, technology-transfer never dominated the activity portfolio of a research centre. Yet, it has been considered as a distinctive feature of a group vis-à-vis other research groups even if industry cooperation occurs on a rather low level (Schmoch et al., 2010, p. 10). Hence, the study regards the technology-transfer mission in case C as justified, given the majority of the

research projects that involve industry partners and the confirmation of its Research Director.

Medical applications in physics as a field of natural science, covers the broad research field of the scientists in Research Centre F. The Research Centre belonged to the large share of European HEI research centres in the field whose scientists are simultaneously affiliated to a huge joint research unit. These joint research units are run by the organization itself as well as by HEIs and therefore also staffed with full-time researchers and academics. Again, webpage information indicated a strong collaboration with local institutions and a joint use of laboratories as well as research facilities. Consequently, technology transfer was seen as the most feasible research mission. Whereas this perception is shared by the survey participants (50%), the Research Director clearly prioritized basic research and teaching, which always receives top priority among the Research Centres within the respective institute. Although the scientific director acknowledged that the Research Centre F under investigation could be regarded as more application oriented, a direct confirmation for the technology-transfer mission could not be obtained. Accordingly, knowledge generation and graduate-teaching receive top-priority. Again, Schmoch's et al. (2010) observation with respect to the missing technology-transfer mission in the scientists' self-concept and the rather external forces (government, funding agencies) for technology-transfer activities may also apply to the case at hand. Hence, scientists may identify themselves more with basic research objectives that are less concerned with an industrialization of its results. Applied physics requires substantial experimental setups (46.67%) which are usually conducted in the laboratories of the alliance partners, and thus, may involve a more fundamental purpose.

Nevertheless, the fact that the research conducted was observable in medical applications, seems to support a technology-transfer mission. The fuzziness within the transfer oriented mission is also likely to occur from the balancing act necessary to maintain a fundamental understanding of the research project while having regard to current or future practical problems, which Stokes (1997) has termed “use-inspired basic research”. Probably, Research Centres seek to excel in scientific performance that entails more than one dimension (e.g., publications). This is particularly true for technology-transfer oriented centres which are advised to create measures that stimulate both technology transfer as well as basic research (Schubert, 2009).

4.4.2 “Soft” levers of control.

As with the other research missions that highlighted the importance of the beliefs system in academic work, interview data of the technology-transfer oriented research mission showed the strongest insistence upon the scientists’ values and beliefs. Again, one of the reasons for this phenomenon might be due to the fact that these missions are not fragmented as in the social sciences where various subfields and, thus, beliefs, coexist. Therefore, it might be a natural occurrence that individuals in the technology-transfer centres show a strong inward focus, best described by Burt’s closure mechanism: “Closure involves strengthening connections within a group to focus the group on a limited set of options and practice. Closure is associated with trust and alignment, ultimately enhancing efficiency.”(2009, p. 2). The Research Director of Case C notes:

“It’s a very open community, so to speak. There is a lot of possibility, in the sense that if something happens, then we have to take action... [...] ... Then it is very easy to do so because the threshold is very low to work together.”

Furthermore, the beliefs system played an important role during the recruitment process to ensure future resources:

“There is a close connection between us and students, masters for example. That means that they have a relatively easy way of contacting us, knowing what’s going on in research in the institute, that means for us attracting Ph.D.s [...]. That’s really a benefit, I myself think this is really efficient. ...[...]... You may know these people already for five years, [...], when they come to the university you can see persons you would like to have in a group, or a person who likes to join.” (Research Director, Case C)

Whereas the comments of Research Director C pointed to a strong internal cohesion in Research Centre C, an even stronger tendency towards closure was observed in the comments of Research Director of Case F:

“I think it is very difficult for somebody who is not a scientist to give good hints to a scientist how to operate... [...]... We have our ontology, we have our internal culture, nobody can help us ... [...] ... When I talk to my colleagues at the high level management we know how to do it and no external guy if it is not one of us could ever say something. We would not like, we would not accept, because they don’t know anything about what we are doing.”

Whereas the information networks of Research Centre C and F seem to counteract these statements, they do not seem to be surprising at the second glance. As mentioned before, individuals in Research Centre F appear to rely more on external ties (76.92%) because individuals are simultaneously affiliated to a huge overarching national research collaboration to share infrastructure and expert knowledge. Since researchers in this national association belong to the same discipline, the external ties seem to be a necessary precondition for the development of bonding social capital between the various collaboration partners. In contrast, Research Centre C shows a high degree of collaboration within Alpha (51.52% ties between HEI sub-units), because the overarching institute is more than five times as big as those of Research Centre F in terms of scientific staff. It is therefore likely that the required infrastructure and expert knowledge already

exists within Alpha. However, the external ties are also not negligible (36.36%) indicating the need for bridging social capital that may develop into bonding between industry and academic partners to facilitate knowledge transfer. Another indicator for social closure within the research group is the awareness network as displayed in Table 13. Among the three research missions, scientists in the technology-transfer Research Centres show the highest degree of awareness for their colleagues' skills.

In summary, technology-transfer centres appear to be characterized by a high degree of bonding social capital, which can be regarded as necessary to develop bonding social capital between cooperation partners for effective transfer activities. Next, I describe how formal MACSs were used to turn bonding social capital within the Research Centre to bonding social capital between cooperation partners.

4.4.3 “Hard” levers of control.

Given the important role of budgets, quality management systems and reporting standards to legitimize the research centres' activities in the eyes of funding agencies and collaboration partners, these accounting technologies were used interactively in Research Centres C and F. According to the Research Director of Research Centre C, the interactive use did not impede the accumulation of bonding social capital.

“I as a scientific director, I have together with all the group members and the professors, I have a meeting [...] and it is also on performance indicators. Then the group leaders have this [meeting] with their staff and the daily guide together with the promoter has that [meeting] with the PhD students [...]. There are the scouts from the web program, so everyone has to answer and every year they have to sign that they [scientific staff] agree and not only that they [KPIs] have just been discussed. [...] They [KPIs] don't negatively influence. One of the key performance indicators in the institute is to show that they [scientific staff] collaborate. I see them [KPIs] only positive.”

To comply with the requirements imposed by Beta, Research Director in Centre F also uses KPIs in a rather interactive than diagnostic way:

“This is a small, relatively small lab. This is not thousands of people, where I don’t know each of them and where I don’t know exactly what they are doing. But I have a format given by the university and I have to check each point, I have to ask all questions: “Okay, let me see. Have you been happy with me last year? And they say yes. Okay, thank you!” “Do you have complains?- No.”, “Did you fulfill your job/ your duties? Yes or No?” Then I have to rank. To me this is useless, but they want it and then I do it.”

Given the potential risks entailed through all cooperation as mentioned before, these risks are likely to be enhanced in academic-industry collaborations. Thus, research project management systems are important in terms of project planning and to clarify the deliverables, which allows for an ex ante alignment of interests and intellectual property regulations. In Research Centre C, interactive and regular discussions took place on KPIs on the Ph.D. students’ and Research Centre level as well as on budgetary allocations. Research Director C appeared as a successful broker, who was engaged in a variety of prominent national programs in the centre’s discipline. Being involved in a number of consortia helped screening the environment for new opportunities, which is of utmost importance in technology-transfer to identify potential network partners given the continuous flux of the field. Thus, the interviewee proactively sought for chairman positions in the most important national programs in his discipline:

“Part of the job is of course to be a representative in our country [anon.] on the national policy. This national program is extremely important because it ensures the common research in our country [anon.] by making choices in our country [anon.] what to do on nanotechnology and how we have to invest. This program is a 300 Million Euro program, so it is quite big. But that is of course also very important, being a chairman within this program with the same philosophy [of Research Centre C] - and that’s the three pillars: scientifically top, a very good infrastructure as well as valorization.” (Research Director, Case C)

Residing on the front end of national research programs, the Research Director permits centre C to broker new alliances with partners that are most beneficial for the delivery of projects in accordance with the national programs' new strategic priorities. Timing advantages, access to new resources and the possibility to design the network to the advantage of Research Centre C, e.g. in terms of authority and power, are the potential outcomes of these processes. Besides, individual researchers within Centre C were encouraged to utilize their network to establish industry cooperation, e.g. by intensifying loose contacts with which they had already had positive experience. In this process, KPIs on the individual scientist's level, e.g. in terms of a bibliometric profile, assumes an important signalling function, because successful technology transfer has been related to high levels of inter-personal trust (Krücken, 2003). Thus, in line with the findings of Krücken (2003), it emerged from the interview data that trust was not granted to the Research Centre, but to individual researchers. This exemplifies how diagnostic MACSs may help to establish academic- industry collaboration and to develop bonding social capital between two different organizations to overcome the institutional gaps. Further diagnostic MACSs on the Research Centre's level such as budgets and performance measurement systems helped to gain legitimacy in the eyes of the business partner. Consortia on the national level that involved academic as well as industry researchers also helped to create visibility for the research institute and Research Centre C that is at best translated into legitimacy and reputation. In this vein, Research Director C stated:

“Let's say, for example, once a year, the other leader of my group and me, we are going to a group in one of our institutionalized international research centres and discussing about what are new directions to go...[...]... We follow the existing

programs in the group, as well as we follow what is internationally important and then we try to evaluate things and to, well, try to be part of it.”

