THE UNIVERSITY *of* EDINBURGH

Corporate Intellectual Capital Reporting: the Case of Germany

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Declaration

This is to certify:

(a) that the thesis has been composed by myself, and

(b) that the work is my own, and

(c) that the work has not been submitted for any other degree or professional qualification.

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Date

Abstract

This study investigates potential motivations for intellectual capital (IC) reporting in management reports of 428 German companies for the accounting year 2010. To infer motivations, agency theory and legitimacy theory are applied to test which theory better explains IC reporting. To approach methodological issues regarding how to measure IC value and IC reporting, the study is structured in three research projects. The first two research projects analyse methodological approaches, providing the basis for testing theories in project three. In the first project, a novel measure to estimate IC value is identified in the area of mergers and acquisitions research and innovatively applied to the area of IC research. This novel long-run value-to-book measure allows testing of previously untested IC-related hypotheses. The second research project supports a parsimonious design of a research framework for an IC content analysis and specifies which IC components are important to focus on. In the final project, the results show that legitimacy theory better explains IC reporting compared to agency theory. According to the findings, IC reporting is motivated to legitimise a company's market position and to justify the use of intangible resources. The findings of this study contribute to the research areas of measuring IC value, analysing IC content, and applying theories to IC reporting.

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- FRBC Doctoral Stream 2012
- EIASM Interdisciplinary Workshop on Intangibles, Intellectual Capital & Extra-financial Information 2012
- Doctoral Seminar at the Justus-Liebig-University Giessen 2012
- EAA Annual Congress 2013

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Abbreviations

AktG	Aktiengesetz (German Companies Act)
GAAP	Generally Accepted Accounting Principles
GASC	German Accounting Standards Committee
HC	Human capital
HGB	Handelsgesetzbuch (German Commercial Code)
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IC	Intellectual capital
ICB	Industry Benchmark Classification
IDW	Institut der Wirtschaftsprüfer (Institute of Public Auditors, Germany)
IFRS	International Financial Reporting Standards
IIRC	International Integrated Reporting Committee
LRVTB	Long-run value-to-book
MtB	Market-to-book
MV	Market value
MVC	Market value consolidated
R&D	Research and development
RC	Relational capital
ROA	Return on assets
ROE	Return on equity
SC	Structural capital
SME	Small and medium-sized enterprise
VAIC™	Value Added Intellectual Coefficient™

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Chapter 1:
Introduction

1.1 Motivation for this study

1.1.1 New reporting models for intellectual capital

Publications from international institutions have recommended new financial reporting models for explaining value creation processes (ICAEW, 2009; IIRC, 2011; 2013). The suggested models focus on two main areas in corporate reporting practices. On the one hand, international institutions advocate that new reporting models should create links between business models, strategy and corporate value creation. On the other hand, they emphasise reporting on other forms of capital which are not explicitly accounted for in the financial statements. The International Integrated Reporting Committee (IIRC) proposes that these other forms of capital include among others intellectual capital and social capital (IIRC, 2011; 2013). The suggested reporting models offer new research areas with a wide range of potential research questions. Some questions have been approached in the literature on how to interrelate reporting areas, such as value, strategy and business models. With a different focus, investigations have been conducted of corporate reporting on other forms of capital. This study focuses on one interesting aspect within the discussion on other forms of capital: intellectual capital (IC) reporting.

The approach to integrated reporting by the IIRC dedicates particular attention to corporate reporting on other forms of capital, including IC. In a consultation draft, published by the IIRC in 2013, a separate section outlines these other forms of capital, named ‘the capitals’ (IIRC, 2013, sec.2B). When the discussion paper from 2011 and the consultation draft from 2013 are compared, an increased emphasis on IC reporting by the IIRC is apparent (IIRC, 2011; 2013). The guidelines on ‘the capitals’ have been further elaborated in the consultation draft in 2013. In 2011, other

forms of capitals were briefly outlined to be incorporated in an integrated reporting model. The IC reporting approach in the consultation draft in 2013 focuses more detailed on stocks and flows of capitals and their value contribution. The consultation draft declares that the aim of reporting on the various forms of 'the capitals' is to provide information on corporate value creation (IIRC, 2013, sec.2D). The findings of this study may provide a basis for further discussions on the approach to IC reporting in the IIRC consultation draft.

IC has gained increasing attention in the literature because IC has been argued to constitute an important competitive advantage and to play a major role in corporate value creation (Hall, 1992; 1993; Brooking, 1996; Sveiby, 1997; Stewart, 1997). The importance of IC has evoked research into different aspects of IC, such as IC management, IC measurement and IC reporting (e.g. Edvinsson, 1997; Marr et al., 2003; Guthrie & Petty, 2000). As IC reporting represents a central communication platform for this important form of capital, IC reporting has been investigated by academics, practitioners and governmental institutions. International institutions have developed IC reporting guidelines to support corporate IC reporting (DATI, 2000; DMSTI, 2003; European Commission, 2001; 2009). The International Accounting Standards Board (IASB) has also implemented IC reporting in a practice statement for a management commentary (IASB, 2010a). This brief overview introduces the research area of IC reporting which offers interesting research opportunities for this study. The literature on IC reporting is reviewed in more detail in chapter 2. The review of the literature reveals that research gaps exist in the area of IC reporting, particularly regarding potential motivations for corporate IC reporting.

1.1.2 Intellectual capital reporting in Germany

Germany offers a unique research setting for IC reporting due to a mandatory management report containing information on IC (GASC, 2010a). Further information on the German management report is outlined in chapter 3 in an overview of the German context. The German management report has traditionally been required as a separate section in the annual report to provide additional

narrative disclosure on corporate performance and value creation. Within the German regulation, IC-related information is partly required and partly recommended. The required management report facilitates approaching the research questions for this IC reporting research. The German Accounting Standard (GAS) 15 provides requirements and guidelines for reporting (GASC, 2010a). According to GAS 15, corporate reporting is aimed to reduce the information gap between managers and users (GASC, 2010a, sec.3) and to focus on sustainable value creation (GASC, 2010a, sec.30–35). These declared aims are consistent with the concepts of agency theory, as further elaborated in chapter 7.

The reporting regulation provides an interesting research setting in Germany for IC reporting, as the ideas of agency theory are encouraged. Based on this situation, agency theory is applied in this study. To investigate motivations for IC reporting, the concepts of agency theory are contrasted with the ideas of legitimacy theory. Following these two theories, different potential motivations for IC reporting are investigated. As agency theory and legitimacy theory represent theories of voluntary disclosure, a separation of voluntary IC reporting is important to test developed hypotheses. The German regulation with requirements and recommendations on IC information allows distinguishing voluntary IC reporting. This thesis addresses the gap of investigating potential motivations for corporate IC reporting in the unique setting of listed German companies. Despite the interesting study setting for IC reporting in Germany, few academic studies have investigated IC reporting, as outlined in chapter 3. Studies on corporate reporting in Germany exist but with a different focus, such as value reporting (Hayn & Matena, 2005) or IC reporting concepts for small and medium-sized companies (BMWi, 2006).

Regarding the German management reporting regulations, a new German standard was published combining management and risk reporting in 2013, GAS 20 (DRSC, 2013). A change in the German approach to IC reporting is apparent (GASC, 2010a; DRSC, 2013), as further outlined in chapter 3. The German Accounting Standards Committee (GASC) altered the declared aim of the management report. In GAS 15, the aim of the management report is to reduce the information gap between users and

management (GASC, 2010a, sec.3). The aim of GAS 20 is to report on the use of the group's resources (DRSC, 2013, sec.3). Furthermore, the principle to 'focus on sustainable value creation' (GASC, 2010a, sec.30–35) was abandoned in GAS 20. The change in the declared aim of the management reporting regulation indicates that the GASC transformed the underlying concepts for corporate IC reporting. The new aim, to report on the use of resources, is consistent with the concepts of legitimacy theory, as further outlined in chapter 7. Therefore, the investigation of potential motivations for corporate IC reporting is particularly interesting for the German setting.

The motivation for this IC reporting study in Germany was guided by the idea of corporate IC reporting to outline IC value creation encouraged by the management reporting regulation. As a German native speaker with a first degree in Controlling, Finance and Accounting from a German university, the researcher is in a position to judge the outcomes in the light of the German background. The background knowledge is important for the design of the research framework for IC reporting, being developed in a pilot study approach in chapter 6. This IC reporting study started with enthusiasm that the German IC reporting approach may take a pioneering role for IC reporting models. However, the findings show that IC reporting of German companies is used as a legitimisation tool rather than explaining IC value creation. The IC reporting does not focus on underlying corporate IC values but on creating a positive corporate image to legitimise the company's status. The results have implications for policy and practice to improve corporate IC reporting and may serve to justify the new approach to IC reporting in GAS 20 (DRSC, 2013).

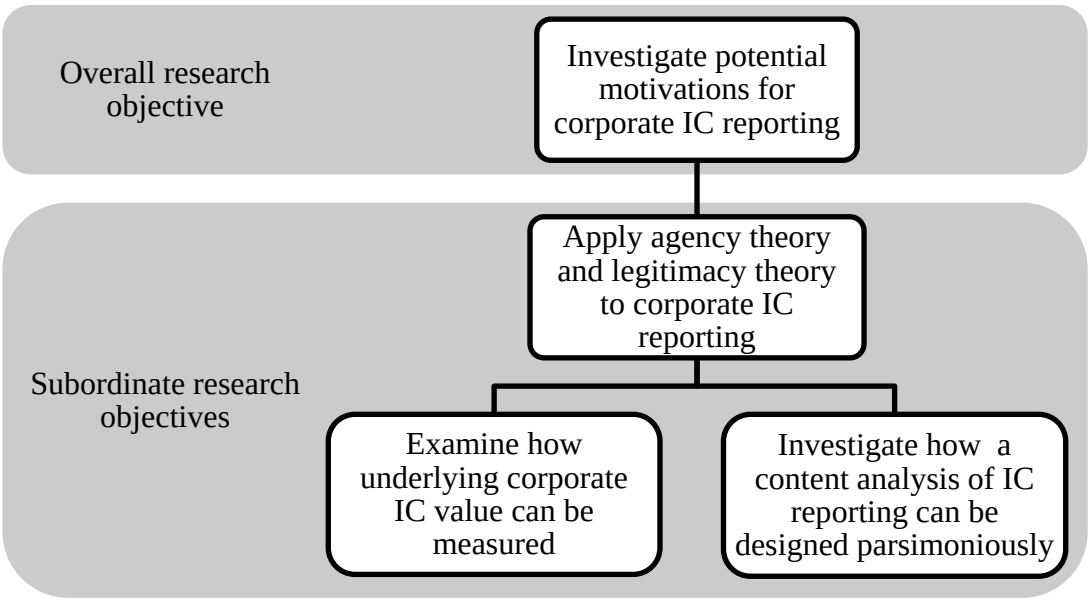
1.2 Research questions and contribution

1.2.1 Research questions

The review of IC reporting literature in chapter 2 shows that the area of IC reporting has been researched in numerous studies. However, several questions have not been fully answered by prior studies. The research aims of this IC reporting study address gaps in the IC reporting literature. This study has the overall aim to investigate

potential motivations for corporate IC reporting. To achieve this aim, this study contrasts agency theory with legitimacy theory. For the German setting, with the declared aim of the management report to reduce the information gap between managers and owners (GASC, 2010a), agency theory is particularly applicable. In order to investigate potential motivations for corporate IC reporting, agency theory is contrasted with another reporting theory. Legitimacy theory is chosen for this study as it offers different explanations for IC reporting motivations. Furthermore, legitimacy theory follows the new approach of the German regulation GAS 20 (DRSC, 2013), outlined in section 1.1.2. Agency theory and legitimacy theory are applied to IC reporting in a subordinate research aim to infer potential motivations for corporate IC reporting. Moreover, subordinate research aims, to investigate IC value measures and to examine a parsimonious design for IC content analyses, shed light on the areas of IC measurement and IC content analysis. The research aims for this IC reporting study form a hierarchy of objectives, as illustrated in Figure 1.1.

Figure 1.1 Hierarchy of research objectives



Notes

This figure shows the hierarchy of research objectives. To achieve the overall research objective of this study, subordinate research objectives are in place.

The research objectives of this study lead to the following research questions:

(1) How can underlying corporate IC value be measured?

(2) How can a content analysis of IC reporting be designed parsimoniously?

(3) Does agency theory or legitimacy theory explain corporate IC reporting?

To achieve the overall research aim, subordinate questions are introduced. In order to infer potential motivations for corporate IC reporting, agency theory and legitimacy theory are applied to IC reporting in research question (3). The findings to the subordinate research questions (1) and (2) provide the input data for answering research question (3) on a basis that is methodologically defensible. Following the concepts of agency theory, this study hypothesises a positive relationship between underlying corporate IC value and IC reporting to reduce the information gap between managers and owners. To analyse whether IC reporting is related to underlying corporate IC values, a company's underlying IC value needs to be investigated. Hence, research question (1) is concerned with measuring IC value. Research question (2) considers the issue of evaluating narrative IC reporting. As narrative IC reporting can be extensive, research question (2) investigates how content analyses of IC reporting can be designed parsimoniously. The results of the first two questions facilitate a methodologically defensible design to answer research question (3) in order to infer potential motivations for corporate IC reporting to achieve the overall research aim of this study.

1.2.2 Overview of the research approach

The three research questions of this study, presented in section 1.2.1, are approached in three individual research projects. The first two projects address the subordinate research aims in methodological studies. Project one investigates question (1), how IC value can be measured. The second project examines question (2), how a content analysis of IC reporting can be designed parsimoniously. These methodological research projects one and two have their own value for IC reporting research as they address specific gaps in the IC reporting literature. Furthermore, the findings of projects one and two facilitate to approach question (3), whether agency theory or

legitimacy theory explain corporate IC reporting. In chapter 4, a more detailed overview of the methodology of this study is outlined with information on the data collection process. Data availability was one of the most challenging parts of this study as IC value is not accounted for in the financial statements. Therefore, data availability is a main driver for the research design. More detailed methods for each research project are explained in the respective empirical chapters. The research projects are presented in chapters 5 to 7.

1.2.3 Focus of this study

IC reporting can be investigated from numerous perspectives. Therefore, this section emphasises the focus and the boundaries of this IC reporting study. This study examines narrative IC reporting in corporate annual reports, particularly in management reports. The management report as part of the annual report is considered as an important source of narrative information on IC. The question of accounting for intangible resources in the financial statements is not addressed in this research study. For measuring IC value to answer research question (1), this study concentrates on holistic market-based approaches. The review of literature on IC value measures, presented in chapter 5, highlights the importance of holistic approaches. For analysing corporate IC reporting and answering research questions (2) and (3), the content of IC reporting is at the focus of this study. To safeguard similar conditions for corporate IC reporting, this study investigates IC reporting in a cross-sectional approach in one country, as is discussed in chapter 2. In doing so, potential influences of reporting regulations, country-specific backgrounds and time are kept constant.

1.2.4 Contribution

This study contributes to the IC reporting research area in three dimensions. The findings of this study contribute to the areas of IC measurement, design of a content analysis of IC reporting, and IC-related theories. First, this study adds to the body of knowledge on IC measurement. The results of project one, on estimating a measure

of IC value, allow testing previously untested IC-related hypotheses. The innovatively applied measure of IC value offers new research approaches to estimating IC value and to use this measure in further empirical studies. Second, this study contributes to the area of content analysis of IC reporting. The findings suggest a practical pilot study approach to develop research frameworks for content analyses of IC reporting for a new research setting. The recommended parsimonious approach supports comparability across content analysis studies of IC reporting. Furthermore, the results of project two contribute to a definition of IC reporting perceived by companies. Third, this study makes a theoretical contribution to the area of IC reporting research by exploring whether agency theory or legitimacy theory better explains corporate IC reporting. The innovative comparison of these two theories with regards to IC reporting sheds light on the potential motivations for corporate IC reporting.

1.3 Main results

1.3.1 Estimating a measure of IC value

In chapter 5 research question (1) is addressed, how to measure underlying corporate IC value. Three potential IC value measures are compared in a regression analysis on corporate performance: market-to-book (MtB), Tobin's q and long-run value-to-book (LRVTB). The measure LRVTB has been developed in mergers and acquisitions research by Rhodes-Kropf et al. (2005). This study innovatively applies LRVTB to the area of IC research. As IC is argued to support corporate performance in terms of profitability (Hall, 1992; 1993), the measure with the highest explanatory values in a regression analysis is interpreted to serve as best indicator for IC value. The findings show that LRVTB best explains corporate performance in terms of profitability with significantly higher explanatory values. Hence, the results suggest that LRVTB serves as best estimator for IC value compared to MtB and Tobin's q. This measure can be applied in empirical investigations of IC.

The newly identified IC value measure is then applied to test IC-related hypotheses within project one. In this research project, determinants of IC value are investigated.

LRVTB, as the IC value measure with the highest explanatory value, is used to test hypotheses on IC value. The hypotheses on the relationship between IC value and leverage as well as IC value and concentrated ownership have been previously untested. Controlling for industry, the relationships are analysed between the level of corporate IC value and seven potential determinants: intangible assets on the balance sheet, expenses in research and development (R&D), motivational payment to employees, leverage, concentrated ownership, company size, and company age. According to the results, IC value is significantly positively related to motivational payment to employees and leverage. Size shows a significantly negative association with the level of IC value. The other factors show no relationship to the corporate level of IC value. The negative relationship between IC value and size is in contrast to the literature. A reason for decreasing IC value for larger companies may be a reducing level of efficiency.

1.3.2 Designing a parsimonious research framework for IC content analysis

Chapter 6 approaches research question (2), how to design a research framework for an IC content analysis parsimoniously. Content analysis studies on IC reporting have widely been conducted with ex ante defined checklists of IC components in the research frameworks for IC reporting (e.g. Guthrie & Petty, 2000; Bukh et al., 2005). An intensive review of the research frameworks for IC reporting applied in prior studies shows that the included IC components vary. This variation raises the question of comparability across prior content analysis studies of IC reporting. Furthermore, researchers following prior frameworks face an unclear situation how to design a research framework for IC reporting. To investigate the design of IC content analysis, this research project conducts correlation analyses of IC reporting scores for different numbers of IC components in the IC research frameworks. The findings show that for relational capital and human capital corporate IC reporting can be investigated with the three most widely-used components. For structural capital, IC reporting can be captured with the eight most widely-used IC components. The IC categories, structural, relational, and human capital, are further outlined in chapter 2.

The findings of this project add to the area of content analyses of IC reporting regarding four aspects: designing a parsimonious research framework, suggesting a pilot study approach, approaching companies' perceptions of IC reporting, and indicating comparability of prior studies. First, the findings show that a parsimonious IC research framework, focusing on the three to eight most widely-used IC components, is sufficient to capture corporate IC reporting. Second, the findings of this project provide a practical pilot study approach for developing IC research frameworks, grounded in actual corporate IC reporting. Third, the results of this research project can be useful for narrowing the definition of IC reporting. The findings can help to infer a definition of IC reporting from the companies' perspectives. Corporate IC reporting can be investigated with three to eight IC components which are widely used in academic IC reporting research. Hence, for companies the definition of IC reporting most closely corresponds to these components. Fourth, the findings suggest that prior studies are comparable if the most widely-used IC components are included in the research frameworks for IC reporting. A correlation analysis of reporting scores for applying selected prior research frameworks to the German dataset shows that previous research frameworks are comparable if the important most widely-used components are included.

1.3.3 Applying agency theory and legitimacy theory to IC reporting

Research question (3), whether agency theory or legitimacy theory explains corporate IC reporting, is addressed in chapter 7. Following agency theory or legitimacy theory, different motivations for corporate IC reporting are investigated (e.g. Guthrie et al., 2004). Based on the concepts of agency theory, IC reporting is used to inform about actual underlying IC values in order to reduce the information asymmetry between managers and owners. With IC value not being visible in the financial statements, company owners may require additional information to evaluate corporate IC value. IC reporting may address this information gap. Ownership diffusion and underlying IC values serve as variables indicating the information gap to test agency theory. Following the concepts of legitimacy theory, IC reporting is motivated to legitimise the corporate market position and to justify the use of

resources. To investigate legitimisation of a company's market position, this study elaborates on the idea of mispricing by Jensen (2005) to represents a legitimacy threat. Mispricing is seen as a deviation of the company's market value from its underlying long-run intrinsic value (Rhodes-Kropf et al., 2005), as further discussed in chapter 5. Intangible assets recognised on the balance sheet and R&D expenses serve to test whether IC reporting is used to justify the use of intangible resources.

To test whether agency theory or legitimacy theory better explains IC reporting, a regression analysis is conducted. The regulation applicable to the mandatory management report in Germany allows a distinction of different IC reporting types: required, recommended, and voluntary IC reporting. As agency theory and legitimacy theory are theories of voluntary disclosure, the investigation focuses on voluntary IC reporting to infer potential motivations. The results point to legitimacy theory, which then allows inferences of potential motivations for corporate IC reporting. The findings show that voluntary IC reporting is significantly positively related to mispricing, intangible assets and R&D expenses. These significant relationships indicate that companies use their IC reporting to legitimise their market position and to justify the use of intangible resources. The variables for ownership diffusion and corporate underlying IC value are not significantly associated with voluntary IC reporting. To conclude, the results suggest that the motivations for corporate IC reporting lie in legitimising the company's market position and justifying the use of intangible resources rather than reporting on actual IC values or reducing the information gap between managers and owners.

1.4 Structure of thesis

The thesis is structured into eight chapters. The next two chapters provide the background for this study with regards to prior literature and the research setting. In chapter 2, the literature on IC reporting is reviewed. First, a definition of IC is derived from previous approaches to serve for this study. Then the literature review concentrates on IC reporting studies, with a special focus on their methodological approaches. Literature on other aspects of IC research, which are relevant to answer

the research questions of this study, is reviewed within the respective research projects. Hence, literature on IC value measurement is addressed in project one on estimating a measure of IC value. For project two, on designing an IC content analysis parsimoniously, the literature on research frameworks for IC content analysis is further inspected. Literature on theoretical aspects of IC reporting is scrutinised for project three of applying theories to IC reporting. After the general review of IC reporting literature in chapter 2, the German background for IC reporting is outlined in chapter 3 with regards to the regulations applicable to the management report and the country-specific setting in Germany.

The main body of this study is structured into four chapters. Chapter 4 provides an overview of the methodology for this study with explanations on research design, sample selection and data sources, particular characteristics of German companies, and methodological limitations of the study. The three research questions are addressed in separate research projects, presented in individual chapters. Chapter 5 examines research questions (1), how corporate IC value can be measured by comparing three potential estimators of IC value. Within this project, the identified IC value measure with the highest explanatory value is used to investigate determinants of IC value. Research question (2), how a content analysis of IC reporting can be designed parsimoniously, is approached in chapter 6. Correlation analyses are conducted for IC reporting scores, considering different IC components. To answer research question (3), whether agency theory or legitimacy theory explains corporate IC reporting, the links between these theories and IC reporting are elaborated in chapter 7. The results of the statistical analysis in this final project allow inferring potential motivations for corporate IC reporting. The final chapter 8 concludes this thesis with a summary and discussion of the key findings, limitations and suggestions for future research.

Chapter 2:
Review of literature on intellectual capital reporting

2.1 Introduction

The overall research aim of this study is to investigate potential motivations for corporate reporting on intellectual capital (IC), as outlined in chapter 1. To approach this overall research aim, the literature on IC reporting is reviewed in this chapter. The aim of this literature review is threefold: help to define IC for this study, identify gaps in the literature, and support the development of the research approach for this study. The outcome regarding these aims is drawn in the conclusion of this chapter. This literature review focuses on IC reporting studies, mainly following a content analysis approach, because this study is located in the area of IC reporting. The broader literature on IC research is considered for IC definitions, IC within corporate reporting, and the development of IC research. As this chapter aims to support the development of the research approach of this study, the IC reporting studies are reviewed in detail regarding their methodological considerations. This chapter gives an overview of the IC reporting literature. For hypothesis development, certain aspects of the IC literature are discussed in further detail in the respective empirical chapters 5 to 7 within the three research projects of this study, as mentioned in chapter 1.

The findings of this literature review reveal the following gaps in the IC reporting literature: finding an IC value measure, refining the research framework for a content analysis of IC reporting, and testing IC-related theories. In order to approach the overall research aim of this study, three research questions are developed from these gaps identified in the literature, outlined in chapter 1. The review of methodological

considerations in previous IC reporting studies shows what to consider for the design of this IC reporting study. Regarding the sample selection, a sample being sufficiently large for validity is preferable to enable theory testing. As IC reporting may change over time with regulatory alterations and an increasing awareness of IC reporting, this study is cross sectional to keep time constant. Furthermore, to keep country-specific, regulatory, economic and technological circumstances constant, this study investigates IC reporting in a single country. Annual reports are widely used in IC reporting and have been found to proxy for corporate IC reporting. Therefore, this study focuses on management reports as part of annual reports. The research design should control for industries, as the industry sector may influence IC reporting. Finally, the research approach should be designed parsimoniously without unnecessarily collecting data on IC reporting which is not utilised in the study.

This literature review is structured as follows. In section 2.2 the concept of IC is reviewed regarding different ways of defining IC, accounting for IC within corporate reporting, and an overview of the development of IC research. Section 2.3 focuses on IC reporting research, setting out how researchers have approached IC reporting and how research frameworks for content analysis studies have been developed. Methodological considerations in prior studies on IC reporting are reviewed in section 2.4 regarding theories, sample selection, time aspects, country focus, communication channels, and industry groupings. The findings of the literature review, outlined in the concluding section 2.5, define IC for this study, identify gaps in the literature and help to design the research approach for this study on IC reporting.

2.2 The concept of IC

2.2.1 Definitions of IC

2.2.1.1 Defining IC based on its effect

Intangible resources have been argued to considerably contribute to competitive advantages and eventually to value creation (Hall, 1992; 1993). An increasing importance of intangible resources relative to tangible resources has been identified

(Stewart, 1997; Edvinsson & Malone, 1997). Due to the potential value contribution and relative importance of intangible resources, research has paid increasing attention to these intangibles. Initial studies tried to describe the phenomenon of intangible resources (Brooking, 1996; Stewart, 1997; Sveiby, 1997; Edvinsson & Malone, 1997; Roos et al., 1997). They established the idea of IC and highlighted its strategic importance. IC is seen as the basis of a company's ability to react efficiently to the environmental context by utilising its intangible resources (Hall, 1992; Brooking, 1996; Stewart, 1997). As IC represents a company's capability to adapt to a changing knowledge-based economic environment, companies are able to reach a certain level of stability in value creation by utilising their IC as competitive edge (Mouritsen, 2006). Due to the elusive nature of IC, many definitions describe what IC does rather than what it is. According to this view, IC supports value creation as a competitive advantage.

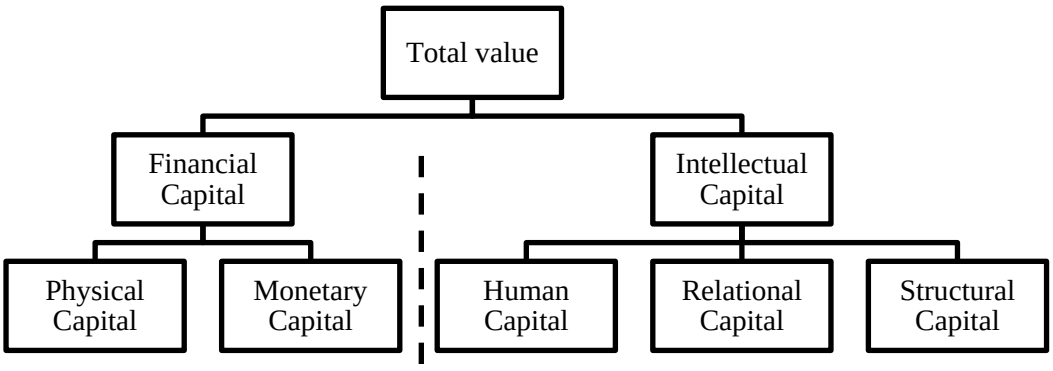
2.2.1.2 Defining IC in categories

To describe IC, it has been characterised in three main categories: efficient internal structures, beneficial relations, and employee skills (Edvinsson & Malone, 1997; Sveiby, 1997). First, internal structures form one important part of IC, such as processes, routines, patents, research and development (R&D). They support the company in running as going concern and they help create innovations. Second, favourable relations to important stakeholders, such as suppliers, customers, business partners and investors, build another cornerstone of IC. Third, IC includes people working for the company and their development, such as competencies, qualifications, trainings, and skills. These components of IC are commonly referred to as structural, relational and human capital (Beattie & Thomson, 2007; Li et al., 2008) or internal, external and human capital (Guthrie & Petty, 2000; Bozzolan et al., 2003). According to this approach, the composition of IC may vary across the established main categories for different business models because the appearance and operations of IC depend on the corporate context.

2.2.1.3 Defining IC by setting outer boundaries

Another approach to define IC is to distinguish IC from other assets to establish a broad IC concept. This approach serves as a residual definition of IC as it describes the outer boundaries of IC in comparison to other assets. Roos et al. (1997) suggest outer boundaries of IC by contrasting IC to what they call 'financial capital'. Financial capital, in their definition, consists of tangible assets in physical form or monetary form. IC, on the other hand, comprises the remaining intangible resources. An illustration of this definition is developed for the literature review of this study and is shown in Figure 2.1. This residual differentiation leaves sufficient scope to account for IC's uniqueness, intangibility and its dynamics because IC may be different for every company due to different value creation processes. The innovative nature of IC entails continuing developments. This relatively broad definition of IC allows accounting for dynamic developments and new IC elements to come.

Figure 2.1 Boundaries of IC



Notes

This figure illustrates the outer boundaries of IC compared to financial capital. This distinction serves as a residual definition of IC, as IC is dynamic and unique for every company and cannot be defined conclusively.

2.2.1.4 Different terminologies for IC

Inconsistencies appear in varying terminologies for IC. Although the concept of IC has widely been adapted, a range of terms is used interchangeably for IC, such as intangibles or knowledge assets (Lev, 2001; Sveiby, 1997). These inconsistencies may cause reviews of IC-related literature to focus only on a certain term used for IC. Moreover, certain areas of IC research may be omitted due to different IC terminologies, as can be seen in Guthrie et al. (2012). Their meta-analysis of IC research tends to focus mainly on studies using the term IC compared to other work on intangible resources. Different terminologies also cause confusions if the terms are not circumscribed. Particularly, the term 'intangibles' may be unclear as it may denote intangible assets which are or should be recognised on the balance sheet (Skinner, 2008). On the other hand, some researchers refer to 'intangibles' as all intangible resources (Villalonga, 2004), which is used synonymously with IC.

2.2.2 IC within corporate reporting

2.2.2.1 IC in the balance sheet

As IC consists of intangible resources, the balance sheet has been criticised by Lev and Zarowin (1999) to be of diminishing informativeness. For companies reporting under IFRS, most tangible assets are found on the balance sheet but intangible assets are recognised only if they fulfil certain criteria, such as being separable or arising from legal rights, as outlined in IAS 38 (IASB, 2009b). However, IC value goes beyond recognised intangible assets. Hall (1992) suggests that capabilities provided by intangible resources can be differentiated according to their required level of activities to create and maintain them. This distinction by activity levels indicates that intangibles cannot simply be purchased. After purchasing intangibles, further action is required to maintain and utilise them. Following Hall's (1992) argument, the demand for active long-term engagement is not reported on the balance sheet within recognised intangible assets. Moreover, intangibles which have been developed internally are hardly accounted for on the balance sheet (IASB, 2009b). Assessing the balance sheet therefore provides only limited information on IC value.

2.2.2.2 IC in the income statement

To consider IC value beyond recognised intangible assets, Penman (2009) emphasises the income statement. He argues that earnings incorporate IC value because they are generated by utilising IC value. This argument is consistent with the underlying idea that IC value facilitates strong performance, as reviewed in section 2.2.1.1. Accordingly, a higher level of IC value would result in higher earnings. Furthermore, the income statement provides some information about IC investments. These are partly represented in expense components such as R&D, advertising, and employee benefits including training (Amir et al., 2003). However, this chapter suggests that IC-related expense classifications are not necessarily available since expenses may not be subdivided with sufficient detail. Individual IC investments may not represent the full picture because potential interactions between different IC items, such as well-educated employees and technology, are unclear from the expenses in the income statement (Mouritsen, 2006). These interactions may contribute considerably to IC value, as argued by Chaminade and Roberts (2003). Consequently, the income statement may provide some indication of IC value input as expense components and IC value return included in earnings rather than a full picture of IC value.

2.2.2.3 IC in corporate documents

Additional sections in the annual reports besides the financial statements may provide some further information on IC. Reporting on IC is not required by international reporting standards and only few national regulations or guidelines exist. Denmark, for example, provides guidelines for IC statements (DMSTI, 2003). The Danish guidelines encourage companies to create IC statements to support IC management and to serve simultaneously for external IC reporting. Some broader IC-related requirements and recommendations are included in the mandatory management report in Germany (GASC, 2010a). This management report requires information on sustainable value creation with further specific recommendations on

IC reporting. With the reporting on IC and its role in the value creation process, the market has access to additional information from a management perspective. According to these national approaches, IC reporting is largely narrative in nature with the intention to illustrate the relations between IC and value creation. Consequently, within the general understanding of IC concepts, outlined in section 2.2.1, every company with internal processes, relations to external parties, and employees would have IC to report on. Guidelines and regulations on IC reporting in corporate documents are further reviewed in chapter 3.

2.2.3 Development of IC research in three stages

The development of IC research can be described in three stages. Petty and Guthrie (2000) identify two stages in the area of IC research: identifying IC and managing or measuring IC. In the IC literature, the initial focus has been on exploring the IC concept by locating and understanding IC and its importance. According to Petty and Guthrie (2000), the second stage of IC research has focused on managing and measuring IC. However, Marr et al. (2003) argue that no generalisable measures have been found. The literature review in this chapter shows that the area of IC research has been growing and a third stage can be observed as IC reporting research (Guthrie et al., 2004; Guthrie et al., 2012). The sequence and definition of stages in IC research may vary with different environmental settings and ideas. IC approaches in Nordic countries, such as Sweden or Denmark, proposed that management and reporting of IC should evolve simultaneously rather than subsequently and that IC statements also act as management tools (Edvinsson, 1997; Mouritsen et al., 2001). Therefore, the literature review of this study reasons that the different stages in the IC development may not be separable and results from continuing research on measurement and management may influence IC reporting and respective studies. Hence, the IC concept should be seen in the context of the environmental conditions.

The different stages in the development of IC research highlight that IC has different aspects: IC definitions, IC management and measurement, and IC reporting. These stages represent individual perspectives of IC with separate research areas. In the

process of developing IC management, different ideas have emerged drawing on a general understanding of knowledge management, such as scorecards (Kaplan & Norton, 1996; Edvinsson, 1997). Interviews with managers and market experts indicate that knowledge management is considered important and scorecards are used but that holistic IC concepts have been hardly practised (Fincham & Roslender, 2003). Although a managerial awareness of IC reporting necessity is identified, a lack of external reporting on IC-related aspects is found to be prevalent. This lack is confirmed by Beattie and Thomson (2010). Their findings indicate that IC value is widely regarded to considerably contribute to value creation but IC reporting may not fully disclose this contribution. The respondents noticed a discrepancy between IC management and external reporting. Due to these discrepancies between the different aspects of IC, namely definition, management, measurement, and reporting, IC research should consider the different research areas of IC drawing from the broad IC literature. For this study, the review of literature on IC measurement is further developed in chapter 5.

2.3 IC reporting research

2.3.1 Approaching IC reporting

As the definitions provided in initial studies on the IC concept (Brooking, 1996; Stewart, 1997; Sveiby, 1997) have been broad, more specific outlines have been needed to make IC reporting more researchable. Researchers may have different opinions on the IC concept and on IC reporting but how could they know whether their concepts are applicable to investigate corporate IC reporting practices? To approach IC reporting and to enable meaningful research, exploratory studies have been conducted, such as case studies (Mouritsen et al., 2001) or interviews with companies (van der Meer-Kooistra & Zijlstra, 2001). One main finding of these studies is that IC should be embedded in a story describing its different aspects and roles in an organisation. To examine how IC reporting is perceived across corporate functions, Beattie and Thomson (2010) investigate IC reporting from preparers' perspectives in different departments, namely human resource management, finance and marketing. They find that IC value is regarded as essential in the value creation

process by a majority of respondents. Additionally, their findings suggest that IC reporting may be driven by different purposes of different departments. However, the study does not allow conclusions whether the findings represent views on IC reporting of a company as a whole or of individual respondents because responses from different functional positions may not be provided from the same company.

In an overarching long-term study on learning loops in reporting mechanisms for corporate intangibles, Holland (2004; 2006) interviewed participants from both users' and preparers' perspectives. He identifies fundamental interactions between corporate IC reporting and market analysis. Because fund managers and analysts, as users of corporate information, demanded more IC information than published by the companies, private meetings are found to be exploited as means of IC reporting. Companies seem to provide rather ad hoc lists of indicators which are currently demanded instead of a comprehensive value-creation story. Hence, Holland (2004; 2006) suggests that IC reporting has evolved as responses to a changing economic environment and changing questions by investors and analysts. This literature review suggests that a weakness in Holland's (2004; 2006) argument might lie in outdated data since interviews were conducted between 1997 and 2000 in a time of emerging awareness of IC reporting. García-Meca and Martínez (2007) found that analysts used IC information in their reports. Hence, these studies allow the conclusion that analysts demand IC-related data from companies in form of private disclosure and then provide the IC information in their own reports.