These collaborations therefore also played a considerable role in gaining time advantages as Research Centre C’s discipline has been described as “very hectic” where “lots of things are going on because it’s really on the frontier of research” (Research Director, Case C). Thus, formal MACSs, e.g. in forms of research proposals, offered more objective ways to broker alliances and to approach potential industry partners. Formalized research proposals clearly communicated the project’s purpose, its deliverables, and expectations towards potential cooperation partners and built a solid foundation for negotiations in this way. Particularly, it outlined the centre’s credentials and highlighted its infrastructure, which made the centre an attractive collaboration partner for industry:

“The success rate of our group is very depending [sic] on the success of the institute. That means that the success of the institute [anon.] or the infrastructure gives us the opportunity to have such a high success rate. And this is especially for our group in material science because we developed equipment that is quite unique. [...] this equipment is also part of the institute... [...]... We are really beneficial to be part of the institute.” (Research Director, Case C)

In Research Centre C, these bridging social ties facilitated the growth of intensive cooperation with industry. For instance, the team of Research Centre C also involves a professor from industry, who serves as an “intermediate to have a junction with this company” (Research Director, Case C). Although the company representative shared face-time with the academics of Research Centre C only once a week, the industry professor was largely integrated into the Research Centre which helped to overcome the “cultural gap” (Krücken, 2003). On average, research projects together with industry are evaluated twice a year and usually arrange for Ph.D. student placements. Rather than

following a strict top-down approach, the Research Director seemed to be more concerned with the empowerment of the staff, i.e. in fitting together the centre's capabilities with arising opportunities similar to the observations of previous research (Montauti et al., 2011). In summary, Research Centre C portrayed a case where bridging and bonding social ties worked in tandem to facilitate internal coordination while successfully positioning the Centre in the knowledge market.

On the contrary, Beta's Research Director of the technology oriented Research Centre (Case F) acted more as a buffering mechanism in decoupling the centre's operational work from formal structures and requirements:

“We don't think that fancy and complicated methods are needed. We try to be very flexible, very simple. We don't want to create overheads. Our mandate is clear, we don't want to lose time with fancy, complicated managing structures. We try to be old-fashioned, maybe with some inefficiency, I can accept, but we cannot invest too complicated managerial structures. We don't like this. A scientist doesn't like to talk about - I mean you have to find people [...] like me that have to also take into account some management. Mostly researchers like to do their research without dealing so much with funding. Unfortunately I have to do that, but I try to limit this to a bare minimum.” (Research Director, case F)

In this case, the collected field data framed a Research Centre where the collision of internal academic values with external financial requirements became most apparent. This cultural clash is substantiated by a strong belief that the exorbitant transparency and reporting requirements are at the costs of the quality of the scientists' work given the limited time resources beside the pressure from funding agencies to produce scientific knowledge in a rapid manner. KPIs are perceived as too complex with an insufficient ability to reflect the wide spectrum of scientific work:

“Evaluation is a big issue, I can understand. I'm talking to you as a user. I don't like if somebody wants to evaluate me, but I understand why and [...] a government has certainly to understand whether the choice they made of giving more funds to our discipline [anon.] was worth. But once more, you always have

to have in mind what is the outcome...[...]...I think there must be more intelligence in the evaluation. More intelligence, you should understand that culture is always a good fact, culture is good, whatever it means - whether this is science, applied science or literature or music. ...[...]... Otherwise it is useless, it's just an overhead and a loss of time for us.” (Research Director, Case F)

Further, the loss of control over their own operations is seen as a serious threat:

“You know our community is very well monitored by ourselves. We have peer reviews, we have external reviews but always from people of our community. [...] So we have a very complicated, more complicated than you could think, structure for internal assessment, evaluation, granting of funds, but this is always internal because we would never accept someone who doesn't know at all what we are doing to decide whether I should do this or that.” (Research Director, Case F)

However, Beta's movement towards more accountability and transparency requires directors to monitor more and trust less, which would have considerable consequences for bonding social capital. When the Research Director of Research Centre F was asked about in which way formal MACSs were used to assess individual performance, a tendency towards decoupling emerged:

“No, no, no. I try not to do it [deliberately creating tensions]. This is my skill. I try to tell people: well you didn't get AAA, you just get a A+, because you remember the single work that you proposed have to be reworked again, what do you think? Can we do this next year?”

4.4.4 Case study evidence in the light of the proposed framework.

Nanotechnology (Case C) and physics (Case F) can be described as scientific disciplines operating in a common scientific paradigm. Individuals within these fields tend to show a high collective identity, which was argued to enhance the mutual dependence among researchers (Whitley, 2000). At the same time, funding plays a crucial role because of the high cost of the scientific equipment (Seeber, forthcoming). Despite belonging to the same scientific discipline, there is a huge difference between Research Centre C and F: research outputs of centre F often have no direct economic and

social relevance whereas it is not uncommon that scientific results in Research Centre C find direct applications. However, medical physics can be regarded as a subfield where scientific outcomes are more predictable and applicable to highly specialized, societal problems. Successful “used inspired basic research” (Stokes, 1997) has been observed in Research Centre F to require skills beyond the writing of effective funding proposals and maintaining bridging social ties with external stakeholders. This is because Research Directors in case C and F are urged to develop relations between their own centre and similar research facilities as well as industry partners to address highly specialized problems in a rapid manner. High mutual dependence among the scientists was assumed to build on high levels of bonding social capital. Yet, the strong reliance on external backers for the finance of the equipment combined with previous research findings pointing to a more personalized pattern of transfer activities (Krücken, 2003), have led to the expectation that bonding social capital between collaborators is indispensable.

What can be derived from the Research Centre’s F information network (see Table 14) is the high degree of specialization, since collaboration with other subfields is non-existent (ties between HEI sub-units 0%). Moreover, the high degree of external ties (76.92%) is likely to occur from the fact that this Research Centre is embedded in a huge international research program. In contrast to the interview data that indicated a strong internal cohesion among scientists, this was neither reflected in Research Centre C nor in Research Centre F, with a minimal number of internal social ties (12.12% in case C and 23.08% in case F). The low evidence for the relevance of closure, and thus, bonding social capital within these research missions, and previous qualitative research in university knowledge transfer (Krücken, 2003), which reported the importance of shared

values and trust between cooperation parties, are interpreted in favour of bonding social capital between collaborators as most supportive for the technology-transfer mission.

When analyzing the mission specific output bundles of Research Centre C and F, the Research Centres seem to draw considerable differences. There can be no doubt about Research Centre C's strong valorization performance.

Research Centre F is more concerned with fundamental research in medical applications, which significantly complicates the measurement of its transfer performance. While both centres cannot be compared based on their technology-transfer output bundles, Research Centre C appears to excel in its deliverables when compared at an international level.

Also, both Research Centres show an excellent publication performance, in terms of quantity and with regard to the impact of scientific publications (see Table 18). This is in line with the findings of Schmoch et al. (2010), who related the nanotechnology discipline to a high impact publishing culture.

Table 18: Technology-transfer oriented output bundles

	C	F
Total number of patents	20	n.a.
Institutionalized international research collaborations	10	1
Institutionalized national research collaborations	3	1.
Number of industrial partners	2	n.a.
Number of ISI- Web of Science Publications¹	517	333
Number of citing articles Web of Science²	9.101	2.969
Group h-index³	10.64	10.00

¹ Excluding publications of Ph.D. students, enquiry period from 1950 to 10/2011, publications include articles, books, book review, book chapters, reviews, reprints, proceeding papers, editorial material, meeting abstracts, notes, letters, scripts

² Excluding self-citations

³ h-index is "A scientist has index h if h of his or her N_p papers have at least h citations each and the other $(N_p - h)$ papers have $\leq h$ citations each" with N_p = numbers of papers published (Hirsch, 2005, p. 16569), calculated for the research centre based on Web of Science individual h-indices divided by the number of scientists with an h-index > 0 , excluding Ph.D.s

4.5 Cross-case analysis of the interplay between MACSs and social capital

In this section I will perform a cross case analysis between the different institutional contexts and research missions that seeks to identify some communalities and contrasts in the data set.

When interviewees in Beta were asked about their main responsibilities in the research institute and, especially with regard to the respective Research Centre, most of them asserted that they did not attempt to “manage” the Research Centre and reported rather general responsibilities of their position:

“I have to guide rather than manage.” (Research Director, Case F)

“I think the main task is to get an overview of the research centre, to keep track of it, to coordinate, and to enable in a sense. At most it is an indirect executive function, and if management then in the well-known and particular leadership style in an academic environment. In essence, it is more about coordination and keeping the strings together, to think ahead, but it’s of course not comparable to the management of another institution.” (Research Director, Case E)

In my discussions with Research Directors of Alpha and Beta, the picture reversed. Its research activities appeared to be crucial for Beta’s identity, resulting in various structures, procedures and tools to manage research and its related activities more proactively. In fact, Research Directors in Alpha were more explicit about specific tasks in their description of conferred management duties, usually embracing the three buzzwords of ensuring quality, focus and mass. This observation may parallel their institutional environments. Nevertheless, Research Directors in Alpha and Beta indicated that a more informal mode of control prevails in their Research Centre, pointing to a distributive and participative leadership style. Typical examples of coordination mechanisms include the open discourse and communication culture and the use of project management systems in order to support the centre’s research projects from the

preparation of the proposal to the completion of the project. They were an integral part of the day-to-day management of academic work, operationalized by rather soft steering means: “I think it’s really, I mean in my case, by having regular meetings, by seeing where people are, requiring deadlines, discussing the drafts, bringing things forward. Basically it’s through interaction within the group here.” (Research Director, Case D).

Across all cases, the individual researchers, mostly senior professors, assume financial responsibility for the projects. However, in Beta it appeared that this was mainly a response to NPM requirements pushing for higher transparency and financial accountability. In Alpha, on the contrary, this regulation seems to emerge as a natural phenomena derived from the universities’ overall mission, as indicated by the following comment:

“This is a university where you get paid, where you as a group get paid, because of the things you do and this is quite opposite of most of the universities... [...] And at this university they know that they have a shortage if they don’t have enough money. It’s themselves that they have to blame and that makes a big difference. So put the responsibility for getting money for the groups as low as possible. That’s, that makes an enormous change. This university is doing extremely well in getting externally funded projects.” (Research director A)

Therefore, Research Directors in Alpha inevitably create tensions between themselves and the heads of the research groups with respect to the internal allocation of research funds, building a subtle foundation for further discussions:

“They always want more than it is available. But that’s okay, it’s a negotiation between the groups and me as a scientific director. And they know that I only have a certain amount of money [...]. For 80 % of the group it is not a problem, but let’s say for 20 % it is a problem. We have to see how good they are, we have to look at their key performance indicators [...]. That’s not the nicest part of the job.” (Research Director, Case C)

In contrast to Alpha, the Research Centres in Beta receive a lump sum based on the Research Centres' size. Nevertheless, Beta's management plans to use more performance-based indicators in the future for which it just implemented a new reporting tool to collect performance data from the various Research Centres. As expected, the dataset of Beta showed a considerable resistance towards the movement from a professional to this more managerial mode of working.

They [Beta' management] try, but I think they will not succeed [performance-based internal resource allocation], because it's very difficult. I mean you would run into a revolution, people would protesting on this [sic]. I think very pessimistic on this. I think most of the reviews are just there because they [management of Beta] have to do it, but at the end you have no big impact. (Research Director, Case F)

However, this attitude towards MACSs was not shared by Research Director D who guides basic research activities in two of the Research Centres under the umbrella of the research institute led by him.

In all Research Centres, the associated workload introduced by reporting requirements and the use of budgets and key performance indicators is generally perceived as an obstacle for the effective delivery of the research mission. The study will elaborate on the potential threat for bonding social capital arising from these observations across the different missions in the subsequent sections. Nevertheless, Research Directors in Alpha show more tolerance for managerial approaches since formal MACSs are used in more proactive ways to match scientists' responses in terms of their social ties with the research missions' demands.

Both HEIs also employed research project management systems that were maintained through informal interactions such as brown-bag lunches or open channels of communications beside the more formalized meetings. Generally, the mentioned

instruments have been described to be used in ways that highlight the importance of communication, the sharing of tacit knowledge and information exchange. For instance, interactive research project management systems were also used for organizational learning as indicated by Research Director of case D:

“What we try to encourage is when people make mistakes or [mistakes] happening, then they are being discussed. Not to put them away but that they are being discussed in the staff meetings. We can learn the lessons here, that’s what we encourage.”

Although these mechanisms are formalized, e.g. in terms of formal and regular appointments where the actual progress towards the research projects are discussed, they are perceived as effective means to enrich the scientists’ cultural capital base. These organic controls and decision-making procedures appear to be most supportive for bonding social capital within the Research Centre. Therefore, continuous face-time and interactions during research projects that span at least two to three years helped to build and sustain bonding social capital. Project management systems for research activities were also used to signal the competences to relevant funding and cooperation partners and, thus, employed to broker structural holes (Burt, 1992).

As became apparent during the previous discussions, the field data indicates that the opinions of the Research Directors’ on the profitability of more diagnostic MACSSs, such as MbOs, reporting standards or KPIs, are not homogeneous across, and in some cases within, the research missions. These diagnostic controls are less flexible to embrace academic values. Also, they tend to be adopted due to external pressures, e.g. based on demands from university management (Alpha) or to obtain legitimacy from funding agencies (Beta). As a result, they impose a threat for bonding social capital in particular. Although used in an interactive way, budgets and key performance indicators create

higher transparency for individual results. This interactive use that first and foremost seeks to create awareness for strategic directions among individual researchers, may even arrange for higher visibility of peer performance as enhanced discussions are likely to disclose this information.

5 Discussion and Conclusion

5.1 Overview of Case Study Findings

In this section, I discuss the case study findings in the light of the proposed framework and develop theoretical insights.

5.1.1 Publication oriented research centres.

In general, the structural components of publication oriented Research Centres were corroborated: publication oriented Research Centres exhibit a high degree of collaboration, where the success is increasingly dependent on team members' efforts. This was also observed in Research Centre D, which deals with basic research in the field of social sciences. Here, the mode of working is still more abstract and significantly different to basic research in the hard sciences, which often involves team work in laboratories to address highly specialized problems. The collected information and awareness network data indicated a lower mutual dependence among researchers in these kinds of Research Centres, pointing towards the need for more bridging social ties. Also, in Research Centre E individuals indicated the lowest awareness of their colleagues' skills among the six Research Centres under consideration, which consequently imposed an obstacle for bonding social capital. In accordance with my conjecture in the proposed framework, Research Centre A, which operates in a more intensive performance culture, shows a higher performance in the relevant output bundles (see Table 16). Whereas the Research Centres may be comparable in terms of size, one should be cautioned about their different scientific disciplines and the associated differences in their publication cultures, ontologies and thus, beliefs. Nevertheless, the field data points to a trend where "hard" levers of control play a considerable role to legitimate the Research Centres'

performance to external stakeholders, e.g. funding agencies and collaboration partners. These arguments were also approved by the Research Directors in both institutional contexts. Remarkably, the publication oriented research mission is the only one among the three missions under examination where Research Directors from both institutional contexts perceived MACSs as important means to meet the various requirements imposed by internal as well as external constituents. Both centres operate in more or less institutionalized networks which feature close proximity to their own Research Centre. In this vein, the fundamental and fragmented nature of research made the use of MACSs more attractive in order to ensure “coherence” and “focus”. This observation supplements the findings from the study of Montauti et al. (2011) which argues for the importance of three levels of coherence in order to establish a dominant position in the fund seeking process: (1) coherence with and capitalization on the defined research focus, (2) coherence with the research priorities advocated by the corresponding HEIs and (3) coherence with the research themes regarded as significant among the scientific community. Especially in Research Centre D, the first level of coherence appears to be decisive to generate and maintain legitimacy in the exo-institutional network that is composed of main funding agencies and the cooperation partners. On the second level of coherence, a performance mandate assigned by Beta’s management also embraces strategic directions that need to be met. The centres’ transition from an interdisciplinary approach to research to a more disciplinary mode of research, which was driven by the incentives set by the scientific community, illustrate the importance of the third level of coherence. As mentioned before, it is not only necessary to produce excellent scientific results, but also to convince the scientific community of its quality to obtain legitimacy

and reputation that can be transformed into economic capital under certain conditions (Bourdieu, 1986; Oakes et al., 1998). Given the relatively unique and young field of research in Centre D, it seems rather unrealistic for its individuals to “change the values of resources” through the “mobilization of other actors who make similar demands”, e.g. with the “formation of social networks promoting alternative value assignments to resources” or “revolutions that aim to replace the community’s decision makers” (Lin, 2001, p. 32). The centre’s reversion to a disciplinary approach was therefore necessary to create a favourable social structure as key performance indicators received more internal as well as external legitimacy.