2.3.2 Investigating IC reporting in content analysis studies

2.3.2.1 Developing research frameworks for IC reporting

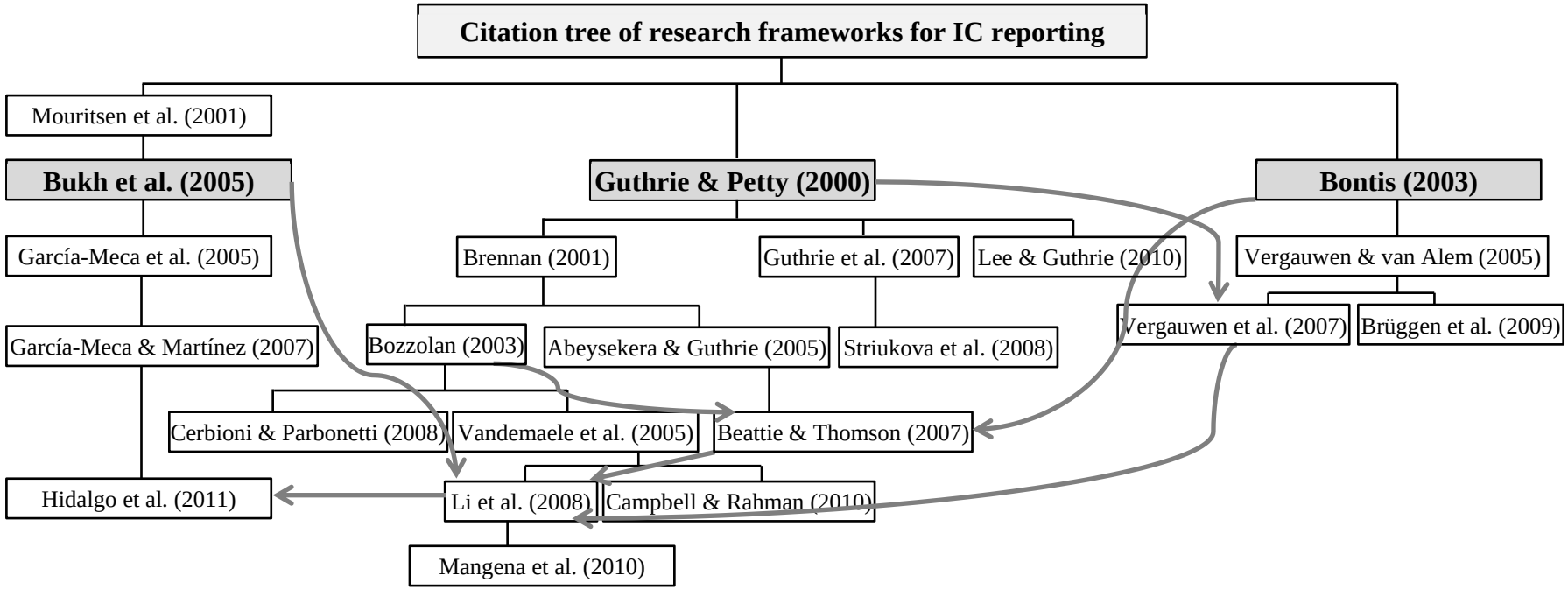
To examine IC reporting, considering its narrative nature, content analysis appears to be a feasible method. Accordingly, content analysis has been identified to be most popular for investigating IC reporting (Guthrie et al., 2004; Beattie & Thomson, 2007). Although content analysis has some acknowledged inherent drawbacks, such as subjectivity, it has been widely used over a decade of IC reporting research, as can be seen in a meta-analysis by Guthrie et al. (2012). Research frameworks for IC

reporting have been introduced and modified to investigate the narratives on IC (e.g. Guthrie & Petty, 2000; Bukh et al., 2005; Bontis, 2003). Some studies do not provide details of the applied research frameworks for IC reporting or else they omit to explain modifications to re-used research frameworks. This constitutes a problem of transparency. Justifications of why adopted research frameworks have been modified are rarely discussed. García-Meca and Martínez (2007), for example, altered Bukh et al.'s (2005) framework without providing reasons for their changes. Consequently, follow-up studies face difficulties in duplicating previously developed frameworks.

2.3.2.2 Influences between and across IC research frameworks

An analysis of the succession of prior content analysis studies of IC reporting shows a tendency to re-use and adapt research frameworks for IC reporting, as illustrated in the citation tree in Figure 2.2. Three major strands have been established in content analysis studies of IC reporting following three influential papers: Guthrie and Petty (2000), Bontis (2003) and Bukh et al. (2005). These strands have initially developed parallel to each other but more recently mutual influences and combinations appear across these approaches (e.g. Vergauwen et al., 2007; Li et al., 2008; Hidalgo et al., 2011). The adaptation of a certain research framework for IC reporting may be due to conceptual considerations, certain conditions given in the sample or driven by trends in IC reporting research. As decisions on IC categories are usually not discussed in content analysis studies, conclusions are not possible why modifications are applied. The IC categories and their labels are often treated as given. Beattie and Thomson's (2007) review acknowledges that alternative IC categorisations exist in IC reporting content analyses. Nevertheless, they have no strong claim why they use the categories structural, relational and human capital.

Figure 2.2 Influences between and across prior IC research frameworks



Notes

This figure illustrates influences between and across research frameworks for IC reporting. Three major strands have been established from three influential papers: Guthrie and Petty (2000), Bontis (2003) and Bukh et al. (2005). The research frameworks for IC reporting developed in these strands have been re-used, adjusted and modified by many studies. Mutual influences appeared as following studies have drawn from the research frameworks for IC reporting from several studies. This citation tree shows which prior studies are cited for designing the research frameworks.

Re-using previously developed frameworks in IC research has become common practice, as found by Guthrie et al. (2012). They interpret this development as maturing process of IC research. In an initial stage of IC reporting research, new frameworks have been designed for different research projects. Later studies increasingly applied or considered prior frameworks. However, Guthrie et al. (2012) do not distinguish between adopting or adjusting IC research frameworks. Following their reasoning, this literature review argues that although the number of newly proposed frameworks has reduced, it is difficult to conclude whether currently used frameworks show a higher degree of uniformity. Some studies introduce their research frameworks for IC reporting as being based on prior studies but numerous amendments may actually result in different approaches. While, for example, Hidalgo et al. (2011) claim to have adopted García-Meca et al.'s (2005) approach, the number of IC-related items differs and the classification of IC categories changed without presenting the final framework for comparison. A detailed comparison of research frameworks for IC reporting is further developed in chapter 6.

2.3.2.3 Comparability across IC reporting studies

The development of IC reporting investigations and the mutual influences of the research frameworks for content analyses, reviewed in sections 2.3.2.1 and 2.3.2.2, show a lack of agreement on how to assess corporate IC reporting. The research frameworks for the content analysis studies of IC reporting vary. Therefore, the comparability of previous studies is problematic. In a review by Beattie and Thomson (2007) dissimilarities are evident across the commonly-used method of content analysis for IC reporting studies. Different coding units such as sentences or words may be used, scoring systems may vary regarding information types and repetitions plus the consideration or exclusion of pictures and graphs may differ. The design of research frameworks for identifying IC information may be based on previous studies, adjusted or self-constructed. Guthrie et al. (2012) also highlight the variety of approaching research frameworks for IC reporting. Hence, the comparability of prior content analysis studies of IC reporting may be questionable.

2.4 Methodological considerations in IC reporting research

2.4.1 Comparison of approaches in IC reporting research

In this section, studies in the area of IC reporting research are reviewed regarding their methodological considerations. As outlined in section 2.1, this chapter focuses on IC reporting investigations. The selection of studies for this review is dominated by content analyses because this method is widely used for IC reporting research, as outlined in section 2.3.2.2. Due to the complexity of IC reporting, as discussed in section 2.3, previously conducted IC reporting investigations have been designed in diverse manners. Table 2.1 shows a synoptic comparison of previous IC reporting studies considering different aspects. This synopsis compares theories, time, country focus, communication channels and industry groupings as methodological consideration in prior IC reporting research. The following sections review the methodological considerations separately as presented in the columns of Table 2.1.

2.4.2 Theories related to IC reporting

Based on the different aspects of IC, outlined in section 2.2.3, theories from different disciplines can be considered for IC reporting. Table 2.1 shows that theories related to IC reporting range from resource-based and actor-network approaches (Mouritsen et al., 2001) to cost of capital analysis (Bukh et al., 2005; Mangena et al., 2010). The most commonly mentioned theories are general reporting theories, such as agency, legitimacy or stakeholder theory (Guthrie et al., 2004; Beattie & Thomson, 2007). However, describing IC reporting has been at the centre of many studies, referring to but rarely testing theories on IC reporting (Guthrie & Petty, 2000; Brüggen et al., 2009). Exploratory and explanatory studies dominate the IC reporting research. However, the results of some studies can be interpreted with regards to theories, as can be done for Striukova et al. (2008). In a content analysis of IC reporting in different corporate documents, IC information is found to be differently balanced for diverse audiences. This literature review interprets their findings to implicitly support stakeholder theory advocating that IC reporting responds to stakeholder demands across different means of stakeholder communication.

Table 2.1 Synoptic table of previous studies of IC reporting

Studies	Theory	Sample Size	Time	Country	Channels	Industry
Abeysekera & Guthrie (2005)	Explanatory	30 companies	Cross-sectional	Sri Lanka	Annual report	not controlled
Beattie & Thomson (2007)	Exploratory; refer to Positive Accounting Theory, Legitimacy, Stakeholder	1 company	One point in time	UK	Annual report	
Bontis (2003)	Exploratory	10,000 companies	Cross-sectional	Canada	Annual report	not controlled
Bozzolan et al. (2003)	Exploratory; refer to Agency Theory, Signalling Theory	30 companies	Cross-sectional	Italy	Annual report	knowledge/traditional
Brennan (2001)	Exploratory	11 companies	Cross-sectional	Ireland	Annual report	only knowledge based
Brüggen et al. (2009)	Exploratory Implied Agency Theory	125 companies	2002-2004	Australia	Annual report	9 industry groups
Bukh et al. (2005)	Cost of Disclosure Theory	68 IPOs	1990-2001	Denmark	IPO prospectus	knowledge/traditional
Campbell & Rahman (2010)	Exploratory	1 company	1978-2008	UK	Annual report	
Cerbioni & Parbonetti (2007)	Agency Theory, Governance	54 companies	2002-2004	Europe	Annual report	only biotechnology
García-Meca et al. (2005)	Agency and Signalling Theory	257 reports	2000-2001	Spain	Analyst presentation	financial/non-financial
García-Meca & Martínez (2007)	Implied value-relevance	260 reports	2000-2003	Spain	Analyst report	9 industry groups
Guthrie & Petty (2000)	Exploratory	19 companies	Cross-sectional	Australia	Annual report	6 industry groups
Guthrie et al. (2007)	Exploratory; refer to Stakeholder Theory, Legitimacy Theory	50 Australia 100 Hong Kong	Cross-sectional	Australia, Hong Kong	Annual report	not controlled
Hidalgo et al. (2011)	Agency Theory, Governance, refer to Signalling, Capital Market, Cost-Benefit Theory	100 companies	2005-2007	Mexico	Annual report	Industry dummies, number not specified

Table 2.1 Synoptic table of previous studies of IC reporting – continued

Studies	Theory	Sample Size	Time	Country	Channels	Industry
Lee & Guthrie (2010)	Exploratory	156 companies	2001-2004	Global	Annual report + Analyst reports	only IT sector
Li et al. (2008)	Agency Theory, Governance	100 companies	Cross-sectional	UK	Annual report	7 industry groups
Mangena, et al. (2010)	Cost of Capital; refer to Stakeholder, Legitimacy, Agency	126 companies	Cross-sectional	UK	Annual report	15 industry groups
Mouritsen et al. (2001)	Resource-based, Actor-Network-Theory	17 companies	2 years	Denmark	IC statement	service sector, mainly IT
Singh & Van der Zahn (2008)	Signalling Theory	444 IPOs	1997-2006	Singapore	IPO prospectuses	10 industry groups
Striukova et al. (2008)	Explanatory Implied Stakeholder Theory	15 companies	Cross-sectional	UK	Documents on website	4 industry groups
Vandemaele et al. (2005)	Exploratory	180 reports	1998, 2000, 2002	Netherlands, Sweden, UK	Annual report	not controlled
Vergauwen & van Alem (2005)	Exploratory	95 companies	2000-2001	Netherlands, France, Germany	Annual report	not controlled
Vergauwen et al. (2007)	Exploratory	60 companies	Cross-sectional	Sweden, UK, Denmark	Annual report	knowledge/traditional
Williams (2001)	Exploratory	31 companies	1995-1999	UK	Annual report	material R&D/no R&D

Notes

This table shows a synoptic comparison of IC reporting studies which conducted a content analysis of IC reporting. The studies are compared regarding their applied theories, sample sizes, time considerations, country focus, communication channels under review, and industry groupings.

Although reporting theories have been referred to or indirectly supported in the IC reporting literature, no strong theory seems to have been established. Mouritsen (2006) argues that IC reporting theories change with the IC definition chosen. He does not favour any theory to be superior but promotes the position that a clear decision enhances IC reporting studies. This position acknowledges that the range of potential IC reporting theories may be wide but in order to identify and interpret reporting patterns one theory needs to be chosen and tested. Marr et al. (2003) also call for approaches to test theories on IC reporting to enhance IC reporting research. To enable theory testing and to enhance IC reporting research, Mouritsen (2006) demands creative research designs. Theories applied and related to IC reporting are further reviewed in chapter 7. The detailed review discusses which theories are applied in this study and develops links between the selected theories and IC reporting.

2.4.3 Sample selection for IC reporting studies

2.4.3.1 Sample size

To initially explore IC reporting, relatively small samples have been investigated in detail. Mouritsen et al. (2001) accompanied case companies in the process of creating IC statements and investigated IC reporting by means of observations and interviews. The aim of this in-depth case study has been to gain knowledge about the possibilities and requirements of IC reporting to advise on the development of institutional guidelines for IC statements. The findings suggest that IC reporting can act as management tool and contains a narrative story to illustrate value-creation processes. To improve on case studies' inherent limitations of low generalisability, extended comparisons have been undertaken in form of content analyses. The sample sizes vary from very small case samples of one company report (Beattie & Thomson, 2007) up to large samples of 10,000 reports (Bontis, 2003), as illustrated in Table 2.1. A sample of one report is selected by Beattie and Thomson (2007) to exemplify the coding process for IC reporting. After they found inconsistencies across prior IC content analyses, they highlight different aspects of coding procedures to be considered in an IC content analysis. These aspects are further discussed in chapter 6.

2.4.3.2 Focus on large companies

Exploratory studies approaching IC reporting through content analysis, primarily focus on a relatively small sample of the largest companies listed on the respective stock exchange (Guthrie & Petty, 2000; Brennan, 2001; Bozzolan et al., 2003; Abeysekera & Guthrie, 2005; Striukova et al., 2008). This sample selection of only large companies inherently serves as control mechanism for a potential size effect, as size is shown to be positively associated to IC reporting (Brüggen et al., 2009; García-Meca et al., 2005). As most studies conducted a manual content analysis, the sample size is naturally limited given the time-consuming procedures. Larger samples may provide richer data for inferences and for testing IC-related hypotheses, as is also advocated by Lee and Guthrie (2010). Software-aided coding may be a feasible tool for approaching this issue (Bontis, 2003; Lee & Guthrie, 2010). However, computerised coding may be criticised for misinterpreting or omitting the IC context (Beattie & Thomson, 2007). Therefore, an explanation of the coding process is important to allow the readers to draw conclusions.

2.4.4 Considerations of time

2.4.4.1 Controlling for time

IC reporting is found to have developed over time and is assumed to be amended to a changing environment, as discussed in section 2.2.3. Therefore, the time factor should be considered in the design of IC reporting research. Methodological considerations of time vary across previous IC reporting investigations, as shown in Table 2.1. Time is either fixed in cross-sectional studies or controlled for in longitudinal studies. On the one hand, cross-sectional analyses enable investigations of IC reporting under the same external circumstances. Economic and regulatory changes are kept constant in a cross-sectional study. This approach seems common in IC reporting research (Guthrie & Petty, 2000; Vergauwen et al., 2007; Li et al., 2008; Mangena et al., 2010). On the other hand, effects over time are explicitly considered and analysed in longitudinal studies. For longitudinal studies the interpretations may

be problematic due to a changing environment, knowledge progress and continuous IC reporting adaptations. The advantage of considering IC reporting at several points in time is to capture changes in corporate IC reporting practices.

2.4.4.2 Longitudinal studies

In a content analysis of Danish IPO prospectuses between 1990 and 2001, Bukh et al. (2005) suggest that IC reporting generally increased over time. This upward trend may not be surprising since the IC concept has been evolving during that period and became a management issue in the late 1990s, as discussed in section 2.2.3. This development limits interpretations. Singh and Van der Zahn (2008) found a similar pattern to report more frequently on IC-related components in IPO prospectuses between 1997 and 2006. Their findings face the same limitations of an increasing awareness of IC reporting. Recent listings of knowledge-intensive companies may also have affected the results, as implied by Bukh et al. (2005). Their results indicate that IC reporting is influenced by the overall economic situation. Hence, time-series investigations of different IPO companies may be problematic. These studies of IPO prospectuses have an essential drawback of investigating IC reporting not only at different points in time but published by different companies. IC reporting differences are bound to occur for several uncontrollable reasons.

A longitudinal content analysis is conducted by Williams (2001) on annual reports between 1996 and 2000. The results indicate that IC reporting has increased over time, as is also found in other longitudinal studies (Vandemaele et al., 2005). Accordingly, longitudinal approaches offer supporting results for the suggestion that IC reporting has been rising with the IC concept emerging in the literature. One exceptional longitudinal study is conducted by Campbell and Rahman (2010) on the IC reporting practices of one company over a time period of thirty-one years. They found a strong increase of IC information. Relational capital is most frequently reported in all but three years with a distinct upward trend. The dominance of information on relational capital is consistent with cross-sectional studies (Guthrie & Petty, 2000; Vergauwen & van Alem, 2005; Vandemaele et al., 2005; Guthrie et al.,

2007). Campbell and Rahman (2010) found that reporting on the other categories, structural and human capital, has been much more stable over the time period under review. The reporting style moved towards more narrative information with factual information being reduced in proportion. This literature review suggests that in order to investigate purely voluntary IC reporting changes, regulatory changes over time would need to be controlled for.

2.4.5 Country focus in IC reporting studies

2.4.5.1 Country-specific issues in IC reporting

Previous IC reporting investigations have mainly been conducted in single-country studies considering IC reporting within a given country-specific setting. Cross-country comparisons of IC reporting exist but are few in number, as outlined in Table 2.1. One reason, why cross-country studies may be problematic, is different levels of technological progress and national IC value, as found by Lin and Edvinsson (2010) in an international comparison. The country focus is also depending on regulations or guidelines to foster IC reporting, as mentioned in section 2.2.2.3. Regulatory initiatives may act as starting points for investigations, as has been the case in Denmark (Mouritsen et al., 2001). Strictly prescribed reporting structures, however, may decrease the scope for voluntary narrative IC reporting, such as in the USA, with fairly standardised management's discussion and analysis reports (FASAB, 1999; SEC, 2002; 2003a; 2003b). This might be a reason why market-based approaches on accounting data rather than content analyses of additional corporate information dominate IC investigations with US focus (Lev et al., 2009; Villalonga, 2004; Amir et al., 2003).

IC reporting is considered to be influenced by country-specific considerations and reporting frameworks for investigating IC reporting may need to be amended. In a study of IC reporting in Australian companies, Guthrie and Petty (2000, p.245) state that the framework is adjusted for 'items likely to be reported by Australian companies'. Unfortunately, the selection is not explained in detail so that reproductions with country-specific amendments for further studies cannot be based

on similar procedures. Bukh et al. (2005) support that differences across countries may affect reporting practices. They conduct a content analysis of Danish IPO prospectuses over time assuming that voluntary reporting practices have been well-established in Denmark and inferences may not be practical for analyses in a broader institutional context, partly due to national legislation and traditions. However, the literature review of this study suggests that in the time period under review, between 1990 and 2001, the IC concept has been emerging gradually and in the early stages IC reporting may neither have been common in Denmark nor other countries.

2.4.5.2 Cross-country studies

A study across different countries, namely Australia and Hong Kong, is conducted by Guthrie et al. (2007). While in Australia IC information on external and internal capital dominates corporate IC reporting, Hong Kong companies report more on human capital. Although the findings are compared across the chosen countries, the results appear to be two separate studies describing general differences without identifying strong patterns which may be country specific. Other studies which compare IC reporting across countries show similar results describing IC reporting divergence in different countries (Vergauwen & van Alem, 2005; Vergauwen et al., 2007; Vandemaele et al., 2005). These cross-country studies describe differences in IC reporting across selected countries rather than explaining the differences. Particularly, European countries are selected for these cross-country investigations of IC reporting. Vergauwen and van Alem (2005) suggest that IC reporting differences may be caused by different reporting regulations and auditor conservatism. Following their argument, this literature review reasons that the findings of cross-country studies are mainly descriptive because they cannot account for all possible factors which influence IC reporting in different countries.

2.4.5.3 Controlling for country-specific issues in IC reporting

IC reporting studies have focused on individual countries with few international comparisons (Guthrie et al., 2007; Vandemaele et al., 2005). Strong arguments exist

against international IC reporting studies, such as particular country-specific settings (Bukh et al., 2005) and companies being embedded in different levels of national IC value and technological progress (Lin & Edvinsson, 2010). In their international comparisons, Guthrie et al. (2007) and Vergauwen and van Alem (2005) suggest that the national reporting regulations influence IC reporting. This shows a need to control for national reporting regulations in an IC reporting study. Particularly as IC value reaches beyond the financial statements, as outlined in section 2.2.2, regulation may vary strongly across countries. While reporting of additional information may be voluntary with some guidelines, some jurisdictions may provide detailed requirements. For these reasons an IC reporting study should control for country influences. Single-country studies offer research settings where country-specific issues in IC reporting investigations are kept constant, such as country-specific background and reporting regulations.

2.4.6 Communication channels under review

2.4.6.1 Range of communication channels

Over the course of time, different communication channels have been developed for IC reporting, such as IC statements in Denmark (Mouritsen et al., 2001). If such documents are published by companies and available for investigations, then these statements offer additional research opportunities regarding IC reporting. As discussed in section 2.2.2.3, in some institutional settings IC reporting is encouraged and guidance is provided by standard setters. However, corporate IC statements may be in initial stages or intended for internal use only. Studies are rare on particular communication channels for IC reporting but often focus on annual reports. Investigations on IC reporting have been broadened to include further communication channels besides annual reports. This development can be seen in Table 2.1. The scope of IC reporting instruments being analysed ranges from IPO prospectuses (Bukh et al., 2005; Singh & Van der Zahn, 2008) to separately published IC statements (Mouritsen et al., 2001) with annual reports as most commonly examined documents (Guthrie & Petty, 2000; Bozzolan et al., 2003; Guthrie et al., 2007).

Because of the difficulties to capture all corporate information, annual reports have been used as main proxy for corporate IC reporting, as reviewed by Guthrie et al. (2004). The meta-analysis of IC reporting literature by Guthrie et al. (2012) also shows that annual reports are predominantly investigated for IC information. In order to investigate reporting in extraordinary situations, such as public listings, communication means other than annual reports are more relevant for corporate purposes and different proxies ought to be used for IC reporting studies. Bukh et al. (2005) and Singh and Van der Zahn (2008) examined IPO prospectuses to investigate IC information provided to attract new potential investors. The evaluation of corporate communication with analysts is likely to be found in analysts' reports which may proxy for the importance of IC value perceived by analysts (García-Meca & Martínez, 2007). This shows that, despite the common use and acceptance of annual reports as reporting proxies, the appropriateness of communication channels should be considered for the particular investigation purpose of IC reporting.

2.4.6.2 Investigating several communication channels

With additional information being widely available on corporate websites, the accessibility of different communication channels can be used for IC reporting investigations. Based on this rationale, Striukova et al. (2008) compared IC information provided in different communication channels available on corporate websites including analyst presentations, annual and interim reports, corporate web pages and CSR reports. With certain information purposes for different communication means, the review of this chapter questions whether a standardised reporting index across communication channels may capture these differences in IC reporting. Their findings suggest that several channels of corporate communication contain IC reporting but IC information is mainly provided in annual reports and on corporate web pages. These results suggest that annual reports may be a reasonable representation of overall corporate IC reporting. Based on the findings by Striukova et al. (2008), this literature review argues that their findings imply that IC reporting

research focusing on annual reports as a proxy for corporate IC reporting may provide meaningful results and inferences regarding the overall IC reporting level.

2.4.7 IC reporting across industry sectors

2.4.7.1 IC reporting across different industries

Since IC constitutes a competitive advantage, as discussed in section 2.2.1.1, competing companies within the same industry sector may aim to develop similar IC components. Following this argument, IC may be more essential for some business models or different industries may focus on different IC components. Therefore, IC reporting may differ across industries which should be controlled for in IC reporting research. IC reporting within an industry sector may be conducted under comparable circumstances as important value drivers may consist of similar IC components. Hence, industry considerations need to be taken into account for IC reporting research according to the value creation process and the related business model. Prior IC reporting studies arrange the samples into industry groups in a variety of ways, as illustrated in Table 2.1. For example, García-Meca et al. (2005) group the companies into financial and non-financial industry sectors. Their findings show no significant association to IC reporting in analyst presentations. This may not be surprising as this industry classification does not take due account of the varying importance of IC in the value creation process between the two industry groups.

2.4.7.2 Single or dichotomous industry grouping

Some studies have focused on a single knowledge-intensive industry, such as IT or biotechnology (Lee & Guthrie, 2010; Cerbioni & Parbonetti, 2007), or they distinguish between knowledge-intensive and traditional industries, such as high tech and manufacturing (Bozzolan et al., 2003; Bukh et al., 2005; Vergauwen et al., 2007). Lee and Guthrie (2010) investigate the global IT sector whereas Cerbioni and Parbonetti (2007) examine European company reports in the biotechnology sector. However, the reduced complexity by focusing on one industry sector cannot overcome reporting variations due to country-specific corporate IC reporting. A

dichotomous distinction of knowledge-intensive and traditional industries may be chosen due to relatively small samples to indicate IC reporting patterns for general business models (Williams, 2001; Bozzolan et al., 2003). These studies expect that knowledge-intensive companies report more on IC as their business models rely more heavily on intangible resources. Hence, additional information on IC may be essential to explain the value creation process. This expectation that knowledge-intensive industries report more on IC compared to traditional sectors is confirmed by Bukh et al. (2005) and Bozzolan et al. (2003). However, the definitions of high tech companies are not stated explicitly and may diverge between these studies. Furthermore, the review of this chapter suggests that diversified company segments hamper distinct classifications of industry groups.

2.4.7.3 Numerous industry groupings

Other studies divide their samples into numerous industry groups according to different business models. Striukova et al (2008) focus on four specific industry groups. The findings deviate from their expectations since retailing surpasses technology companies in terms of IC reporting scores. Their study suggests that IC reporting might not entirely be related to knowledge-sensitivity. The literature review of this study argues that their choice of sectors is not fully explained and other eligible sectors may have provided different results. Certain types of IC information in the research framework of the content analysis may be influenced by the nature of business in specific industries. Consequently, this may provide biased findings across the chosen sectors, such as distribution channels being potentially stronger in the retail sector. Brüggen et al (2009) classify their sample into nine industry groups. They find that only the sectors IT and healthcare are significantly positively associated with IC reporting. The literature review of this study points out that the results by Brüggen et al. (2009) may be biased due to the high number of industry groups for the relatively small sample and the unknown sample distribution across industries.

2.4.8 Unutilised IC reporting information in prior studies

The mainly exploratory studies have considered a diverse range of factors potentially being associated to IC reporting and accordingly have collected diverse data in the process of the IC reporting investigations. For their content analysis of IC reporting, Guthrie and Petty (2000) collected more criteria than they analysed, such as location of information. Due to unsystematic IC reporting practices, feasible comparisons and conclusions from this additional information might have been hampered. Guthrie and Petty (2000) suggest further research to account for location of information. However, as reasonable inferences from the location of information are not provided, their study does not make clear how the location could be implemented. Striukova et al. (2008) record tone, type and location of disclosure, unfortunately they do not further examine the implications for IC reporting. While Abeysekera and Guthrie (2005) introduce the idea of intellectual liabilities, they have not examined IC reporting for these intellectual liabilities. These studies show that a parsimonious research design is important in order to achieve the research aim, without unnecessarily collecting data on IC reporting which is not utilised in the study.

2.5 Conclusion

The aims of this literature review are: to define IC for this study, to identify gaps in the literature of IC reporting, and to support the development of the research design for this IC reporting study. The findings of this review facilitate approaching the overall research aim of this study to investigate potential motivations for corporate IC reporting. The IC literature is further reviewed for hypothesis development for the respective research projects in chapters 5 to 7. Based on the review of IC reporting literature, outlined in this chapter, conclusions are drawn regarding the following aspects: definition of IC for this study, research gaps identified in prior literature, and considerations of the research design. These aspects are separately discussed in the following paragraphs.

The definition of IC for this study is a combination of two approaches to define IC suggested in prior literature, in accordance with the respective perspectives of IC under review. The definitions of IC reviewed in section 2.2.1 help to define the concept of IC applied in this study. For this IC reporting study, IC is seen to support corporate value creation as a competitive advantage, following the approach outlined in section 2.2.1.1. This definition is particularly important for research project one on estimating a measure of IC value. Furthermore, this study considers categories to define IC, as reviewed in section 2.2.1.2. Accordingly, the main features of IC are described by categories. The IC categories applied in this study are based on the widely-used terminology: structural, relational, and human capital. This approach to define IC in categories is essential for the research framework for IC reporting designed for research projects two and three. Formulating a clear definition of IC and potential differences between IC and strategic advantages can be seen as a separate gap in the IC literature. This gap is not further investigated in this study but leaves scope for future research.

From this literature review some unanswered questions are identified regarding IC measurement and IC reporting. The gaps are: finding an IC value measure, refining the research framework for a content analysis of IC reporting, and testing IC-related theories. These gaps help to develop the subordinate research questions for this study, as outlined in chapter 1. First, measuring IC value offers research opportunities. IC value cannot be found in financial reporting and the area of IC measurement is inconclusive on how best to measure IC value, as reviewed in sections 2.2.2 and 2.2.3. Second, the area of IC reporting research shows inconsistencies in designing research frameworks for content analyses in section 2.3. With no strict separations of authors being obvious, except for three main strands, previous IC reporting investigations influence each other and should be consulted for further research. However, the questionable comparability of prior IC reporting studies may hinder judgments how best to design a research framework. The content analysis procedures and components may have to be reconsidered in research frameworks for IC reporting. Third, the review of theories related to IC reporting in section 2.4.2 suggests that theories for IC reporting have rarely been tested, which

offers an interesting research opportunity. Theory testing supports achieving the overall research aim of this study.

The review of methodological considerations, presented in section 2.4, helps to develop the research approach for this study regarding sample selection, time aspects, country focus, communication channels and industry groupings. As outlined in section 2.4.3, prior studies have mostly investigated IC reporting in small samples, focusing primarily on large listed companies. Prior studies have mainly been conducted to explore IC reporting in small samples but the review in this chapter highlights that small samples hamper generalisability and theory testing. In order to test IC reporting theories in this study, a relatively large sample is required to empirically test IC-related hypotheses. Time also needs to be considered in an IC reporting study. IC reporting may vary over time, as shown in section 2.4.4, due to changes in the environment regarding reporting regulations and an increasing awareness of IC reporting. This study investigates IC reporting in a cross sectional research approach to keep time constant. Furthermore, the country-specific context should be controlled for by holding the country constant, as reviewed in section 2.4.5. This study focuses on a single country to investigate IC reporting. Chapter 3 outlines how Germany offers a unique research setting for this single-country study.

A range of different communication channels has been under review in previous IC reporting studies, as illustrated in section 2.4.6. The literature review of this study suggests that the communication channel should be chosen according to the research objectives, such as selecting IPO prospectuses for the special event of public offerings. As this study aims to investigate regular corporate IC reporting, the communication channel is chosen from regular corporate publications. Furthermore, the review shows that annual reports are suitable for IC reporting investigations because annual reports have been widely used and they have been shown to be feasible proxies for corporate IC reporting. This study focuses on management reports as a separate section of annual reports. The reasoning why German mandatory management reports are considered to be suitable for this study is presented in chapter 3. The industry groupings, reviewed in section 2.4.7, highlight

the importance to control for industry in an IC reporting study. The industry may affect corporate IC reporting as IC may play a different role in the value creation process across industries due to different business models. The approach of industry groupings applied in this study is further developed in chapter 4.

This literature review shows that the methodological approach of an IC reporting study has to consider several issues, such as industrial sectors, country-specific and regulatory backgrounds. The discussion of unutilised information on IC reporting collected in previous studies in section 2.4.8 shows that the research approach should be designed carefully in accordance with the research aim. Therefore, the creative design demanded by Mouritsen (2006) to enable theory testing for IC reporting, as outlined in section 2.4.2, needs to be constructed parsimoniously to avoid becoming too complex. A parsimonious approach allows focusing on certain aspects of IC reporting and considering additional company attributes at the same time in order to test IC-related theories. Therefore, this study focuses on the main relevant aspects of IC reporting to achieve the overall research aim.

Chapter 3:
German context for researching intellectual capital reporting

3.1 Introduction

To approach the overall research aim of this study on potential motivations for corporate IC reporting, Germany offers a unique research setting with partly required and partly recommended IC information in a mandatory management report. Standardised reporting on additional information in narrative form enables analysing IC reporting in the mandatory management report. German companies with limited liability are required to publish a management report which has been regulated by law in the German Commercial Code. When the EU Modernisation Directive demanded additional explanations to present a 'fair review' (European Parliament, 2003, sec.9), an additional standard was introduced on the German management report: the German Accounting Standard No 15 (GAS 15) (GASC, 2010a). The standard requires and recommends some information on IC. These requirements and recommendations create a unique research setting in Germany.

This chapter provides an overview of the German context for this IC reporting research. Section 3.2 describes the legal regulation of the German management report and the management reporting standard to outline the setting for IC reporting in Germany. In section 3.3, IC management and IC reporting developments are reviewed in European countries and Germany in particular. As guidelines on IC reporting in European countries have mutual influences, it is important to portray surrounding IC reporting developments to explain the German background. In this context, the section considers additional German guidelines on IC management and IC reporting for small and medium-sized companies. The German social setting for

IC reporting is outlined in section 3.4. The review of IC reporting research projects in Germany and the position of stakeholders in German companies provides an understanding of how important IC reporting may be deemed to be in Germany.

3.2 German management report

3.2.1 Historic development of the management report

In 1978, the European Commission passed the Fourth Council Directive as guidance on accounting regulation for European countries (European Commission, 2007). In Germany the guidance was implemented in the German Commercial Code (HGB) in 1985.[1] Since then management reports have been required as a separate part of annual reports with additional disclosure on corporate activities and performance. The regulation applies to all listed and unlisted German companies with limited liability, headquartered in Germany. Separate sections in the HGB cover the regulations for single entities and for consolidated group reporting with very similar requirements.[2] Relaxations exist for small and medium-sized companies with limited liability and companies which are not trading securities at an organised market.[3] The regulations require any company with limited liability to provide 'a fair review of the development of the business', 'expected developments with material opportunities and risks', and 'research and development activities'.[4] The legal requirements have been extended over the years to account for external circumstances and developments. For example, since 2004 important performance indicators and risk management have to be incorporated in the management report. In 2009, an information requirement was added on the internal control system regarding reporting processes.

The European Modernisation Directive in 2003 demanded amendments to the Fourth Council Directive (European Parliament, 2003; European Commission, 2007). Following the amendments, a separate guideline on the management report was

[1] Sections 264, 289 and 315 HGB
[2] Sections 289 HGB for single entities and 315 HGB for group reports
[3] Sections 264, 264d and 289 HGB
[4] Sections 289 and 315 HGB

initiated in addition to the German regulation by the German Federal Ministry of Justice in 2004 (Bundesministerium der Justiz, 2004). Therefore, the German Accounting Standards Committee (GASC) developed a new accounting standard for management reports in 2005 (GASC, 2010a). The GASC is an institutional body to advise the legislator in financial reporting issues. Moreover, the GASC provides accounting standards for consolidated group reporting with guidance on how to apply reporting regulation (Fink & Keck, 2005). These standards are then passed by the Federal Ministry of Justice and are 'presumed to represent German proper principles for consolidated financial reporting' (Fink & Keck, 2005, p.138). GAS 15 on management reporting was published in 2005 and revised in 2010 (GASC, 2010a). The revision was made in the course of the German Accounting Law Modernization Act. In a further revision in 2013, the German standards on management reporting, GAS 15, and risk reporting, GAS 5, were combined in a new standard GAS 20 (DRSC, 2013). This new standard applies for accounting years beginning in 2013. Table 3.1 shows a chronological development of the regulation on the German management report.

Table 3.1 Development of the regulation on the German management report

Year	Regulation
1978	Fourth Council Directive passed by the European Commission as guidance on accounting regulation (European Commission, 2007)
1985	Following the European guidance, a mandatory management report is introduced in Germany in the German Commercial Code (HGB) ; Sections 264, 289, 315 HGB
	Regular revisions by the legislator between 1985 and 2013
2003	EU Modernisation Directive demanding amendments to the Fourth Council Directive and requiring a presentation of a 'fair review' (European Parliament, 2003)
2005	To implement demanded amendments, GAS 15 is introduced in Germany with requirements and recommendations on the management report (DRSC, 2010; GASC, 2010a)
2010	Revision of GAS 15, adding recommendations on IC-related information in the German management report (GASC, 2010a)
2013	Introduction of GAS 20 combining management reporting and risk reporting (DRSC, 2013)

Notes

This table shows the chronology of the development of the regulation on the German management report.

According to the HGB, the management report has to be audited for all companies with limited liability, except for small companies.[5] The auditor has to critically read the management report. The German Commercial Code requires auditors to check whether the information provided in the management report is consistent with the financial reporting. To assist auditors in auditing the management report, guidance by a professional auditing body is provided. The Institute of Public Auditors in Germany (IDW) published a standard (Auditing Standard No. 350) with guidelines on the auditing process (IDW, 2010). According to the IDW, the core principle for auditing management reports is to investigate whether the information supports creating a fair review. For forward-looking information, the IDW recommends to check plausibility given the financial statement and the company's situation. In a review on auditing management reports in Germany, Hayn and Matena (2005) argue that the critical reading also applies to particular reporting concepts, such as value reporting, as this adds to providing a fair review. Their argument can be extended to IC information, as this may be essential to create a fair review.

3.2.2 German Accounting Standard 15 (GAS 15)

GAS 15 applies to consolidated group reporting according to section 315 HGB and is recommended for single entities according to section 289 HGB. The German regulation is in place until international requirements for a management commentary will be established (Hayn & Matena, 2005; Fink & Keck, 2005). GAS 15 (GASC, 2010a) incorporated the reporting features demanded in the Modernisation Directive with amendments to the Fourth Council Directive (European Parliament, 2003; European Commission, 2007) and extended them, as shown in Table 3.2. In the table, writing in bold type shows items which are interpreted in this study to follow the concepts of IC reporting. The comparison of the Fourth Council Directive and GAS 15 reveals that German companies are required to report more information in their management reports than is demanded as a minimum by the European Commission. A reason why GAS 15 requires additional information may lie in the German tradition of the management report, as outlined in section 3.2.1.

[5] Sections 316 and 317 HGB

Table 3.2 Comparison between Fourth Council Directive and GAS 15

Article	Fourth Council Directive	Section	GAS 15
46(1)a	at least a fair review of the development and performance of the company's business and of its position	Summary	The Standard establishes five principles for the management report: completeness; reliability; clarity and transparency; the conveyance of management's perspective; and a **focus on sustainable value creation**
		9	**all information from the perspective of management that a knowledgeable user requires to assess** the development of **business**, the group's position and the expected development
		37	description shall address the **main products** (goods and services) and **business processes**; the primary sales markets and the **competitive position** of the group within those markets;
		51	If the change in a specific item is attributable to several significant factors, such factors shall be presented in full and in the order of their significance. Examples of possible factors include: a) shortage of raw materials, shortage of **qualified staff**, uncertain **supply arrangements**; b) the development of **patents, licences or franchise agreements**; c) a high **dependence on specific suppliers or customers**.
46(1)c	additional explanations of amounts reported in the annual accounts	80	Disclosures, for instance about leased or rented assets and **internally generated intangible items**, shall be presented where these items are significant for the economic position of the group.
46(2)b	important events that have occurred since the end of the financial year	81	Significant events occurring after the balance sheet date shall be disclosed and the **expected impact** of those events on the results of operations, financial position and net assets of the group shall be discussed.
		83	The expected development of the group for the following two financial years shall be described. This shall also include the **development of new sales markets**, the **use of new processes**, for example for purchasing, production or sales, and the **introduction of new products or services**.
46(2)c	activities in the field of research and development	40	**Research and development activities** shall be described and discussed
		42	**Significant changes in research and development** activities compared with the previous year
46a(1)c	main features of internal control and risk management systems in relation to the financial reporting process	100	The group management report shall also address the material characteristics of the **internal control and risk management system** relevant for the consolidated financial reporting process
		105	Disclosures on the effectiveness of the internal control and risk management system are not required.

Notes

This table shows a comparison of extracts from the Fourth Council Directive (European Commission, 2007) and GAS 15 (GASC, 2010a). Reporting requirements following the concepts of IC reporting are highlighted in bold type. GAS 15 exceeds the Fourth Council Directive with additional requirements on sustainable value creation, information from the management's perspective and specific business factors.

The declared intention of the reporting principles in GAS 15 is to 'reduce the gap between the information available to users of the financial statement and that available to management' (GASC, 2010a, para.3). Ideas from the concepts of value reporting (Arbeitskreis Externe Unternehmensrechnung, 2002) and reporting on intangible resources (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005) have been implemented into GAS 15. The overall principles of reporting from a management's perspective and reporting on sustainable value creation (GASC, 2010a) are attributable to the value reporting concept. The expansion towards reporting on value has been advocated by a working group on value reporting (Arbeitskreis Externe Unternehmensrechnung, 2002). With regards to the concept of IC reporting, GAS 15 (GASC, 2010a) also includes IC information being partly required and partly recommended. The working group 'Accounting and Reporting on Intangible Assets' developed recommendations on IC reporting (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005). They suggest what kind of information on intangibles is important to add to a fair review of the company.

3.2.3 GAS 15 recommendations related to IC

Many suggestions with regards to IC reporting have been implemented in GAS 15 as recommendations (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005). Some recommendations are part of the main standard with more specific recommendations in the appendix of GAS 15 (GASC, 2010a). In the main standard, the wording specifies which IC information is recommended to report on. For example, with regards to changes in the structure of income, GAS 15 recommends disclosures on 'efficiency of production', 'quality assurance' or 'dependence on customers and suppliers' (GASC, 2010a, para.59). The entire appendix of GAS 15 is titled as 'Recommendations for Management Reporting'. It contains additional explanations for the requirements in certain paragraphs. This guidance offers support on how to interpret the standard. Moreover, the appendix provides examples of non-financial key performance indicators and specific IC indicators. Table 3.3 shows extracts from the appendix of GAS 15 with regards to IC reporting. The writing in bold type is interpreted in this study to be related to IC reporting.

Table 3.3 IC-related reporting recommendations in the appendix of GAS 15

Section	GAS 15
145 (referring to 31 et seq.)	**examples of non-financial key performance indicators** include information on the **customer base**, environmental and **employee matters, research and development** (where these disclosures are not made in the research and development report in accordance with paragraph 40) and on the **social reputation** of the group promoted, for example, as a result of sponsoring or charitable donations by the entity.
146 (referring to 31 et seq.)	Examples of disclosures on the **customer base**: **portfolio of customers and its composition, changes in the customer base, customer satisfaction**. Examples of disclosures on environmental aspects: emissions, energy consumption, compliance with applicable environmental protection regulations, environmental audits Examples of disclosures on **employee matters**: **turnover, length of service, remuneration structures, vocational training structures, continuing professional development measures, internal incentive measures**. Examples of disclosures relating to the entity's **social reputation**: corporate social responsibility, social and cultural involvement, **corporate culture**. Depending on circumstances, examples of additional disclosures may relate to: **supplier relationships, patent applications, product quality**.
169 (ref. to 77 et seq.)	**Disclosure of the group's intangible items is recommended**. This information includes an explanation of the disclosures **in the context of the expected development of the group**, together with material risks and opportunities associated with this development.
170 (referring to 77 et seq.)	The information reported can give users an **insight into the group's intangible resources**, irrespective of their accounting treatment. **Information about intangible items** may, for example, distinguish between **human capital, customer relationships, supplier relationships, investor and capital market relationships, organisational and process advantages, and business location factors**.
172 (ref. to 77 et seq.)	Specifically, changes in **human capital, customer relationships and organisational and process advantages should be discussed** if they could significantly affect the economic position of the group.
173 (referring to 77 et seq.)	In conjunction with disclosures about **human capital**, the provision of information about **staff turnover rates, employee training measures, training costs per employee, remuneration systems and arrangements**, as well as significant changes in collective bargaining and **management/labour agreements** is recommended. **Customer relationships** may be described, for example, by reference to **customer satisfaction, customer retention rates, the market shares of principal products or value added per customer**. **Organisational and process advantages** may be described, for example, by reference to order **throughput times and information about product quality**, such as reject rates per product and the level of warranty expenditure.

Notes

This table shows extracts from the appendix of GAS 15 (GASC, 2010a) with IC reporting recommendations. IC-related recommendations are highlighted in bold type. The recommendations cover specific examples of IC indicators, such as customer base or employee turnover.

The recommendations on IC-related information follow the categorisation of IC suggested by the working group 'Accounting and Reporting on Intangible Assets' (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005). The working group advises to 'distinguish between human capital, customer relationships, supplier relationships, investor and capital market relationships, organisational and process advantages, and business location factors' (GASC, 2010a, para.170). Particularly, changes in these IC categories are recommended to be discussed to provide a fair review of the position of the company (GASC, 2010a, para.172). As distinguishing among these IC categories and providing specific IC indicators is recommended, most IC reporting is not mandatory. Mainly information on research and development (R&D) and intangible items is required, as shown in Table 3.2 above. The recommendations provide guidance for the companies with the aim to establish an awareness of how information on intangible values can be presented in the management report (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005). Companies are encouraged to report on the recommended IC-related information.

3.2.4 Revision of GAS 15 in 2010

Due to a revision of GAS 15 in 2010, as outlined in section 3.2.1, management reports for the accounting year 2010 are interesting for this study. The changes made to GAS 15 in the revision process are highlighted in the mark up version of GAS 15 (DRSC, 2010). The main objectives and principles remained unchanged in the 2010 revision. Within the main body of the standard, minor changes were implemented, such as renaming the 'forecast report' as 'report on opportunities and risks' without relevant modifications in contents (DRSC, 2010, sec.83–92). Reporting requirements were added on the use of financial instruments (DRSC, 2010, sec.93–99) and on internal control and risk management systems relevant for the consolidated financial reporting process (DRSC, 2010, sec.100–106). Regarding the required information related to IC, particularly on R&D and intangible items, GAS 15 was not altered (DRSC, 2010, sec.40, 42, 80). Therefore, in the revision of GAS 15 in 2010, the changes within the reporting requirements of IC-related information are negligible

and are not considered to cause reporting bias for IC reporting in the first year after its implementation.

Regarding IC recommendations, the revision of GAS 15 in 2010 led to additional sections in the appendix. The additional sections recommend reporting on customer base, employee matters, suppliers, patent applications and product quality as examples of non-financial key performance indicators (DRSC, 2010, sec.145–147). Other IC-related recommendations in the appendix remained unchanged regarding intangible items (DRSC, 2010, sec.172–173) and the IC categorisation recommended by the working group 'Accounting and Reporting on Intangible Assets' (DRSC, 2010, sec.170), as stated in section 3.2.3. The new IC-related recommendations as additional sections in the revised version of GAS 15 may have renewed awareness of IC reporting in German companies, which may be useful for this IC reporting study. The insignificant minor changes regarding IC reporting in the main body of GAS 15 are not considered to cause concerns for reporting bias. Therefore, management reports for the accounting year 2010 are analysed for this IC reporting study.

3.2.5 New standard on combined management and risk reporting GAS 20

In 2013, a new standard, GAS 20, was passed on the German management report, combining management reporting and risk reporting. GAS 20 applies to accounting years beginning after 01/01/2013 (DRSC, 2013), as outlined in section 3.2.1. Therefore, management reports following the new standard GAS 20 will be published and available for research in 2014. Accordingly, GAS 15 is still the relevant standard for published management reports over the course of this study. Overall, the new standard GAS 20 combines GAS 15 (GASC, 2010a) on management reporting and GAS 5 (GASC, 2010b) on risk reporting. This section introduces the new standard and compares GAS 20 with GAS 15 to show recent developments in the regulation on the German management report. The changes in IC-related approaches in the management report regulation are interesting to compare with the outcomes of this IC reporting study in the conclusions in chapter 8.

Table 3.4 shows a comparison of GAS 15 and GAS 20 regarding IC-related information considered in this IC reporting study.

Table 3.4 Comparison of GAS 15 and GAS 20 regarding IC-related information

GAS 15	Section	GAS 20	Section
Aim: reduce information gap between users and management	3	Aim: report on use of resources	3
Principle: focus on sustainable value creation	30-35	deleted; new principles: materiality, proportionality of information	32-35
IC categories following recommendation by the working group	170	deleted	
No reporting on strategies and objectives included		Recommendations for voluntary reporting on strategies and objectives	39-44
Recommendations for IC-related non-financial indicators in appendix	145-156	Recommendations for IC-related non-financial indicators in main text	107
Requirements to report on R&D activities	40-42	Stronger requirements on R&D reporting with input and output	48-52

Notes

This table shows a comparison regarding IC-related information considered for this IC reporting study in GAS 15 (GASC, 2010a) on management reporting and the new standard GAS 20 (DRSC, 2013) on combined management and risk reporting.

The comparison of GAS 15 and GAS 20 shows the regulatory changes considered to be related to IC reporting in this study, as argued in sections 3.2.2 and 3.2.3. Overall, the unique research setting in Germany remains unaffected with a mandatory management report containing partly required and partly recommended IC-related information. However, three aspects, which are regarded in this study to affect IC reporting, have been removed in the new management reporting regulation. First, the focus on sustainable value creation has been removed because the GASC decided that the sections regarding this issue did not constitute an appropriate reporting principle across the whole reporting standard (DRSC, 2013, sec.B12). Second, the objective of the standard changed from the declared aim to ‘reduce the gap between information available to users […] and that available to management’ (GASC, 2010a, sec.3) to report on the use of the group’s resources (DRSC, 2013, sec.3).

Thirdly, the IC categorisation in GAS 15 (GASC, 2010a, sec.170), as outlined in section 3.2.3, was deleted.

In contrast to the removed IC-related sections, three IC aspects have been strengthened or added to the new standard. First, the IC-related recommendations on non-financial key performance indicators, which were introduced in the revision in 2010, as reviewed in section 3.2.4, were moved from the appendix to the main body of the standard (DRSC, 2013, sec.107). Second, the requirements for reporting on R&D were strengthened with a separate heading in GAS 20. More attention is paid to input and output for R&D activities demanding quantitative information (DRSC, 2013, sec.48–52). Finally, recommendations regarding voluntary reporting on strategies and strategic objectives are newly added to GAS 20 compared to GAS 15 (DRSC, 2013, sec.39–44). After long discussions, reporting on strategies and strategic objectives was introduced as a recommendation rather than an obligation (KPMG, 2012). The consequences of the changes to the regulation on the German management report are not yet foreseeable. The regulatory changes may offer future research opportunities using German management reports.

3.3 Movements towards IC management and reporting in Europe

3.3.1 European projects and guidelines on IC reporting

As a response to the development of the IC concept, outlined in chapter 2, international projects to encourage IC reporting have been conducted. Among these projects are the Danish approach to IC statements (DATI, 2000) and the MERITUM Project (2001) by the European Commission. They represent institutional publications to highlight the importance of IC. Between 2000 and 2009, IC guidelines have been implemented in the European Union and in national approaches in Denmark, Germany and Austria (European Commission, 2001; 2009; DATI, 2000; DMSTI, 2003; GFMEL, 2004; BMWi, 2008; Knowledge Management Austria, 2006). Table 3.5 shows a timeline of guidelines on IC management and IC reporting in European countries. These projects have partly been developed in cooperation with pilot companies and academics, for example Mouritsen et al.

(2001). The institutional guidelines have been developed in international teams with mutual influences. Ricceri (2008) found strong similarities in an extensive overview of international IC guidelines. The different approaches agree that IC is firm specific and should be reported in the context of respective business concepts.

The timeline of IC reporting guidelines shows that the aims of the European IC guidelines are to increase awareness of IC, to support IC management and to encourage IC reporting. All of the European IC projects, except for the Danish approaches, classify IC in three categories: structural, relational, and human capital (European Commission, 2001; 2009; GFMEL, 2004; Knowledge Management Austria, 2006; BMWi, 2008). This categorisation is widely used in the IC literature, as reviewed in chapter 2. The Danish guidelines use different terminologies and add an additional category: processes, customers, employees, and technology (DATI, 2000; DMSTI, 2003). Most guidelines have been developed for small and medium-sized enterprises (SMEs) (GFMEL, 2004; Knowledge Management Austria, 2006; BMWi, 2008; European Commission, 2009). Overall, the institutional standard setters mainly provide guidance as to what information on IC may be relevant for internal management purposes and to investors. Due to the complexity of IC, the European projects have developed recommendations on IC management and IC reporting instead of passing standardised regulations which might not fit all business models. According to these guidelines, IC reporting is not limited to financial statements, is mainly narrative and is principally voluntary, encouraged by institutional guidance.

Table 3.5 Timeline of IC reporting guidelines in European countries

Year	Country	Funding	Title	Aims + Approaches
2000	Denmark	Danish Agency for Trade and Industry	A Guideline for Intellectual Capital Statements (DATI, 2000)	Guidelines for a knowledge narrative Support knowledge management Developed with 17 pilot companies + academics
2001	European Union	European Commission	Meritum Project (European Commission, 2001)	Guidelines for managing and reporting on intangibles Support companies in identifying their IC Highlight importance of IC as strategic advantage in information era
2003	Denmark	Danish Ministry of Science, Technology and Innovation	Intellectual Capital Statements – The New Guideline (DMSTI, 2003)	Review of 1st guideline in 2000 Co-operation between researchers, companies, consultants, and industry organisations
2004	Germany	German Federal Ministry of Economics and Labour	Intellectual Capital Statement – Made in Germany (GFMEL, 2004)	For SMEs IC toolbox for internal management purposes Pilot project to test applicability with volunteering enterprises
2006	Austria	Austrian Ministry of Economics and Labour	Wissensbilanz A2006 (Knowledge Management Austria, 2006)	For SMEs IC statement as management tool, support innovation management Mostly adopted by private companies, universities, and research institutions
2008	Germany	German Federal Ministry of Economics and Technology	Wissensbilanz – Made in Germany 2.0 (BMWi, 2008)	Review of 1st guideline in 2004 For SMEs Expanded Wissensbilanz 1.0 based on experiences with IC toolbox IC calculator for internal management purposes
2009	European Union	European Commission	InCaS: Intellectual Capital Statement (European Commission, 2009)	For SMEs German pilot projects as input Core countries: France, Germany, Poland, Slovenia, Spain, UK

Notes

This table shows a timeline of guidelines on IC reporting developed and published in European countries. The guidelines have been developed in international teams with mutual influences and follow similar aims: to highlight the importance of IC and to support companies in identifying, managing and externally reporting on IC. Most IC guidelines focus on SMEs.

3.3.2 German ‘Wissensbilanz’

With regards to IC reporting guidelines for SMEs, a German approach has been initiated in practice as a standardised approach has been demanded by companies (Alwert, 2005). Governmental institutions have supported this movement towards IC management and IC reporting, as the government realised the importance of IC for the German economy (Edvinsson & Kivikas, 2007). Guidelines for IC statements, named ‘Wissensbilanz’, were developed for SMEs in iterative processes with pilot companies (GFMEL, 2004; BMWA, 2005; BMWi, 2008). In the course of the European movements towards IC management and IC reporting, outlined in section 3.3.1, German guidelines on IC statements were developed in English first with international experts on the advisory board (GFMEL, 2004). One expert involved was Leif Edvinsson, who developed the ‘Skandia Navigator’ as an IC reporting tool (Edvinsson, 1997). Then the guidelines were translated into German (BMWA, 2005). The German term ‘Wissensbilanz’ for IC statements can also be translated as keeping a balance of knowledge resources. In this manner, the German approach provides guidance on knowledge management and IC reporting (GFMEL, 2004; BMWA, 2005). The guidelines also provide an IC toolbox for internal purposes to raise an understanding of where IC values lie.

In a survey study with SMEs, Alwert and Vorsatz (2005) found that German companies considered the ‘Wissensbilanz’ as a tool for internal communication and particularly for knowledge management. The approach is considered to be valuable in order to reveal potential for improvements, innovation and optimisation. This was confirmed in a governmental study on the usage of the ‘Wissensbilanz’ with 52 pilot SMEs (BMWi, 2006). The majority of participating companies consider communicating the IC statement to banks and investors. The initial guidelines on the ‘Wissensbilanz’ were then revised to incorporate the experiences of the pilot companies, as ‘Wissensbilanz 2.0’ (BMWi, 2008). Alwert et al. (2009) tested the relevance for analysts of the ‘Wissensbilanz’ statement with mock reports of pilot SMEs. The mock reports were presented to experienced bankers, financial analysts and auditors. Their results indicate that the ‘Wissensbilanz’ reports support investors

in assessing future potentials and risks. The users requested that the reports refer to financial data and that they are concise. However, one stated limitation is that their study only focuses on SMEs and their market partners.

3.4 German setting for IC reporting

3.4.1 National efforts on knowledge resources

The country-specific setting in Germany may have promoted the projects on IC management and IC reporting. Edvinsson and Kivikas (2007) argue that German companies have recognised knowledge management as decisive factor to safeguard competitiveness and sustainability in a globalising economy. Edvinsson and Kivikas (2007) see Germany as a high-cost country to protect employment with efficient IC management. Furthermore, they portray the background of the 'Wissensbilanz' to be based on Germany's tradition in leadership with a social responsibility and a more long-term, ethical view on management behaviour. In an international comparison of national IC levels for 40 countries between 1995 and 2008 by Lin and Edvinsson (2010; 2011), Germany ranks above average. The German level of IC is particularly high on what they refer to as 'renewal capital'. This IC category covers 'efforts to increase its competitive strength' and 'encourage future growth' (Lin & Edvinsson, 2011, p.4). Included in 'renewal capital' are investments in R&D, patents, start-up companies, and capacity for innovation. These findings together with the 'Wissensbilanz' projects, outlined in section 3.3.2, indicate that IC has been appreciated in Germany on a national level.

Following this line of thought, IC-related values have been promoted on various levels in Germany (e.g. GFMEL, 2004; BMWi, 2008; BMWi, 2010). Specific requirements and recommendations on IC items in the management report regulations emphasise that German regulators deem IC to be important (GASC, 2010a). Fink and Keck (2005) argue that the aim of the extended reporting requirements with components from value reporting and IC reporting, as outlined in sections 3.2.2 and 3.2.3, is to encourage an advanced IC management. This emphasises again the importance of IC for the German economy. A study on the

competitive position of Germany as a location with a sound foundation of knowledge resources, initiated by the Federal Ministry of Economics and Technology, highlights the perceived importance of progress and IC's contribution to value creation in the German society (BMWi, 2010). The government promotes knowledge management 'to safeguard and further establish competitive advantages for operating businesses in Germany on a knowledge basis' (BMWi, 2010, p.4). An on-going discussion between academics and practitioners about how best to account for IC value shows an appreciation of IC in the German society (Arbeitskreis Immaterielle Werte im Rechnungswesen, 2005; Edvinsson & Kivikas, 2007; Alwert et al., 2009).

3.4.2 Strong stakeholder representation

Strong stakeholder groups may also encourage IC management and IC reporting in Germany. In their study on different governance systems, Dignam and Galanis (2009) consider the German system as an insider governance system where stakeholders' objectives play an important role in company operations and have an influential power. According to their argument, important insider stakeholder groups are employees and banks. This insider system has evolved historically in Germany. The economic system of the 'Soziale Marktwirtschaft' (Social Market Economy) was developed to balance the interests of capital and labour (Nicholls, 1994). Employees have several ways to promote their interests. On the one hand, strong labour unions fight for the employees' well-beings (Ball, 2005). On the other hand, employee representatives are legally required on the supervisory board in the two-tier board structure.[6] Banks represent another influential stakeholder group in German companies (Soderstrom & Sun, 2007). Traditionally, banks have worked closely with companies to stimulate economic growth (Dignam & Galanis, 2009). Given these close relationships, banks may receive additional information and may have insights into corporate operations. This is consistent with the findings of studies on the use of IC statements that companies may consider showing them to the banks (Alwert & Vorsatz, 2005; Edvinsson & Kivikas, 2007), as discussed in section 3.3.2.

[6] Sections 95-96 in the German Companies Act (AktG), section 7 in the Law on Co-Determination (MitbestG)

3.5 Conclusion

This chapter outlines the German context for IC reporting research. With regards to IC reporting, Germany offers a unique research setting. In Germany, IC management and IC reporting are encouraged on a national level. The tradition of a mandatory management report, as summarised in section 3.2.1, enables narrative investigations on a large scale with comparable reporting structures. The additional accounting standard GAS 15 on management reporting, which can be characterised as proper principles of accounting, contains components of value reporting and IC reporting. As outlined in sections 3.2.2 and 3.2.3, IC components are partly required and partly recommended in the management report. This situation allows distinguishing among required, recommended and voluntary IC reporting to answer the research questions of this study. To investigate potential motivations for corporate IC reporting, the reporting can be differentiated according to the level of requirement. This differentiation enables to test theories of voluntary reporting, as outlined in chapter 1. The revision of GAS 15 in 2010 constitutes an interesting situation because IC-related recommendations were added which may have renewed awareness of IC reporting, as discussed in section 3.2.4. Therefore, management reports for the accounting year 2010 are analysed for this study. The latest development on the management reporting regulation in 2013, as reviewed in section 3.2.5, may be interesting to compare with the findings of this study in the conclusions.

The German approach of an IC statement for SMEs, the 'Wissensbilanz', has been embedded in the movements towards guidelines on IC management and IC reporting in European countries. International experts have participated in developing the German guidelines, as illustrated in sections 3.3.1 and 3.3.2. German research in the area of IC reporting shows that the 'Wissensbilanz' is considered as a useful tool for internal communication and IC management. Governmental guidelines and studies on knowledge resources in Germany constitute national efforts on IC management and reporting, as discussed in section 3.4.1. These efforts are aiming to safeguard employment and sustainability and to establish competitive knowledge advantages in

Germany. The national efforts in the area of IC show that IC is deemed important in the German society. IC management and IC reporting may also be stimulated by strong stakeholder representations in the insider governance system, as outlined in section 3.4.2. Previous studies in the area of IC reporting in Germany focused on the use and relevance of IC statements in SMEs and for their market partners, such as banks. This study investigates IC reporting of publicly listed German companies. The country-specific and social setting of national efforts on IC and strong stakeholder groups together with the management reporting regulations encourage companies to report on their IC management and utilisation.

Chapter 4:
Methodology overview

4.1 Introduction

The aim of this chapter is to give an overview of the methodological design of this intellectual capital (IC) reporting study. More detailed methods are described in the respective empirical chapters. The methods of this study are selected to address the three research questions, as outlined in chapter 1. The methodology is designed taking into account the findings on methodological considerations in prior IC literature, reviewed in chapter 2. For the research setting, Germany is chosen as the mandatory management report offers a unique situation with partly required and partly recommended IC information, as outlined in chapter 3. This methodology overview is structured as follows. Section 4.2 summarises the research questions with underlying assumptions. Section 4.3 outlines the research design of this study with an overview of the research setting and the individual research projects. The sample selection is illustrated in section 4.4 with a description of the industry grouping applied in this study and with database issues in the data collection process. Section 4.5 describes the characteristics of the German sample regarding variety of shares, proportion of debt and adoption of international reporting standards. The methodological limitations of this IC reporting study are outlined in section 4.6.

4.2 Research questions

4.2.1 Summary of research questions

The review of IC reporting literature in chapter 2 shows that the area of IC reporting has been researched from several perspectives in numerous studies. However, several questions have not been fully answered by prior studies. The research aim of this IC reporting study addresses a gap in the IC reporting literature. This study has the aim

to investigate potential motivations for corporate IC reporting by testing whether agency theory or legitimacy theory better explains IC reporting. Moreover, the subordinate research questions, to investigate IC measures and to examine a parsimonious design for IC content analyses, shed light on unanswered questions. The research questions of this IC reporting study are the following, as presented in chapter 1:

(1) How can underlying corporate IC value be measured?

(2) How can a content analysis of IC reporting be designed parsimoniously?

(3) Does agency theory or legitimacy theory explain IC reporting?

4.2.2 Underlying assumptions

To answer the research questions of this study, some assumptions are essential for approaching IC reporting. The two main assumptions are that IC value exists and IC reporting is practised by corporations. If IC value did not exist, IC reporting would be unnecessary. Consequently, IC research and this IC reporting study would become redundant. According to the arguments and findings of prior studies outlined in the review of literature on IC reporting in chapter 2, IC reporting is highly likely to exist as information on IC is found in prior IC reporting research. Following the ideas of agency theory to answer research question (3), the relationship between IC value and IC reporting is examined. Given that this study investigates the association of IC reporting with underlying corporate IC value, the existence of corporate IC value is fundamental. Furthermore, IC value is assumed to be measurable. The assumption of measurability enables to approach research question (1), how to measure IC value. If IC value was not measurable, the overall research aim of potential motivations for corporate IC reporting would require to be addressed with different subordinate research questions. In that case, the application of agency theory to IC reporting could not be tested regarding underlying corporate IC value.

The review of literature on IC reporting in chapter 2 shows that prior studies have investigated, categorised, and measured IC value and IC reporting. Their findings may give an indication whether the assumptions for this IC reporting study are

reasonable. With regards to the existence and measurability of IC value, several approaches have been addressed (e.g. Edvinsson, 1997; Stewart, 1997; Marr et al., 2003). The discussion on IC value measures will be further outlined in chapter 5 on estimating a measure of IC value. Although researchers from different areas have used different terms for IC, such as intangibility (Villalonga, 2004), intangibles (Lev, 2001) or intangible resources (Hall, 1992; 1993), the existence of IC value has been widely accepted. For IC reporting, previous studies have found that companies provide IC-related information in several countries (e.g. Guthrie & Petty, 2000; Abeysekera & Guthrie, 2005; Striukova et al., 2008). Based on the findings of prior research, the assumptions seem practical for this IC reporting study that IC value exists and is measurable and that IC reporting is provided.

4.3 Research design

4.3.1 Research setting

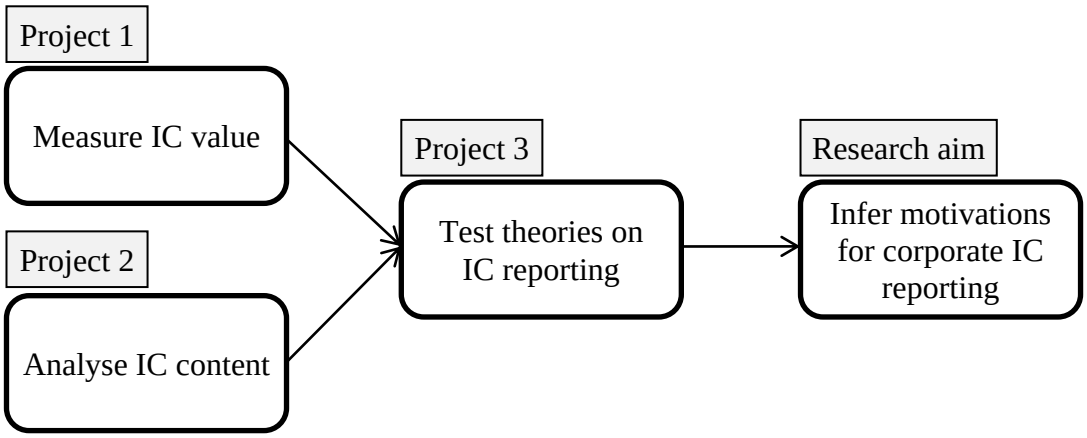
Germany offers a unique research setting for IC reporting investigations, as discussed in chapter 3 on the German context. Following this discussion, the relatively high level of national IC and a mandatory management report with IC-related information create a unique environment for IC reporting. For these reasons, Germany is chosen as the research setting for the overall research aim to investigate potential motivations for corporate IC reporting. The underlying assumptions of this study, outlined in section 4.2.2, require that IC value and IC reporting exist. The relatively high level of national IC, found by Lin and Edvinsson (2010; 2011), with efforts to develop knowledge resources suggests that IC value on the company level may be highly likely to exist in Germany. As the German management report requires IC-related information (GASC, 2010a), the assumption of IC reporting to be provided by companies is met. Therefore, Germany constitutes a suitable research setting to approach the research questions of this study as the underlying assumptions are likely to be met. Particularly in the accounting year 2010, IC reporting may have been stimulated due to the revision of the German Accounting Standard GAS 15 adding IC-related recommendations, as outlined in chapter 3. Therefore, this IC reporting study investigates IC reporting in the accounting year 2010.

4.3.2 Approaching the research questions in three projects

4.3.2.1 Overview of research approach

To achieve the overall research aim, this study addresses the three research questions, as introduced in chapter 1 and summarised in section 4.2.1, in three individual research projects. Figure 4.1 shows the sequence of the three research projects of this study. The first two research projects analyse methodological approaches to measure IC value and to design a content analysis of IC reporting. The findings of projects one and two form the basis for answering the main research question, to test agency theory and legitimacy theory for IC reporting in project three. The results of project three allow inferring motivations for IC reporting.

Figure 4.1 Sequence of research projects in this study



Notes

This figure shows the research approach of this study. To achieve the overall research aim, to investigate motivations for IC reporting, three projects are designed. Projects one and two address the methodological issues of measuring IC value and designing a content analysis of IC reporting. The findings of the methodological projects provide the basis for project three to test whether agency theory or legitimacy theory better explain IC reporting. Motivations for IC reporting are inferred according to the results of project three.

4.3.2.2 Project one: estimating a measure of IC value

The first project of this IC reporting study addresses research question (1), how to measure underlying corporate IC value. Chapter 5 'Estimating a measure of IC value to test its determinants' covers this project. This methodological project compares three potential IC value measures to examine which measure indicates corporate underlying IC values with the highest explanatory power. The measures under review in this project are market-to-book ratios (Stewart, 1997; Edvinsson & Malone, 1997), Tobin's q (Lev, 2001; Villalonga, 2004) and long-run value-to-book (LRVTB) (Rhodes-Kropf et al., 2005). The measure LRVTB has been developed by Rhodes-Kropf et al. (2005) in the area of mergers and acquisitions research. This study interprets LRVTB as a measure for IC value and innovatively applies LRVTB to IC research. The aim is to identify the measure for IC value with the highest explanatory power in order to then use this measure for further analyses. Within this project IC-related hypotheses are tested on determinants of IC value. The findings of this project provide a measure for IC value to be used in research question (3), to test whether agency theory or legitimacy theory explains IC reporting.

4.3.2.3 Project two: designing a parsimonious framework for IC content analysis

The second project approaches research question (2), how a content analysis of IC reporting can be designed parsimoniously. The project is presented in chapter 6 'Content analysis of intellectual capital reporting – Parsimony in research design'. In order to test agency theory and legitimacy theory on IC reporting in research question (3), IC reporting itself requires a detailed investigation. For analysing narrative IC reporting, content analyses have previously been conducted using research frameworks with ex ante specified checklists of IC components (e.g. Guthrie & Petty, 2000; Abeysekera & Guthrie, 2005). In principle, an IC reporting study could follow prior research frameworks for a content analysis of IC reporting. However, previously developed research frameworks differ regarding the IC components considered, as further discussed in a review of previous research frameworks in chapter 6. The question arises as to which IC components matter for a

content analysis of IC reporting. This project focuses on the design of a content analysis for IC reporting. Using different IC components, this project tests, how to parsimoniously design a research framework for an IC content analysis. The findings provide the basis for research question (3) on testing agency theory and legitimacy theory on IC reporting in the final project.

4.3.2.4 Project three: applying agency theory and legitimacy theory

In the final project, research question (3) is addressed, whether agency theory or legitimacy theory explains IC reporting, in chapter 7 'Applying agency theory and legitimacy theory to intellectual capital reporting'. The findings of this project allow inferences on the potential motivations for IC reporting to achieve the overall research aim of this study. This final project uses the methods developed in the first two methodological projects. The German research setting allows distinguishing among required, recommended and voluntary IC reporting due to the regulation on the mandatory management report. This distinction is important as agency theory and legitimacy theory apply to voluntary reporting. Based on the concepts of agency theory, this study suggests that IC reporting is intended to reduce the information gap between managers and owners. In order to test this suggestion, two aspects of the information gap are analysed: ownership diffusion and the underlying corporate IC value. Following the idea of legitimacy theory, IC reporting is used to legitimise a company's status. This study examines two aspects of IC reporting for legitimacy: addressing a legitimacy threat and justifying the use of intangible resources.

4.3.3 Intended interviews for triangulation

In addition to the three projects outlined in section 4.3.2, semi-structured interviews were intended for triangulation of results as last step in the overall analysis. The intention was to investigate IC reporting processes and decisions after considering the findings on IC reporting in the management reports. Interviews were planned to be held with three to five companies with high IC reporting scores, achieved in the content analysis in project two. For this purpose, the companies were ranked

according to their IC reporting scores. Companies with the thirty highest scores were considered as potential interview partners. As no prior access to companies with high IC reporting scores existed for the researcher, four companies were contacted via email with reminders and requests by phone. The investor relation departments were the initial contact points as they were assumed to have an overview of reporting preparations. Employees of the investor relation departments could either be interview partners or refer to responsible departments. In this process, the corporate communication or corporate finance and controlling department were involved for two companies. Two companies were interested and asked for the intended interview questions. The prepared questions are shown in Table 4.1. As the interviews were intended to be held in German, the questions were originally formulated in German and then translated into English.

By all four companies the enquiries for interviews on their IC reporting were refused. The companies named different reasons for the refusals. One company omitted to specify reasons. Two companies named time constraints and sensitivity of data as explanations for refusing the interview requests. However, the explanation of data sensitivity seems questionable since the IC information had already been published in the management report, as only companies with high IC reporting scores were selected. This may indicate that the companies were unclear about what IC reporting means. The response by one company was surprisingly honest. The department for corporate finance and controlling declared that the company did not have a central IC reporting management. The information for IC reporting is collected from different departments, such as human resources, without central control over the IC information. They refused the interview request because they believed to provide no additional input to this IC reporting study. Due to the reluctance of German companies to participate in interviews on IC reporting, this IC reporting study focuses on the three projects, outlined in section 4.3.2.

Table 4.1 Prepared questions for intended interviews

English translation of prepared interview questions	Originally prepared interview questions in German
What is the meaning/significance of intellectual capital for your company?	Welche Bedeutung hat intellektuelles Kapital für Ihr Unternehmen?
What do you understand by intellectual capital?	Was verstehen Sie unter IC?
How important do you think IC is for your company? Why?	Für wie wichtig erachten Sie IC für Ihr Unternehmen? Warum?
Which IC categories do you consider as most important?	Welche Bestandteile des intellektuellen Kapitals sind besonders wichtig?
How would you describe the management reporting process?	Wie würden Sie den Berichterstattungsprozess des Lageberichts beschreiben?
What is your aim of the management report?	Was ist das Ziel des Lageberichts?
What kind of information do the departments provide?	Welche Informationen liefern die verschiedenen Abteilungen?
Whom is the management report for/who is the user group?	Wer ist die Zielgruppe des Lageberichts?
How do you actively report on IC?	Wie setzen Sie die Berichterstattung zum intellektuellen Kapital aktiv um?
What do you consider as IC reporting?	Was betrachten Sie als Berichterstattung zum intellektuellen Kapital?
Do you have an IC reporting strategy?	Haben Sie eine Strategie für die Berichterstattung zum intellektuellen Kapital?
How do you manage/control IC reporting?	Wie leiten Sie die Berichterstattung zum intellektuellen Kapital?
Is IC reporting rather a side benefit of the management report?	Stellt IC Reporting eher einen Nebeneffekt der Lageberichterstattung dar?
Do you think IC reporting may gain importance in the future? Why?	Erwarten Sie, dass IC Reporting in der Zukunft an Bedeutung gewinnt? Warum?
Why do you report on IC?	Warum berichten Sie über Ihr intellektuelles Kapital?
What role does regulation (GAS 15) play for IC reporting?	Welche Rolle spielt DRS 15 bei der IC Berichterstattung?
How do you utilise IC reporting to tell a value creation story?	Wie nutzen Sie IC Reporting, um Ihre Wertschöpfung darzustellen?
Do you consider IC reporting as valuable?	Denken Sie, die IC Berichterstattung bietet einen Mehrwert?
Who demands information on IC in the management report?	Wer fordert Informationen zum intellektuellen Kapital im Lagebericht?
Are there any other sources for users to find out about IC?	Können Nutzer sich IC Informationen über andere Quellen beschaffen?
What IC information do users demand?	Welche Art von IC Information fordern die Nutzer?

Notes

This table shows interview questions prepared for the planned semi-structured interviews. As the interviews were intended to be held in German with representatives from German companies, the questions were originally prepared in German and then translated into English.