It also parallels the observations of Chenhall et al. (2010), whose investigation provided some evidence that the discrepancies between an individuals’ values and those of its organization can be mitigated on the basis of the organizations’ beliefs system. Thereby, the mission of the Research Centre assumed an important role. Signalling a centre’s scientific focus was necessary to obtain legitimacy from funding agencies. This process was enforced by the formation of alliances that communicated the centre’s mission to stakeholders, particularly to funding agencies. As identifiable from their income structure (see Table 15 and Figure 5), scientists in Research Centre A successfully acquired research projects that primarily spanned a time frame of three to four years in contrast to Research Centre D, which successfully acquired a single but prestigious long-term social science project. Clearly, the dominance of TPFs in these Research Centres helped them to gain the legitimacy that was necessary to broker alliances and maintain beneficial relationships with cooperation partners. Finally, the results of the field data reflect the findings of Schubert (2009), who found that regular

evaluations are an appropriate tool to foster basic research. The rather long-term horizon of research projects in publication oriented research centres lend themselves to the use of more diagnostic controls such as key performance indicators to direct the attention to the centre's deliverables and provide a long-term agenda. Table 19 summarizes the emerging themes during the interviews with Research Directors of the publication oriented mission.

5.1.2 Graduate-teaching oriented research centres.

As anticipated, bonding social capital appeared to be advantageous for graduate oriented Research Centres. Generally, individuals in Research Centres B and E were concerned about the maintenance of the scientific structure, engaged in various committees and review activities while making some space for research. Since time for research was more constrained by teaching activities than in other centres, they relied even more on a redistribution of teaching efforts. However, in Research Centre B this redistribution took place internally whereas teaching loads in research centre E were coordinated within an institutionalized network. Consequently, a more intensive use of MACSs was expected to hamper performance in Research Centre B, but could not be corroborated with the collected output bundles when comparing the teaching-missions across the two national contexts (see Table 17). MACSs were regarded as trivial by the Research Director of Case E, which could have had significant negative spill-over effects to internal as well as external constituencies.

Table 19: MACSs and social capital in publication oriented research centres

Mission	HEI/ Country	RC	Emerging themes regarding the use of “soft” levers and its implication for		Decisive social capital dimension based on information and awareness network	Emerging themes regarding the implications of the interactive and diagnostic levers of control for the decisive social capital dimension
			Bonding Social Capital	Bridging Social Capital		
Publication orientation	Alpha/ NPM- Forerunner	A	Combination of formal and informal communication processes as well as top-down and bottom-up decision making procedures created tensions that are solved based on the centre’s beliefs system	Importance of lobbying and focus of research to create visibility in order to ensure access to resources	Bridging High Awareness of colleagues’ competences, more external and ties between HEI sub-units than internal social ties	PMS ¹ signal competences, targets and expectations to funding agencies and collaboration partners (consortia important to ensure sufficient funds for discipline in general) Budgets created tensions but were solved based on SRO ² s and beliefs system KPI ³ s to remain focused
	Beta/ NPM Latecomer	D	Lower mutual interdependence among researchers within the centre are not supportive of bonding, “work packages” as boundary systems	Ensuring visibility with communication strategy to external stakeholders, Beliefs system helped to broker structural holes and to establish sustainable networks, Importance of a limited number of institutionalized network partners	Bridging Lowest Awareness of colleagues’ competences, more external than internal social ties	KPI ³ s to remain focused and to obtain coherent research results Interdisciplinary research approach interfered with KPIs, led to a breakdown in bonding social capital within the centre demonstrate the need to obtain internal legitimacy for MACSs even if bridging social ties seem to be most decisive for delivery of research mission

¹ Project management systems

² Strategic research orientations

³ Key performance indicator

On the other hand, the transparency of budgets in Research Centre B, e.g. with respect to the allocation of government funds for conferred Ph.D. titles, may have contributed to a more beneficial social structure to deliver graduate teaching.

Neither Research Centre had been recognized as a strategic priority by their HEI. This may be a natural occurrence of graduate-teaching oriented centres since individual researchers within this mission are supposed to be more concerned with the maintenance of the scientific infrastructure through educating the next generation of scientists, rather than focusing on research activities. Again, this poses an extra challenge with regard to the second level of coherence as described by Research Director B:

“The extra challenge is also to stay alive more or less within Alpha’s [anon.] context which is predominantly technological. So, my task is also to make sure that the research programs that we are conducting here are so coherent, so convincing that within the university and outside the university there is no doubt that it’s a solid, coherent research program... [...] ... There is a mix now but in the present time which also has to do with economic crises and so on, so at present, the focus is very much again on what the university does with technology and that means that we as a research institute are all the time confronted with the question where do we step in, what can we contribute to this [...]. I am convinced that we need excellent research in the social and in the behavioural sciences in this university and from that position we can do all kinds of interesting things with our colleagues in the technical institutes, but we first need to have our own basis. That is what I am struggling for. “

The institutional identity of Beta is still strongly shaped by the traditional university model, which does not naturally match with the demand for more technology-transfer activities. Similar to Research Director E’s attitude towards MACSs, Research Director F regarded MACSs rather as an obstacle to deliver high quality research than providing useful information to deliver its performance mandate. According to Brignall and Modell (2000), a lack of coherence between budget allocations and the organizational environment within a public institution, e.g. tensions between the interests

of different stakeholders, may prompt the decoupling of operations. In the accounting literature, the decoupling of operations has been discussed as means to generate legitimacy and operating flexibility (Lukka, 2007; Mouritsen & Larsen, 2005). Table 20 summarizes the collected field data.

5.1.3 Technology-transfer oriented research centres.

Even though Research Centres C and F appear less than a perfect match due to Research Centres F's more fundamental nature, it rapidly became clear that team work and a high mutual dependence were the decisive characteristics of the scientists' working mode in these types of research centres. The common paradigm and beliefs shared by the scientists in these centres are accompanied by a high degree of internal cohesion. To conduct big-scale projects that are common within these research missions, a lot of resources need to be moved within these scientists' networks as evidenced by their more externally oriented social ties. Indeed, decoupling procedures could have been observed in several ways: (1) division of labour, (2) strategic collaborations and (3) use of laboratories that have been created for basic research and which are then shared with collaboration partners. The latter seeks to facilitate more "use inspired basic research" that might be translated into economic profit. In striking contrast, Research Centre C's Research Director engaged in various screening activities that helped to control resources to the advantage of the centre. Such mechanisms included, for example, active participation in scientific committees and a high involvement in scientific programs, especially on the national policy level. In this way, Research Director C obtained relevant information in a timely manner to successfully take advantage of emerging opportunities.

Table 20: MACSs and social capital in graduate-teaching oriented research centres

Mission	HEI/ Country	RC	Emerging themes regarding the use of “soft” levers and its implication for		Decisive social capital dimension based on information and awareness network	Emerging themes regarding the implications of the interactive and diagnostic levers of control for the decisive social capital dimension
			Bonding social capital	Bridging social capital		
Graduate-teaching orientation	Alpha/ NPM latecomer	B	Enhanced mutual dependence, beliefs are communicated during recruitment of Ph.D.s to ensure compatible values	SROs ² encourage scientists to limit the scope of potential network partners	Bonding More internal and ties between HEI sub-units social ties than external ties, high awareness of colleagues skills	Budgets, KPIs ¹ and SROs ² , MbOs ³ were used to create awareness for the centre’s deliverables and created tensions that were solved based on SROs ² and beliefs system Interactive use of PMS ⁴ , transparent budgets and exact KPIs ¹ used in imprecise ways allowed for bonding social capital Top down approach for research and educational activities (threat for bonding social capital)
	Beta/ NPM latecomer	E	Low mutual interdependence among researchers: Research projects often conducted by a single researcher Communication and discourse culture to foster bonding social capital	Beliefs system formalized in mission statements helped to broker alliances to establish a institutionalized network	-	Interactive PMS ⁴ created enabling environment, discourse and communication culture allowed for strong bonding MbOs ³ helped scientists to monitor progress towards “production of PhDs” but were regarded as redundant Reporting requirements lacked internal legitimacy (symbolic acceptance of MACSs e.g. implementation of reporting database), which meets with resistance among the centre’s scientists , but helped to position the centre in the institutionalized education network and enhance visibility (basis for bonding between network partners)