4.4 Sample selection

4.4.1 Sample for measuring IC value in project one

For measuring IC value in the first project, panel data is desirable because the measures Tobin's q and LRVTB require long-run information for each company. Therefore, data for German companies listed between 2000 and 2010 is collected from the database *Datastream*. Due to data availability for German companies, the time period before the year 2000 cannot be considered. Further information on this issue is outlined below in section 4.5.1. A list of German companies, headquartered in Germany, listed on the Frankfurt Stock Exchange is downloaded from *Datastream*. To safeguard suitability to be included in the sample, certain criteria are checked, such as address of headquarters and geographic region of listing. This approach resulted in a large number of companies with many unavailable data points. To ensure data availability of necessary financial information, certain companies are subsequently excluded from the list. Companies with unavailable data on total assets, market value (MV) and market value consolidated (MVC) for the entire period 2000-2010 are excluded as they are delisted before the time period under review. Then, double counted shares are deleted. This resulted in a total sample of 873 companies with 7,728 firm years.

If a company is delisted during the time period under review, information from the financial reports becomes unavailable. However, market value information is often provided with constant values for some years following the delisting. These years cannot be used for the sample as data from the financial statements are unavailable. Furthermore, a distinction is not possible among mergers, delistings, bankruptcies or moves to unregulated markets. *Datastream* provides no indication of what caused the delisting. Hence, further investigations on the development of IC value, such as examining whether companies with low IC value are more likely to become insolvent, cannot be conducted with the data available. The design of the first project is mainly stimulated by data availability. The numbers of excluded companies and the procedures to reach the final sample for project one are illustrated in Table 4.2.

Table 4.2 Sample of German companies for measuring IC value

Sampling procedures	Number of companies
German companies listed on German stock exchange between 2000-2010	1540
Data on total assets unavailable	(310)
Data on market value (MV) unavailable	(69)
Data on market value consolidated (MVC) unavailable	(264)
Double counted companies	(24)
Final sample for measuring IC	873

Notes

This table shows the composition of the sample of German companies for measuring IC value in project one with panel data. First, a list of German companies, headquartered in Germany, listed on the Frankfurt Stock Exchange between 2000 and 2010 is downloaded from *Datastream*. Then companies are subsequently excluded due to unavailability of data. The final sample constitutes 873 companies resulting in 7,728 firm years.

4.4.2 Sample for investigating IC reporting in projects two and three

The IC reporting investigations in projects two and three focus on a cross-sectional analysis of IC reporting. As IC reporting may be influenced by external economic, political or regulatory circumstances, this study conducts a cross-sectional investigation of IC reporting to keep these factors constant, as outlined in chapter 2. For investigations of IC reporting, a list of companies listed on the German stock exchange on 30/12/2010 is downloaded from *Datastream*. Then certain companies are excluded from this list. Table 4.3 shows a summary of the sample for investigating IC reporting. As only companies with headquarters in Germany are required to publish a management report, international companies, not headquartered in Germany, are not considered. Companies with problems of data availability due to insolvency proceedings, litigation issues, suspended shares, delistings or major restructurings are dropped from the sample. Furthermore, companies with short fiscal years in 2010 and IPOs in 2010 are excluded. The reason is that IC reporting may be different and incomparable if the reporting period does not refer to a full year or in the initial year after an IPO. For the final sample of 428 companies, annual reports for the accounting year ending in 2010 are downloaded from the company websites.

Table 4.3 Sample of German companies for investigating IC reporting

Sampling procedures	Number of companies
Population of German stock exchange on 30/12/2010	584
International companies listed on German stock exchange	(43)
German companies listed on German stock exchange on 30/12/2010	541
Unavailable companies (insolvency proceedings, litigation, major restructuring, etc.)	(101)
Healthy German companies	440
Companies with short fiscal year in 2010	(4)
Healthy German companies with comparable financial reports listed on 30/12/2010	436
IPOs in 2010	(8)
Sample for intellectual capital reporting study	428

Notes

This table shows the sample for investigating IC reporting in projects two and three. 428 healthy German companies listed on the German stock exchange on 30/12/2010 are considered with no short fiscal year and no IPO in 2010.

4.4.3 Industry grouping

The samples are classified into industry groupings based on the overall corporate business models, as discussed in chapter 2. The idea behind that approach is that the importance of IC may be related to the company's business model. Prior literature suggests that IC may be more important in some industries than in others (Brennan, 2001; Bozzolan et al., 2003; Brüggen et al., 2009). Following this line of thought, the relationship between the industry and IC may affect the development of IC value and IC reporting. To be competitive, companies operating in the same industry may focus on similar IC components. Therefore, a classification of the sample into industry groups is important. Industry classifications differ across previous IC reporting studies, as reviewed in chapter 2. Some studies differentiate two main classifications: traditional and high-tech industries (e.g. Bozzolan et al., 2003). Other studies classify more industries with varying numbers depending on what is appropriate for their samples (Guthrie & Petty, 2000; Bukh et al., 2005; Brüggen et al., 2009). With regards to measuring IC value, prior studies on LRVTB or Tobin's q have widely applied the Fama & French twelve industry classification (Rhodes-Kropf et al., 2005; Hertzel & Li, 2010; Villalonga, 2004). However, the distribution over these twelve industries is not practical for the sample of German companies.

The question arises how the sample can best be grouped into industry sectors for this IC reporting study. This study suggests that industry groupings can never be optimal because many diversified firms operate in various industries. The information, however, is difficult to obtain as *Datastream* allocates the industry classification based on the main business area. Therefore, certain simplifications and assumptions are needed for this IC reporting study to enable industry groupings. In order to answer detailed industry-specific questions, case studies would be preferable to develop deeper understandings of the relationship between business models and IC value. As this study does not aim to answer industry-specific questions but attempts to control for industry, relatively simple industry groupings seem plausible. To compare the effect of industry groupings on IC reporting scores, ANOVA and Kruskal-Wallis analyses are conducted. ANOVA compares mean values across groups while Kruskal-Wallis tests for equal medians with less demanding assumptions. Chapter 6 explains in detail how the IC reporting score is obtained. Based on the *Datastream* item 'Industry Classification Benchmark (ICB)' ten sectors are subsequently classified into four industry groups. Table 4.4 shows the results of the ANOVA and the Kruskal-Wallis analyses.

Table 4.4 ANOVA and Kruskal-Wallis analysis for industry groupings

Panel A: Descriptive statistics by sectors for IC reporting scores

Industry group	Sector	N	mean	sd	median	min	max
Consumer	consumer goods	50	9.22	4.52	8.86	1.63	30.96
N=123	consumer services	51	8.48	3.23	8.21	3.17	17.03
	transport + logistics	22	8.09	2.51	8.10	4.08	14.47
Finance N=62	banks + financial services	62	6.27	2.44	5.78	0.00	12.61
Pharma & Tech	technology	74	11.24	3.41	11.24	5.07	21.75
N=116	telecommunication	5	9.37	2.91	8.71	5.97	12.93
	healthcare & pharmaceutical	37	10.51	3.97	9.33	4.85	22.06
Industrial	industrial	62	8.58	2.46	8.58	3.68	15.76
N=127	chemicals	13	9.84	3.25	9.01	6.16	15.47
	basic resources + construction + utilities	52	7.89	2.71	7.75	3.45	17.63

Panel B: ANOVA by industry groupings for IC reporting scores

Industry group	Industry	df	SS	MS	F	p
Consumer	consumer	2	24.110	12.055	0.87	0.420
N=123	residual	120	1655.983	13.800		
	total	122	1680.092	13.771		
Pharma & Tech	pharma & tech	2	25.768	12.884	1.00	0.370
N=116	residual	113	1452.905	12.858		
	total	115	1478.673	12.858		
Industrial	industrial	2	42.205	21.103	3.01	0.053
N=127	residual	124	870.644	7.021		
	total	126	912.849	7.245		

Panel C: Kruskal-Wallis Test by industry groupings for IC reporting scores

Industry group	Industry	N	Rank Sum	H	p
Consumer	consumer goods	50	3306.50	1.24	0.539
N=123	consumer services	51	3063.00		
	transportation + logistics	22	1256.50		
Pharma & Tech	technology	74	4604.50	2.76	0.252
N=116	telecommunication	5	224.00		
	pharma & healthcare	37	1957.50		
Industrial	manufacturing	62	4167.00	4.49	0.106
N=127	chemicals	13	1016.50		
	basic resources + construction + utilities	52	2944.50		

Notes

These tables show descriptive statistics of IC reporting scores by industries (Panel A), ANOVA analysis (Panel B) and Kruskal-Wallis analysis (Panel C). Based on the *Datastream* item 'Industry Classification Benchmark (ICB)' the sample of 428 companies is initially grouped into ten sectors. The companies are subsequently grouped into four industries. The changes in the mean and median IC reporting scores for re-arranging industry groups are captured by ANOVA and Kruskal-Wallis analyses. The results in Panel B and Panel C show that reducing the number of industries has no significant effects at the 5%-level for any industry group.

The findings of the ANOVA and the Kruskal-Wallis analyses show that the changes in mean and median values are not significant at the 5%-level for the industry groups. The finance industry is not included in the ANOVA and Kruskal-Wallis analyses because the ICB grouping is applied without re-arrangements. For this study, the industry groupings are re-arranged from ten sectors into four industry groups, subsequently adding subsectors to an industry group. This approach allows testing whether a simplified industry grouping of four groups is feasible for this IC reporting study without changing the mean and median IC reporting scores. As this study applies the industry grouping as a control variable to consider industry-specific environments, the simplified industry groups seem plausible. The companies in the samples for measuring IC value and for investigating IC reporting are grouped into four industry groups: consumer, finance, pharmaceutical & technology, and industrial. Table 4.5 shows the industry grouping with subsectors for the sample of 428 companies for investigating IC reporting.

Table 4.5 Industry groupings of German sample for investigating IC reporting

Industry grouping	Subsector	Number of companies
Consumer	Automobile & Parts	12
N=123	Food & Beverages	10
	Media	24
	Personal Household Goods	28
	Retail	18
	Transportation & Logistics	22
	Travel & Leisure	9
Finance	Banks	5
N=62	Financial Services	29
	Insurance	6
	Real Estate	22
Pharma & Tech	Healthcare & Pharmaceuticals	37
N=116	Software	58
	Telecommunication	5
	Technology	16
Industrial	Basic Resources	9
N=127	Chemicals	13
	Construction & Materials	14
	Industrial Goods	62
	Oil & Gas	19
	Utilities	10
	Total	**428**

Notes

This table shows the sample of 428 companies on a sector level for investigating IC reporting, based on the *Datastream* item ‘Industry Classification Benchmark (ICB)’.

4.4.4 Issues with database *Datastream*

In the process of collecting data from the database *Datastream*, several issues have appeared which are addressed in this section. Generally, *Datastream* adjusts the data for certain criteria before the data are made available. In the descriptions with footnotes, the adjustments are outlined to explain what the respective data represent. Most adjustments are easily replicable but some issues have been encountered where the adjustments are unclear. In some cases, the description and the footnotes are contradicting, such as for the *Datastream* item '01651 Net income – bottom line'. The description states that the item '01651 Net income – bottom line' represents net income after tax but the footnotes describe the item as profit before tax. Moreover, data for net income are provided in three different items as net income available to common, bottom line, and after preferred dividends. To be able to make a decision on which data is most suitable and to scrutinise unclear adjustments, financial reports from five companies are chosen to compare actual data with data from *Datastream*. This comparison of real financial statements with *Datastream* values allows reconciliations to clarify issues with the database.

For the German companies, no major differences between net income available to common and net income after preferred dividends are found. Bottom line net income shows differences in form of extraordinary items, such as incomes or losses for discontinued operations after tax. As this study regards extraordinary items as being outside the scope of underlying corporate IC, the *Datastream* item '01651 Net income – bottom line' after extraordinary items is considered to be suitable for this IC reporting study. In the reconciliations, some additional issues with *Datastream* data have emerged. Some adjustments are not explained explicitly in the descriptions or footnotes within *Datastream*. The *Datastream* item '02999 Total assets' does not mention that total assets are adjusted for deferred tax although this is found in the reconciliations for this study. Despite these issues, the data for this IC reporting study are collected from *Datastream* for two main reasons. First, reconciliations are replicable in a logical analysis of the accounting information. Second, the adjustment procedures made by *Datastream* are supposed to be equivalent for all companies in

the sample. Hence, the data collected from *Datastream* is considered to be comparable across the sample and to be proportional to published accounting data.

4.5 German company characteristics

4.5.1 Variety of shares

German companies have a variety of shares which represent ordinary shares. This section highlights the distinctive features of German shares. According to German Companies Act (AktG), German companies issue shares with different rights and characteristics.[7] This regulation has led to a variety of shares, such as shares with preference rights. Generally, German preference shares participate in profits and liquidation residuals and constitute equity according to German law.[8] If shares have a notion of preferred shares to be classified as equivalent to debt, German companies emphasise the peculiarities of these preferred shares and explicitly state their characteristics in the notes to the accounts. In German annual reports, shares with the notion of debt-like preferred shares are named subsidiary or hybrid capital or the English term 'preferred shares' is used rather than a German translation (e.g. IKB Deutsche Industriebank, 2010). These preferred shares are provided in the *Datastream* item '03451 Preferred stock'. Preferred stock is rare in German companies. For the total sample of 7,728 firm years, only 81 cases show preferred stock spread over 24 companies.

As a consequence of the variety of German shares, the data on market value has to be reviewed. The *Datastream* item 'Market value (MV)' considers only one kind of ordinary shares. However, many German companies have numerous shares which constitute equity. Hence, MV does not represent the actual market value of equity as only regular ordinary shares are included by *Datastream* in MV. As some shares are unlisted, a simple summation of the market values of individual shares is impossible in order to arrive at the actual market value of equity for German companies. A different source of information is required. The *Datastream* item 'Market value,

[7] Sections 11-12 AktG
[8] Sections 152 and 160 AktG

consolidated (MVC)' provides a solution to this problem as it considers all shares with equity characteristics. However, MVC is only available from 2000 onwards which limits the data collection. The differences between MVC and MV may vary considerably. Table 4.6 shows the differences between MVC and MV on the basis of MV for the sample of 7,728 firm years. The ratio indicates by what percentage MVC exceeds MV with the mean value for the total sample of 0.46 indicating that MVC is on average 46% higher than MV. The sample is grouped into three size panels based on total assets. For large companies MVC exceeds MV by 125% on average. In an additional reconciliation, the total market value of individual shares is added and is compared to MV and MVC for five companies with numerous shares. As MVC is closer to the real market value of equity for German companies, it is chosen for this study.

Table 4.6 Difference between MVC and MV in German sample

Difference between MVC and MV	N	mean	sd	min	max
total sample	7728	0.46	11.23	-1.00	702.45
small companies	2579	0.02	0.25	-0.31	9.02
medium-sized companies	2577	0.12	1.48	-0.93	26.04
large companies	2572	1.25	19.39	-1.00	702.45

Notes

This table shows the difference between the *Datastream* items 'Market value, consolidated (MVC)' and 'Market value (MV)' for the sample of 7,728 firm years of German listed companies between 2000 and 2010. The sample is divided by size into three equal groups based on total assets. While MV considers only one kind of ordinary shares in the market value of equity, MVC includes all shares with equity characteristics. The mean values indicate the percentage by which MVC exceeds MV. Particularly, for large companies the difference is distinctive. MVC is collected for the market value of equity of German companies for this study.

4.5.2 Proportion of debt

Another characteristic of German companies is a relatively high proportion of debt. Banks have traditionally played a major role for financing German companies (Dignam & Galanis, 2009), as outlined in chapter 3. The role of banks is still significant which can be seen in relatively high leverage ratios. Table 4.7 shows a

summary of leverage ratios as the percentage of debt compared to total capital for the sample of 7,728 firm years. The leverage ratios are considered for the total sample and by size groups divided into three equal groups based on total assets. The leverage ratios vary from close to zero up to nearly one hundred per cent of debt to total capital for all sizes. Overall, the mean values and quartile values indicate that larger companies have a higher proportion of debt compared to smaller companies. The high leverage ratios and the influence of banks may be important for some factors of this IC reporting study and have to be considered carefully. The influence of leverage in the analysis of IC value in chapter 5 may be distinctive for the German setting.

Table 4.7 Proportion of debt in German sample

Leverage	N	mean	sd	lower quartile	median	upper quartile	min	max
total sample	7656	53.23	26.28	33.03	56.67	73.17	0.05	99.99
small companies	2514	38.49	25.86	16.02	35.70	57.89	0.17	99.92
medium-sized companies	2570	52.57	23.45	35.04	55.76	69.98	0.05	99.99
large companies	2572	68.30	20.31	56.19	69.53	82.92	0.46	99.77

Notes

This table shows leverage ratios as a percentage of debt to total capital for the sample of 7,728 firm years of German listed companies between 2000 and 2010. The sample is divided by size into three equal groups based on total assets. Particularly, large companies have a high proportion of debt.

4.5.3 Adoption of international reporting standards in Germany

In the time period under review, from 2000 to 2010, international reporting standards gained importance and entailed changes in reporting regulation in Germany. The adoption of the International Financial Reporting Standards (IFRS) is considered in this section. According to European regulation, the implementation of international standards was mandatory for listed companies by 2005 (European Parliament, 2002). An early voluntary adoption of international standards or a change to US Generally Accepted Accounting Principles (GAAP) was completed in some German companies, which is seen by Leuz and Verrechia (2000) as a sign of commitment to increased disclosure. German GAAP according to the German Commercial Code

(HGB) has been considered to focus on prudent accounting with a conservative nature (Soderstrom & Sun, 2007). Hung and Subramanyam (2007) show that the change from German GAAP to international reporting resulted in higher asset values, net income, book value of equity, and higher intangible assets. However, they find no increase in value relevance for the adoption of international reporting standards. Furthermore, the change to international standards had no significant effect on earnings management in German companies (van Tendeloo & Vanstraelen, 2005).

These prior studies on the adoption of international reporting standards in Germany show that the accounting numbers have increased with the change from German GAAP to international standards without affecting value relevance or earnings management. This IC reporting study needs to consider, if the adoption of international standards has consequences for this IC reporting study. *Datastream* provides information on the applied accounting standards in the item '07536 Accounting Standards Followed'. The data shows that almost every company had a change in accounting standards over the time period under review. Some companies changed before 2000, as reviewed by Leuz and Verrechia (2000). Between 2000 and 2010 some companies switched from US-GAAP to IFRS and others from German GAAP to IFRS. The vast majority of companies moved to IFRS before or in 2005 with some smaller companies applying IFRS after 2005. Some companies changed twice their accounting standards followed in the time period under review from German GAAP to US GAAP and then to IFRS. This situation raises difficulties in controlling for the adoption of IFRS. With regards to IC reporting, the management report has continuously been regulated by German national standards, as outlined in chapter 3. Therefore, changes in accounting standards are assumed to be negligible for this study of corporate IC reporting.

4.6 Limitations of the study

The methodological approach of this IC reporting study faces some limitations. If the assumption stated in section 4.2.2, that IC value is measurable, may not hold, the approaches to measure IC value may be inappropriate. In that case, the IC value

measures may record market perceptions or certain competitive advantages other than underlying corporate IC value. However, these values may still provide an indication of the levels of IC value or IC value potential. Another limitation for measuring IC value is that data availability drives the measures rather than what is desirable to be included in a measure of IC value. The German company characteristics may entail limitations of this study as the results may be particular to the German setting. Moreover, industry-specific investigations are limited because no detailed insights into certain industries are conducted. The industry groupings are simplified without considering industry diversifications of companies. Therefore, the industry grouping can only be applied to control for overall business models rather than allowing industry-specific conclusions with sufficient certainty.

4.7 Conclusion

This chapter outlines the methodology of this IC reporting study. To achieve the overall research aim, to investigate potential motivations for corporate IC reporting, agency theory and legitimacy theory are applied to IC reporting. In order to test these theories on IC reporting, two subordinate questions are in place to investigate how to measure IC value and how to analyse the content of IC reporting. The summary of research questions with underlying assumptions is presented in section 4.2. Each of these questions is examined in a separate research project, as outlined in section 4.3.2. The data collection with database issues is outlined in section 4.4. For the interpretation of the results, the German company characteristics outlined in section 4.5 are considered. This chapter provides an overview of the methodology. Further details on methodological procedures are discussed in the respective empirical chapters. The following three chapters present the research projects. First, the subordinate research questions (1) and (2) are approached in chapter 5 and chapter 6. The results of these methodological projects provide input data on a basis that is methodologically defensible in order to answer research question (3) in the third project in chapter 7.

Chapter 5:
Estimating a measure of intellectual capital value to test its determinants

5.1 Introduction

This project contributes to intellectual capital (IC) research by innovatively applying a measure from mergers and acquisitions research to IC value which offers new research opportunities. The findings shed light on determinants of IC value which contribute to IC management. This research project responds to the challenge posed by previous IC research to develop more creative quantitative approaches to estimate IC value (Mouritsen, 2006; Marr et al., 2003). These previous studies argue that quantitative measures enhance tests on IC-related hypotheses, which are investigated in this study. Studies on market-based approaches to IC value are at the centre of this research project. This study innovatively compares three measures to examine which may best indicate IC value: market-to-book (MtB), Tobin's q, and long-run value-to-book (LRVTB). The IC value measure with the highest explanatory value in a regression on corporate performance is seen as the best estimator for IC value. This IC value measure is then used to examine determinants of IC value.

The aim of this research project is threefold:

a) Estimate three measures of IC value: MtB, Tobin's q and LRVTB
b) Find the measure of IC value with the highest explanatory value
c) Investigate determinants of IC value by empirically testing IC hypotheses

First, 5,075 firm years of German companies across four industry groups are investigated to estimate and compare the IC value measures. The LRVTB measure has been developed in mergers and acquisitions research (Rhodes-Kropf et al., 2005).

This study innovatively applies LRVTB to IC research. The results suggest that LRVTB serves best to estimate IC value with the significantly highest explanatory power compared to MtB and Tobin's q. This LRVTB measure provides an approach to further investigate IC value and to test previously untested hypotheses on IC. Second, LRVTB is applied to examine the determinants of IC value. Seven factors are investigated for an association with IC value: intangible assets recognised on the balance sheet, expenses in research and development (R&D), motivational payment to employees, concentrated ownership, leverage, company age, and company size. The relationships between IC value, leverage and concentrated ownership have previously been untested.

The findings of this study contribute to the literature in several ways. On the one hand, the measure LRVTB, developed by Rhodes-Kropf et al. (2005), is identified as the IC value measure with the highest explanatory value. This measure adds to IC measurement research as it can be used in future research to further investigate IC value. On the other hand, the findings on the determinants of IC value contribute to IC management research. The results show that IC value is significantly positively related to leverage and motivational payment to employees and significantly negatively associated with size. Recognised intangible assets, R&D, company age and concentrated ownership have no significant associations with IC. The findings of this study can serve as guidance for IC management for the development of IC value. Hence, complex structures in large companies may hamper the development of IC value but motivational payments to employees and influential banks, monitoring intangible investments, may support IC value development.

This chapter is structured as follows. In section 5.2, the literature on IC measurement is reviewed together with studies on determinants of IC value from a broader IC research area. The literature review discusses the importance of measuring IC value in section 5.2.1 and prior approaches to measuring IC value, with their weaknesses, in section 5.2.2. To justify the measures chosen for this study, section 5.2.3 outlines how some of the weaknesses can be addressed and section 5.2.4 discusses what aspects need to be considered for investigating IC value measures. Potential

determinants of IC value are reviewed to develop IC-related hypotheses in section 5.2.5. The research design of this project is developed in section 5.3. The results are analysed in section 5.4, where firstly, the findings of the statistical analysis of IC value measures are presented and secondly, the identified estimator of IC value is applied to examine IC value determinants.

5.2 Literature review

5.2.1 Importance of measuring IC value

5.2.1.1 IC as strategic advantage for corporate performance

IC is seen to be a cornerstone of corporate performance and to support the development of competitive advantages, as discussed in chapter 2. Research on the importance of IC value has been conducted in a broad range of IC research, such as in the areas of management or disclosure studies. These studies have used different terminologies for the same underlying concept of IC, such as IC, intangible resources or intangibility, as outlined in the review of IC literature in chapter 2. The review of this chapter is based on one major idea being consistent across different studies, as reviewed with regards to IC definitions in chapter 2: IC is conceptualised to represent a strategic advantage for corporate performance. Hall (1992; 1993) argues that a company engaging strategically with IC develops sustainable competitive edge based on its individual capabilities. Therefore, IC can be seen to equip the company with unique resources which cannot easily be imitated by competitors (Lev, 2001). The competitive advantage is reflected in strong corporate performance and high company value (Stewart, 1997; Edvinsson & Malone, 1997). According to this argument, companies with a high level of underlying corporate IC value are expected to perform well. Hence, IC value represents a significant performance driver.

The range of studies to examine the relationship between IC value and performance is narrow and can be separated in two areas: value added approaches and survey approaches. Studies following a value added approach use a measure developed by Pulic (1998) to observe IC potential. Firer and Williams (2003), Chen et al. (2005) and Phusavat et al. (2011) investigate the relationship between IC and performance

in developing markets. Zeghal and Maaloul (2010) examine IC in UK companies with specific information on value added being available. In these studies, the value added measure of IC is regressed on measures of corporate performance, such as return on equity, return on assets, and growth in sales. The findings indicate that corporate performance is related to IC value. However, the findings may be limited due to sample selection bias and weaknesses in the value added measure, as further discussed below in section 5.2.2.2. Based on surveys and questionnaires, Youndt et al. (2004) and Reed et al. (2006) also find a positive relationship between IC profiles and performance in terms of profitability. Their results may be biased due to their survey approach, further discussed in section 5.2.1.3, but they support the argument that companies with more distinctive IC profiles generate higher returns compared to companies with less developed IC. Following that argument, this study interprets IC value as a competitive advantage which supports strong corporate performance.

5.2.1.2 Purposes of measuring IC value

Due to the importance of IC as strategic advantage for corporate performance and to create company value, as discussed in section 5.2.1, measures for IC value have been demanded (Marr et al., 2003; Mouritsen, 2006; 2009). IC value measures are seen to serve two main purposes: IC management and IC research. First, IC value measures allow managers to actively engage with IC and monitor its development (Mouritsen, 2009). Some indicators of IC value have been established for IC management based on internal data, as reviewed by Marr et al. (2003). Their review shows that for management purposes individual IC indicators have been relatively successful to estimate aspects of IC value but no approved overarching measures have been developed. Second, IC value measures can support theory testing in the area of IC research (Marr et al., 2003; Mouritsen, 2006). However, no strong measure has been established. As the area of IC management lacks generalisable measures and relies on internal data, IC research cannot easily use measures from IC management. Approaches to measure IC value for research purposes encompass diverse non-financial measures for value creation (e.g. Mouritsen, 1998). The approaches are seen to be neither encompassing nor satisfactorily generalisable (Bontis, 2001).

5.2.1.3 Difficulties in measuring IC value due to data availability

Measuring IC value is problematic because IC is difficult to capture from corporate reporting, as outlined in chapter 2. The intangible resources and their interactions may not be obvious from the financial statements. As reviewed in chapter 2, difficulties in measuring IC value appear to be the limited data availability of quantitative IC-related information and unobservable boundaries of IC. Given the limited accounting information on IC, prior attempts to estimate IC value have sought measurable indicators in other data sources. Exploratory studies approached the concern of IC value and performance based on surveys and questionnaires to collect managerial information on corporate IC value. Following this approach, Youndt et al. (2004) and Reed et al. (2006) conduct quantitative analyses of IC profiles. The review of this project argues that the survey approach, used in these two studies, may be problematic for two reasons: managers' misunderstandings of IC and misjudgement of corporate IC profiles. First, the studies do not mention whether managers' understandings of IC are examined to ensure comparability within the surveys and questionnaires. Second, individual managers may not be in a position to correctly estimate a company's IC profile which may lead to misjudgements. Hence, the results of these two studies may be biased.

5.2.2 Approaches to measure IC value

5.2.2.1 Overview of approaches to measure IC value

For researching IC value, data availability issues are more prominent than for IC management. While IC management can draw on internal data to examine IC, external data on IC value is rarely available for IC research. Therefore, IC research has investigated numerous approaches to find indicators of IC value from different perspectives, as further outlined in the following sections. Overall, the approaches to measure IC value suggested in prior literature are categorised in three groups for this chapter: resource-based approaches, component-based approaches, and market-based approaches. This categorisation depends on the information sources used. Resource-

based measures focus on IC-related expenses as IC investment inputs. Component-based approaches try to find proxy measures for individual IC components. Market-based approaches investigate IC value within a company's market value. These approaches are separately discussed in the following sections.

5.2.2.2 Resource-based approaches to measure IC value

Resource-based approaches to measure IC value rely on information provided in the income statement. They consider IC-related expenses as resources invested to develop IC value. Research on IC management suggests that measures of IC value should be based on data that can be collected internally, such as information on the costs of engaging with specific customer groups (Edvinsson & Malone, 1997; Bontis, 2001). With regards to the availability of information about IC-related expenses, approaches to measure IC without access to internal data face a major problem. The expense classifications in the income statement may not be provided in sufficient detail for IC analyses, as outlined in chapter 2. Therefore, some disclosed expense categories are assumed to proxy IC components even if the expenses may not entirely represent the respective IC components. This approximation reveals how resource-based IC value measures face problems to capture comprehensive aspects of IC value. Moreover, treating expenses as IC input entails the problem of unrecorded IC investments. As Lev and Radhakrishnan (2005) mention, IC investments may exist beyond the income statements. If employees participate in private further education in their leisure time, their increased knowledge affects human capital without being included in corporate documentation and reporting.

In an attempt to investigate the potential of IC, Pulic (1998; 2004) suggests the Value Added Intellectual Coefficient™ (VAIC™) as IC indicator. For this measure, labour expenses are argued to equate corporate human capital as an investment rather than an expense. However, if human capital is seen as an investment, the question arises, whether it would represent an asset, which Pulic (1998; 2004) has not addressed. Countering Pulic's (1998; 2004) view this chapter argues that if human capital was an asset, labour expenses would have to be added to capital employed for the

calculation of VAIC™. Furthermore, Pulic (1998; 2004) considers the remaining operating expenses to represent structural capital as the residual of value added less human capital. The review of this project argues that Pulic's (1998; 2004) residual approach faces two major weaknesses. First, the residual approach assumes that all operating expenses are related to IC. Second, it may not capture all IC as favourable financial relations are omitted, which may be reflected in interest expenses rather than operating expenses. Despite these flaws, IC studies have worked with the concept of VAIC™ (e.g. Williams, 2001; Firer & Williams, 2003; Nazari & Herremans, 2007). The findings of these studies may be flawed and need to be interpreted with care due to the weaknesses of the VAIC™ measure, as discussed in this paragraph.

Another resource-based measure for IC value is organization capital, described as unique corporate structures and processes to generate competitive edge (Lev, 2001). Although studies on organization capital do not refer to intangible resources, the underlying notion corresponds to IC. The measure by Lev and Radhakrishnan (2005), further developed by Lev et al. (2009), suggests that the expense category selling, general and administration indicates organization capital. Their results show that organization capital as IC component can predict corporate performance. They interpret organization capital as an efficiency measure for investments on employees, systems, brands etc. This chapter suggests a countering argument that the presented interpretation of organization capital contradicts the initial description by Lev et al. (2009). Initially, organization capital is categorised as efficient structures and processes, which is equivalent to structural capital. Later organization capital is interpreted to simultaneously measure efficiency for all IC categories. The contradictions in the definition of organizational capital are also criticised by Walker (2009). Moreover, inconsistencies in the estimation procedures between Lev and Radhakrishnan (2005) and Lev et al. (2009) hamper an understanding of what organization capital essentially measures or how it can be interpreted. The approach is complex due to transformations which hinder replications.

5.2.2.3 Component-based approaches to measure IC value

Another approach to measure IC value is based on individual IC components. However, this approach is not often used in prior studies (Saenz, 2005; Lev et al., 2005; Pantzalis & Park, 2009). A reason why measures for IC components are seldom approached may be because quantitative information on individual IC components is rarely published. Therefore, it may be difficult to directly investigate IC components using representative measures. Some individual IC components are examined where financial data is published in financial statements, such as R&D or intangible assets, in broader studies (e.g. Amir et al., 2003; Lev et al., 2005). These studies do not necessarily claim to investigate IC but intangible resources. For one IC category the question has been controversially discussed whether measures should be introduced at all. This category is human capital. The option of measures for human capital has been debated with regards to recognition in the balance sheet (Johanson, 1999; Roslender, 2009). However, no strong measures for human capital have been established. This is not surprising given that the discussion is still unsettled whether trying to measure human resources is reasonable at all.

In the area of market valuation research, Pantzalis and Park (2009) investigate human capital. They apply ratios of market value of equity over the total number of employees to compute the industry median human capital value. The industry median is then multiplied by the company's number of employees to impute the company's value of human capital. However, the number of employees only represents one aspect of human capital, not considering education, training or other components of human capital. Hence, the review in this chapter suggests that the human capital measure by Pantzalis and Park (2009) provides an indication of personnel input to generate market value rather than human capital. In a more context-focused approach, Saenz (2005) considers human capital indicators based on information published in IC reports. This attempt to circumvent the lack of financial data on human resources by referring to textual information requires subjective judgements. The approach is based on human capital indicators which are common to the companies under review to enable comparability. Countering this approach,

the review of this chapter argues that this auxiliary approach may omit unique attributes which constitute a company's human capital.

The approach to measure IC value regarding individual IC components has contradicting views. Mouritsen (2009) argues that unobservable interactions between IC categories hamper component-based measures of IC value. According to his view, attempts to measure IC on a categorical level may omit IC value generated by interactions between IC elements. Furthermore, categorised measures may account for IC with incorrect boundaries between categories, e.g. employee training on IT systems could be attributed to either human or structural capital. Findings from studies engaging with companies on their views on IC confirm the importance of interactions between IC categories (van der Meer-Kooistra & Zijlstra, 2001; Chaminade & Roberts, 2003). The interactions, interrelations and connectivity of IC categories are seen to contribute considerably to IC value. They constitute a strong argument against IC value measures on a component level. Therefore, one overall approximate IC value measure in a holistic market-based approach may outperform component-based approaches to measure IC value.

5.2.2.4 Holistic market-based approaches to measure IC value

Market-based approaches have been developed because the market is assumed to perceive IC value beyond the financial statements (Sveiby, 1997). Therefore, market-based data is seen to incorporate IC value in the company value. This approach addresses IC value in a holistic way, not distinguishing among certain IC components. The focus of holistic approaches is the overall effect of IC value on the company value which may be most suitable due to relations between individual IC components and their contribution to IC value, as discussed in section 5.2.2.3. In an analysis of IC value based on different approaches of Tobin's q, Villalonga (2004) also concludes that the holistic approach captures IC value more comprehensively. Therefore, holistic approaches may provide enhanced measures to estimate IC value. Interactions between IC components and IC investments are captured in the overall value. IC investments are reflected in earnings with an effect on company value, as

argued by Penman (2009), even if they go beyond financial reporting, as considered in section 5.2.2.1. Therefore, holistic market-based approaches are argued to be most suitable to capture IC value, compared to resource-based and component-based approaches.

Based on the holistic market approach, the disparity between market value and book value, represented in an MtB ratio above one, has been suggested to indicate IC value (Edvinsson & Malone, 1997; Stewart, 1997; Sveiby, 1997; Roos et al., 1997). However, some weaknesses of MtB as an estimator of IC value have been discussed in the literature. Brennan and Connell (2000), supported by Dumay (2012), criticised the idea of using MtB ratios to represent IC value. They stated two major weaknesses: historic cost accounting and market value fluctuations. First, they highlight that market values are already likely to exceed book values due to historic cost accounting. Second, fluctuations in market values may distort estimations of IC value without necessarily representing actual changes in IC value. Therefore, excess market values may not be completely attributable to IC value since market reactions are not exclusively based on IC considerations. In interviews with managers, van der Meer-Kooistra and Zijlstra (2001) found that corporations also consider MtB ratios as insufficient indicators for IC value for similar reasons. Managers argue that temporary fluctuations in market values may coincide with unchanged levels of IC value. Therefore, MtB may not only indicate IC value but further market perceptions.

The issue of market value fluctuations partially addresses the assumption of efficient markets (e.g. Fama, 1970). Accordingly, market participants efficiently include IC values in corporate market values. However, agency theory suggests that information gaps exist between managers and owners, resulting in the market not having access to all information required to efficiently evaluate corporate values (Ross, 1973). The information gap also applies to IC, resulting in market values potentially not incorporating the total underlying corporate IC value. Particularly, since IC is not traceable from financial statements, as reviewed in chapter 2, the market may lack IC-related information which may be necessary for correct assessments. Due to market inefficiencies and restrictions in information availability, companies may be

mispriced (Shleifer & Vishny, 2003). Accordingly, IC measures based on MtB capture additional short-run considerations besides IC value. In the area of mergers and acquisitions research, company values are investigated based on merger and acquisition events which provide additional information to estimate long-run growth opportunities and intrinsic company values (e.g. Rhodes-Kropf et al., 2005). As IC is argued to represent long-run growth opportunities, IC value corresponds to the views of intrinsic company values. This is the reason why this chapter consults mergers and acquisitions research to identify a potential measure for IC value.

5.2.3 Addressing weaknesses of MtB as measure of IC value

5.2.3.1 Historic cost accounting in MtB

In the holistic market-based approaches, MtB has been considered to indicate IC value but this measure has been criticised, as discussed in section 5.2.2.4. One reason, why market values diverge from book values, is historic cost accounting. This stated weakness of MtB as an indicator for IC value has been addressed in the literature. Two main aspects of historic cost accounting have been argued to cause differences between market and book values. First, financial information is based on historical data (Brennan & Connell, 2000). While the book values of most assets are recognised in terms of their historical costs, the market may incorporate fair values of some assets into the company value. Second, a lag effect is argued to cause distortions regarding IC value (Dumay, 2012). Financial statements are only published periodically with book values representing information on the past period. The market value, however, is formed on a daily basis. Therefore, the market value considers recent events and decisions and their potential future impacts.

To address the issue of historic cost accounting as a weakness of MtB, Tobin's q has been used. Villalonga (2004) found that Tobin's q may serve as approximate measure for corporate intangibility, which can be seen as IC. Tobin's q attempts to provide a ratio of market value over replacement values of tangible assets. However, the computations of market value and replacement costs are subject to assumptions (Lindenberg & Ross, 1981; Smirlock et al., 1984). The replacement costs are based

on the idea of how much a company would have to pay to replace its assets considering the current level of technical progress, inflation and real depreciation. With the underlying assumptions, Tobin's q may partially reduce the distortion of MtB rather than representing an accurate measure of IC value. Nevertheless, the adjustments of historic costs to replacement costs may improve the measure for the purpose of indicating IC value. The first hypothesis is therefore stated as follows:

$H_{5.1}$: The explanatory power of Tobin's q regarding corporate performance is higher than of MtB to serve as a measure of IC value

5.2.3.2 Focus on long-run value to account for fluctuations in MtB

Prior IC literature has described IC as a company's long-run growth opportunities to establish a competitive advantage, as discussed in section 5.2.1.1. The review in section 5.2.2 shows that previous studies have approached measures of IC value focusing on IC-related resources, individual IC components, and current market values. In the search for potential measures of corporate IC value, this study has consulted research beyond the IC literature. The main focus of this search has been on the aspect of long-run and sustainable value to be accounted for in a potential IC value measure. As the issue of estimating intrinsic company values is prevalently investigated in mergers and acquisitions research, this research area is reviewed for this study, as mentioned in section 5.2.2.4. With the benefit of hindsight after mergers and acquisition events, this research area estimates measures of intrinsic company values within corporate market values. Rhodes-Kropf et al. (2005) offer an approach to decompose MtB in order to estimate LRVTB as a measure of a company's long-run growth opportunities. Following this line of thought, the review of this chapter suggests that the described characteristics of LRVTB are similar to the characteristics of IC value as a strategic advantage. Therefore, this study innovatively applies the LRVTB measure to the area of IC research.

The LRVTB measure developed by Rhodes-Kropf et al. (2005) represents a company's long-run growth opportunities as one component of MtB. This

component is estimated as the intrinsic company value after accounting for mispricing. Mispricing is seen as the deviation of the company's market value from its underlying long-run intrinsic value (Rhodes-Kropf et al., 2005; Hertzel & Li, 2010; Doukas et al., 2010). Relative valuation approaches comparing a company to its industry peers allow identifying which companies are underpriced or overpriced (Doukas et al., 2010). Potential reasons for mispricing are manifold. Market inefficiencies may induce mispricing, as argued by Jensen (2005). In this manner, Pantzalis and Park (2009) suggest that the market is not able to correctly assess real company value partly due to incomplete reporting on intangible resources. Therefore the share prices are noisy. Mispricing may also be caused by idiosyncratic risk which cannot be hedged, as reasoned by Doukas et al. (2010). Moreover, they suggest that mispricing may be due to unanticipated reactions to corporate decisions or diverging perceptions of growth opportunities and risk.

In their approach to examine long-run intrinsic corporate value, Rhodes-Kropf et al. (2005) decompose the MtB ratio into three components: firm-specific error, time-series sector error and LRVTB. The first two components refer to mispricing of individual companies and industries whereas the latter is argued to indicate long-term growth opportunities. The results of Hertzel and Li (2010) are consistent with the interpretation by Rhodes-Kropf et al. (2005) that LRVTB represents long-run growth options. The long-run value component of MtB as a potential measure for IC value is interesting for this study. According to the initial idea of IC to constitute a competitive advantage, as outlined in section 5.2.1.1, IC can also be seen to represent sustainable growth opportunities. Therefore, the LRVTB measure is worth reviewing for estimating IC value as it addresses the weakness of mispricing inherent in MtB. Based on this argument, this study interprets LRVTB as underlying corporate IC value and extends the application of LRVTB to serve as a novel measure of IC value. The focus on the long-run aspect of LRVTB as IC value initiated the second hypothesis to compare LRVTB to MtB, which is based on current market values:

$H_{5.2}$: The explanatory power of LRVTB regarding corporate performance is higher than of MtB to serve as a measure of IC value

5.2.4 Aspects to be considered when measuring IC value

5.2.4.1 Importance of industry

The industry sector represents an important aspect of IC as industry may determine IC value due to the economic context. IC is very context specific and an overall approach may not be able to consider its facets, as Reed et al. (2006) conclude from their findings. Additionally, Lev et al.'s (2009) approach shows clearly that IC measures should be compared within a group of peer companies to enable assessments due to IC's facets. To account for industry-specific characteristics of IC, industry is generally controlled for as its influence may be essential for the results (e.g. Villalonga, 2004; Pantzalis & Park, 2009; Ludewig & Sadowski, 2009). As IC constitutes a competitive advantage, competing companies within the same industry sector may aim to develop similar components of IC under similar economic circumstances. Moreover, IC may be more essential for some business models or different industries may focus on different IC components. Therefore, IC should be examined within an industry rather than across the total sample. This aspect is particularly important for IC value measures. Following these ideas, this project argues that industry groups need to be considered for comparing different levels of corporate IC value.

5.2.4.2 Levels of IC value rather than monetary values

The review of various approaches to measure IC value in section 5.2.2 shows that IC value is difficult to capture. Mouritsen (2009) even argues that it is impossible to measure IC value in monetary terms but it is important to understand how to estimate relative levels of IC value. According to his argument, estimating levels of IC value is necessary for IC research. He demands IC value measures to estimate levels of IC value rather than monetary values. As reviewed in section 5.2.1.2, measuring IC value is important to enhance IC research because measures of IC value facilitate testing IC-related theories and hypotheses. Following Mouritsen's (2009) view, this study argues that attempts to measure IC value in absolute values are bound to be

unsatisfactory. This study considers measures of IC value to roughly estimate IC value rather than to reveal exact absolute IC values. Based on this view, this study suggests grouping the IC value measures into levels of corporate IC value in order to reduce complexity to enable comparisons of the different IC value measures.

5.2.4.3 Lagged effect of IC value

This study follows the idea that IC value supports corporate performance, as discussed in section 5.2.1.1. Taking this argument further, an empirical analysis of IC value and current performance may be biased due to the lag effect of accounting data, described in section 5.2.3.1. Following this argument, this study suggests that corporate performance is actually explained by past IC values because accounting data account for the past period whereas market-based IC values observe the financial year end. Moreover, the interpretation of IC to represent long-run growth opportunities suggests that IC affects performance for several years to come. This line of thought has been introduced in the literature but rarely tested. Chen et al. (2005) conduct several analyses with potential measures of IC value lagged for one, two or three years. The results for different lags are similar. Hence, their findings do not indicate what lag length is suitable. The findings by Lev et al. (2009) also indicate that IC value affects future performance without specifying a time period.

Based on this line of thought, this study suggests that, with regards to corporate performance, IC value should be examined with a lagged effect. However, prior research does not allow conclusions on which length best captures the lagged effect of IC value on corporate performance. Several questions remain unanswered to specify a time lag. For IC value to translate into strong performance, the IC value requires to be maintained and utilised. The IC value at the end of the financial year is readily available to be used to support performance in the following period but corporate IC value may be outdated or lost in the future. Villalonga (2004) even argues that IC development may lock a company in a competitive disadvantage in the long term. Hence, the effect of IC value in the longer future requires further investigations on how IC value has to be maintained or how IC value may decline

over time. As the optimal length of lags cannot be concluded from prior studies, this study assumes that performance is supported by IC value with a lag of one year.

5.2.5 Potential determinants of IC value

5.2.5.1 Applying the measure of IC value to test its determinants

Due to the lack of a generally accepted IC value measure, determinants of IC value have partly not been empirically investigated, as further discussed in the following sections. Hypotheses regarding the relations of IC value to ownership concentration or leverage have not been tested. The choice of IC value measurement resulting from the tests for $H_{5.1}$ and $H_{5.2}$ provide a basis for empirical studies on IC value. This choice offers new research opportunities and allows testing previously untested hypotheses related to IC value. One area to be advanced by empirical research is the examination of determinants of IC value. The findings contribute to IC management, as the development of IC value can be guided by relevant determinants. The interesting question of what is associated with IC value has attracted researchers to investigate IC from different perspectives. Conceptual frameworks have been developed for links between IC value and management or governance. These frameworks have been investigated in exploratory and conceptual studies. Prior literature has suggested some potential determinants of IC value in different research areas which are drawn upon to develop IC-related hypotheses in the following sections.

5.2.5.2 Potential determinants of IC value from financial statements

Some potential determinants can be found in the IC information available in the financial statements. As discussed in chapter 2, intangible assets recognised in the balance sheet represent one component of IC. Although the information on recognised intangible assets is criticised as being incomplete (Lev & Zarowin, 1999), it partly indicates one IC element. Furthermore, the income statement provides some expense categories which represent IC investments, such as R&D or advertising (Amir et al., 2003). Villalonga (2004) tried to measure IC in a hedonic approach,

which estimates IC by accumulating its individual components. The IC elements she used are: R&D, advertising, and recognised intangible assets. Although Villalonga (2004) found that the hedonic measure was incomplete, the three analysed IC elements seem to be important in determining IC value. However, information on advertising expenses is rarely available and cannot be generally investigated. The association of the IC value level with recognised intangible assets and R&D is tested with the following hypotheses:

$H_{5.3}$: Recognised intangible assets are positively associated with the level of IC value
$H_{5.4}$: Corporate R&D expenses are positively associated with the level of IC value

Employee benefits represent a further available expense category that can be classified as IC investment. On the one hand, these expenses include employee training and development to continuously improve employee skills. On the other hand, efficient payments may serve as motivation for employees. As argued by Groshen (1991), competitive payments, which are adequate for employee skills, prevent a movement of labour and increase productivity. Hence, efficient payments may attract and retain skilled employees who contribute considerably to IC. A payment effect has been found to be significant in a study on organizational capital by Ludewig and Sadowski (2009). They compare a company's average payment per employee, based on salaries in the income statement, with the industry average to obtain a ratio of efficient payment. Employee payment is tested in the following hypothesis:

$H_{5.5}$: Motivational payment is positively associated with the level of IC value

5.2.5.3 Potential determinants of IC value in the financial structure

The corporate financial structure is another potential determinant of IC value. As the association of the corporate financial structure with IC value has been previously untested, the conceptual study by Keenan and Aggestam (2001) is reviewed. From a corporate governance perspective, they discuss the influence of concentrated

ownership on IC. However, the effect on IC value is not clear from their conceptual discussion. On the one hand, block holdings may focus on stability rather than innovation and creativity. This may conflict with IC and constrain its development. On the other hand, widely spread owners may lack the ability to effectively govern IC. Therefore, the level of IC value may be lower compared to companies with concentrated ownership. A relationship between ownership concentration and IC value is hypothesised without specifying the expected direction of association:

$H_{5.6}$: Ownership concentration is associated with the level of IC value

The position of banks is an additional aspect of a company's financial structure. For companies with a high proportion of debt, banks may represent influential stakeholders. This may be particularly distinctive for insider governance systems, as discussed by Dignam and Galanis (2009), where banks have strong influential power with increasing debt to equity ratios. Dignam and Galanis (2009) describe insider governance systems with a relatively strong focus on stakeholder concerns, which are dominant in countries such as Germany and Japan. Keenan and Aggestam (2001) argue that banks as influential stakeholders may increase the fiduciary responsibility to monitor intangible investments. Therefore, companies may be forced to manage their IC more actively. Hence, the development of IC value may be accelerated and its utilisation may be supported with a strong influential position of banks. This view on the influential position of banks and IC value leads to the following hypothesis, which has been previously untested:

$H_{5.7}$: Leverage is positively associated with the level of IC value

5.2.5.4 Potential determinants of IC value in company characteristics

Firm age is seen to be an influential factor as companies develop IC value over time. Nahapiet and Ghoshal (1998) argue that time is important for IC value because of an accumulative effect. Particularly, the management literature has investigated the relationship between company age and IC value with inconclusive results. In a study

on corporate IC profiles, Youndt et al. (2004) find no significant influence of company age. Reed et al.'s (2006) results suggest that age has a significant influence for one panel in their sample of personal and commercial banks. According to their findings company age seems to positively affect IC value for personal banks but not for commercial banks. However, an explanation is missing why age may significantly influence IC value for a certain group of banks. As their research is based on surveys, the answers provided by the companies may be biased, as discussed in section 5.2.1.3, to generate the discrepancy between the panels. The general argument that company age may impact on IC value is stated in the following hypothesis:

$H_{5.8}$: Company age is positively associated with the level of IC value

Company size may also have an influence on the corporate level of IC value. The variable company size usually acts as control variable in IC studies (Reed et al., 2006; Youndt et al., 2004). Youndt et al. (2004) suggest that company size may positively influence IC value due to advantageous access to resources and market power. Their findings show that the influence of company size on IC value is positive but not significant. In an attempt to explain this outcome, they suggest that characteristics of large companies may not necessarily affect the creation of IC value. Reed et al. (2006) find a significant positive effect of size on IC value in both panels of personal and commercial banks. However, as their sample is limited to the banking sector this result may not be generalisable. The proposition that IC value may increase with company size is tested in the final hypothesis:

$H_{5.9}$: Company size is positively associated with the level of IC value

5.3 Research design

5.3.1 Sample of German companies

The total sample comprises 7,728 firm years of companies listed on the German stock exchange between 2000 and 2010, as outlined in chapter 4. For the comparison

of IC value measures the sample is reduced to 5,075 cases due to data availability for estimating all three measures of IC value: MtB, Tobin's q and LRVTB. Germany offers interesting research opportunities for IC value measures. In an international comparison conducted by Lin and Edvinsson (2010), based on macroeconomic characteristics, Germany is found to be a country with high IC. This facilitates a study of IC value measures as corporate IC value needs to exist in order to be measured, as discussed in chapter 4. To account for the diversity of IC, as outlined in section 5.2.4.1, the sample is subdivided into four industry groups according to the overall business model: consumer, finance, pharmaceutical & technology, and industrial. The chosen industry grouping is further discussed in chapter 4. Table 5.1 shows the distribution of cases by industry groups and years.

Table 5.1 Sample of German companies by industry and year

Year	Consumer	Finance	Pharma & Tech	Industrial	Total
2000	138	24	92	140	394
2001	135	24	79	129	367
2002	158	45	116	134	453
2003	147	43	127	124	441
2004	144	45	129	117	435
2005	151	49	128	117	445
2006	154	56	132	134	476
2007	164	78	140	158	540
2008	156	69	139	159	523
2009	144	85	134	149	512
2010	140	69	130	150	489
Total	1,631	587	1,346	1,511	5,075

Notes

This table shows the sample of German companies by industry groups and years. The sample comprises 5,075 firm years to compare the three IC value measures: MtB, Tobin's q and LRVTB. The total sample of available 7,728 firm years is reduced due to data availability issues for all three measures.

5.3.2 Estimating Tobin's q

Tobin's q is estimated to measure IC value as a ratio of market value to replacement costs. For this study, Tobin's q is calculated in accordance with Villalonga (2004) based on Lindenberg and Ross (1981) and Smirlock et al. (1984). For the computation of Tobin's q as IC value measure corporate data is taken from *Datastream* and information on price indices from *Eurostat*. Table 5.2 shows the variables used to estimate Tobin's q with their data sources. Applied assumptions are zero technological progress and 10% depreciation. A stagnant technological progress simplifies the calculation and is consistent with the approach by Villalonga (2004). The assumption for depreciation applied in prior research is 5% (Smirlock et al., 1984; Villalonga, 2004). In this study, Tobin's q is computed with 5% and 10% depreciation with no significant differences. The depreciation rate is raised to 10% in this study to account for a variety of depreciation methods. For inventory accounting, the average cost method is assumed to be followed by all companies according to IAS 2 (IASB, 2010b). Therefore, the inventories are adjusted for inflation over one year, as suggested by Lindenberg and Ross (1981).

A further assumption for computing Tobin's q is that replacement costs of assets are assumed to equal book values for the year 2000 or the first year the company appears in *Datastream* for the period under review from 2000 to 2010. This approach to set book values equal to replacement costs for the first year of the period under review and to gradually add more companies is common practice in prior literature (e.g. Smirlock et al., 1984; Villalonga, 2004). Additionally, if the computed replacement costs of plant, property and equipment result in negative values due to disinvestments, replacement values are capped at net book values. The case of computed negative replacement costs has not been illustrated in previous studies using Tobin's q (Lindenberg & Ross, 1981; Smirlock et al., 1984; Villalonga, 2004). However, negative computed replacement costs for assets seem implausible as assets are subject to impairment tests according to IAS 36 (IASB, 2009a). Therefore, the net book value of property, plant and equipment is assumed to represent the minimum replacement costs if the computation results in negative values.

Table 5.2 Variables for estimating Tobin's q

Variables	Data source	Code
Net property, plant and equipment	Datastream	2501
Gross property, plant and equipment	Datastream	2301
Inventories	Datastream	2101
Total assets	Datastream	2999
Preferred stock	Datastream	3451
Total liabilities	Datastream	3351
Market value of equity	Datastream	MVC
Industry producer prices index - capital goods	Eurostat	sts_inpp_a
GDP and main components price index	Eurostat	namq_gdp_p

Notes

This table shows the variables used for estimating Tobin's q with their data sources.

5.3.3 Estimating LRVTB

5.3.3.1 Decomposing MtB

Rhodes-Kropf et al. (2005) argue that due to market mispricing, as defined in section 5.2.3.2, MtB ratios are not fully suitable to represent corporate long-term growth options, in this study considered to represent IC value. According to Rhodes-Kropf et al. (2005), a ratio of intrinsic value to book value provides an indication of underlying growth opportunities. Therefore, they initially decompose MtB into two parts, as shown in Equation 5.1, based on real corporate value: market-to-value and value-to-book. The component market-to-value points to mispricing while value-to-book indicates corporate long-term growth options. Market values and book values are then transformed into natural logarithms which are presented in lowercase letters, as illustrated in Equation 5.2.

Equation 5.1

$$Market\ to\ book\ = Market\ to\ value\ \times Value\ to\ book$$

Equation 5.2

$$m - b = (m - v) + (v - b)$$

In Equation 5.2, *m* represents the natural log of corporate market value, *v* indicates the natural log of true intrinsic value and *b* is the natural log of book value. This construct is further broken down to distinguish between two mispricing elements. Mispricing may be driven by a whole market sector or it may be specific to a firm. To account for firm-specific and sector-specific evaluation errors, Rhodes-Kropf et al. (2005) add another element to their decomposition of MtB ratios, as illustrated in Equation 5.3. The three components of MtB are: firm-specific error, time-series sector error and LRVTB. The firm-specific error examines the disparity between a company's market value and industry-specific short-run accounting multiples. Hence, this measure is concerned with the difference between corporate market value and the underlying short-run value given the accounting data of the company and its industry peers at a certain point in time. The time-series sector error investigates differences between short-run and long-run value fundamentals given the industry which the company operates in. The last component represents long-run growth options for the company by looking at the difference between a company's intrinsic value and its book value.

Equation 5.3

$$m_{it} - b_{it} = \underbrace{m_{it} - v(\theta_{it}; \alpha_{jt})}_{\text{firm specific error}} + \underbrace{v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_{j})}_{\text{time-series sector error}} + \underbrace{v(\theta_{it}; \alpha_{j}) - b_{it}}_{\text{LRVTB}}$$

The left-hand side of Equation 5.3 denotes the natural log of MtB of company *i* at time *t*. On the right-hand sight the natural logs of the three components of MtB are given. The first element, $m_{it} - v(\theta_{it}; \alpha_{jt})$, represents the firm-specific error, current mispricing, as the ratio of the market value and contemporaneous fundamental value of company *i* at time *t*. The estimation of contemporaneous fundamental value is based on corporate accounting data θ_{it} and contemporaneous industry multiples α_{jt} for industry *j*. The second element specifies the time-series sector error: $v(\theta_{it}; \alpha_{jt}) - v(\theta_{it}; \alpha_{j})$. This measure is calculated as the difference between the natural log of contemporaneous and long-run fundamental values. While contemporaneous fundamental values are based on industry multiples at a certain point in time, long-run values require long-run industry multiples as an average over time. Firm-specific

accounting data ensure that company characteristics are adequately considered. Finally, the third element, LRVTB, is the ratio of intrinsic corporate value to book value indicating long-run growth opportunities measured by $v(\theta_{it}; \alpha_j) - b_{it}$.

5.3.3.2 Three models for estimating LRVTB

Intrinsic corporate value is not easily available, neither from market data nor from accounting data and therefore requires estimation procedures. Rhodes-Kropf et al. (2005) suggest three models to estimate the components of MtB ratios to evaluate a company's mispricing and growth opportunities. For the decomposition, market and accounting values are used to generate contemporaneous and long-run industry multiples in a statistical regression model. As a first step, market values are regressed on accounting data for each industry in order to determine contemporary industry multiples. These short-run industry multiples are used to calculate contemporaneous fundamental company values. Furthermore, they provide the basis for long-run industry multiples averaged over time. The three different estimation models subsequently consider more accounting data in the linear regression: book values, net income, and leverage.

The estimation procedures for the three different models are presented in Table 5.3. The third model, with book value of equity, earnings, and leverage, is repeatedly used to estimate core or alternative mispricing measures in mergers and acquisitions research (Hertzel & Li, 2010; Pantzalis & Park, 2009; Doukas et al., 2010). However, no reasons are given in these studies why model 3 is applied. Which of the models, suggested by Rhodes-Kropf et al. (2005), may be superior, is not discussed in the literature. The three models subsequently add more accounting information in the regressions. With regards to parsimonious approaches, it needs to be considered whether all the variables included in model 3 are necessary. The models 1 and 2 serve the same purpose and may provide the same results as model 3 but may be less prone to errors. Moreover, as only accounting information on book value of equity and income are required for models 1 and 2, they have less data requirements than model 3. Therefore, models 1 and 2 have advantages regarding data availability.

Table 5.3 Different models for estimating LRVTB

Equation	Variables
Model 1	
$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \varepsilon_{it}$	m_{it} = natural log of market value of company *i* at time *t* b_{it} = natural logs of book value of equity of company *i* at time *t* α_{0jt}; α_{1jt}= multiples
$v(B_{it};\ \hat{\alpha}_{0jt};\ \hat{\alpha}_{1jt}) = \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt} b_{it}$	$\hat{\alpha}_{0jt}$; $\hat{\alpha}_{1jt}$ = contemporaneous industry multiples
$\bar{\alpha}_j = \frac{1}{T}\sum \hat{\alpha}_{jt}$	average of fitted values over time for long-run industry multiples $\bar{\alpha}_j$
$v(B_{it};\ \bar{\alpha}_{0j};\ \bar{\alpha}_{1j}) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j} b_{it}$	$\bar{\alpha}_{0j}$; $\bar{\alpha}_{1j}$ = long-run multiples
Model 2	
$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt}\ln(NI)^{+}_{it} + \alpha_{3jt} I_{(<0)}\ln(NI)^{+}_{it} + \varepsilon_{it}$	m_{it} and b_{it} as above NI^{+}_{it} = absolute value of net income of company *i* at time *t* $I_{(<0)}\, ln(NI)^{+}_{it}$ = dummy for negative net income of company *i* at time *t* α_{0jt}; α_{1jt}; α_{2jt}; α_{3jt}= multiples
$v(B_{it}; NI_{it};\ \hat{\alpha}_{0jt};\ \hat{\alpha}_{1jt}; \hat{\alpha}_{2jt}; \hat{\alpha}_{3jt}) = \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt} b_{it} + \hat{\alpha}_{2jt}\ln(NI)^{+}_{it} + \hat{\alpha}_{3jt} I_{(<0)}\ln(NI)^{+}_{it}$	$\hat{\alpha}_{0jt}$; $\hat{\alpha}_{1jt}$; $\hat{\alpha}_{2jt}$; $\hat{\alpha}_{3jt}$ = contemporaneous industry multiples
$\bar{\alpha}_j = \frac{1}{T}\sum \hat{\alpha}_{jt}$	average of fitted values over time for long-run industry multiples $\bar{\alpha}_j$
$v(B_{it}; NI_{it};\ \bar{\alpha}_{0j};\ \bar{\alpha}_{1j}; \bar{\alpha}_{2j}; \bar{\alpha}_{3j}) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j} b_{it} + \bar{\alpha}_{2j}\ln(NI)^{+}_{it} + \bar{\alpha}_{3j} I_{(<0)}\ln(NI)^{+}_{it}$	$\bar{\alpha}_{0j}$; $\bar{\alpha}_{1j}$; $\bar{\alpha}_{2j}$; $\bar{\alpha}_{3j}$ = long-run multiples
Model 3	
$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt}\ln(NI)^{+}_{it} + \alpha_{3jt} I_{(<0)}\ln(NI)^{+}_{it} + \alpha_{4jt}\, LEV_{it} + \varepsilon_{it}$	m_{it}; b_{it}; NI^{+}_{it}; $I_{(<0)}\, ln(NI)^{+}_{it}$ as above LEV_{it} =leverage as 1 – (equity/total assets) of company *i* at time *t* α_{0jt}; α_{1jt}; α_{2jt}; α_{3jt}; α_{4jt}= multiples
$v(B_{it}; NI_{it};\ \hat{\alpha}_{0jt};\ \hat{\alpha}_{1jt}; \hat{\alpha}_{2jt}; \hat{\alpha}_{3jt}; \hat{\alpha}_{4jt}) = \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt} b_{it} + \hat{\alpha}_{2jt}\ln(NI)^{+}_{it} + \hat{\alpha}_{3jt} I_{(<0)}\ln(NI)^{+}_{it} + \hat{\alpha}_{4jt}\, LEV_{it}$	$\hat{\alpha}_{0jt}$; $\hat{\alpha}_{1jt}$; $\hat{\alpha}_{2jt}$; $\hat{\alpha}_{3jt}$; $\hat{\alpha}_{4jt}$ = contemporaneous industry multiples
$\bar{\alpha}_j = \frac{1}{T}\sum \hat{\alpha}_{jt}$	average of fitted values over time for long-run industry multiples $\bar{\alpha}_j$
$v(B_{it}; NI_{it};\ \bar{\alpha}_{0j};\ \bar{\alpha}_{1j}; \bar{\alpha}_{2j}; \bar{\alpha}_{3j}; \bar{\alpha}_{4j}) = \bar{\alpha}_{0j} + \bar{\alpha}_{1j} b_{it} + \bar{\alpha}_{2j}\ln(NI)^{+}_{it} + \bar{\alpha}_{3j} I_{(<0)}\ln(NI)^{+}_{it} + \bar{\alpha}_{4j}\, LEV_{it}$	$\bar{\alpha}_{0j}$; $\bar{\alpha}_{1j}$; $\bar{\alpha}_{2j}$; $\bar{\alpha}_{3j}$; $\bar{\alpha}_{4j}$ = long-run multiples

Notes

This table shows the three models for estimating LRVTB suggested by Rhodes-Kropf et al. (2005).

5.3.3.3 Applied model for estimating LRVTB

To estimate LRVTB, the three models suggested by Rhodes-Kropf et al. (2005) are compared in Table 5.4. The variables used to estimate LRVTB with their data sources are shown in Panel A. LRVTB is estimated for the total sample according to each model, as outlined in section 5.3.3.2. The descriptive results are presented in Panel B. According to the findings for LRVTB using different models, the mean values seem to be closely spread around the same value for all three models. The differences for the standard deviation appear to be small across the models. Minimum and maximum values differ across the three models for LRVTB. For model 2 and model 3, the minimum and maximum values show a smaller divergence compared to model 1. To test the differences between LRVTB values estimated by the different models, a correlation analysis compares the values of LRVTB for the three models, suggested by Rhodes-Kropf et al. (2005). The correlation values in Panel C show that LRVTB values for model 2 and model 3 are highly correlated. Hence, these two models seem to provide very similar values for LRVTB.

For computing LRVTB, further features in the estimation process can be criticised, such as a potential look-ahead bias, time sensitivity and using market data three months after the financial year end. Look-ahead bias may be inherent in the calculation of LRVTB because long-run industry multiples refer to the entire period for estimating LRVTB value for each year. An additional issue is that LRVTB values may be sensitive to the time period under review. Hence, external circumstances given at a certain time may dominate the estimation. Furthermore, Rhodes-Kropf et al. (2005) use market data three months after the financial year end because they assume this time lag for publishing accounting information. However, the market may be informed earlier about accounting data by press releases. To investigate these further issues for estimating LRVTB, comparisons are conducted in the same manner with correlations for different variations. LRVTB values are compared for 2005 and 2010 regarding a potential look-ahead bias. For the publication time lag, LRVTB values are compared for market data at the financial year end and three months later. The findings of these comparisons show similar results and are not presented here.

Table 5.4 Estimating LRVTB

Panel A: Variables for estimating LRVTB

Variables	Data source	Code
Market value of equity	Datastream	MVC
Common equity	Datastream	3501
Net income	Datastream	1651
Total assets	Datastream	2999

Panel B: Descriptive results for LRVTB using different models

Model used	N	mean	sd	min	max
Model 1	6624	0.475	0.188	-0.326	1.506
Model 2	6619	0.479	0.388	-1.666	3.025
Model 3	6619	0.480	0.403	-1.420	3.150

Panel C: Correlation analysis for different models for estimating LRVTB

Model used	Model 1	Model 2	Model 3
Model 1	1	0.452*	0.424*
Model 2	0.498*	1	0.947*
Model 3	0.482*	0.964*	1

Notes

These tables show the variables used to estimate LRVTB (Panel A), descriptive results (Panel B) and a correlation of LRVTB values (Panel C) using the three different models, presented in Table 5.3. Panel A shows the variables used for estimating LRVTB with their data sources. Panel B shows descriptive results for LRVTB estimated with the three different models suggested by Rhodes-Kropf et al. (2005). The results show that the mean values are relatively closely spread around the same value across the three different models. The minimum and maximum values deviate for model 1 compared to the other two models. Panel C shows correlations for comparing LRVTB using the three different models according to Rhodes-Kropf et al. (2005). Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. The results show that LRVTB values for model 2 and model 3 are highly correlated.

For this study, model 2 by Rhodes-Kropf et al. (2005) is applied to estimate LRVTB with book value of equity and income as accounting information and market data three months after the financial year end. The analysis of LRVTB using different variations in computing LRVTB shows that the three models provide similar results with different data requirements. However, due to the differences in minimum and maximum values for LRVTB, as presented in Table 5.4 Panel B, the results of models 2 and 3 may be more comparable. Given that LRVTB values from models 2 and 3 are highly correlated, as shown in the correlation analysis in Table 5.4 Panel C, the model with least data requirements may be preferred for reasons of parsimony, discussed in section 5.3.3.2. To visualise the intrinsic value as IC value indicator in the comparison of IC value measures, the link between LRVTB in natural logarithms and ratios of MtB or Tobin's q may be complex. Hence, LRVTB is transformed to ratios by antilogarithms to be directly comparable to MtB and Tobin's q.

5.3.4 Comparing IC value measures

5.3.4.1 Regression model to compare IC value measures

The relationship between IC value and performance, as outlined in section 5.2.1.1, is a basic assumption of this study. This assumption enables the innovative comparison of different IC value measures. Corporate performance in terms of profitability is regressed on the three suggested indicators: MtB, Tobin's q and LRVTB. The linear regression results are compared with regards to explanatory power. This allows investigating whether the measures Tobin's q and LRVTB serve as better estimators of IC value by addressing flaws of MtB. As IC has been found to positively impact on corporate performance in terms of profitability (Youndt et al., 2004; Reed et al., 2006), the measure that best explains the relationship to corporate performance can be interpreted as best estimator of IC value. In accordance with prior literature, performance is measured as profitability. The measures used for this study are return on equity (ROE) and return on assets (ROA). The two performance measures are ranked for this analysis, controlling for year and industry in the ranking to account for the different industrial and economic environments, as outlined in section 5.2.4.1.

The IC value measures are grouped into deciles to analyse different levels of IC value rather than monetary value, as discussed in section 5.2.4.2. Industry and year are controlled for in the deciles, equivalent to the performance rankings. In the model, the rank of performance measures are regressed on lagged deciles of IC value measures to examine how previous period's levels of IC value contribute to performance, as outlined in section 5.2.4.3. It is important to lag IC value as performance is generated by utilising previously developed IC value. The deciles of IC value measures are interacted with the dummy variables of the four industry groups: consumer, finance, pharmaceutical & technology, and industrial. This interaction illustrates how IC value affects performance in different industries after accounting for industry in performance ranks and deciles of IC value. The regression is clustered by company and is illustrated in Equation 5.4. Comparing the explanatory power of the different regression modifications with MtB, Tobin's q or LRVTB enable testing which measure has the highest explanatory value.

Equation 5.4

$$performance_t = \beta_0 + \beta_1 level\ of\ IC_{t-1} \times \sum \alpha_i\ industry_j + \beta_2 size_j + \varepsilon_j$$

The variables are computed as follows. *Performance* represents the ranks of the two profitability measures (ROE and ROA), controlled for industry and year at time *t*. The *level of IC* represents deciles of the three IC value measures (MtB, Tobin's q, and LRVTB) lagged by one period, controlled for industry and year. The dummy variable *industry* is interacted with the IC measures and represents the four industry groups. This interaction accounts for the differences in IC value across the four industries. The control variable *size* is measured as the natural logarithm of total assets. Table 5.5 presents the definitions (Panel A), descriptive statistics (Panel B), and correlations (Panel C) of the variables used in the regression analyses. For the correlation, the alternative performance measures ROE or ROA, are correlated to the three measures of IC value and to the control variable company size for the total sample and the four industry groups. Columns denoted with P show Pearson correlation values; columns with S represent Spearman correlation values. The correlation coefficients do not imply multicollinearity.

Table 5.5 Descriptive statistics for the analysis of IC value measures

Panel A: Definitions of variables

Variable	Definition	Function
ROE	rank of return on equity, controlled for industry + year	Dependent variable
ROA	rank of return on assets, controlled for industry + year	Dependent variable
deciles MtB	deciles of MtB ratios controlled for industry and year	Test hypotheses $H_{5.1}$ + $H_{5.2}$
deciles Tobin's q	deciles of Tobin's q controlled for industry and year	Test hypothesis $H_{5.1}$
deciles LRVTB	deciles of LRVTB controlled for industry and year	Test hypothesis $H_{5.2}$
size	natural logarithm of total assets	Control variable
industry	dummy for industry groups: consumer, finance, pharma & tech, industrial	Interaction to illustrate industry outcome

Panel B: Descriptive statistics

	N	mean	sd	min	max
ROE	4992	64.31	40.67	1	162
consumer	1605	73.77	42.67	1	162
finance	575	30.33	20.29	1	85
pharma & tech	1321	62.29	37.10	1	138
industrial	1491	69.02	40.43	1	159
ROA	5009	64.67	40.93	1	162
consumer	1616	74.25	42.93	1	162
finance	568	29.94	20.07	1	84
pharma & tech	1325	62.49	37.22	1	138
industrial	1500	69.43	40.66	1	159
deciles MtB	5075	5.47	2.87	1	10
deciles Tobin's q	5075	5.47	2.87	1	10
deciles LRVTB	5075	5.47	2.87	1	10
size	5075	11.79	2.09	4.70	19.17

Panel C: Correlations

	Total		**Consumer**		**Finance**		**Pharma&Tech**		**Industrial**	
	P	S	P	S	P	S	P	S	P	S
					ROE					
deciles MtB	0.20*	0.18*	0.24*	0.24*	0.18*	0.16*	0.13*	0.12*	0.26*	0.26*
deciles Tobin's q	0.22*	0.20*	0.27*	0.27*	0.18*	0.18*	0.16*	0.15*	0.25*	0.25*
deciles LRVTB	0.33*	0.28*	0.37*	0.37*	0.23*	0.18*	0.20*	0.18*	0.47*	0.46*
size	0.24*	0.26*	0.26*	0.28*	0.08	0.09*	0.20*	0.22*	0.23*	0.23*
					ROA					
deciles MtB	0.18*	0.16*	0.21*	0.21*	0.14*	0.12*	0.13*	0.12*	0.22*	0.22*
deciles Tobin's q	0.23*	0.21*	0.28*	0.28*	0.20*	0.20*	0.18*	0.17*	0.26*	0.26*
deciles LRVTB	0.30*	0.27*	0.35*	0.35*	0.19*	0.15*	0.20*	0.17*	0.42*	0.41*
size	0.17*	0.21*	0.17*	0.20*	0.01	0.06	0.17*	0.19*	0.11*	0.13*

Notes

These tables show definitions (Panel A), descriptive statistics (Panel B), and correlations (Panel C) for the regression analysis of IC value measures. The performance measures (ROE and ROA) are regressed on the measures of IC value (MtB, Tobin's q and LRVTB) to identify the measure with the highest explanatory value. Panel B describes ranks for ROE and ROA, for the total sample and the industry groups, deciles of IC value measures and size. Panel C shows correlations for ROE or ROA with the IC value measures and the control variable size. Asterisks indicate a 5%-significance level. Columns P show Pearson and columns S Spearman correlations. The correlations are low and do not imply multicollinearity.

5.3.4.2 Vuong's closeness test to test hypotheses on IC value measures

As this study innovatively compares measures of IC value, a reasonable way has to be found to differentiate between the suitability of the measures. This project compares the measures in terms of their explanatory values for the regression model, outlined in section 5.3.4.1. This approach seems reasonable considering the limited given knowledge on IC value measures. To test hypotheses $H_{5.1}$ and $H_{5.2}$, Vuong's closeness test is applied to investigate whether the differences in explanatory power, R^2, of different models are significant. Vuong's closeness test is based on likelihood ratios to identify which model is closer to the real model (Vuong, 1989). The null hypothesis assumes that two models are equal in representing the real model. The alternative hypothesis states that one model shows a higher degree of closeness to the real model. Hence, if the null hypothesis is rejected, one model has a significantly higher explanatory value compared to the competing model. The direction of the Vuong z-statistic indicates which model is closer to the real model. This closeness test serves the purpose of comparing IC value measures in terms of explanatory value. If the null hypothesis is rejected, one model can be identified with the best estimator of IC value. For this test, the R^2 values of the models are compared.

5.3.5 Testing hypotheses on determinants of IC value

The results of comparing measures of IC value, as outlined in section 5.3.4, provide insights on which measure acts as best estimator for IC value. This measure is then used as dependent variable in a linear regression to test determinants of IC value. As developed in hypotheses $H_{5.3}$ to $H_{5.9}$, seven different factors are tested as potential determinants of IC value. These factors are: recognised intangible assets, R&D expenses, motivational payment to employees, concentrated ownership, leverage, company age, and company size. To account for differences in IC across industries, the model also controls for the industry groups: consumer, finance, pharmaceutical & technology, and industrial. The regression is shown in Equation 5.5 below and is clustered by companies. Table 5.6 shows definitions (Panel A), descriptive statistics (Panel B), and correlations (Panel C) of the variables to measure potential factors

that may be related to IC value. The correlation table shows Pearson correlations in the lower left-hand corner and Spearman correlations in the upper right-hand corner. As the levels of correlation results are relatively low, the issue of multicollinearity can be neglected, as each variable captures a distinct company characteristic.