¹ Key performance indicator
² Strategic Research Orientations
³ Management by Objectives
⁴ Project Management System

Moreover, it helped align the strategic focus of its centre, mobilize resources, and remain determined in its investment strategy. Again, this parallels the crucial role of the beliefs system (Chenhall et al., 2010) in terms of the three levels of coherence (Montauti et al., 2011). Coherence on the first level has been described as “a patient building of scientific track, through specific choices and continuity of research which cannot abstract from skills, expertise and reputation of involved people” (Montauti et al., 2011, p. 13). In Research Centre C, this was facilitated by having a clear research focus per se based on the institutes’ strengths which are capitalized on the Research Centres’ level. On the second level of coherence, strategic priorities set by the research institutes played a significant role. Since Research Centre C belonged to the research institute which had already been identified as strategic flagship of Alpha, the engagement in various committees and programs on the policy level was necessary to maintain this status. The third level of coherence entails the idea of flexibility: being able to respond to new opportunities in brokering new alliances that seek to enrich the research focus without neglecting the first level of coherence. As the chairman of an important national program and its accompanying networks, including the Research Centre’s strategic alliance partners, the director is allowed a decent overview of the skills and expertise possessed by potential alliance partners. If the research focus changes on the second level, Research Centre C can immediately broker new partnerships given the time and tacit knowledge advantage obtained by its director due to these active policy involvements. Time advantages especially arise from the tacit knowledge about changes in research priorities that can be obtained through the participation in scientific committees and national programs. Knowing to which subfields resources will be allocated in the near future may

allow for a faster brokering with collaboration partners that provide the necessary skills and competences for this new research direction before competitors may have a chance to respond to these changes. Hence, the high involvement of Research Directors on the research policy level, which was especially observed in the technology-transfer mission, can be regarded as an alternative to the rather vertical approaches inherent to European HEI research centres. This complements the findings of Bleiklie et al. (2011), who elaborate on a “network governance” approach that coexists beside the NPM inspired managerial approaches. The emerging themes during the interviews with the technology-transfer oriented research directors are outlined in Table 21.

5.2 Concluding Remarks

The purpose of this study was to examine how individuals in knowledge-intensive settings, i.e. scientists in HEI research centres, respond to MACSs. The exploration started with a review of the current knowledge about MACSs and social capital and proceeded on this basis to the development of some tentative conjectures. These propositions were further examined with the aid of a comparative case study. Given the little knowledge about control practices in knowledge intensive organizations in general, and research centres of HEIs in particular, I regarded it as more desirable to refine theory in borrowing conceptualizations of the interplay between social capital and MACSs from the NPO sector (Chenhall et al., 2010) and then combining it with insights from the HEI literature (Schmoch et al., 2010; Schubert, 2009; Seeber, forthcoming).

Table 21: MACSs and social capital in technology-transfer oriented research centres

Mission	HEI/ Country	RC	Emerging themes regarding the implications of the belief and boundary levers of control for		Decisive social capital dimension based on information and awareness network	Emerging themes regarding the implications of the interactive and diagnostic levers of control for the decisive social capital dimension
			Bonding social capital	Bridging social capital		
Technology- Transfer Orientation	Alpha/ NPM- Forerunner	C	Intensive Team work, Successful transfer builds on high levels of trust between academics and industry researchers, Academic beliefs system is formalized in the research PMS ¹ to establish trust in academic-industry collaboration, industry researcher as integral part of research group	Need for various bridging ties to share facilities/ specialized equipment, influence national policy, create visibility and obtain timing advantages Importance of Lobbying, institutionalized international research partners and spin-off companies to screen the environment	Bonding between collaboration partners High awareness of colleagues' skills, mostly ties between HEI sub-units and external ties	PMS ¹ as compatible MACSs for academic and industry values that helped to signal competences to potential partners, formalized research proposal helps to mitigate the institutional gaps in clarifying the purpose, deliverables, time frame, intellectual property issues and thus, communicated research centre's reputation and credentials to external parties Budgets interfered with internal legitimacy but were necessary to obtain external legitimacy Intensifying loose contacts with the aid of KPIs - MACSs helped to broker sparse networks in developing bonding social capital between academic-industry consortia
	Beta/ NPM Latecomer	F	Intensive beliefs system, high internal cohesion (indicative of social closure, Burt 2009), intensive team work with individuals from the same specialized field	Need for various bridging ties to share and access facilities/ highly specialized equipment, strong inward focus complicates industry collaboration Importance of active participation in European research collaboration	Bonding between collaboration partners Highest awareness of colleagues' skills, considerably more external ties, no ties between HEI sub-units	PMS ¹ are used interactively to map long-term research projects (enhancing bonding social capital between mostly academic partners) Cultural Clash: Budgets, KPIs ² , and reporting requirements are not compatible with academic values (MACSs reflect the spectrum of scientific work to an unsatisfactory degree) Information based on MACSs are perceived as redundant as information already existent in the highly cohesive network

¹ Project Management System

² Key Performance Indicator

Evidence obtained from the collected field data and online survey corroborated the propositions concerning the impact of social structure within and external to research centres on the different intensities of “hard” control levers (as mirrored in NPM dissemination). These reciprocal effects tend to determine the effectiveness of the interplay between different control levers for the management of research activities across different missions.

Drawing on Bourdieu’s (1986) different types of capital and idea of symbolic violence (Bourdieu & Passeron, 1977), this paper describes the present situation of HEI research centres that find themselves in a tension between increased external pressures for higher efficiency and the need to gain legitimacy from internal constituents for an effective delivery of their research mission. Simons’ (1995) LOC framework, which is based on the concept of tensions, was used to analyze how social connectedness within and between research centres of HEIs affects the management of the current challenges faced by these organizations. His framework embraces important control systems from the management control literature that are explicitly linked to the achievement of strategy: the boundary system, the beliefs system, the diagnostic and interactive control system. In the current study, Simons’ (1995) coherent and comprehensive framework built the foundation to examine the study’s key research questions: can we obtain and manage the potential benefits of social capital in applying Simon’s (1995) well-recognized levers of control (LOC) framework to the higher education context? Can directors of HEI research centres use these control levers to create a better fit between individual values and those of external constituents to leverage research performance? Further, the paper made an effort to understand how the reciprocal effects between social

capital and the different components of the LOC framework impact the research centres' strategy, i.e. the delivery of its research mission.

Generally, the case study supports the usefulness of Simons' (1995) LOC framework to study social relations and how they may influence managers' capability to solve the inherent tensions faced by HEI research centres to deliver their research missions. Given the dynamics involved in both- individual responses towards MACSs inside the research centre, and the turbulent institutional context that exercises external pressures, the LOC has been proven as an appropriate framework. This is because it allows for the examination of emergent and intended strategy (e.g. research focus) as well as formal (KPIs) and more informal controls (beliefs). The case material suggests that the concept of social capital had much to offer to explain the sometimes contradictory effects of the different control levers when they were found to be more or less supportive for the delivery of the research mission. Given the flaws in measuring scientific performance as well as the definition of the research missions and their degree of comparability across the national contexts, it would be misleading to conclude that a more managerial approach to research activities would result in superior research performance. What can be argued is that a more intensive and proactive use of MACSs, particularly with regard to the control of the socially constructed process of a centres' research focus and mission at the three different levels of coherence (Montauti et al., 2011), does not necessarily impede research performance. This conclusion builds on the overall observation that the mission specific performance indicators of the research centres in Alpha that operate in a NPM forerunner country may even show a tendency to result in higher research performance.

5.2.1 Theoretical implications.

The case study provides an adequate theoretical framework that warrants further empirical studies for this line of research. The findings add to management accounting knowledge concerning the complex interplay between formal and more informal MACSs. As Simons (1995) did not investigate the reciprocal effects of different control levers in great detail, scholars have started to look at the interplay of different control levers (Henri, 2006; Tuomela, 2005). The present study therefore refines the interplay between formal and more informal control levers by explicitly taking into account its effects on social relationships within as well as external to an HEI research centre. It has been argued that MACSs need to be designed and used in ways that correspond to both- the coordination of individuals and the social structure surrounding the HEI research centre, simultaneously. When working in tandem, these two mechanisms have been observed to constitute effective MACSs in research centres of HEIs. Theoretically, the study's results contribute to a recent stream in the management accounting literature focusing on MACSs and their effects on the more informal structure of the organization and its stakeholders, primarily by building on the work of Chenhall et al. (2010). In this vein, the study at hand supplements those authors' findings that are centred around the importance of the beliefs system within a NPO to deliver effective welfare services without neglecting economic concerns.