Equation 5.5

$$IC_j = \beta_0 + \beta_1 intangibles_j + \beta_2 R\&D_j + \beta_3 payment_j + \beta_4 ownership_j + \beta_5 leverage_j + \beta_6 age_j + \beta_7 size_j + \sum \alpha_i industry_j + \varepsilon_j$$

The variables to investigate determinants of IC value are computed as follows. *IC* is the antilog of LRVTB. *Intangibles* represent recognised intangible assets scaled by total assets. *R&D* is accounted for in a dummy variable. It takes the value 1 if a company declares R&D expenses in the income statement, 0 otherwise. A dummy variable *payment* is introduced for motivational payments to employees. The variable takes the value 1 if the average payment per employee is above the industry average, and takes the value 0 if it is below the industry average. Concentrated ownership is captured by *ownership* as the percentage of shares closely held by family members and employees. *Leverage* is the percentage of debt compared to total capital. *Age* is measured as the years since the company was founded and *size* is the natural logarithm of total assets. Furthermore, the control variable *industry* is a dummy variable for the four industry groups, with consumer serving as base variable.

To get further insights in the analysis of IC value determinants, the regression is conducted with different model specifications focusing on certain company indicators, as distinguished in sections 5.2.5.2 to 5.2.5.4. First, the model is applied with all variables, as presented in Equation 5.5 above. Second, the regression is conducted focusing on the potential determinants from the financial statements: intangible assets, R&D expenses, and motivational payment to employees. Third, IC value is regressed on potential determinants of IC value in the financial structure: concentrated ownership and leverage. Finally, potential determinants in company characteristics are investigated: age and size. The control variable industry is included in all different model specifications to account for industry differences.

Table 5.6 Descriptive statistics for determinants of IC value

Panel A: Definitions of variables

Variable	Definition	Function
IC value	antilog of LRVTB as measure of IC	Dependent variable
intangibles	intangible assets scaled by total assets	Test hypothesis $H_{5.3}$
R&D	dummy variable: 1 if R&D expenses declared, 0 otherwise	Test hypothesis $H_{5.4}$
payment	dummy variable: 1 if payments per employee above industry average, 0 otherwise	Test hypothesis $H_{5.5}$
ownership	percentage of shares held by family members and employees	Test hypothesis $H_{5.6}$
leverage	percentage of debt to total capital	Test hypothesis $H_{5.7}$
age	company age as years since company was founded	Test hypothesis $H_{5.8}$
size	natural logarithm of total assets	Test hypothesis $H_{5.9}$
industry	dummy for industry groups: consumer, finance, pharma & tech, industrial; consumer as base industry	Control variable

Panel B: Descriptive statistics

	Continuous variables					Dummy frequency	
	N	mean	sd	min	max	0	1
IC value	5076	1.76	0.69	0.23	17.02		
intangibles	5057	0.14	0.17	-0.10	0.95		
R&D	5076					3290	1786
payment	4666					2863	1803
ownership	3365	19.49	25.45	0.00	100.00		
leverage	5029	53.33	23.83	0.18	99.99		
age	5076	48.47	51.13	0.00	269.00		
size	5076	11.79	2.09	4.70	19.17		

Panel C: Correlations

	IC value	*intangibles*	*R&D*	*payment*	*ownership*	*leverage*	*age*	*size*
IC value	1	0.04*	-0.03	0.08*	0.04*	0.11*	-0.10*	-0.20*
intangibles	0.00	1	0.12*	0.06*	0.02	0.00	-0.24*	-0.01
R&D	-0.08*	0.06*	1	0.13*	-0.04*	-0.08*	0.08*	0.25*
payment	0.05*	0.07*	0.12*	1	0.00	-0.07*	-0.01	-0.03
ownership	0.02	-0.01	-0.04*	0.00	1	-0.09*	-0.15*	-0.17*
leverage	0.20*	-0.02	-0.06*	-0.08*	-0.07*	1	0.29*	0.38*
age	-0.07*	-0.25*	0.06*	0.00	-0.15*	0.32*	1	0.42*
size	-0.25*	-0.01	0.30*	0.01	-0.14*	0.38*	0.40*	1

Notes

These tables show definitions (Panel A), descriptive statistics (Panels B) and correlations (Panel C) of variables in the regression analysis of determinants of IC value. In the correlation table, Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. The correlation level between the regression variables is low and does not imply multicollinearity.

5.4 Results

5.4.1 Results for comparing measures of IC value

5.4.1.1 Descriptive results for IC value measures

IC value measures are calculated for a sample of 5,076 firm years of German companies. Due to limited data availability in the context of adjustments in the computation for Tobin's q, the available number of firm years is reduced from 7,728 firm years for all three measures to result in an equal sample size. This enables a comparison of explanatory values between the different approaches for the same companies. Furthermore, the antilog of LRVTB is taken to match the format of MtB and Tobin's q, as outlined in section 5.3.3.3. Since MtB represents a ratio of market value to book value and Tobin's q a ratio of market value to replacement costs, LRVTB is transformed into a ratio. The antilog of LRVTB can be interpreted as a ratio of a company's intrinsic value to its book value, as reviewed in section 5.3.3.1. For all three ratios a value above 1 indicates underlying corporate IC value. Table 5.7 shows the descriptive results of the three IC value measures for each industry.

For all three measures the mean value is above one across all industry groups. This result suggests that IC value exists in the majority of German companies. Some companies seem to have no IC value for some years, as the minimum values are below one, approaching zero for all measures in all industries. In comparison, MtB takes the highest values in all industries with the highest standard deviations. Hence, MtB is the most volatile measure for IC value and reveals big discrepancies between market values and book values. These discrepancies may be due to the discussed weaknesses of historic cost accounting and market price fluctuations. Accordingly, for Tobin's q the mean values and standard deviations are lower than for MtB after adjusting for historic cost accounting. The same is true for the antilog of LRVTB after accounting for mispricing. With regards to the mean values, Tobin's q seems to be lowest but LRVTB shows the smallest standard deviation. However, the descriptive results neither provide evidence which measure serves as best IC value estimator nor do they indicate any strong industry patterns.

Table 5.7 Descriptive results of IC value measures

		MtB	Tobin's q	LRVTB
Total	mean	3.15	1.50	1.77
N=5,075	sd	25.12	1.30	0.71
	min	0.07	0.13	0.23
	max	1620.00	25.46	17.17
Consumer	mean	3.52	1.47	1.87
N=1,631	sd	16.49	1.32	0.80
	min	0.07	0.28	0.28
	max	373.56	25.46	10.38
Finance	mean	2.08	1.35	1.53
N=587	sd	3.09	0.96	0.36
	min	0.10	0.13	0.47
	max	49.87	10.19	3.14
Pharma & Technology	mean	2.86	1.69	1.79
N=1,346	sd	9.41	1.64	0.73
	min	0.11	0.23	0.27
	max	269.55	23.61	9.90
Industrial	mean	3.42	1.42	1.74
N=1,511	sd	41.77	1.01	0.67
	min	0.11	0.35	0.23
	max	1620.00	11.46	17.17

Notes

This table shows descriptive results of the IC value measures MtB, Tobin's q and antilog of LRVTB computed for a sample of German companies. Due to data availability issues for computing all three measures, the sample contains 5,075 firm years grouped into four industries. The findings represent ratios of company value to book value with different adjustments for historic cost accounting and mispricing in the measures Tobin's q and LRVTB. Ratios above the value of one indicate underlying corporate IC value.

5.4.1.2 Regression results of comparing measures of IC value

To identify a measure of IC value with the best explanatory value, a regression analysis is conducted for corporate performance in terms of profitability, as discussed in section 5.3.4. The regression results are shown in Table 5.8 with different model specifications in columns (1)-(6), clustered by company. While in columns (1)-(3) ranked ROE is regressed on deciles of MtB, Tobin's q and LRVTB, in columns (4)-(6) ranked ROA serves as performance measure. Performance ranks and deciles of IC value measures are controlled for industry and year in the ranking and grouping procedures. Significant results for the interaction terms between lagged IC value measures and industry groups provide information on how much the ranking of performance differs for a higher level of IC value within a certain industry. Alternative variations in computing the IC value measures are considered: rankings, percentiles, and ratios. The results for these varying computations are similar and are not shown here. The distinction of industries is important for the results, as outlined in section 5.2.4.1. If industry is not controlled for in the rankings and groupings, the results may differ due to industry-specific facets of IC.

For increasing levels of IC value, a company's performance rank rises significantly for both performance measures and all IC value measures, except for the financial industry. These results show by how much the company's performance rises in the ranking, within the industries consumer, pharmaceutical & technology and industrial, with an increase in IC value by one decile for each IC value measure. In contrast, for the finance sector a higher level of IC value seems to be disadvantageous for the ranking of corporate performance. This finding is inconsistent with the underlying assumption that IC supports performance and value creation, as outlined in section 5.2.1.1. Moreover, a negative relationship between IC value and performance in the financial sector also contradicts the results by Reed et al. (2006). However, their research is based on survey information provided by the companies and may be distorted, as outlined in section 5.2.1.3. To resolve the issue of IC's adverse association with performance for finance companies, further detailed investigations of the financial industry are needed to examine potential reasons.

Table 5.8 Regression results for measures of IC value

	(1)	(2)	(3)	(4)	(5)	(6)
	ROE			ROA		
	MtB	Tobin's q	LRVTB	MtB	Tobin's q	LRVTB
constant	-6.555	-9.137*	-22.549***	15.043**	9.713*	-0.472
	(-1.27)	(-1.78)	(-4.35)	(2.48)	(1.67)	(-0.08)
lagged deciles of IC measures						
consumer	5.211***	4.938***	5.985***	4.693***	5.025***	5.695***
	(12.94)	(12.77)	(15.68)	(11.00)	(11.96)	(14.48)
finance	-1.421***	-1.600***	-0.458	-2.090***	-1.745***	-1.042***
	(-3.89)	(-4.10)	(-1.50)	(-5.29)	(-4.37)	(-3.17)
pharma & tech	4.010***	3.768***	4.947***	3.405***	3.673***	4.431***
	(9.66)	(8.84)	(13.65)	(7.91)	(8.17)	(11.89)
industrial	3.958***	3.603***	4.730***	3.648***	3.911***	4.606***
	(9.54)	(8.46)	(11.64)	(7.89)	(8.44)	(10.34)
size	4.362***	4.697***	5.336***	2.771***	3.075***	3.630***
	(10.04)	(10.92)	(12.39)	(5.55)	(6.41)	(7.21)
Model summary						
R^2	0.215	0.204	0.243	0.167	0.179	0.202
Adj. R^2	0.213	0.202	0.231	0.166	0.177	0.191
N	4098	4098	4098	4092	4092	4092

Notes

This table shows the results for the regression analysis of corporate performance on levels of IC value measures, clustered by company. The dependent variable for performance is measured as the rank of ROE or ROA, controlled for industry and year. Levels of IC value are measured as deciles of MtB, Tobin's q or antilog of LRVTB. T-statistics are given in parenthesis underneath values for coefficients. Asterisks indicate the level of significance: * 10% significance, ** 5% significance, *** 1% significance. Columns (1)-(6) represent different model specifications using different measures for corporate performance and IC value: (1) ROE and MtB, (2) ROE and Tobin's q, (3) ROE and LRVTB, (4) ROA and MtB, (5) ROA and Tobin's q, (6) ROA and LRVTB. Significant results for lagged deciles of IC value measures for each industry group indicate how the level of last period's IC value influences the rank of performance within each industry.

$$performance_t = \beta_0 + \beta_1 level\ of\ IC_{t-1} \times \sum \alpha_i\ industry_j + \beta_2 size_j + \varepsilon_j$$

5.4.1.3 Results for Vuong's closeness test for IC value measures

A comparison of the regression results for the different IC value measures allows investigating hypotheses $H_{5.1}$ and $H_{5.2}$, as outlined in section 5.3.4.2. The explanatory power of the regressions with MtB, Tobin's q and LRVTB indicate the best IC value measure as it best explains performance. For ROE, the explanatory power is highest with LRVTB, followed by MtB and Tobin's q. LRVTB also provides the best explanation for performance measured by ROA in terms of R^2. Tobin's q as approximate IC value measure performs better than MtB in explaining corporate performance for ROA. The significance in the difference between R^2 for the models is tested using Vuong's closeness test, shown in Table 5.9. The findings suggest that the regression models with LRVTB perform significantly better compared to MtB and Tobin's q for both performance measures. The models with Tobin's q show inconsistent results, as Tobin's q is significantly outperformed by MtB for ROE but performs significantly better than MtB for ROA. Overall, the results demonstrate that LRVTB serves as estimator of IC value with the significantly highest explanatory value compared to MtB and Tobin's q.

Table 5.9 Results for Vuong's closeness test

	R^2 for model with			Vuong	
	MtB	Tobin's q	LRVTB	z-statistic	p-value
Model with ROE	0.215	0.204		2.371	0.018**
	0.215		0.243	-2.797	0.005***
		0.204	0.243	-3.624	0.000***
Model with ROA	0.167	0.179		-2.884	0.004***
	0.167		0.202	-3.586	0.000***
		0.179	0.202	-2.209	0.027**

Notes

This table shows the results of Vuong's closeness test for comparing R^2 of different models for regressing corporate performance on IC value measures (see Table 5.8). Significant p-values indicate that one model is significantly closer to the real model compared to the other model under review. Asterisks indicate the level of significance: * 10% significance, ** 5% significance, *** 1% significance. The results support $H_{5.2}$ but they are inconclusive for $H_{5.1}$.

The findings of Vuong's closeness test allow drawing conclusions which of the three measures serves as best estimator of IC value. The results are inconclusive for $H_{5.1}$ as Tobin's q does not add explanatory power compared to MtB for ROE but for ROA. Hypothesis $H_{5.2}$ is supported and LRVTB outperforms MtB and Tobin's q in terms of explanatory power for both performance measures in the regression analyses. The findings suggest that adjusting historic costs to replacement costs and accounting for market fluctuations in the long-run value partly reduces the weaknesses of MtB as a proxy measure for corporate IC value. Compared to MtB and Tobin's q, LRVTB can be interpreted to serve as best estimator for IC value, as LRVTB has the highest explanatory values in the regression analyses with corporate performance in terms of profitability. This innovatively applied LRVTB measure of long-run value offers new research opportunities as the most applicable measure of IC value.

5.4.2 Results for determinants of IC value

5.4.2.1 Regression results for determinants of IC value

As LRVTB is found to be the best estimator of IC value in section 5.4.1.3, compared to MtB and Tobin's q, LRVTB is applied to examine potential determinants of IC value. To test hypotheses $H_{5.3}$ to $H_{5.9}$, a regression analysis is conducted, as outlined in section 5.3.5. For the regression analysis, the dependent variable is a ratio of IC value measured as the antilog of LRVTB. Table 5.10 shows the results for the regression analysis on the determinants of IC value, clustered by company, with different model specifications presented in the four columns. The model specifications focus on certain indicators at a time: all variables, determinants from the financial statements, determinants in the financial structure, and determinants in company characteristics. As the explanatory powers are low for the model specifications with individual company characteristics, the interpretation focuses on the results for the regression model with all variables. Significant results indicate which factors are associated with IC value. Alternative variations of LRVTB as measure of IC value are also tested: rankings, deciles and percentiles. The results for the regression analysis with these variations for transforming LRVTB are similar and are not shown here.

Table 5.10 Regression results for determinants of IC value

	(1)	(2)	(3)	(4)
constant	2.528***	1.843***	1.383***	2.883***
	(20.16)	(52.19)	(20.09)	(24.82)
intangibles	-0.135	-0.137		
	(-1.30)	(-1.36)		
R&D	0.049	-0.141***		
	(1.33)	(-4.47)		
payment	0.066**	0.072***		
	(2.06)	(2.53)		
ownership	0.000		0.001	
	(-0.39)		(0.97)	
leverage	0.011***		0.007***	
	(9.07)		(6.62)	
age	-0.001			0.000
	(-1.59)			(0.82)
size	-0.114***			-0.090***
	(-8.34)			(-9.44)
industry				
finance	-0.247***	-0.295***	-0.223***	-0.334***
	(-5.08)	(-7.28)	(-4.44)	(-9.35)
pharma & tech	0.082	0.033	0.161***	-0.092**
	(1.56)	(0.72)	(3.16)	(-2.13)
industrial	-0.022	-0.086**	-0.089*	-0.068*
	(-0.44)	(-2.04)	(-1.77)	(-1.82)
Model summary				
R^2	0.170	0.027	0.072	0.083
Adj. R^2	0.168	0.026	0.071	0.082
N	3138	4654	3337	5076

Notes

This table shows results for the regression analysis of determinants of IC value. The dependent variable IC value is measured as the antilog of LRVTB, clustered by companies. T-statistics are given in parenthesis underneath values for coefficients. Asterisks indicate the level of significance: * 10% significance, ** 5% significance, *** 1% significance. Columns (1)-(4) represent different model specifications focusing on different company indicators: (1) all variables, (2) determinants from financial statements, (3) determinants from financial structure, (4) determinants in company characteristics. Significant results indicate how the different variables are associated with corporate IC value.

$$IC_j = \beta_0 + \beta_1 intangibles_j + \beta_2 R\&D_j + \beta_3 payment_j + \beta_4 ownership_j + \beta_5 leverage_j + \beta_6 age_j + \beta_7 size_j + \sum \alpha_i industry_j + \varepsilon_j$$

5.4.2.2 Results for testing hypotheses on determinants of IC value

For testing determinants of IC value, the results suggest that three out of seven variables are significantly associated with IC value. These factors are motivational payments to employees ($H_{5.5}$), leverage ($H_{5.7}$) and company size ($H_{5.9}$). However, the relationship of size ($H_{5.9}$) is in contrast to the expectation. Although Youndt et al. (2004) conceptualised that market power and access to resources of larger companies support IC value, the results show opposite outcomes. Therefore, the results contradict $H_{5.9}$. A potential reason may be that larger companies may lose efficiency in complex structures for creating IC value. Motivational payment to employees ($H_{5.5}$) and leverage ($H_{5.7}$) are significantly positively related to corporate IC value. This means that hypotheses $H_{5.5}$ and $H_{5.7}$ are supported. The positive association of motivational payment with IC value is consistent with Ludewig and Sadowski's (2009) study on organizational capital. The relationship between leverage and IC value has been previously untested. The significant positive relationship may be particularly significant for Germany as a country with high leverage ratios and an insider governance system, as outlined by Dignam and Galanis (2009) and reviewed in chapter 4. Hence, banks have great influential powers which may encourage active monitoring of intangible investments and management of IC value.

The results, considering all variables in the regression model, provide no evidence to support hypotheses $H_{5.3}$, $H_{5.4}$, $H_{5.6}$ and $H_{5.8}$. Intangible assets ($H_{5.3}$) and R&D ($H_{5.4}$) are not associated with IC value. The results for *R&D* across the different model specifications are inconsistent as *R&D* shows a significant negative relationship to IC value in the model specification focusing on determinants from the financial statements. As R^2 is only 0.026 for this model specification, these findings are not considered to be relevant. For the model with all variables, investments in R&D show a positive sign, while increasing intangible assets seem to decrease IC value. As information on R&D and intangible assets is disclosed in the financial statements, the market may consider these items differently without contributing to IC value represented in ratios of exceeding market values. In a study on intangible resources, Villalonga (2004) found that Tobin's q captured more IC value than a measure of

hedonic q based on R&D, intangibles and advertising. The findings of this chapter may help to explain why hedonic q omitted IC information and resulted in lower IC values. As intangible assets and R&D are found to have no strong relationship to corporate IC value in this study, they may not provide adequate information for a hedonic approach to simply accumulate these components of IC value.

Concentrated ownership ($H_{5.6}$) and company age ($H_{5.8}$) seem to have no association with IC value at all as their coefficients are close to zero. As the relationship between concentrated ownership and IC value has been previously untested, this study developed hypothesis $H_{5.6}$ based on the conceptualisation by Keenan and Aggestam's (2001). Their vague conceptualisation of concentrated ownership cannot be supported in any direction. The relationship between IC value and ownership is also tested with a dummy variable for family holdings bigger than 20% and concentrated government holdings. As the results are very similar, they are not shown here. With regards to company age, the non-significant result is consistent with the findings by Youndt et al. (2004). For the control variable *industry*, the consumer sector serves as basis. There seems to be an industry pattern but it is only significant for finance with the lowest level of IC value compared to all other industries. This indicates that the results by Reed et al. (2006) on the banking sector may be very specific and not transferable to other industries. The more traditional business models within the industrial sector may entail a lower level of IC value. For pharmaceutical & technology the sign of the coefficient is positive, indicating that IC value is highest in this sector. According to the business model being based on more intangible resources, this may not be surprising.

5.5 Conclusion

The aims of this project are to identify the measure for IC value with the highest explanatory value out of three estimators and use this measure to examine determinants of IC value. First, three measures for IC value are estimated and compared. Different approaches to measure IC value are reviewed in section 5.2.2. As in section 5.2.2.4 holistic measures are argued to capture IC value more

comprehensively, three holistic market-based measures are chosen for this study: MtB, Tobin's q and LRVTB. The comparison of the three measures enables to find the best estimator of IC value in terms of explanatory value in a regression of corporate performance on the level of IC value, as outlined in section 5.3.4. Second, the identified best estimator is then applied to investigate determinants of IC value by testing IC-related hypotheses which have partly been previously untested, namely with regards to concentrated ownership and leverage. To examine potential determinants of IC value, a regression analysis provides insights on what variables are significantly associated with IC value, as illustrated in section 5.3.5.

The three IC value measures, MtB, Tobin's q and LRVTB, are estimated for a sample of 5,075 firm years of German listed companies. For Tobin's q and LRVTB the estimation procedures outlined in sections 5.3.2 and 5.3.3 are applied. The IC value measures are compared in a regression analysis for their association with corporate performance in terms of profitability, as discussed in section 5.3.4. This method allows identifying which measure serves as best estimator for IC value with regards to explanatory value. For the analysis of IC measures, the criticism of MtB as estimator of IC value has initiated the hypotheses to test whether MtB, Tobin's q or LRVTB serve best to estimate IC value, as discussed in section 5.2.3. To test the hypotheses on IC value measures, Vuong's closeness test is applied to compare the explanatory values of the regression models. The findings for IC value measures, presented in section 5.4.1, are unclear regarding hypothesis $H_{5.1}$ that Tobin's q exceeds MtB in measuring IC value. For the performance measures of ROE and ROA the findings are inconclusive for Tobin's q. LRVTB is identified to be the best estimator of IC value considering the long-run intrinsic value, supporting $H_{5.2.}$ This measure from the research area of mergers and acquisitions offers new research opportunities for empirically investigating IC value.

The hypotheses on determinants of IC value are partly based on conceptual studies because IC value and its potential determinants have rarely been investigated, as reviewed in section 5.2.5. Hypotheses on the relationships between IC value and leverage as well as concentrated ownership have been previously untested. The

findings discussed in section 5.4.2, suggest that IC value is significantly positively associated with motivational payments to employees above industry average and the influential power of banks with increasing leverage ratios. These findings are consistent with hypotheses $H_{5.5}$ and $H_{5.7}$. The significant positive relationship between IC value and motivational payment to employees corresponds with the findings by Ludewig and Sadowski (2009) in their study on organizational capital. The significant positive association of leverage with IC value supports the conceptual relationship between IC value and the position of banks as influential stakeholder, suggested by Keenan and Aggestam (2001). Unexpectedly, larger companies seem to have a significantly lower level of IC which contradicts $H_{5.9}$ and prior studies (Youndt et al., 2004; Reed et al., 2006). A potential reason why size is significantly negatively related to IC value may be that IC value is more difficult to create with increasing size and complex structures. Other factors are found to be non-significant for IC value: recognised intangible assets ($H_{5.3}$), R&D expenses ($H_{5.4}$), concentrated ownership ($H_{5.6}$) and company age ($H_{5.8}$). Further research is required to investigate potential reasons for these non-significant relationships.

This project is subject to limitations. Further research should be conducted to test the robustness of LRVTB as a measure of IC value. This study innovatively compares three measures of IC value based on the best explanatory value for corporate performance. This approach to distinguish among the three IC value measures may be limited as company value and performance may be inherently related, although the correlation analysis does not imply multicollinearity. Further investigations could explore whether LRVTB could serve as predictive measure of IC value and performance. The relationship between performance and IC value measures is argued to be lagged by one year, as outlined in section 5.2.4.3. This relationship requires further investigations as the long-term development of IC value may justify longer lags. Another issue is that industry differences and their impact on IC value are not investigated in detail as industry is treated as dummy variable and control variable. Testing LRVTB for longer lags, in predictive studies, in other research settings, and for specific industries may also facilitate more generalisable conclusions for this newly applied measure of IC value. Additionally, some findings may dominate a

German sample, such as the strong association of leverage with IC value because the influential power of banks may be strong in the German insider governance system. To test whether this relationship is particular to the German setting, future research can replicate the study in a different country.

The innovative approach to IC value measures, applied in this study, contributes to the area of IC research, particularly IC measurement and IC management. This approach enables empirical investigations of IC value from new perspectives. The findings of this study motivate further empirical research on IC. The industry-specific IC value patterns offer new research opportunities for IC. An interesting question is why IC value is negatively related to performance in the financial sector. Furthermore, the unexpected significantly negative relationship between IC value and size encourages further research. The reasons why larger companies have a lower level of IC value may be interesting for management purposes to more actively engage with IC according to size requirements. Investigations in this area may support to encounter the potential problem of negative size effects on IC value. Further research could examine in detailed investigations, such as case studies, whether the size effect is related to international activities or more complex internal structures. With regards to leverage to have a significant positive relationship to IC value, future research may examine how banks may monitor intangible investments. Further insights into the monitoring effect on IC value by influential stakeholders, such as banks, may enhance IC management. The wide range of further research opportunities, which the newly identified IC value measure offers, is unlimited. Creative research questions are highly encouraged to better understand IC value through empirical investigations.

Chapter 6:
Content analysis of intellectual capital reporting – Parsimony in research design

6.1 Introduction

The aim of this methodological project is to investigate how to design a parsimonious research framework for a content analysis of intellectual capital (IC) reporting. This research project answers the question of whether a focus only on the most widely-used IC components is sufficient for a content analysis of IC reporting. As content analysis studies are subjective in nature (Krippendorff, 2004), the research frameworks represent the researchers' perceptions of IC. An intensive review of research frameworks for IC reporting in prior studies shows differences regarding the numbers, categorisations and labels of IC components. Furthermore, Guthrie and Petty (2000) suggest adjusting the research framework to the research setting without guidance on adjustment procedures. To address this unclear situation, this project investigates research frameworks of an IC content analysis. The findings of this study contribute to the IC reporting literature of content analysis studies in four dimensions: designing a parsimonious research framework, suggesting a pilot study approach for a new research setting, approaching companies' perceptions of IC reporting, and indicating comparability of prior studies.

This project examines the relations between different IC components in a correlation analysis to investigate how a research framework for IC reporting can be designed parsimoniously. The IC components are selected based on a review of research frameworks for IC reporting applied in prior studies, to identify which components

appear to be most important for each IC category. If the content analysis scores are significantly highly correlated, this indicates that the insights into corporate IC reporting are very similar even if IC components are added. The results show that for relational capital (RC) and human capital (HC) the three most widely-used components provide very similar results compared to accounting for all components. For structural capital (SC), the reporting practice is more diverse but considering the eight most widely-used components indicates corporate reporting on SC. The high correlations suggest that IC reporting scores are similar for widely-used IC components and all IC components. This means that focusing on the most widely-used components is sufficient to capture corporate IC reporting. A further correlation analysis, applying selected previous research frameworks to the German dataset, investigates comparability of prior studies. The findings indicate that the results of prior IC content analyses are comparable even if the research frameworks consider different components, as long as the most widely-used components are included.

Section 6.2 reviews the literature on IC content analyses to investigate the similarities and differences in IC research frameworks. Research frameworks for IC reporting are reviewed on high-level IC categories and low-level IC components to reveal differences in content analysis studies on IC reporting. The methods to investigate IC reporting in Germany and to examine a parsimonious content analysis design are outlined in section 6.3. The approach of a pilot study to develop a research framework for IC reporting is presented in section 6.4. In section 6.5, two correlation analyses are conducted to explore the minimum number of IC components for each IC category to capture IC reporting sufficiently and to examine comparability of prior studies. These analyses allow answering the research question of this project.

6.2 Literature review

6.2.1 Investigating IC reporting with research frameworks

IC reporting is found to be mainly narrative, as reviewed in chapter 2. Therefore, a content analysis approach has been widely used to investigate IC reporting. Researchers have introduced research frameworks with checklists of IC-related items

(e.g. Guthrie & Petty, 2000; Bontis, 2003; Bukh et al., 2005). These checklists are designed or chosen ex ante by the researchers to approach IC reporting (e.g. Brennan, 2001; Striukova et al., 2008). The research frameworks can be seen to represent the respective researchers' perceptions and definitions of IC reporting. Regarding ex ante definitions of IC reporting, the questions arise as to where the IC definitions come from and how they are incorporated in the research frameworks. The research frameworks are based on general conceptualisations of IC, such as by Brooking (1996), Sveiby (1997), Edvinsson and Malone (1997), and Stewart (1997). These IC studies have broadly conceptualised IC to support a company in sustainable value creation with efficient internal structures, beneficial relationships, and human resources. This broad concept can be argued to have the advantage of being flexible to adjust the boundaries of IC if new innovations are developed. Moreover, this concept can be adjusted for IC reporting research in different settings to account for potential country differences, as applied by Guthrie and Petty (2000). However, no guidance is found on how to adjust a research framework to a new research setting.

The broad IC concept leaves scope for different interpretations and perceptions of IC reporting. Therefore, IC reporting research has to define a view of IC reporting in the research frameworks. Researchers incorporate their IC perceptions in the research frameworks in hierarchical sets of high-level IC categories and sub-categories (e.g. Bukh et al., 2005). High-level categories are designed to outline major areas of IC, such as SC, RC, and HC (e.g. Vergauwen et al., 2007). The sub-categories provide further information within each high-level category to explain what the respective high-level category encompasses, such as intellectual property, distribution channels, or employees (e.g. Guthrie et al., 2007). The sub-categories can either represent individual IC components or groups of IC components (e.g. Cerbioni & Parbonetti, 2007). The focus of this study is on the checklists in the research frameworks for IC reporting which are normally only referred to in the appendix of content analysis studies on IC reporting. To compare previous research frameworks, 22 IC reporting frameworks of content analysis studies are reviewed in this study. In the following, this study acknowledges hierarchical structures of high-level IC categories and lower-level IC components which are reviewed separately in the following sections.

6.2.2 Comparison of high-level IC categories in research frameworks

6.2.2.1 Development of high-level IC categories

Numerous research frameworks have been developed for different IC reporting studies in various countries over time, as discussed in chapter 2. An analysis of citations across IC reporting studies shows which approaches the research frameworks follow, as illustrated in Figure 2.2 in chapter 2. Three major strands have been established for developing research frameworks for IC reporting. The three strands follow three influential papers: Guthrie and Petty (2000), Bontis (2003) and Bukh et al. (2005). These three research frameworks for IC reporting have been re-used, modified and combined by numerous studies, as discussed in chapter 2. Guthrie et al. (2012) also found that over time few new frameworks have been introduced but old frameworks have been repeatedly modified. Beattie and Thomson (2007) argue that differences in IC reporting content analyses and transparency problems hinder comparability and continuity across IC reporting studies. Hence, the question arises whether prior IC reporting studies investigate the same fundamentals of IC reporting and whether they are comparable.

A review of which IC categories and IC components are included in IC research frameworks may shed light on the question of whether prior studies on IC reporting are comparable. As mentioned in section 6.2.1, 22 IC reporting studies are selected for this study. The selected studies follow the three major strands by Guthrie and Petty (2000), Bontis (2003) and Bukh et al. (2005). Additional studies are not regarded to add further insights as current studies seem to adjust the three strands rather than creating new ones. Therefore, the selection of these 22 research frameworks for IC reporting is considered to represent a reasonable overview. A comparison of high-level categories of research frameworks for IC reporting suggested in the 22 studies under review is shown in Table 6.1. This comparison of high-level IC categories reveals four major developments: differences in labelling IC categories, different numbers of categories, a current tendency to use a common terminology, and different views on considering strategy as a separate IC category.

Table 6.1 Comparison of high-level IC categories

Number of high-level IC categories	High-level IC categories	Studies	Countries
1	Intellectual Capital	Bontis (2003)	Canada
		Vergauwen & van Alem (2005)	The Netherlands + France + Germany
3	Human, Internal, External	Guthrie & Petty (2000)	Australia
		Bozzolan et al. (2003)	Italy
		Vandemaele et al. (2005)	The Netherlands + Sweden + UK
		Abeysekera & Guthrie (2005)	Sri Lanka
		Guthrie et al. (2007)	Australia +Hong Kong
		Cerbioni & Parbonetti (2007)	Europe
		Striukova et al. (2008)	UK
		Lee & Guthrie (2010)	Global
	Employee competencies, Internal, External	Brennan (2001)	Ireland
	Human, Structural, Relational	Vergauwen et al. (2007)	Sweden + UK + Denmark
		Beattie & Thomson (2007)	UK
		Li et al. (2008)	UK
		Campbell & Rahman (2010)	UK
		Mangena et al. (2010)	UK
		Hidalgo et al. (2011)	Mexico
4	General IC, Human, Structural, Relational	Brüggen et al. (2009)	Australia
5	Human, Customers, Organization, Innovation/R&D, Strategy	García-Meca & Martinez (2007)	Spain
6	Employees, Customers, Processes, Technologies, Strategy, R&D	Bukh et al. (2005)	Denmark
		García-Meca et al. (2005)	Spain
		Singh and Van der Zahn (2008)	Singapore

Notes

This table shows a comparison of high-level IC categories applied in previous research frameworks for IC reporting. The number of IC categories varies between one and six with different labels. For this analysis, 22 research frameworks for IC reporting are investigated which follow the three major strands of research frameworks by Guthrie and Petty (2000), Bontis (2003) and Bukh et al. (2005).

6.2.2.2 Differences in labelling IC categories

One obvious disparity across prior research frameworks for IC reporting is that IC categories are labelled differently. Since Guthrie and Petty's (2000) early content analysis study, further studies use slightly different terminologies for IC categories. Nevertheless, prior studies coherently follow the same idea that IC is driven by organisational procedures, beneficial relations, and employee skills (Vandemaele et al., 2005; Guthrie et al., 2007; Striukova et al., 2008; Mangena et al., 2010). The overview of IC categories in prior research frameworks in Table 6.1 shows that different researchers use different labels for the same underlying concepts. However, disagreement remains about which categories best describe IC and how to distinguish among categories. Although the IC categories, SC, RC, and HC, are commonly accepted as high-level categories, alternative IC labels are used. While some studies name the aspect of favourable external relations 'relational capital' (Vergauwen et al., 2007; Li et al., 2008), some use the term 'external capital' (Brennan, 2001; Cerbioni & Parbonetti, 2007) or 'customer capital' (Bukh et al., 2005; Singh & Van der Zahn, 2008). Hence, the differences in labelling are obvious for the high-level IC categories in prior research frameworks.

6.2.2.3 Variations in the number of IC categories

Another disparity between prior research frameworks is that the number of IC categories varies between one and six. The overview in Table 6.1 shows that a combination of three categories dominates IC reporting research. Few studies consider IC itself as a comprehensive category without further sub-groupings (Bontis, 2003; Vergauwen & van Alem, 2005). While this approach may capture the overall gist of the IC concept, it may miss important components of IC reporting. Furthermore, this approach allows for fewer levels in the hierarchy because additional describing sub-categories are omitted. The approaches with one or four categories are not followed by many studies and are abandoned quickly (e.g. Brüggen et al., 2009). Frameworks with five or six high-level IC categories share the same foundation. Bukh et al. (2005) have developed a framework with employees,

customers, processes, technologies, strategy, plus research and development (R&D) as defining categories. This framework is applied by García-Meca et al. (2005) and later slightly redesigned by García-Meca and Martinez (2007). In the modified version, processes and technologies are aggregated to one category, named organization, without explaining the reason for restructuring the research framework. Compared to other studies, the same overall concept of IC, consisting of structures, relations and humans, is reflected in these categories.

6.2.2.4 Tendency to a common terminology for IC categories

The overview of IC categories in prior research frameworks in Table 6.1 also reveals that a tendency towards a common terminology is apparent among later papers. The predominantly adapted categories are named structural, relational, and human capital (e.g. Campbell & Rahman, 2010; Mangena et al., 2010; Hidalgo et al., 2011). More recent studies have classified IC as SC, RC, and HC rather than employee competencies, internal or external capital (Brennan, 2001; Guthrie & Petty, 2000). Although Brüggen et al. (2009) added an additional category for general IC in their research framework, they used the same labels for the remaining categories: SC, RC, and HC. This gradual trend to a consistent terminology of IC categories has two main advantages for IC reporting research. First, these prominent labels describe more distinctly what IC comprises, namely structures, relations and humans. Hence, the common terminology may support clarity in IC reporting research. Second, this uniform denotation may help to shape commonly shared perceptions of IC. As the terms SC, RC, and HC have been established as a common terminology, these terms are used in this study for high-level IC categories.

6.2.2.5 Views on 'strategy' as IC category

The overview of prior research frameworks in Table 6.1 shows different views across research frameworks regarding 'strategy' as a separate IC category. The aspect of strategy as an IC category is advocated by some studies but not included in other research frameworks for IC reporting. Whether 'strategy' represents an IC category

remains a controversial issue. ‘Strategy’ is considered as an IC category in the approach by Bukh et al. (2005) and studies based on their framework (García-Meca & Martínez, 2007; Singh & Van der Zahn, 2008). The category ‘strategy’ broadly covers strategic statements about investments in new business opportunities and to position the company in its environment. Devoting a separate high-level IC category to strategic issues highlights how important these researchers conceive strategy in the concept of IC. Other studies have not reacted to this statement of ‘strategy’ as a separate IC category. Strategy has been mostly neglected in studies with fewer IC categories. It has been omitted and it has not been discussed in comprehensive IC reporting reviews, such as by Beattie and Thomson (2007) or Guthrie et al. (2012). Hence, the significance of ‘strategy’ for IC reporting studies is unclear.