Further, the case study illustrated how "hard" levers of control impacted "soft" levers of control, but also how these mechanisms worked the other way around, which, in the realm of HEI research centres, seems to be of particular relevance. It contributes to the accounting literature by providing a starting point to explore the role and possible

effects of the conflicting organizational pressures on public sector executives (Abernethy & Chua, 1996), i.e. research directors of HEI research centres, who may proactively use MACSs to shape the social structures of their units to enhance organizational performance.

In the case of the NPM latecomer country, the case material responds to the discussion on the importance of an organization's levers of controls to obtain external (Pfeffer & Salancik, 1978) as well as internal (Moll & Hoque, 2011) legitimacy. Shedding some light on how research centre directors of HEIs seek to balance internal and external legitimacy requirements with the aid of different components of MACSs addresses the suggestion of Moll and Hoque (2011), who demonstrated the need to seek legitimacy among internal stakeholders for the implementation of new accounting technologies in a HEI.

Further, it can be argued that the study provides some evidence for "hybrid professionals" similar to the study of Kurunmäki (2004), who provides some evidence as to doctors' ability to integrate more economic concerns in their paradigm that used to be dominated by social and humanitarian ideals. With the exception of the Research Director associated with the publication oriented research mission, the study at hand could not find any hints of a hybridization of Research Directors in the NPM latecomer country. The gradually increasing and conflicting pressures in this institutional context have not triggered Research Directors to deal with these multiple pressures by combining multiple roles, but by decoupling their operative environment from external requirements. Especially in Research Centre F, the strong professional ethos of its Research Director still resulted in a decoupling of certain routines at the research centre level. Based on

these grounds, it was argued that the beliefs and values held by a research director can affect the alignment of perceived pressures.

5.2.2 Practical contributions.

Practical implications of this study convey a solid message: MACSs do have a place in HEI research centres if not used blindly. In line with Chenhall et al. (2010), who builds on Simons (1995, p. 134) assertion, the beliefs system may be capable of providing sufficient focus while being flexible enough to embrace economic values that correspond to external pressures. Echoing the results from Montauti et al. (2011), “soft” levers of control have been identified as most supportive to shape the social structure around the HEI research centre’s environment to their benefit. Overall, research activities seem to require strong leadership, not in the sense of a strict top-down approach guided by diagnostic controls, but in creating and maintaining a strong research focus that is flexible enough to respond to emerging opportunities without losing research focus.

In detail, the study highlights how research directors may use MACSs to structure the social network around their research centres that are most supportive for the delivery of their research missions. Case study evidence with regard to the publication oriented research centres suggests they tend to rely on higher levels of bridging social capital. Thus, research directors should particular pay attention to legitimize the research centre in the eyes of the scientific community. In this regard, MACSs proved to fulfil an important function in signalling competences, e.g. regarding the utilization of resources, to funding agencies and collaboration partners. While diagnostic controls, e.g. KPIs and budgets, are useful to direct scientists’ attention towards critical deliverables, they are less likely to compromise academic values when used interactively. Whilst embracing

internal legitimacy, interactive research project management systems can offer effective means to broker new alliances by clarifying objectives and signalling competences to potential network partners. Efforts to legitimize “hard” levers of control among scientists inside the research center can be actively supported by the “soft” levers of control. For instance, diagnostic MACSs may help scientists to remain “sharp” and finding their niche, which not only generate internal legitimacy but also help to visualize the scientists’ accomplishments. This does not mean that researchers are bound to their research niche where they cannot change their research focus, as the shaping of the beliefs is subject to a dynamic process according to three levels of coherence (Montauti et al., 2011).

The case study findings in reference to the graduate- teaching oriented research centres allow for less concrete conclusions. In general, these centres have been found to benefit from enhanced bonding social capital. As research directors within this mission categorization are expected to focus on the maintenance of the scientific structure, they are urged to find valid measures to assess this kind of scientific work, e.g., in paying particular attention to the involvement in scientific review boards and committees and graduate teaching. Budgets play an important role in these centres and have been found to foster graduate-teaching if used with sufficient transparency, e.g., in allocating the full sum of governmental aid to the research centre where the Ph.D.s have been trained. However, graduate-teaching research centres that seek to deliver education within a network may have to expand their bonding social capital to their collaboration partners. This may again change the emphasis research directors should pay to the different control levers as indicated by the technology-transfer mission.

Technology-transfer oriented research centres rank among the research centres that inevitably seem to pursue a two-fold mission: to excel in basic research that produce results which are immediately convertible into economic capital in the ideal case. Not surprisingly, network data provided an inconclusive picture, indicating that these centres' social network structure need to be well balanced with bridging social capital well as bonding social capital between network partners. "Hard" controls such as key performance indicators and budgets have been found to legitimize research centres to funding agencies and to industry partners. Brokering new alliances are important when shifts in one of the levels of coherence (Montauti et al., 2011) occur. In this respect, MACSs in terms of interactive project management systems provide useful bridges to potential collaborators. Nevertheless, bridges with new industry partners need to be further developed on the basis of bonding social capital as knowledge-transfer relies on high levels of trust between individuals of both parties (Krücken, 2003). Integrating an industry researcher into the academic team that is controlled with interactive MACSs would therefore allow for an accumulation of bonding social capital between the academic and industrial institution. Similar to the publication oriented mission, the "soft" levers of control may play a supporting role to create internal legitimacy for "hard" controls such as key performance indicators that also embrace more transfer oriented measures. In summary, technology-transfer oriented research centres seem to follow a two step procedure, where the focus of the social capital dimension and thus, appropriate MACSs, need to be adjusted accordingly.

5.2.3 Limitations.

The combination of different data sources offered a comprehensive view of the research sites. Using interviews to investigate the interviewee's perception of their current challenges, a short online survey to collect network data together with financial documents and webpage information allowed for a good understanding of the differences in external and internal pressures faced by research directors in a NPM forerunner and latecomer country. However, this study only started to scratch the surface of the complex and continuously changing environment of control mechanisms in today's research centres of HEIs. Its cross sectional nature does not allow for any generalizations beyond the research sites. Results are purely descriptive as a consequence of its exploratory purpose. While investigating the management accounting and control practices in HEI research centres from a more socialized angle, there can be no doubt that the processes under scrutiny involve considerable dynamics that require time in order to unfold their effects. A longitudinal study would be desirable for a stronger empirical validation of the proposed framework. Moreover, the study relies to a large extent on limited interview data without any direct observations.

Further limitations of the study relate to the classification of the research missions. Firstly, it should be noted that the selected HEIs are not necessarily representative of their national context, but rather pursue missions that have been determined by their management and, thus, are likely to be indirectly instead of directly driven by institutional context. Against the background of NPM, research centres of HEIs are encouraged to specialize, but usually try to diversify their research output profile. The study therefore collected three mission estimates in order to mitigate the potential

perception and expression bias arising from self-reported research missions and the measurement bias inherent to the webpage analysis. Hence, a quantitative follow-up study could not only establish a causal link between the LOC, social capital and research performance variables, but would also allow for a correlation analysis between the self-reported activity profile and the centre's multi-dimensional performance data as demonstrated in the study of Schmoch et al. (2010). Particularly, a more comprehensive network analysis of HEI research centres in the style of the study of Cross and Cummings (2004) would build the basis for a regression analysis between LOC variables and research performance including social capital as a moderator, which would lead to a more robust argument for the moderating impact of social capital.

5.2.4 Future research.

The study suggests a variety of research avenues from which future investigations could depart. Further research is warranted in order to pay more attention to the informal organization in HEI research centres that goes beyond the type and use of control levers. In light of further exploration of the moderating impact of social capital on the MACSSs-research performance relationship, it might be useful to transfer the study's framework to other fields such as NPOs, other public agencies or professional firms.

Given the dynamic nature of the concept of social capital, certainly better classifications of social capital should be developed that also take into account their reciprocal effects. Literature in this domain has already discussed that both forms of social capital do not necessarily need to be mutually exclusive, but research in this domain is still in its infancy regarding how to conduct a more solid empirical examination (Adler & Kwon, 2002).

One of the most intriguing findings of the study was that there was a consensus among research directors among the publication oriented research missions regarding the usefulness of MACSs to enhance the research performance of their organizations. Future research could therefore explore how scientific leadership relates to the capability to balance the inherent tension of HEI research centres.

Another finding of this study that deserves further research is the role of a research centres' beliefs system. For example, centres that are characterized by a strong beliefs system, e.g. those that operate on a common paradigm, indicate a considerable imbalance of social capital. It would be interesting to investigate how this imbalance affects the beliefs system to mobilize resources both within and external to the research centre, with subsequent consequences for the effectiveness of MACSs.

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Appendices

Appendix A: Letter of Invitation And Consent

LETTER OF INVITATION AND CONSENT (to be sent through e-mail)

(Date):

Dear (Research Participant's Name):

You are being invited to participate in a research study on the role of management control systems in higher education. Specifically, I am interested in how new public management reforms have influenced the use of management accounting and control systems in the research centres of higher education institutions. In particular, I am interested in your perception of key characteristics of your research centre, and the extent to which management and accounting control systems are used to assess achievement of research-related goals. The purpose of this letter is to ask for your consent to participate in my masters' thesis research. Your opinion is important to me, and will help me to complete my graduate studies.

I would expect my contact with you to require up to two hours of your time. First, I would meet with you for an interview that would last about 45 to 60 minutes. The interview would be recorded so that I can accurately reflect on your comments. Second, if at all possible, I would also like to obtain copies of relevant institutional documents on research performance and pertinent internal management accounting systems. Finally, I would administer a short online survey to all members of a single research group. Thus, I would require your assistance in identifying a research group. The survey collects information about the information they need to complete their work. It should require no more than 15 minutes for each individual to complete.

There are no anticipated risks or discomforts related to participation in this research. However, if you or the survey participants feel uncomfortable with any part of this study at any time, you have the right to withdraw your participation in the study with no consequences. If you consent to the interview, you may choose not to answer some or all of the questions with no consequences. Although you will not benefit directly from participation in this study, I hope that other higher education practitioners will benefit from my research insights.

I will take several steps to protect your anonymity, and that of your institution. Although the interview will be recorded, the taped record will be destroyed once it has been typed up. The typed interview will NOT contain any mention of your name, and identifying information from the interview will be removed. The survey is completely anonymous unless contact information are provided voluntarily. The typed interviews and survey data will be kept in a locked filing cabinet at the University of Applied Sciences Schmalkalden (Germany). Only the main researchers (that is, my thesis co-supervisors

and me) will have access to the interview and survey data. All information will be destroyed after five years time.

The results from this study will be presented in writing in my masters' thesis, and later in an academic journal article. The results may also be presented in person at an academic conference. However, at no time will your name be used or any identifying information revealed. If you would like to receive a copy of the results from the study, you may contact me as follows:

Mobile: +0049/(0)17656060622 or via e-mail: kellerm4@stud.fh-sm.de

(kellermann@uleth.ca)

If you require any information about this study, please do not hesitate to contact me. Alternatively, if you would like to speak to one of my thesis supervisors, please contact them as follows:

Dr. Peter Schuster (Professor for Management Accounting)
University of Applied Science Schmalkalden, Thüringen, Germany
Telephone: +0049(0)3683/688-3112
Schuster@fh-sm.de

Dr. John M. Usher (Professor of Strategy and Org. Theory)
University of Lethbridge, Alberta, Canada
Telephone +001/403-329-2759
john.usher@uleth.ca

If you have any questions about your rights as a participant in this research, you may also contact the Office of Research Services at the University of Lethbridge at +001/403-329-2747 or research.services@uleth.ca.

I will contact you by telephone for your answer. Alternatively, you may contact me at +0049/(0)17656060622 or kellerm4@stud.fh-sm.de (or kellermann@uleth.ca).

Sincerely,
Carolin Kellerman

M.Sc. (Candidate), Faculty of Management
The University of Lethbridge, Canada

M.A. (Candidate), International Business & Economics
University of Applied Sciences Schmalkalden, Germany

Appendix B: Research Project Outline

Research Project Outline

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Project Title:

“Bridging and Bonding in HEI Research Centres:
Exploring the Moderating Influence of Social Capital on Performance Outcomes under NPM-
driven MACSs”

Justification, Relevance and Expected Outcomes or Impacts:

The new public management reforms have increased the focus and emphasis on appropriate management accounting and control systems (MACSs), as evidenced by new governance mechanism for higher education institutions to transform them into formal organizations. Accordingly, research centers of higher education institutions are encouraged to make tremendous investments in their control systems.

This research project seeks to investigate how MACSs can be employed to assist directors of research centres in higher education institutions (HEIs) to achieve their goals and to monitor progress towards accomplishing these goals.

Previous work/ Background:

A recent study of research centres in HEIs found that the effectiveness of new public management (NPM) tools for the steering of research activities is contingent on the research centres mission (Schubert, 2009).

Additionally, Chenhall et al. (2010) reveals that MACSs, arising from NPM in a non-governmental organization, evoke certain tensions between the type of management control system and the development of internal (“bonding”) and external (“bridging”) social ties.

Given these insights, the current study formulates proposals regarding the likely impact of the MACSs arising from NPM on the performance of research centres as moderated by the effects of social capital (“bridging” and “bonding” social ties). The research missions are expected to accentuate or diminish the theoretically identified performance- social capital tensions.

Objectives:

The current research project aims to explore organizational factors that may influence the use of management control systems, as well as several types of control systems. Particularly, the project examines how individual responses to MACs in terms of “bridging” and “bonding” social ties affect research performance. The overall objective of the study is to better understand the productivity of research centres in the higher education setting. Thus, the research project seeks answers to how a research centre’s MACSs satisfy the imperatives of new NPM without sacrificing its research mission.

Appendix C: Individual Informed Letter of Consent

INDIVIDUAL INFORMED LETTER OF CONSENT

Title of the project:

“Bridging and Bonding in HEI Research Centres: Exploring the Moderating Influence of Social Capital on Performance Outcomes under NPM-driven MACSs”

1. I have been invited and agreed to participate in a research project conducted by Carolin Kellermann.
2. The purpose of this research is to better understand the productivity of research centres of higher education institutions. The study will particularly address how management accounting and control systems, which arise from new public management, are implicated in the development of social ties internal and external to a research centre. I was asked to participate in this study to discuss my perception of critical strategic variables for achieving the desired research performance and the role of management accounting and control systems in these processes.
3. There are no foreseeable risks or discomforts to me if I agree to participate in the study. I have the alternative to choose not to participate in this research study.
4. The study’s outcome will benefit higher education institution practitioners and contribute to the exploration of the role of management accounting and control systems in uncertain environments. I will not benefit directly from participation in this research.
5. My participation will involve a single one-on-one interview with the principal researcher, Carolin Kellermann. The interview will be audio taped by the researcher and will last for approximately 60 min. If individual results of the research centre are discussed, my own identity will be protected by using a pseudonym rather than my name or other identifying information. Also, a pseudonym will be used for the name of my institution.
6. I allow any collected archival material to be used for the written thesis, unless otherwise stated below. By signing the form below, I give my permission to audiotape the interview. Once the tape is transcribed, the tape will be destroyed. All transcripts will be stored in a locked cabinet located in the researcher’s locked office. Only the researcher will have access to the data.
7. My participation in this study is voluntary and I am free to withdraw at any time. All data I and members of my research centre have shared prior to the time of withdrawal will be destroyed. As the session unfolds, I am free to choose not to answer any questions asked. There are no consequences for not answering a question or withdrawing from the study.

8. Results of this study may be used for the researchers' master thesis, publications or scientific presentations.

9. Any questions I have concerning the research study or my participation in it, before or after my consent, will be answered by Carolin Kellermann, Graduate Student,

- a) University of Applied Sciences Schmalkalden, Thüringen, Germany
 - Mobile: +0049-(0)176/56060622
 - kellerm4@stud.fh-sm.de
- b) University of Lethbridge, Lethbridge, Alberta, Canada – kellermann@uleth.ca

10. This project is a joint thesis between the

- a) University of Applied Science Schmalkalden under supervision of Dr. Peter Schuster, Professor for Management Accounting, University of Applied Sciences Schmalkalden, Thüringen, Germany: Telephone: +49(0)3683/688-3112, Schuster@fh-sm.de and the
- b) University of Lethbridge under the supervision of Dr. John M. Usher, Professor of Strategy and Org. Theory, University of Lethbridge, Alberta, Canada: Telephone 403-329-2759, john.usher@uleth.ca.

If you require any information about this study, or would like to speak to one of my supervisors, please feel free to contact either of them directly by phone, mail or email.

I understand that questions about my rights as a participant in this research may be addressed to the Office of Research Services, University of Lethbridge (Phone: 403-329-2747 or Email: research.services@uleth.ca).

I have read the above information concerning a study about management control systems in research centres of higher education institutions, and consent to participate in this study. I understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefits to which I may otherwise be entitled. In signing this consent form, I am not waiving any legal claims, rights or remedies. A copy of this consent form will be given to me.