6.2.3 Comparison of lower-level IC components in research frameworks

6.2.3.1 Synopsis of IC components in research frameworks

The comparison of high-level IC categories in section 6.2.2 shows that prior research frameworks for IC reporting studies use different high-level categories to outline their definitions of IC. However, the review of high-level IC categories offers no answer for a parsimonious design of research frameworks for IC reporting. An investigation of lower-level IC components may allow drawing more advanced conclusions. A comprehensive comparison of lower-level IC components in Table 6.2 shows which components are considered in content analysis studies of IC reporting. The frequency of using certain lower-level IC components across research frameworks provides a ranking which IC components are more widely-used than others in prior IC reporting studies. Several inconsistencies become apparent for lower-level IC components in the review of the selected 22 prior IC research frameworks. These inconsistencies add a degree of complexity to IC reporting investigations. Four major aspects arise from this comparison of lower-level IC components: the concentration on some widely-used IC components, differences in hierarchical levels, classification differences, and the use of synonyms to label IC components. These aspects are separately discussed in the following sections.

Table 6.2 Synopsis of lower-level IC components

Panel A: Structural Capital

Lower-level IC components	Occurrence across 22 prior studies	Synonyms across prior 22 studies	Alternative classification compared to SC
Corporate culture	21	Organisational culture	Organizational, Strategy
Information systems	18	Knowledge-based infrastructure	IC
Networking systems	17	(Tele-)Communication systems	Organizational
Intellectual property	16		IC
Management process	14	Process	
Management philosophy	11		
Infrastructure	10	Infrastructure assets/capability	
Patents	10		Innovation, Customers
Research projects	10	Research and development	Innovation/R&D
Financial relations	9	Financial dealings, strategy	Relational Capital
Technological processes	9	Technology, IT systems	Organizational, IT
Organisational learning	8	Corporate learning	IC
Knowledge sharing	7	Data interchange	IC, Processes
Organisational structure	7		Organizational, Strategy
Trademarks	7		Strategy
Copyrights	6		
Efforts in working environment	5	Remuneration procedures	Organization/Processes
Management quality	5	Management focus	IC, Human
Product development	5	Product design, New Products	Innovation, Strategy
Business Knowledge	4		IC, General IC
Corporate university	4		IC
Economic Value Added	4	Value Added	IC, General IC
Innovation	4		
Intellectual assets	4	Knowledge/soft assets, stock	IC, General IC
Intellectual capital	4		IC, General IC
Intellectual resources	4	Knowledge resources, material	IC, General IC
Quality improvement	4	Product quality	
Quality management	4	Quality performance	Relational, Strategy
Customer support function	3		
Knowledge management	3		IC
Organisational flexibility	3	Organisational adaptability	
Production technology	3		Strategy, Technology
Structural capital	3		IC
Accreditations	2		
Business model	2		Organizational
Distribution network	2		Relational
Efficiency	2		Organizational
Leadership	2		Strategy
New product success rate	2	New product revenue	Innovation/R&D
Operating systems	2	Operation process	
Production rates	2	Productivity	Human
Methodologies	1		
Trade secrets	1		

Panel B: Relational Capital

Lower-level IC components	Occurrence across 22 prior studies	Synonyms across prior 22 studies	Alternative classification compared to RC
Business collaborations	18	Partnership, Strategic alliances	Strategy
Brands	17		Strategy
Customers	17		Customers
Distribution channels	13		
Company reputation	10	Company image	IC, Strategy
Licensing agreements	10		
Customer involvement	9	Customer knowledge/engagement	
Market presence	9	share, leadership, intensity	Strategy
Franchising agreements	8		
Customer loyalty	7		
Favourable contracts	7		
Research collaborations	7		Structural Capital
Company names	6	Client profile, names	
Customer relationships	6		Customers
Customer satisfaction	6		
Customer training and education	6		Customers
Financial contacts	6		Structural Capital
Relationships with suppliers	6	Network of suppliers	Strategy
Distribution network	5	Network of distributors	Structural, Strategy
Public relations	5	External communication	
Competitive intelligence	4		IC, General IC
Customer capital	4		IC
Marketing	4		Strategy
Supplier knowledge	4		IC
CSR activities	3		Strategy
Customer retention	3	Customer turnover, recognition	
Quality standards	3		Structural
Relational capital	3		IC
Relationships with stakeholders	3		
Business agreements	2		
Company awards	2		
Diffusion and networking	2		
Brand development	1		
Brand recognition	1		
Competition	1	Competitors	
Customer acquisition	1		
Customer base	1		
Joint Venture	1		
Market channels	1		
Supply chain	1		

Panel C: Human Capital

Lower-level IC components	Occurrence across 22 prior studies	Synonyms across prior 22 studies	Alternative classification compared to HC
Education	16		
Work-related knowledge	16	Intelligence, brain power	IC
Training	13	Training programme/policy	
Know how	12		IC
Work-related competencies	11		
Employees	10	Personnel	
Vocational qualification	10		
Employee value	9	Value added, Human value	IC, R&D
Development	8	Career development	
Diversity	8	Cultural diversity	IC, Structural
Expert teams	8	Specialist, Teamwork	IC
Number of employees	8	Staff profile	
Age	7		
Professional experience	7	Abilities/Capabilities	
Skills	7	Experience	IC
Commitment/ attitudes/ behaviour	6		
Employee benefits	6	Pensions	
Employee productivity	6		IC
Entrepreneurial spirit	6		
Compensation plans	5	Remuneration systems	
Expertise	5		IC
Recruitment policy	5		
Career opportunities	4		
Employee retention	4	Staff turnover	
Equality	4	Employee equity issues	
Expert network	4		IC, Structural
Human capital	4		IC
Human resources	4	Human assets	IC
Involvement with community	4		Strategy
Job rotation opportunities	4		
Motivation	4		
Employees featured in annual report	3	Other employee features	
Flexibility	3	Flexitime	
Relationship	3	Communicative activities	
Employee share and option plans	2		
Empowerment	2	Taking responsibility	
Innovation	2	Innovativeness	Structural
Union activity	2		
Satisfaction	1		

Notes

These tables show a comparison of lower-level IC components applied in 22 prior research frameworks for IC reporting for SC (Panel A), RC (Panel B), and HC (Panel C). The components are ranked according to their occurrences in the 22 frameworks.

6.2.3.2 Concentration on widely-used IC components

The synopsis of IC components in Table 6.2 shows that some components are widely used while certain components are only referred to in individual studies. For example, 'methodologies' as SC item is only mentioned by Vergauwen et al. (2007) without explaining what this item contains. Beattie and Thomson (2004) compare lower-level IC components of 32 studies in a similar way with a slightly different order of frequencies and a long list of singly named items. IC reporting studies have lately developed as combinations and modifications of prior studies. Therefore, a concentration towards some more prominent IC components is recognisable in the review for this study. Corporate or organisational culture, for example, is referred to as IC item in all but one of the 22 research frameworks reviewed in this study. The few widely-used IC components can be argued to represent more important IC components in IC reporting research compared to IC components which are rarely included in prior research frameworks. These widely-used IC components give an indication for this study to investigate how to design a research framework for IC reporting parsimoniously.

6.2.3.3 Different hierarchies in lower-level IC components

Differently defined hierarchical levels within lower-level IC components are one main issue in the overview of IC components in prior research frameworks for IC reporting in Table 6.2. Lower-level IC components across different studies seem to outline either IC items with descriptions, a list of indicators or mixtures of both. Components which may be used as high-level IC categories in the research framework of one study, may serve as lower-level components in other studies. For example, Bontis (2003) represents an extreme case with only one hierarchical level including SC, RC, and HC as lower-level IC components. These forms of capital represent IC categories on a separate level in studies based on Guthrie and Petty (2000). On the other hand, Bukh et al. (2005) include many IC-related items as lower-level components which are seen to represent IC indicators for lower-level IC components by Campbell and Rahman (2010).

Additional sub-groupings within high-level IC categories also pertain to the problem of different hierarchical levels. As some sub-categories are interrelated, they form sub-groups in several studies whereas they are considered separately in other research frameworks for IC reporting in previous studies. The IC item 'intellectual property' illustrates this issue. On the one hand, 'intellectual property' represents an umbrella term for patents, copyrights and trademarks in studies by Guthrie et al. (2007) and Mangena et al. (2010) among others. On the other hand, 'intellectual property', 'patents', 'copyrights' and 'trademarks' are considered as separate categories of equal value (e.g. Guthrie & Petty, 2000; Vergauwen et al., 2007). This may seem like a pedantic differentiation between hierarchical levels but the results of IC reporting studies may differ. The reporting scores for 'intellectual property' may show the accumulated scores for summarised sub-categories in one study or the absolute scores for the individual term in another study. The partial use of sub-groupings adds complexity to hierarchical levels within research frameworks for IC reporting.

6.2.3.4 Varying classifications of IC components

The third apparent issue in the comparison of lower-level IC components lies in varying category classifications of IC components, shown in the last column of Table 6.2 named alternative classification. While some IC components are allocated to a certain category in one study, they are classified differently in other studies. One example is that Guthrie and Petty (2000), Lee and Guthrie (2010) among others assign 'financial relations' to SC while these are attributed to RC by, for example, Bozzolan et al. (2003) and Vandemaele et al. (2005). This issue refers to the overall problem of defining IC and setting boundaries, as reviewed in chapter 2. Appropriate boundaries are difficult to define between IC categories. Mouritsen (2009) highlights contentious points at the boundaries between categories. Employee training on technology systems, for example, could be categorised as either HC or SC. Furthermore, he argues that interactions between IC items make it difficult to attribute individual items to certain categories. This may partly explain how different

classifications have developed and how they continue to coexist. The varying classifications can be justified by taking different perspectives of each IC item and its contribution to SC, RC, and HC.

6.2.3.5 Different labels for IC components

The fourth matter regarding the use of IC components across IC reporting studies, shown in Table 6.2, are synonymous terms for labelling IC components. As research frameworks for IC reporting often lack a definition of IC components, it is not obvious whether various research frameworks with related words refer to different IC items. Alternatively, these research frameworks could simply use different terms for actually analysing the same IC components. Studies based on Guthrie and Petty (2000) refer to 'business collaborations', for example, while frameworks based on Bukh et al. (2005) mention 'strategic alliances'. It is unclear whether they would consider the same IC items under these components. The problem of synonyms can be overcome by descriptions or explanations of IC sub-categories, as provided by Guthrie et al. (2007). A similar approach is taken by Li et al. (2008). They outline each IC item in the research framework with brief definitions and examples. Beattie and Thomson (2007) present examples for the nature of information which conceptualises IC components. The approach of examples and explanations supports a common understanding of IC components even if they are labelled differently.

6.2.4 IC sub-groupings as suggested solution for disparities

A possible solution may be to group IC components into sub-groups with more flexibility to circumvent the issues of diverse hierarchical levels, different classifications and synonyms. Abeysekera and Guthrie (2005) form sub-groups to simultaneously incorporate different terms and items. In doing so, they have a relatively small number of lower-level IC components serving as umbrella terms for additional related IC items. Supplementary IC items within each sub-group provide guidance and explanations of what different sub-groupings comprise without limiting the content analysis to very specific terms. In this regard, Beattie and Thomson

(2007) advise to separate indicators from sub-groups to structure IC categories more clearly. Campbell and Rahman (2010) effectively use structured IC sub-groupings. They provide explanations of key concepts and a list of indicators for each sub-group. Their well-ordered approach accounts for different hierarchical components and clarifies what is considered as IC information in their analysis.

6.2.5 Framing the research question

The review of research frameworks for IC reporting in sections 6.2.2 and 6.2.3 has identified several inconsistencies across content analysis studies of IC reporting. These inconsistencies lead to the question whether research frameworks for IC reporting can be designed parsimoniously to avoid complex structures for an IC content analysis. Furthermore, the differences in the research frameworks raise the issue of comparability of prior studies as inconsistencies may hamper conclusions to be drawn across prior IC reporting studies. As a certain degree of subjectivity is inherent in content analysis studies (Krippendorff, 2004), the question arises whether different research frameworks increase subjective aspects and make IC reporting studies incomparable. Due to the variety of approaches for IC content analyses, the comparability of previous studies has been questioned in the IC reporting literature (Beattie & Thomson, 2007). Divergence in prior research frameworks for IC reporting may even result in effectively analysing different areas of IC reporting. Additionally, adjustments in the research frameworks to investigate different research settings are advocated without further explanations (Guthrie & Petty, 2000). The variations across previous research frameworks and a lack of guidance for adjustments for new research settings create an unclear situation for following researchers.

If all possible lower-level IC components need to be considered to enable comparisons between prior content analysis studies of IC reporting, research frameworks for IC reporting became very detailed and lengthy. Consequently, the coding process would become very tedious and prone to errors. The question arises whether an agglomeration of previously suggested IC components is needed to

develop a suitable research framework for a content analysis of IC reporting. Alternatively, focusing on a limited number of selected IC components may provide reasonable insights into IC reporting practices for each category, SC, RC, and HC. The comparison of lower-level IC components shows a concentration on few widely-used IC components in section 6.2.3.2. This concentration gives an indication which IC components may be more important to be included in research frameworks for IC reporting. An analysis of IC reporting based on a full research framework compared to only few widely-used IC components allows investigating whether the widely-used components are sufficient to capture corporate IC reporting. This analysis may facilitate less complex approaches to develop research frameworks for IC reporting in a parsimonious design. Moreover, the findings will shed light on whether the differences in prior IC reporting studies hamper comparisons.

6.3 Research methods

6.3.1 Sample of German companies

The sample for this study comprises annual reports, particularly management reports, for the accounting year 2010 of 428 companies listed on the German stock exchange on 30/12/2010, as outlined in chapter 4. Germany offers a unique research setting because a mandatory management report, as a separate section of the annual report, partly requires and partly recommends IC information. The management report provides additional information on the corporate value creation process from a management's perspective, mainly in narrative form. The guidelines for publishing the management report, GAS 15 (GASC, 2010a), contain requirements and recommendations related to IC, as outlined in chapter 3. Therefore, a sample of German companies seems appropriate to approach the question of how to construct a research framework for a content analysis of IC reporting. The companies are grouped into four industry groups: consumer, finance, pharmaceutical & technology, and industrial. The industry grouping based on business models is important as companies in the same industry group may focus on similar IC components, as discussed in chapter 4.

6.3.2 German language characteristics

The IC reporting narratives are analysed in German as the original language version. All companies in the sample are required to publish their annual reports in German. Distinctive features of the German language are compound words where several nouns can be linked together to a single term. For example, the word ‘training’ on its own cannot be allocated to a particular IC category with certainty. ‘Training’ may refer to ‘software training’ as SC, ‘customer training’ as relational capital, or ‘employee training’ as HC. In German these terms translate as compound words ‘Softwareschulung’, ‘Kundenschulung’, and ‘Mitarbeiterschulung’. The contraction to compound words adds information inherent in a single word about the context of the respective ‘training’. This property of the German language allows using words as coding units considering their context sensitivity for IC coding. The language-dependent situation ensures a relatively high level of reliability for correct coding within the IC context as the compound words show the context for the items under review.

6.3.3 Content analysis

6.3.3.1 Coding words with repetition

The underlying concept of the content analysis method is that researchers can draw inferences from narratives by coding text units (Weber, 1985; Krippendorff, 2004). This study follows the idea that a company refers more often to those IC components which it considers to be more important. Therefore, repetitions are considered to count equally to first-time references to provide more detailed information about which IC items companies value most, similar to studies such as Guthrie and Petty (2000) or Bontis (2003). An approach where the same score is achieved whether a component is mentioned only once or several times may be too simplistic, as is also criticised by Beattie and Thomson (2007). Some studies, such as Bozzolan et al. (2003) or Brennan (2001), weight the IC scores for qualitative or quantitative information on IC. As prior literature found that quantitative IC information is rarely provided, quantitative IC information is not investigated in this study. This study

focuses only on narrative information. For graphs and tables only IC-related words in the narrative information are considered. As occurrences count with repetitions, the IC reporting scores are a sum of words that refer to IC components. The IC reporting scores are then scaled by the number of pages or by total words to account for differences in reporting length.

6.3.3.2 Software-aided coding

A computer-aided analysis is conducted because it enables processing high volumes of narratives at a high level of consistency, as argued by Krippendorff (2004). This study analyses a sample of 428 company documents. Therefore, utilising the advantage of a software-aided analysis to process high volumes of narratives is essential for this study. To conduct the content analysis of IC reporting, this study uses the text analysis software *atlas.ti*. In order to ensure that coded units actually refer to IC, previous studies on IC reporting preferred manual coding over software-aided coding to account for the context sensitivity of IC (Beattie & Thomson, 2007). However, the use of content analysis software can be justified for this study since in the German language composite words are commonly used with an inherent indication of their context, as outlined in section 6.3.2. The characteristics of German compound words, to bear contextual meaning, enable software-aided coding on the word level within the IC context.

6.3.3.3 Test for reliability of reporting scores

Reliability is central to a content analysis, as inferring from the text is a subjective process (Krippendorff, 2004; Weber, 1985). To measure reliability, Krippendorff's alpha[9] is applied in this study, as it is commonly used in IC reporting studies, such as Bozzolan et al. (2003). Milne and Adler (1999) see the acceptable level of Krippendorff's alpha to be above 0.75, whereas Krippendorff (2004) himself argues that only values above 0.80 indicate reliability. Therefore, values of Krippendorff's

[9] The calculation of Krippendorff's alpha follows the measure defined by Krippendorff (2004): Krippendorff's $\alpha = 1 - \frac{D_o}{D_e}$, where D_o = observed disagreement and D_e = expected disagreement

alpha above 0.80 are targeted for this study. Reliability of content analysis has different aspects: stability over time, reproducibility across coders and accuracy according to a standard norm (Weber, 1985; Krippendorff, 2004). As no standard norm for IC reporting exists, accuracy cannot be required. To control for stability, two management reports were coded at different points in time by the same coder with Krippendorff's alpha being 0.949. To test reproducibility, four management reports, chosen from different industries and sizes, were coded independently by an outside coder with no IC background, based on clear coding instructions. This test of reproducibility resulted in a value of 0.896 for Krippendorff's alpha. These values of Krippendorff's alpha suggest that the coding procedures and coding instructions are reliable as they support stable and reproducible coding results.

After ensuring stability and reproducibility of the coding instructions, electronic codes were written for the software-aided content analysis. A software-aided content analysis increases the degree of coding reliability and continuity, as argued by Krippendorff (2004). Reliability of the coding process is particularly important for software-aided coding as the researcher needs to be able to rely on the software results for further investigations. To ensure reliability of the IC reporting scores, the software results were compared with manual coding scores for eight management reports, chosen from different sizes and industries. After the first comparison, particularly reporting scores for RC showed differences between electronic and manual coding. Therefore, the researcher gradually changed the codes and double-checked for consistency. Krippendorff's alpha improved from 0.791 to 0.857, which was considered to be reasonable.

6.3.3.4 Summary of content analysis procedures

To ensure transparency of the content analysis, Table 6.3 summarises the procedures applied in this study as outlined in sections 6.3.3.1 to 6.3.3.3. Beattie and Thomson (2007) discuss which aspects of the content analysis procedures are important to be explained. They consider for the procedures of the content analysis: unit of analysis and measurement, volume, location and type of disclosure, searching approach and

checks for coding reliability. The summary table of the content analysis procedures applied in this study is categorised according to the considerations by Beattie and Thomson (2007) for designing the content analysis procedures. Additionally, the language of disclosure is mentioned in this overview as it plays a major role for the content analysis of IC reporting in this study, as outlined in section 6.3.2. Furthermore, the coding device is explicitly stated in the summary because manual coding has been preferred over software-aided coding in prior studies, as described in section 6.3.3.2.

Table 6.3 Summary of content analysis procedures applied in this study

Considerations	Procedures applied in this study
Unit of analysis and measurement	Words are coded and counted as IC disclosure units
	Only narrative information is counted, non-narrative disclosure is not considered
	Headings and highlighted text are considered to be equivalent to standard text
Volume of disclosure	Count of occurrences with repetitions
	Scaled by pages or total words to account for document length
Type of disclosure	Quantitative and qualitative information are not distinguished
	Intellectual assets and liabilities are not distinguished
	For graphs and tables only narrative information is considered as IC words appear
Location of disclosure	Section of annual reports headed "Management Report"
	No further consideration of location within management report
Language of disclosure	German as original language for the sample of German companies
	German compound words carry inherent context meaning
Coding device	Software-aided coding, using *atlas.ti*
Reliability checks	Krippendorff's alpha calculated to measure reliability
	2 management reports coded at different points in time to ensure stability; Krippendorff's α=0.949
	4 management reports coded by independent coder for reproducibility; Krippendorff's α=0.896
	Electronic codes double-checked with manual coding of 8 management reports to improve codes, Krippendorff's alpha improved from Krippendorff's α=0.791 to Krippendorff's α=0.857

Notes

This table shows a summary of the procedures of the content analysis approach of IC reporting applied in this study. The categories to describe the content analysis procedures are based on the considerations by Beattie and Thomson (2007) for designing a content analysis.

6.3.4 Pilot study to develop a research framework for German setting

The literature review in sections 6.2.1 to 6.2.3 reveals inconsistencies across the prior IC research frameworks. Different views how to group IC components and which components to include cause differences in prior studies. Additionally, different reporting environments require adjustments of research frameworks to country-specific or language issues. To develop a suitable IC research framework for this study, a pilot study is necessary for two reasons. First, an initial study of a small sample enables exploring the German setting where IC reporting has hardly been investigated and IC reporting practices are not well-known, as outlined in chapter 3. As prior literature has not suggested how to adjust the research framework for IC reporting to a new research setting, reviewed in section 6.2.1, the pilot study constitutes a way to do so. Second, prior research frameworks provide guidance rather than a clear structure. Therefore, a pilot study facilitates the development of a research framework based on actual reporting practices under review and at the same time being guided by the concepts of international approaches to IC content analysis.

For the pilot study, ten companies are chosen from different industries and sizes from the total sample. Full annual reports are investigated and manually coded to explore overall IC reporting practices of German companies for different reporting sections. The content analysis is grounded in actual reporting, keeping in mind the concepts and categories of IC suggested in prior literature. In the preliminary stage, two management reports were independently investigated by an experienced coder without IC research background and without providing an IC research framework. This initial examination allowed testing for a common understanding of the IC concept. Similar coding results showed that this grounded approach seems feasible. In this process, the question of intellectual liabilities arose and was discussed. As only a limited number of IC reporting studies have considered intellectual liabilities (e.g. Abeysekera & Guthrie, 2005), this consideration raises comparability issues. Furthermore, corporate descriptions hardly allow a clear classification of intellectual liabilities. Therefore, this study does not distinguish intellectual liabilities.

6.3.5 Correlation analysis of IC components

6.3.5.1 Correlation analysis for a parsimonious research framework

A correlation analysis is conducted for different numbers of IC components to examine the research question of this study, how an IC research framework can be designed parsimoniously. To prepare the correlation analysis three steps are taken: develop a full research framework in the pilot study described in section 6.3.4, complete the content analysis for the full framework plus individual IC components, and accumulate widely-used IC components to investigation units. For this study, investigation units are the gradually added most widely-used components of SC, RC, and HC. The ranking of IC components from prior research frameworks, as discussed in section 6.2.3 and presented in Table 6.2, serves as basis for composing the investigation units. For each IC category, this study considers IC components which have been used by at least 10 out of 22 prior studies because they seem to be regarded as important components by a wide range of researchers. This distinction provides a list of nine components for SC, six components for RC, and seven components for HC. The investigation units are presented in Table 6.4.

First, the full research framework for the content analysis is developed in a pilot study, described in section 6.3.4. This research framework represents a full checklist of IC components for a content analysis of corporate IC reporting in Germany. The full research framework differentiates between the three IC categories: SC, RC, and HC. Second, this full research framework is applied in a content analysis. To obtain a differentiation of reporting scores, the content analysis is completed with individual codes for widely-used IC components and for total SC, RC, and HC. Finally, the investigation units are analysed in the correlation analysis. Additionally, the scores for total SC, total RC, and total HC reporting from the full research framework are considered. This approach enables comparing IC reporting on individual widely-used IC components with the full research framework. For the investigation units, the reporting scores are accumulated from the content analysis of the individual IC components. The reporting scores for the investigation units are correlated to investigate whether additional IC components add information about IC reporting.

Table 6.4 Investigation units for correlation analysis of IC components

Panel A: Investigation units for structural capital

Rank	Most widely-used components	Investigation units	
1	Corporate culture	SC1	1
2	Information systems	SC2	1+2
3	Networking systems	SC3	1+2+3
4	Intellectual property	SC4	1+2+3+4
5	Management process	SC5	1+2+3+4+5
6	Management philosophy	SC6	1+2+3+4+5+6
7	Infrastructure	SC7	1+2+3+4+5+6+7
8	Patents	SC8	1+2+3+4+5+6+7+8
9	Research projects	SC9	1+2+3+4+5+6+7+8+9

Panel B: Investigation units for relational capital

Rank	Most widely-used components	Investigation units	
1	Business collaborations	RC1	1
2	Brands	RC2	1+2
3	Customers	RC3	1+2+3
4	Distribution channels	RC4	1+2+3+4
5	Company reputation	RC5	1+2+3+4+5
6	Licensing agreements	RC6	1+2+3+4+5+6

Panel C: Investigation units for human capital

Rank	Most widely-used components	Investigation units	
1	Education	HC1	1
2	Work-related knowledge	HC2	1+2
3	Training	HC3	1+2+3
4	Know how	HC4	1+2+3+4
5	Work-related competencies	HC5	1+2+3+4+5
6	Employees	HC6	1+2+3+4+5+6
7	Vocational qualification	HC7	1+2+3+4+5+6+7

Notes

These tables show investigation units for the correlation analysis for parsimony by IC categories: SC (Panel A), RC (Panel B), and HC (Panel C). The IC components to be included in the investigation units are chosen form the ranking of IC components in prior studies as shown in Table 6.2. The components used by at least 10 out of 22 previous research frameworks for IC reporting are selected. A content analysis is conducted for the individual IC components. The reporting scores from the content analysis on the individual IC components are gradually accumulated for the investigation units.

The correlation coefficients of the investigation units with different numbers of IC components indicate how a research framework for IC reporting can be designed parsimoniously. To discover whether all lower-level IC components are essential for the content analysis results, the reporting scores for the investigation units and the total SC, total RC, and total HC scores are tested for correlation for each IC category. Pearson and Spearman correlations of the investigation units provide an indication of how important it is for each IC category to include additional components. Correlation values above 0.70 are generally considered as highly correlated. Hence, if the investigation units show a significant correlation above 0.70 to total SC, total RC, or total HC scores, the IC reporting can be assumed to be very similar for the remaining components. This means that the ranking of corporate IC reporting and the relative reporting scores are unlikely to change if additional IC components are included in the research framework for IC reporting.

6.3.5.2 Correlation analysis for comparability of prior studies

To investigate the comparability of prior research frameworks, different previous frameworks are selected and applied to the German dataset. For this analysis, the focus is on the widely-used IC components, as presented in the first two columns of Table 6.4 in section 6.3.5.1. This focus on widely-used IC components follows one of the main arguments of this study that the widely-used IC components are sufficient to capture corporate IC reporting, as outlined in section 6.2.5. Prior research frameworks are chosen for this analysis in order to represent a variety of applied widely-used IC components. The selection of studies and the respectively applied widely-used IC components are shown in Table 6.5 for SC, RC, and HC. The research framework by Vergauwen et al. (2007) serves as basis for comparisons because all widely-used components for SC, RC, and HC are included in this framework. For each category, five additional studies are selected to investigate whether different components result in varying reporting scores. The selected studies to be compared to the base framework are: Guthrie et al. (2007), Mangena et al. (2010), Beattie and Thomson (2007), Bukh et al. (2005), Brüggen et al. (2009), García-Meca and Martinez (2007), and Striukova et al. (2008).

Table 6.5 Applied widely-used IC components in selected prior studies

Panel A: Applied widely-used SC components in selected prior studies

	Widely-used SC components								
Selected prior studies	Corporate culture	Information systems	Networking systems	Intellectual property	Management process	Management philosophy	Infrastructure	Patents	Research projects
Vergauwen et al. (2007)	x	x	x	x	x	x	x	x	x
Guthrie et al. (2007)	x	x	x	x	x	x			
Mangena et al. (2010)	x		x	x	x	x	x		
Beattie & Thomson (2007)	x		x		x	x	x		
Bukh et al. (2005)	x	x	x					x	x
Brüggen et al. (2009)	x	x		x					

Panel B: Applied widely-used RC components in selected prior studies

	Widely-used RC components					
Selected prior studies	Business collaborations	Brands	Customers	Distribution channels	Company reputation	Licensing agreements
Vergauwen et al. (2007)	x	x	x	x	x	x
Guthrie et al. (2007)	x	x	x	x		x
Mangena et al. (2010)	x	x	x	x	x	
García-Meca & Martinez (2007)	x		x			x
Bukh et al. (2005)	x	x			x	x
Brüggen et al. (2009)					x	

Panel C: Applied widely-used HC components in selected prior studies

	Widely-used HC components						
Selected prior studies	Education	Work-related knowledge	Training	Know how	Work-related competencies	Employees	Vocational qualification
Vergauwen et al. (2007)	x	x	x	x	x	x	x
Guthrie et al. (2007)	x	x	x			x	
Striukova et al. (2008)	x	x	x			x	x
Mangena et al. (2010)	x	x	x	x	x		x
Bukh et al. (2005)	x		x		x		
Brüggen et al. (2009)		x		x			

Notes

These tables show widely-used IC components applied in selected prior studies by categories: SC (Panel A), RC (Panel B), and HC (Panel C). The studies are selected to examine different widely-used IC components in prior research frameworks.

The selected research frameworks from prior studies provide different compositions of widely-used IC components for SC, RC, and HC. These various compositions of widely-used IC components are applied to the dataset of 428 German companies for the accounting year 2010 for this study. Applying different sets of components from prior studies to the same dataset allows investigating whether differences in prior research frameworks cause incomparability of results for IC reporting scores. The content analysis for the individual most widely-used IC components, as outlined in section 6.3.5.1, provides the reporting scores for the German sample. To investigate prior research frameworks for comparability, the reporting scores are tested for correlation of different compositions of IC components from the selected prior studies. The results of this correlation analysis indicate how far reporting scores diverge if they are based on different prior research frameworks for IC reporting.

6.4 Pilot study to develop a research framework for IC reporting

6.4.1 Developing a research framework for IC reporting

6.4.1.1 Approaching IC reporting in Germany

The pilot study is grounded in actual reporting practices to develop an unbiased research framework considering country and language characteristics for the German setting, as outlined in section 6.3.4. The content analysis for the pilot study is guided by the overall concept of IC which has emerged from prior literature, as discussed in chapter 2. Accordingly, IC reporting refers to intangible resources which contribute to a competitive edge categorised as SC, RC, and HC. This categorisation is chosen to respond to the tendency of using SC, RC, and HC as common labels, discussed in section 6.2.2.4. The pilot coding process provided a long list of IC items which are referred to by the ten companies from the pilot sample. The resulting list is shown in the Appendix of this thesis. However, a lengthy list of specific terms describing IC items may not be feasible. These terms may represent different reporting nuances as indicators or main components of IC. To facilitate a wider content analysis of the total sample, the list of IC items identified in the pilot study requires a clear structure. Therefore, a research framework is developed from the pilot study findings.

6.4.1.2 IC research framework developed from pilot study findings

Prior literature suggests sub-groups to differentiate between categories, concepts and indicators, as outlined in section 6.2.4. IC sub-groups allow considering more items within each category. Therefore, this approach can incorporate previously used items within a neatly arranged and straightforward framework. To develop a feasible structure, the IC items are sub-grouped based on IC research frameworks used in the major strands of prior IC literature and the results of actual reporting. For each category, SC, RC, and HC, six main sub-groups are defined with descriptions and indicators. The sub-groups are based on the contextual relations of the list of components found in the pilot study, as can be seen in the Appendix of this thesis. Table 6.6 shows the IC categories with sub-groupings in the research framework of this study. The sub-groups are similar to Campbell and Rahman's (2010) approach but some components are more strongly emphasised in separate new sub-groups as the IC items found in the pilot study showed that German companies report strongly on certain specific IC components. These separate new IC sub-groups are: product performance, research activities, market positioning, and human resources policies.

6.4.1.3 Pilot study findings on 'strategy' within the IC research framework

Regarding the issue of 'strategy' as IC category, the pilot study indicates that certain strategic issues are related to IC, as can be seen in the Appendix of this thesis. However, it remains questionable whether to include 'strategy' as a separate IC category or to consider it within a sub-group. Generally, 'strategy' explains the need for IC items by linking IC to the corporate business model. When the pilot companies relate strategic issues to IC, they seem to justify the development of IC items. Examples for strategy-related IC items found in the pilot study are: strategic orientation, strategic alliances, strategic acquisitions, strategic partners and brand strategy. These strategic considerations can serve as indicators for IC across categories. Therefore, this study argues that strategy represents a link between IC and value creation rather than constituting a separate category. Therefore, strategy-related IC components are included as indicators within respective sub-groups.

Table 6.6 Research framework for content analysis of IC reporting in this study

Panel A: Structural Capital

IC sub-grouping	Description	Indicators
Intellectual assets	A company's intangible assets both recognised on the balance sheet and unrecognised	intellectual property patents trademarks, copyrights, domains intangibles, goodwill royalty business, licences, franchising etc.
Processes	Processes, procedures, routines and workflows to run the company as a going concern	management processes, workflows controlling and monitoring accounting and auditing process strategic planning risk management restructuring capacity utilisation etc.
Systems	Systems and technologies developed or used by the company	information system, IT systems planning and control system early risk detection system KPI and reporting system software development etc.
Philosophy and communication	A company's attitude and structure to organise everyday business and information flows	corporate culture; management practice guideline, principles, internal regulation organisational structure know how transfer interconnections and networking communication policy information management etc.
Research activities	A company's activities and facilities in the area of R&D	R&D projects and activities research facilities and resources R&D results and performance R&D report and budget research pipeline, drug pipeline etc.
Product performance	Activities to develop marketable, new and innovative products and to monitor quality standards	product development and improvement product range, launch, pipeline innovation and creativity quality management and precision design, functionality, durability etc.

Panel B: Relational Capital

IC sub-grouping	Description	Indicators
Customers	A company's efforts to develop a beneficial customer base and its engagement with its customers, patients and users	costumer relation management customer base, customer portfolio customer orientation and service customer acquisition and retention rate customer survey customer involvement and satisfaction value added per customer customer training etc.
Distribution network	Processes and activities to sell and distribute a company's products	distribution and sales channels branch network sales force and productivity logistical processes, infrastructure network of suppliers and distributors supply chain management etc.
Brand building	Activities to establish a company's brands and position them in the market	marketing and marketing resources unique selling point bestseller, trend setter, flagship brand awareness and image brand vision and philosophy brand strategy and portfolio etc.
Corporate image building	Activities to improve a company's image and reputation	public relations and investor relations corporate design and logo corporate image and reputation pioneer, specialist financial contacts and partners etc.
Business partnering	Relationships between a company and its business partners and universities	partnerships and co-operations joint ventures co-operation management co-operations with universities partner network etc.
Market positioning	A company's activities to identify and exploit market potential and to become a prevalent competitor in the market	market share, position, market leader strategic acquisition value added competitive position and advantage key markets, emerging market etc.

Panel C: Human Capital

IC sub-grouping	Description	Indicators
Education and vocational qualification	Level of education and professional qualification of the company's employees	apprenticeship, vocational training education quality graduates qualification profile etc.
Competencies	Range of work-related skills, knowledge and competencies that qualify employees as professional experts	know how, knowledge Skills, soft skills experience, expertise, expert teams team work, team spirit etc.
Training and development	A company's actions and facilities to support further education of its employees	training budget and hours training opportunities learning progress and objectives qualification measure etc.
Efforts related to working environment	A company's activities to safeguard a positive working environment	working safety and conditions absenteeism work life balance diversity equal opportunities, discrimination employee structure etc.
HR policies	A company's human resource strategy for recruitment and personnel development	recruitment policies junior employees, talent management personnel expenditure employer image career opportunities remuneration system etc.
Employee relations	Employees' attitudes towards their employer and a company's investigation in that area	employees employee loyalty employee involvement, enthusiasm employee meeting staff turnover, period of employment etc.

Notes

These tables show the research framework for IC reporting developed for this study from the findings of the pilot study, presented in the Appendix of this thesis. IC is categorised as SC (Panel A), RC (Panel B), and HC (Panel C). The IC components are sub-grouped with descriptions and indicators.

6.4.2 Pilot study results for German annual reports

6.4.2.1 Overview of pilot study results

The results of the pilot study show that German companies report on IC in all three categories. In this pilot study, IC reporting is considered for different locations within the annual reports scaled by number of pages in Table 6.7. The IC reporting scores scaled by total words give very similar results and are not shown here because the presentation scaled by page numbers is easier to follow than scaled by total words in small decimal numbers. IC information is presented in all sections of the annual report. A major part of IC information is provided within management reports and CEO letters. RC and HC are also often referred to in company overviews. Information on SC can also be found in the financial statements within the notes to the accounts. Other sections seem to rarely refer to IC.

6.4.2.2 Pilot study findings in management reports and CEO letters

The findings suggest that management reports are reasonable to investigate for this IC reporting study due to high reporting scores throughout the pilot sample for all IC categories. This implies that companies mainly outline IC in their management reports, as required by GAS 15 (GASC, 2010a). The reporting scores for CEO letters are volatile across the pilot companies. CEO letters show standard phrases, such as expressing thanks to employees and customers, rather than actual reporting on IC integrated into the business model. Therefore, CEO letters do not necessarily offer additional information compared to the management report. CEO letters may help to identify some important IC items for each company as the CEO highlights only few components which may be extraordinary for this company. However, this suggestion cannot be inferred from the findings of this pilot study but requires further investigations. Moreover, CEO letters are presented in different formats, such as interviews or comprehensive letters or they are not published at all. Further research would be required why different formats of CEO letters are chosen. An analysis of CEO letters may not provide comparable results across the sample. Therefore, the management report is the focus of the following analysis.