(Printed Name)

(Signature)

(Date)

Restrictions requested by the participant, if any:

Appendix D: Interview Protocol

A Preamble

1. Project Introduction
 - Explain nature of project
 - Explain researcher's background
 - Explain role of the project
 - Clarify Questions
2. Ethical Requirements
 - Outline the role of ethics process
 - Explain consent form and get signature
 - Clarify Questions
3. Data Records
 - Ask for permission to tape the interview (to support transcription)

B Interviewee information

1. Ask the interviewee about general background.
 - a) How long have you been a director of this research centre?
 - b) In what year did you complete your Ph.D?
 - c) Do you have industry background?
2. Verification of research mission
 - a) What percentage of the total working time does the research group invest in the following activities? (100 % in total)
 - i. Research (incl. conference visits)
 - ii. Teaching (incl. preparation)
 - iii. Project acquisition
 - iv. Other activities (consulting, administration)
 - b) Which percentage of the research do the research groups invest in (100% in total)
 - i. Basic research
 - ii. Applied research
 - iii. Experimental research
3. Ask interviewee for general perceptions about HEI research centres and then about the research centre under examination in particular (influence of NPM etc.).
4. Ask interviewee about their role in the organization.
 - a. What do you regard as your main role in the research institute?

- b. Are you currently involved in a research project with another research centre?

C Indicative questions

1. General situation of the research institutes and its operations
 - a) In how many research projects is the research institute currently involved?
 - b) Which are the most important ones?
 - c) Who is in charge for the projects?
 - d) How is funding organized?
 - i. How competitive is funding?
 - ii. Sources of funds?
 - iii. How important are alliances in competing for third party funds?
 - iv. Does your organization allow for budget deficits?
 - v. Before we talk about the mission of the entire research institute, is there a submission for funding?
2. How does the research institute establish a dominant position in the bidding process?
 - a) How are the scientists recruited and trained?
 - b) What do you believe is the most important outcome or service of your institute?
3. Internal Resource Allocation
 - a) Is the research of your institution evaluated on a regular basis?
 - b) If yes, from which institution and in which time intervals?
 - c) Do bibliometric indicators (publications, monographs etc.) play a role in the indicator-based resource allocation?
4. Social Capital
 - a) Can you elaborate a little bit more on the nature of the discipline/ industry sector of the research institute?
 - b) How important are alliance partners for your institute?
 - c) Do you see any conflicts between cooperation vs. competition when collaborating with external partners?
5. Explore the nature of the management process and the role that management accounting and control systems play in these.
 - a) Are the following functions implicated in the management process of the research institute?
 - i. Strategic planning
 - ii. Operational planning/ Costing
 - iii. Financial planning
 - iv. Communication of agendas throughout the research institute
 - v. Evaluation of outcomes
 - vi. Quality control of processes

- vii. Evaluation of individuals at different levels in the research institute/ MbO
 - viii. Cooperation with external partners
 - ix. Other HEI research centres
 - x. Other public institutional bodies
 - xi. Private organizations
 - xii. Development of a public profile
 - xiii. Regular management committees (e.g. research councils)
 - xiv. Ad-hoc committees and projects
- b) To what extent are MACS used to implement these processes?
 - i. Ask to view formal documents (budgets, performance evaluations, etc.)
 - ii. For how long are these MACSs in place?
 - iii. Why have they been introduced?
 - iv. Do formal controls create a tension between you and the group leader of a research centre?
 - c) What is the nature of these controls?
 - i. diagnostic vs. interactive
 - ii. formal vs. informal
6. Values
- a) Describe the organization's mission and purpose.
 - b) Does the institute see itself as a business of earning a monetary return?
 - c) Does the research institute promote the image of efficiency and cost consciousness?
 - d) Do organizational values embrace economic concerns?
 - e) How often are values revised and reaffirmed?
 - f) How are the organizational values embedded in the organizational life and controls?
 - g) What motivates individuals?
 - h) How to achieve their commitment?
7. Future
- a) What challenges do you see for HEI' research centres in general?
 - b) What challenges do you see for your organization in particular?

D Closing

- 1. Address questions or comments
- 2. Ask whether executive summary is requested
- 3. Online Survey/ MACSs documents
- 4. Thanking

Appendix E: Consent Form For Online Survey

Dear (Participant's Name):

The new public management reforms have increased the focus and emphasis on appropriate management accounting and control systems (MACSs), as evidenced by new governance mechanism for higher education institutions. This research project is designed to gain insights into the use and role of MACSs within research centers of higher education institutions (HEIs) and should be highly relevant and of great interest to current research centers.

More specifically, this survey explores organizational factors such as information needs that may influence the use and type of MACSs. I am able to obtain partial financial and demographic information about your organization from public sources. However, to fully explore the nature of your work tasks, especially with regard to your work relationships, I need your help.

The survey is designed to take approximately 15 minutes of your time. With an understanding and appreciation of the demands placed on your time, I have purposefully designed the survey with only the most relevant questions. In return for your time, I will provide you with an executive summary of the results of this survey and provide practical insights and implications. Simply provide an e-mail address at the end of the survey. You can find the survey under the following link: <https://edu.surveygizmo.com/s3/563006/>.

Your responses are anonymous and cannot be traced back to you as configured in the online survey software. No personally identifiable information is captured unless you voluntarily offer personal or contact information at the end of the survey. Additionally, all replies are strictly confidential. All results will be reported only in aggregate by organization to further protect your privacy. Should you have any questions, please feel free to contact me at +0049/(0)17656060622 or via e-mail. Questions about your rights as a participant in this research may be addressed to the Office of Research Services, University of Lethbridge (Phone: 403-329-2747 or Email: research.services@uleth.ca).

Your participation in this study is voluntary and you are free to withdraw at any time. You are free to choose not to answer any one or all questions. At any time, you may decide to withdraw from the study without any consequences. When you indicate that you wish to withdraw, all materials already collected from you will be destroyed. There are no direct benefits to you by your participation in this research.

I greatly appreciate your cooperation in this project as insights into management control cannot be developed without your assistance.

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. Completion of the survey constitutes my consent to participate in this project and gives permission to the researchers to use the anonymous, aggregate data for dissemination and publication.

Appendix F: Online Survey

Bridging and Bonding in Research Centres of HEIs

MASTERS THESIS

***Bridging and Bonding in HEI Research Centres:
Exploring the Moderating Influence of Social Capital on Performance Outcomes under
NPM-driven MACSS***

This research is being conducted to obtain a Master's degree in Management (M.Sc.) as well as in International Business and Economics (M.A.). The study aims to investigate how social ties within and outside to an organization may assist directors of research centres to accomplish their organizational aims against the background of the new public management agenda.

Your responses are anonymous and cannot be traced back to you as configured in the online survey software. No personally identifiable information is captured and all replies are strictly confidential. To further protect your privacy, all results will be reported only in aggregate. Should you have any questions, please feel free to contact me at +0049/(0)17656060622 or via e-mail kellerm4@stud.fh-sm.de. Questions about your rights as a participant in this research may be addressed to the Office of Research Services, University of Lethbridge (Phone: 403-329-2747 or email: research.services@uleth.ca.)

Your participation in this study is voluntary and you are free to withdraw at any time. You are free to choose not to answer one or all particular questions. At any time, you may decide to withdraw from the study without any consequences. When you indicate that you wish to withdraw, all materials already collected from you will be destroyed. There are no direct benefits to you by your participation in this research.

Please read the questions carefully and answer them to the best of your knowledge. The survey will take approximately 15 minutes. Please complete the survey anytime before 5th August 2011.

6. How much of your time do you spend on the following activities (sum 100%)? *

- Research (incl. conferences)
 - Teaching (incl. preparation)
 - Project acquisition
 - Other activities (administration, advisory service)
-

0 out of 100% Total

7. How much of your time do you invest in the following types of research (sum 100%)? *

Basic Research
 Applied Research
 Experimental Research

0 out of 100% Total

8. Please identify up to twenty people (name, surname) that are important in terms of providing you with information to do your work or to help you to think about complex problems posed by your work. These may or may not be people you communicate with on a regular basis and can come from within the organization or outside (e.g. colleagues from other research institutions, former colleagues, family etc.). *

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9. In general, to what extent are you aware of the knowledge and skills of the individuals in your research group?

This does not mean that you necessarily need to have these skills or that you are knowledgeable in these domains, but that you understand what skills these individuals have and domains they are knowledgeable in. *

	1	2	3	4	5	6	7	
To a small extent	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	To a large extent

Please provide any comments with respect to question 4 here:

Organization *

Note: Please provide the name of your research centre as data will be aggregated by organization.

Email (optional)

Note: If you would like to receive an executive summary of the study, please provide an e-mail address here.

Please press the submit button to send the survey.

Thank you for completing the survey. Your response is very important to me.