Table 6.7 IC reporting results of pilot study by location in annual reports

	Section of Annual Reports	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intellectual Capital	Total annual report	1.82	4.40	2.01	4.05	4.66	4.31	3.42	4.88	3.01	5.78
	CEO Letter	4.00	20.75	9.20	19.00	7.50	18.00	4.17	2.67	3.67	8.00
	Report of Supervisory Board	1.25	7.50	1.57	5.25	4.00	7.00	3.33	3.43	4.50	7.50
	Company Overview	1.00	4.58	3.59	6.75	5.46	5.98	2.52	2.83	3.25	4.44
	Management Report	5.20	8.62	2.66	7.77	7.10	8.25	8.79	8.66	4.00	15.50
	Financial Statement	1.01	1.71	0.91	1.91	2.31	1.48	1.32	1.66	2.53	2.69
	Other	1.17	1.00	2.15	2.31	2.77	0.68	3.86	0.57	0.67	1.17
Structural Capital	Total annual report	1.24	1.96	0.99	1.46	1.20	1.41	1.52	2.16	1.38	3.62
	CEO Letter	0.50	2.75	4.00	4.50	2.50	5.50	1.00	1.33	1.00	3.50
	Report of Supervisory Board	0.75	1.83	1.14	3.25	2.25	2.33	1.67	1.57	2.17	4.75
	Company Overview	0.48	1.50	1.18	1.50	2.10	1.00	1.00	1.08	0.55	1.81
	Management Report	3.43	4.92	1.43	2.54	0.38	3.42	3.71	3.79	2.05	10.20
	Financial Statement	0.81	1.09	0.56	1.11	1.04	0.75	0.96	0.83	1.42	1.92
	Other	0.50	0.29	0.69	0.62	0.92	0.21	0.86	0.29	0.33	0.50
Relational Capital	Total annual report	0.38	1.46	0.37	1.54	2.01	1.41	1.05	1.30	0.75	1.38
	CEO Letter	3.00	9.75	1.60	12.50	3.75	9.00	2.83	0.33	1.50	2.25
	Report of Supervisory Board	0.00	4.00	0.00	0.50	1.25	2.67	0.17	0.43	0.83	0.25
	Company Overview	0.48	2.42	0.82	3.97	1.92	1.78	0.59	0.92	0.70	1.75
	Management Report	1.14	1.92	0.57	2.35	3.58	3.00	2.86	2.48	1.16	4.30
	Financial Statement	0.10	0.28	0.05	0.25	0.83	0.34	0.21	0.23	0.55	0.27
	Other	0.50	0.14	0.85	1.54	1.46	0.16	2.71	0.14	0.08	0.50
Human Capital	Total annual report	0.20	0.99	0.65	1.06	1.45	1.49	0.84	1.43	0.88	0.78
	CEO Letter	0.50	8.25	3.60	2.00	1.25	3.50	0.33	1.00	1.17	2.25
	Report of Supervisory Board	0.50	1.67	0.43	1.50	0.50	2.00	1.50	1.43	1.50	2.50
	Company Overview	0.04	0.65	1.59	1.28	1.44	3.20	0.93	0.83	2.00	0.88
	Management Report	0.63	1.77	0.66	2.88	3.15	1.83	2.21	2.40	0.78	1.00
	Financial Statement	0.10	0.34	0.30	0.55	0.44	0.38	0.14	0.59	0.56	0.50
	Other	0.17	0.57	0.62	0.15	0.38	0.32	0.29	0.14	0.25	0.17

Notes

This table shows total IC reporting scores per page by IC categories for the ten pilot companies by location in the annual reports for the accounting year 2010. The reporting location is defined by different separable sections of the annual report. Columns (1) to (10) represent the ten sample companies of the pilot study.

6.5 Testing for parsimony and comparability

6.5.1 Content analysis results for the German sample

6.5.1.1 Descriptive results for total IC reporting by size

The software-aided content analysis is conducted for the management reports of the total sample, as outlined in section 6.3.3. The pilot study findings in section 6.4.2 show that management reports provide feasible insights into corporate IC reporting. Reporting scores are counted for total IC and the three categories SC, RC, and HC. Size panels, based on total assets, are analysed dividing the sample into three equal groups for small, medium-sized and large companies. The results for IC reporting scores by size panels are presented in Table 6.8. The IC reporting scores are scaled by page numbers of the management report. This means that the mean values indicate how many words on average refer to IC on each page. On average, 8.87 words on every page of the management report refer to IC. Results scaled by total words are similar and are not shown here. For all size panels, the reporting scores are highest for SC, followed by RC. For HC the reporting scores are lowest across the size panels, accounting for about one fifth of all IC.

The reporting scores for size panels show no strong pattern. While large companies have the highest average IC reporting scores with 9.11 words, medium-sized companies have the lowest average scores with 8.10. The IC reporting scores for small companies are higher than for medium-sized companies with 8.55. This result is unexpected as prior studies found a positive association between IC reporting and company size, as outlined in chapter 2. Because no pattern is obvious for the IC reporting scores across size panels, size is unlikely to affect the results of the correlation analysis. Additionally, prior literature suggested that industry is related to IC reporting. An analysis of IC reporting by industries is presented in chapter 7 in the analysis applying agency theory and legitimacy theory to IC reporting. The IC reporting by industry suggests a weak industry pattern. No strong associations seem to exist of IC reporting with company size and industry which are unlikely to affect the correlation analysis. However, to control for size and industry, additional investigations are conducted for the following correlation analysis in section 6.5.2.

Table 6.8 Descriptive results of IC content analysis by company size panels

		IC	Structural Capital	Relational Capital	Human Capital
Total sample	mean	8.87	3.82	3.28	1.78
N=428	% of IC		43.1%	36.9%	20.0%
	sd	3.55	1.65	1.80	0.81
	min	0.00	0.00	0.00	0.00
	max	30.96	12.33	15.98	6.06
Large companies	mean	9.11	3.64	3.39	2.08
N=142	% of IC		40.0%	37.2%	22.9%
	sd	3.35	1.26	1.83	0.85
	min	3.17	1.47	0.40	0.42
	max	28.82	7.84	15.00	5.98
Medium-sized companies	mean	8.10	3.40	2.93	1.76
N=143	% of IC		42.0%	36.3%	21.8%
	sd	3.59	1.69	1.69	0.87
	min	0.00	0.00	0.00	0.00
	max	21.22	11.92	9.00	4.33
Small companies	mean	8.55	3.61	3.25	1.68
N=143	% of IC		42.2%	38.1%	19.7%
	sd	3.33	1.62	1.71	0.88
	min	2.91	0.60	0.35	0.40
	max	20.92	9.75	10.00	5.00

Notes

This table shows descriptive results of the content analysis conducted on German management reports for the accounting year 2010 of a sample of 428 German companies grouped into 3 size panels. The size panels are grouped based on total assets as measure of company size. The findings represent occurrences per page of IC-related categories for IC, SC, RC, and HC for the total sample and size panels: small, medium-sized and large companies.

6.5.1.2 Role of widely-used IC components compared to total IC reporting

To consider the role of the most widely-used IC components within the full research framework, this section describes the proportions of reporting scores for the most widely-used IC components. The reporting scores for the most widely-used components are compared to the total scores for each IC category. Table 6.9 shows the descriptive reporting scores scaled by number of pages by industry groups. Two sets of reporting scores are shown here: the total scores for each IC category and the accumulated scores for the individual widely-used IC components. For the total scores of SC, RC, and HC, the full research framework is used, as developed in the pilot study in section 6.4.1.2 and presented in Table 6.6. The reporting scores for the most widely-used IC components are the accumulated reporting scores of the investigation units, as outlined in section 6.3.5 and shown in Table 6.4. The percentages show the proportions of reporting scores which are based on the widely-used IC components for each IC category. The results indicate that the widely-used IC components play an important role in the IC research framework.

The findings show that the reporting scores of the most widely-used IC components account for the majority of total reporting scores for each IC category. The results are very similar across different industry groups without an industry-specific pattern. Nearly sixty per cent of SC reporting is captured by the nine most widely-used components compared to all SC items. For RC, the six most widely-used components account for about half of all RC reporting scores. HC reporting can be covered to more than sixty per cent with the seven most widely-used HC components. Considering the amount and variety of previously used IC components, discussed in section 6.2.3, the findings are meaningful for IC reporting research. These descriptive results suggest that if research frameworks for IC reporting focus on few important IC components, they already capture more than half of all IC reporting. Therefore, the wide range of IC components suggested in prior literature seems abundant. To answer the research question, whether a research framework is sufficient focusing on the most widely-used IC components, a correlation analysis is conducted in the following section.

Table 6.9 Reporting scores of widely-used and total IC components

		Total		Structural Capital		Relational Capital		Human Capital	
		IC	22 items	SC	9 items	RC	6 items	HC	7 items
Total	mean	8.87	5.13	3.82	2.19	3.28	1.72	1.78	1.22
N=428	% of total		57.8%		57.3%		52.4%		68.5%
	sd	3.55	2.15	1.65	1.06	1.80	1.22	0.81	0.60
	min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	max	30.96	17.23	12.33	9.81	15.98	10.65	6.06	4.08
Consumer	mean	8.71	4.92	3.46	1.90	3.56	1.88	1.69	1.14
N=123	% of total		56.5%		54.9%		52.8%		67.5%
	sd	3.71	2.04	1.36	0.73	2.15	1.45	0.82	0.61
	min	1.63	1.70	0.80	0.30	0.43	0.13	0.17	0.19
	max	30.96	17.23	8.92	4.61	15.98	10.65	6.06	4.08
Finance	mean	6.27	3.83	2.88	1.85	2.13	1.19	1.26	0.79
N=62	% of total		61.1%		64.2%		55.8%		62.7%
	sd	2.44	1.67	1.28	1.07	1.34	0.93	0.55	0.38
	min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	max	12.61	9.46	7.31	6.57	6.52	3.45	2.44	1.72
Pharma & Tech	mean	10.93	6.50	4.89	2.80	3.93	2.24	2.11	1.46
	% of total		59.5%		57.3%		56.7%		69.2%
N=116	sd	3.59	2.40	1.94	1.35	1.69	1.28	0.87	0.61
	min	4.85	2.32	1.37	0.85	0.77	0.33	0.40	0.32
	max	22.06	15.67	12.33	9.81	9.84	7.47	4.65	3.35
Industrial	mean	8.43	4.73	3.64	2.09	2.96	1.36	1.83	1.27
N=127	% of total		56.2%		57.4%		45.9%		69.4%
	sd	2.69	1.52	1.22	0.78	1.35	0.71	0.71	0.55
	min	3.45	1.98	0.84	0.56	0.31	0.00	0.36	0.15
	max	17.63	9.79	6.44	4.29	7.47	3.95	4.24	3.38

Notes

This table shows descriptive results of the content analysis conducted on German management reports for the accounting year 2010 of a sample of 428 German companies grouped into 4 industries: consumer, finance, pharmaceutical & technology, and industrial. The findings represent occurrences per page for total IC and the categories SC, RC, HC. The reporting scores for the most widely-used IC components are based on the investigation units presented in Table 6.4. For each category the most widely-used IC components are compared to the reporting scores for the full research framework. The results show that the few widely-used IC components account for the majority of IC reporting scores, playing a major role in the research framework.

6.5.2 Correlation analysis for parsimony in the IC research framework

6.5.2.1 Correlation results for a parsimonious research framework

The results of the correlation analysis of IC reporting scores for widely-used components and for total reporting are presented in this section for the three IC categories: SC, RC, and HC. The results provide an indication how to design a research framework parsimoniously. Reporting scores are considered for the accumulated individual widely-used components and for total SC, RC, and HC. The accumulated individual widely-used IC components represent the investigation units, as outlined in section 6.3.5 and presented in Table 6.4. IC components are considered to play an important role within a research framework for IC reporting when they have been widely-used in at least 10 out of 22 prior studies, reviewed in the synopsis of IC components in section 6.2.3. The choice of investigation units is based on how widely IC components have been used in prior research frameworks, as outlined in section 6.3.5. The reporting scores are gradually accumulated for the investigation units. Hence, the correlation analysis shows how the gradually accumulated IC reporting scores are correlated for each IC category.

The correlation analysis allows insights how to design a research framework as it investigates the additional information in the IC reporting scores for gradually adding IC components. Significant values above 0.70 indicate high correlations. Constantly high correlation coefficients suggest that the additional IC components may not add information on IC reporting. Table 6.10 shows correlations for the nine most widely-used SC components. The correlation results for considering the six most widely-used RC components are presented in Table 6.11. Finally, Table 6.12 shows the correlation values for the seven most widely-used HC components. The tables show Pearson correlation results in the lower left-hand corner and Spearman correlations in the upper right-hand corner. The analysis is also conducted for absolute hits and reporting scores scaled by total words with very similar to even slightly stronger results. Moreover, the correlation analysis is repeated for industry and size panels, showing very similar results without relevant industry or size patterns. The findings for differently scaled reporting scores, industry and size panels are not shown here.

Table 6.10 Correlation results for structural capital components

(N=428)	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	Total SC
SC1	1	-0.043	-0.023	-0.017	-0.050	-0.045	-0.033	-0.040	0.041	0.122*
SC2	0.021	1	0.980*	0.928*	0.813*	0.810*	0.809*	0.801*	0.707*	0.571*
SC3	0.053	0.978*	1	0.948*	0.830*	0.827*	0.826*	0.821*	0.730*	0.608*
SC4	0.033	0.920*	0.943*	1	0.844*	0.840*	0.840*	0.837*	0.764*	0.659*
SC5	-0.025	0.800*	0.815*	0.821*	1	0.998*	0.993*	0.972*	0.818*	0.672*
SC6	-0.019	0.798*	0.813*	0.818*	0.999*	1	0.995*	0.973*	0.820*	0.677*
SC7	-0.012	0.798*	0.814*	0.818*	0.995*	0.996*	1	0.980*	0.835*	0.689*
SC8	-0.012	0.782*	0.797*	0.814*	0.965*	0.966*	0.970*	1	**0.886***	**0.739***
SC9	0.059	0.637*	0.661*	0.704*	0.754*	0.755*	0.764*	**0.858***	1	**0.864***
Total SC	0.137*	0.529*	0.574*	0.627*	0.633*	0.638*	0.643*	**0.719***	**0.853***	1

Notes

This table shows correlations of reporting scores for the SC investigation units based on the nine most widely-used SC components, as outlined in Table 6.4, and total SC. In the correlation table, Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. Bold figures indicate constantly significant correlation values above 0.70. Highly correlated investigation units suggest that considering additional SC components may not add further insights to corporate SC reporting.

Table 6.11 Correlation results for relational capital components

(N=428)	RC1	RC2	RC3	RC4	RC5	RC6	Total RC
RC1	1	0.850*	0.671*	0.627*	0.630*	0.635*	0.572*
RC2	0.733*	1	0.759*	0.719*	0.723*	0.728*	0.655*
RC3	0.683*	0.801*	1	**0.890***	**0.891***	**0.887***	**0.863***
RC4	0.592*	0.749*	**0.881***	1*	**0.998***	**0.992***	**0.915***
RC5	0.592*	0.751*	**0.881***	**0.999***	1	**0.994***	**0.918***
RC6	0.618*	0.755*	**0.883***	**0.993***	**0.994***	1	**0.908***
Total RC	0.536*	0.670*	**0.847***	**0.906***	**0.909***	**0.898***	1

Notes

This table shows correlations of reporting scores for the RC investigation units based on the six most widely-used RC components, as outlined in Table 6.4, and total RC. In the correlation table, Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. Bold figures indicate constantly significant correlation values above 0.70. Highly correlated investigation units suggest that considering additional RC components may not add further insights to corporate RC reporting.

Table 6.12 Correlation results for human capital components

(N=428)	HC1	HC2	HC3	HC4	HC5	HC6	HC7	Total HC
HC1	1	0.922*	0.851*	0.802*	0.744*	0.567*	0.561*	0.552*
HC2	0.961*	1	0.906*	0.857*	0.795*	0.619*	0.614*	0.601*
HC3	0.819*	0.867*	1	**0.943***	**0.891***	**0.741***	**0.741***	**0.718***
HC4	0.788*	0.837*	**0.964***	1	**0.952***	**0.780***	**0.778***	**0.751***
HC5	0.726*	0.779*	**0.912***	**0.957***	1	**0.790***	**0.787***	**0.767***
HC6	0.559*	0.613*	**0.774***	**0.801***	**0.814***	1	**0.993***	**0.934***
HC7	0.548*	0.603*	**0.762***	**0.791***	**0.804***	**0.993***	1	**0.941***
Total HC	0.525*	0.577*	**0.731***	**0.758***	**0.772***	**0.939***	**0.946***	1

Notes

This table shows correlations of reporting scores for the HC investigation units based on the seven most widely-used HC components, as outlined in Table 6.4, and total HC. In the correlation table, Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. Bold figures indicate constantly significant correlation values above 0.70. Highly correlated investigation units suggest that considering additional HC components may not add further insights to corporate HC reporting.

This section describes the findings of the correlation analysis for SC, RC and HC. The results are further interpreted in section 6.5.2.2 below. In Table 6.10, the variables SC1 to SC9 represent the correlation values for the investigation units for the nine most widely-used components of SC. The values for total SC show the correlations to the reporting scores for all SC components from the full research framework, shown in Table 6.6. The correlation coefficients are constantly significantly high above 0.70 for considering at least eight SC components, indicated by bold values. This means that the eight most widely-used components largely capture corporate SC reporting. Table 6.11 shows the correlation results for RC with RC1 to RC6 as the investigation units for the six most widely-used components. The values for total RC indicate how the investigation units are correlated to the reporting scores for all RC components from the full research framework of this study. For the investigation units of at least three RC components, the correlation coefficients show constantly significantly high values. In Table 6.12, HC1 to HC7 characterise the investigation units for HC based on the seven most widely-used components. The correlation coefficients are constantly significantly high if at least the reporting scores of the three most widely-used HC components are considered.

The correlation results of the reporting scores for the individual investigation units indicate similarities in reporting scores for considering different numbers of IC components. For example, the significant correlation values between SC2 and SC3 amount to 0.978 for Pearson correlation and 0.980 for Spearman correlation, at a 5%-significance level. This means that the reporting scores for the IC components ‘corporate culture’ plus ‘information systems’ are significantly highly correlated to the reporting scores for ‘corporate culture’, ‘information systems’ plus ‘networking systems’. Hence, adding ‘networking systems’ to the research framework does not add much in capturing corporate SC reporting. In comparison, the correlation values between SC2 and total SC are 0.529 for Pearson and 0.571 for Spearman correlations. As these values are below 0.70, the correlation is considered to be low. This means that the reporting scores for ‘corporate culture’ plus ‘information systems’ are not significantly highly correlated to the scores for all SC components from the full research framework. The reporting scores are not related but add

separate aspects to the investigation of SC reporting. Hence, a gap exists to total SC for capturing SC reporting with these two components. Further SC components should be included in order to get reasonable insights to corporate SC reporting.

6.5.2.2 Interpretation of results for parsimony in research framework

To investigate, how a research framework for IC reporting can be designed parsimoniously, the correlated scores for the investigation units are examined. Constantly high correlation values, above 0.70, across an increasing number of components are considered to indicate similar reporting scores. The correlation analysis of reporting scores for SC shows significantly high values if at least eight SC components are considered in the reporting scores. For RC and HC, the correlation values are constantly significantly high if at least the three most widely-used components are included in the content analysis. The significant high correlation values confirm that not all components are necessary to investigate corporate IC reporting for each category, as indicated by the descriptive results on the role of the widely-used IC components in section 6.5.1.2. Additional components may not add further insights into corporate IC reporting. These findings of the correlation analysis can be interpreted regarding the parsimonious design of research frameworks for IC content analyses.

The findings of the correlation analysis allow answering the research question, how to design a parsimonious research framework for IC reporting. The results show that research frameworks capture IC reporting sufficiently if they focus on the most widely-used IC components for each category. For SC the eight most widely-used components, for RC and HC the three most widely-used components fairly capture corporate IC reporting. Therefore, these most widely-used components are important to be included in a parsimonious research framework for IC reporting. An overly detailed research framework for IC reporting may add unnecessary difficulty in the coding process without adding further insights to corporate IC reporting. The suggestion that few components may account for a large proportion of total IC reporting shows that sub-groups with indicators and definitions seems to be a

practical solution compared to long detailed lists of individual components. Structuring the research framework for IC reporting into sub-groups with descriptions and indicators, can facilitate to design a suitable, neat and parsimonious research framework for IC reporting, as also suggested by Beattie and Thomson (2007) and applied by Campbell and Rahman (2010).

6.5.2.3 Interpretation regarding corporate definition of IC reporting

Additionally, the findings allow inferring companies' perceptions of IC reporting. In their IC reporting, companies seem to focus on the most widely-used IC components and report much less on additional IC components. This focus may be interpreted in two ways: companies deem these components to be most important for creating IC or they perceive IC reporting to mainly consist of these IC components. This study interprets the findings to indicate a definition of IC reporting as it is perceived by companies. An additional analysis is conducted for industry panels with similar results, as outlined in section 6.5.2.1. Hence, the corporate focus on the most widely-used IC components exists regardless of the industry. This means that companies with different business models across industries still report mainly on the most widely-used IC components. In order to manage the broad area of IC reporting, companies may apply a practical approach by focusing on widely-used components to define IC reporting for their purposes. The focus on the most widely-used IC components across industries indicates that companies define IC reporting within the framework of these most widely-used components. However, further research is needed to get insights to corporate IC reporting processes to support this reasoning.

6.5.3 Correlation analysis for comparability of prior studies

6.5.3.1 Correlation results for comparability of selected frameworks

For the analysis for comparability of prior studies, research frameworks from selected studies are applied to the German dataset and tested for correlation, as outlined in section 6.3.5.2. The results of the correlation analysis, shown in Table 6.13, allow inferences regarding the comparability of previous IC reporting studies

based on different research frameworks. The results of the analysis for parsimony in section 6.5.2.1 suggest that prior research frameworks are comparable if the most important three to eight IC components are included for the respective category. For SC, the eight important components are: corporate culture, information systems, networking systems, intellectual property, management processes, management philosophy, infrastructure, and patents. For RC, the three important most widely-used components are: business collaborations, brands, and customers. For HC, the three important most widely-used components are: education, work-related knowledge, and training. Following this reasoning, this correlation analysis is expected to show that studies are highly correlated where the important most widely-used components are included. If other less important widely-used components are omitted, the reporting scores should still be highly correlated. Significantly high correlation values above 0.70 indicate that the respective applied prior research frameworks are comparable.

With regards to SC, a prediction of the correlation between prior frameworks is difficult because eight out of nine components are important to capture SC reporting sufficiently, as identified in section 6.5.2.1. For SC, every selected study is expected to differ because all selected studies omit at least one of the eight important SC components, shown in Table 6.5 in section 6.3.5.2. Regarding RC and HC, the three most widely-used components are sufficient to capture RC and HC reporting. Therefore, reporting scores are expected to differ for applied prior research frameworks where any of these three important most widely-used components are omitted. For RC, the research frameworks by García-Meca and Martinez (2007), Bukh et al. (2005), and Brüggen et al. (2009) are expected to differ because these frameworks omit one or all three of the three most widely-used RC components. The other two selected studies include the three important most widely components but omit other components. However, these studies are expected to be still highly correlated to the base research framework by Vergauwen et al. (2007) where all widely-used components are included. For HC, the results are expected to differ for the research frameworks by Bukh et al. (2005), and Brüggen et al. (2009), as they omit one or two of the three important widely-used HC components.

Table 6.13 Correlation results for selected prior research frameworks

Panel A: Correlations for widely-used SC components in selected prior studies

N=428	Vergauwen et al. (2007)	Guthrie et al. (2007)	Mangena et al. (2010)	Beattie & Thomson (2007)	Bukh et al. (2005)	Brüggen et al. (2009)
Vergauwen et al. (2007)	1	0.820*	0.746*	0.689*	0.865*	0.686*
Guthrie et al. (2007)	0.755*	1	0.898*	0.857*	0.539*	0.806*
Mangena et al. (2010)	0.687*	0.913*	1	0.952*	0.372*	0.547*
Beattie & Thomson (2007)	0.626*	0.880*	0.966*	1	0.324*	0.441*
Bukh et al. (2005)	0.887*	0.419*	0.282*	0.223*	1	0.553*
Brüggen et al. (2009)	0.686*	0.806*	0.547*	0.441*	0.553*	1

Panel B: Correlations for widely-used RC components in selected prior studies

N=428	Vergauwen et al. (2007)	Guthrie et al. (2007)	Mangena et al. (2010)	García-Meca & Martinez (2007)	Bukh et al. (2005)	Brüggen et al. (2009)
Vergauwen et al. (2007)	1	0.972*	0.847*	0.828*	0.771*	0.381*
Guthrie et al. (2007)	0.998*	1	0.761*	0.828*	0.761*	0.340*
Mangena et al. (2010)	0.994*	0.991*	1	0.818*	0.746*	0.391*
García-Meca & Martinez (2007)	0.828*	0.828*	0.818*	1	0.675*	0.307*
Bukh et al. (2005)	0.771*	0.761*	0.746*	0.675*	1	0.410*
Brüggen et al. (2009)	0.381*	0.340*	0.391*	0.307*	0.410*	1

Panel C: Correlations for widely-used HC components in selected prior studies

N=428	Vergauwen et al. (2007)	Guthrie et al. (2007)	Striukova et al. (2008)	Mangena et al. (2010)	Bukh et al. (2005)	Brüggen et al. (2009)
Vergauwen et al. (2007)	1	0.971*	0.832*	0.981*	0.756*	0.039
Guthrie et al. (2007)	0.972*	1	0.738*	0.991*	0.711*	0.010
Striukova et al. (2008)	0.847*	0.761*	1	0.771*	0.910*	0.103*
Mangena et al. (2010)	0.982*	0.992*	0.785*	1	0.713*	0.024
Bukh et al. (2005)	0.773*	0.742*	0.928*	0.732*	1	0.077
Brüggen et al. (2009)	-0.001	-0.031	0.043	-0.014	0.000	1

Notes

These tables show the correlation results for applying to the German dataset the widely-used IC components of prior research frameworks from selected prior studies, shown in Table 6.5, by categories: SC (Panel A), RC (Panel B), and HC (Panel C). Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. High correlation values above 0.70 suggest that applying different prior research frameworks provides similar results.

The correlation results for SC show that the correlation values are relatively low. This overall finding is consistent with the prediction because all selected studies omit at least one of the eight important widely-used SC components. To the base framework by Vergauwen et al. (2007) with all nine widely-used SC components, only two prior applied research frameworks are highly significantly correlated with values above 0.70: Guthrie et al. (2007) and Bukh et al. (2005). This result is unexpected because these two research frameworks focus on different widely-used SC components, as shown in Table 6.5. Other studies where fewer components are omitted out of the important eight most widely-used ones, such as Mangena et al. (2010), are less highly correlated to the base framework. This divergence in correlations indicates that the eight most widely-used SC components are not equally important for capturing SC reporting. The low correlation values between Bukh et al. (2005) and the frameworks by Mangena et al. (2010) or Beattie and Thomson (2007) suggest that the reporting scores based on these frameworks are not directly comparable for the most widely-used components across these studies.

The correlation tables for RC and HC are more conclusive because only the three most-widely used components are important to capture RC and HC reporting, as outlined in section 6.5.2.1. For RC, the reporting scores are significantly highly correlated to the base framework by Vergauwen et al. (2007) for all but one selected prior framework, namely Brüggen et al. (2009) where two out of the three important RC components are omitted. Although the frameworks by Bukh et al. (2005) and García-Meca and Martinez (2007) each omit one of the three important RC components, the correlation values are significantly high. Hence, the frameworks seem to be still comparable if one of the three important components is not included. The correlation table for HC reporting shows similar results. As the research framework by Bukh et al. (2005) omits one of the three important HC components, it is still significantly highly correlated to the base framework as well as the other selected frameworks. Applying the HC framework by Brüggen et al. (2009) to the German sample provides reporting scores which are not correlated to any of the selected prior frameworks. Hence, their framework, where two of the important HC components are omitted, is incomparable to the other studies.

6.5.3.2 Interpretation of results regarding comparability of prior studies

The findings of the correlation analysis of reporting scores for applying selected prior research frameworks to the German dataset, outlined in section 6.5.3.1, indicate comparability of prior studies. As the widely-used IC components capture most IC reporting, the results of prior studies are comparable if previous research frameworks encompass the three to eight important widely-used components for the respective category. If a research framework neglected IC components which prior literature has rarely used, the findings would not diverge greatly. However, if an IC reporting study excluded the most widely-used three to eight IC components for the respective categories, the results are incomparable to other IC reporting studies. This interpretation regarding comparability of prior studies may enhance IC reporting research. Based on the comparability of previous IC reporting studies, prior findings can be consulted, contrasted, interpreted, and used to develop IC-based theories, as long as the most widely-used IC components are included. The findings suggest for further research to investigate which components are most important, independent from the ranking from prior literature, for example by using a factor analysis or cluster analysis.

6.6 Conclusion

The aim of this project is to investigate how a research framework for IC reporting can be designed parsimoniously. As a content analysis requires subjective judgement by the coder, the results from previous studies are only comparable if the underlying research frameworks have the same IC perceptions, as discussed in section 6.2.1. An intensive review of prior literature, in sections 6.2.2 to 6.2.3, shows that a large amount of different IC components have been considered with inconsistencies in IC research frameworks for content analysis studies. This study interprets the suggestion of IC sub-groups as a potential solution to reduce differences, reviewed in section 6.2.4. To examine the research question framed in section 6.2.5, whether focusing on the widely-used IC components is sufficient to capture IC reporting, a content

analysis and correlation analyses of IC components are conducted. The findings of this study contribute to the literature of IC content analyses in four dimensions, each of which is explained in the following paragraphs: designing a parsimonious research framework, suggesting a pilot study approach for a new research setting, approaching companies' perceptions of IC reporting, and indicating comparability of prior studies.

First, this study contributes to parsimony in designing research frameworks for IC reporting. The findings of this project support that focusing on the most widely-used IC components is sufficient to get insights to corporate IC reporting. To answer the question of parsimony, this study investigates individual IC components which have been widely used in prior research frameworks, as outlined in section 6.3.5. The descriptive results of the content analysis show the important role of the widely-used components in IC reporting practice, as discussed in section 6.5.1. The analysis of the most widely-used IC components shows that these components account for the majority of IC reporting scores. The findings of the correlation analysis show that the most widely-used components largely capture corporate IC reporting, as discussed in section 6.5.2. For RC and HC, the three most widely-used components capture RC and HC reporting. SC reporting is mainly described by the eight most widely-used components. This means that focusing on the most widely-used components is sufficient to achieve reasonable reporting sores for IC reporting investigations. Therefore, IC research frameworks do not require being very detailed with regards to the IC components but focusing on the most widely-used IC components is sufficient to capture IC reporting.

Second, this study contributes to developing a research framework for a new research setting. The pilot study approach to manually investigate a small sample in order to develop a research framework for IC reporting is applied in this study, as outlined in sections 6.4.1 and 6.4.2. This pilot study approach is practicable for developing a research framework for investigating IC reporting in a research setting where little is known about corporate IC reporting. Therefore, a pilot study approach is suggested for future IC reporting studies. Sub-groups seem to be feasible, as applied in Table

6.6. Sub-groupings with descriptions and indicators allow focusing on the main IC components and leaving scope for reporting facets at the same time. The descriptions and indicators also provide additional information about how particular IC sub-groups are interpreted by the researcher. A pilot study, grounded in the actual reporting practice, may show how to sub-group IC for the sample under review. Certain sub-groups may need to be introduced or adjusted according to reporting practices within the research setting, as suggested by Guthrie and Petty (2000). This research project suggests in section 6.4.1.3 that strategy may represent the link between value creation and IC rather than a separate IC sub-group.

Third, this study contributes to the IC reporting research by suggesting an IC definition from companies' perspectives to correspond to the most widely-used IC components. The companies' focus on the most widely-used IC components is interpreted as the companies' perception of IC reporting. For this focus on the most widely-used components in corporate IC reporting two possible interpretations exist: these components are actually most relevant to create IC value or these components outline a practical framework for corporate IC reporting. The first interpretation suggests that companies consider the most widely-used IC components to be actually the most important components in reporting on the creation of IC value. Based on the second interpretation, companies consider the most widely-used IC components to represent a practical definition of IC reporting, as outlined in section 6.5.2.3. This study interprets the findings to indicate a corporate definition of IC reporting, as it is perceived by companies, because companies focus on these components regardless of the industry they operate in. If the most widely-used IC components were actually most important for IC value creation, a variation of widely-used components would be expected across industries due to different business models. Further investigations with insights in the corporate IC reporting processes are required to support this interpretation.

Fourth and finally, the findings of this study support comparability of prior content analysis studies of IC reporting, as discussed in section 6.5.3. With differences across research frameworks in prior studies, the question arises whether prior content

analysis studies of IC reporting have actually investigated the same issues. To analyse the comparability of prior studies, previous research frameworks are selected which include different widely-used components for SC, RC, and HC. These research frameworks are applied to the German dataset in order to provide comparable reporting scores. The reporting scores for the different research frameworks are tested for correlation. If the reporting scores from different frameworks are significantly highly correlated, the previous frameworks provide comparable results in capturing corporate IC reporting. The results of this analysis suggest that the findings of prior studies are comparable if the important most widely-used IC components are included in the research frameworks. Hence, the differences across prior research frameworks are superficial as long as the three to eight important most widely-used components for the respective categories are included in the research frameworks. Therefore, future research can consult the findings of prior studies to compare results, to draw conclusions in meta-analysis studies or to develop IC-related theories.

The following limitations need to be considered for interpreting the findings. This investigation for designing a content analysis of IC reporting focuses on the IC components in the research framework. Other aspects of the content analysis procedures are not examined in this study. Different coding units, such as text units or sentences, counting without repetitions, or weighted reporting scores may provide different results. Moreover, intellectual liabilities are not considered in this study. The reason for neglecting the coding issues is to focus on IC components as one important issue of the research framework for IC reporting. This study concentrates on how many most widely-used IC components capture IC reporting sufficiently. The findings suggest how best to utilise IC research frameworks and to increase comparability. Coding variations and intellectual liabilities represent separate research areas for IC research frameworks. Furthermore, this study focuses on a ranking of widely-used IC components composed from a review of prior research frameworks. A factor analysis may add further insights to the question whether other components may be important which have not been widely-used in previous IC reporting studies. Alternatively, a discourse analysis may enable investigating deeper

levels of corporate IC reporting. Moreover, this study focuses on IC reporting in management reports, not considering CEO letters, as discussed in section 6.4.2.2. CEO letters offer further research opportunities regarding the content of IC reporting and potential reasons for different formats, such as interviews or letters.

The results of this methodological project have implications for IC reporting research. The review of prior IC reporting research shows that the variety of IC components and their use on different hierarchical levels with synonyms cause an unclear situation for following researchers. Therefore, following researchers face difficulties in designing a suitable research framework for IC reporting studies and in approaching new research settings for IC reporting. Furthermore, the unclear situation prevents drawing conclusions across prior studies by comparing their results. The findings of this study serve as guidance for future studies on IC reporting. For designing a parsimonious research framework, future content analysis studies can capture IC reporting sufficiently by focusing on the most widely-used IC components to best utilise prior research frameworks. IC sub-groupings with descriptions and indicators are strongly encouraged as they give additional information on the perception of IC in the respective study. Additionally, this study suggests a pilot study for approaching IC reporting in a new setting or for adjusting a prior research framework for language or country-specific issues. If future research frameworks for IC reporting follow the suggestions presented in this study, the comparability of IC reporting studies may further improve.

Chapter 7:
Applying agency theory and legitimacy theory to intellectual capital reporting

7.1 Introduction

The purpose of this chapter is to investigate whether agency theory or legitimacy theory better explains intellectual capital (IC) reporting, as discussed in chapter 1. This study innovatively introduces to IC reporting research a concept from mergers and acquisitions research to measure IC value and mispricing, developed by Rhodes-Kropf et al. (2005), as discussed in chapter 5. IC is considered to constitute a competitive advantage (Hall, 1992). However, IC comprises intangible knowledge resources whose existence and operations are not easily observable for outsiders. Managers, as insiders, have IC-related information which may be important for the market to assess a company's IC potential. With management being in an information advantage, the German management reporting regulation requires managers to report on sustainable value creation in order to reduce the information gap (GASC, 2010a, sec.3, 30–35). Hence, the ideas of agency theory are particularly interesting for the German setting. To investigate motivations for corporate IC reporting, the concepts of agency theory are contrasted with the ideas of legitimacy theory in this study. Measures for IC value and mispricing enable a statistical analysis to test the hypotheses developed from agency theory and legitimacy theory. Thereby, the results shed light on motivations for IC reporting.

Contradictory suggestions for IC reporting motivations from agency theory and legitimacy theory provide an interesting research setting. An agency theory approach suggests that companies report on IC to reduce the information asymmetry between managers and owners. Based on this argument, IC reporting is expected to increase

with ownership diffusion and IC value in order to explain IC creation. This approach is developed in section 7.2.3. In contrast, legitimacy theory suggests that IC reporting legitimises the company's position in the market. Two legitimacy purposes of IC reporting are discussed in section 7.2.4. On the one hand, mispricing is seen as a legitimacy threat to represent a legitimisation purpose for IC reporting. On the other hand, IC reporting may follow the legitimisation purpose to justify the use of intangible resources. As agency theory and legitimacy theory represent theories of voluntary corporate disclosure, this study focuses on voluntary IC reporting to test the developed hypotheses. The German setting with a mandatory management report with partly required and partly recommended IC information, as outlined in chapter 3, allows distinguishing among required, recommended and voluntary IC reporting. For comparability with prior studies, IC reporting is also investigated for the IC categories, structural, relational and human capital.

The sample of this study comprises 428 management reports of German listed companies for the accounting year 2010. The main results show that voluntary IC reporting is significantly associated with mispricing, expenses in research and development (R&D) and intangible assets recognised on the balance sheet. Ownership diffusion and IC value have no significant relation to IC reporting. The findings indicate that companies use voluntary IC reporting as a tool to legitimise their status. Hence, legitimacy theory better explains IC reporting compared to agency theory. The contribution of this study lies in theoretical and practical aspects of IC reporting research. First, the results contribute to the IC reporting literature, as IC-related hypotheses are innovatively tested to investigate corporate motivations for IC reporting. Second, the findings of this study are of interest for standard setters. The German management report regulation has changed with regards to IC reporting in 2013, as outlined in chapter 3. The findings of this study support the change in the regulatory aim from reducing the information gap (GASC, 2010a, sec.3) to justifying the use of resources (DRSC, 2013, sec.3). Furthermore, the results of this study can be used as a basis for further discussions regarding reporting on 'the capitals' in the consultation draft for international integrated reporting (IIRC, 2013, sec.2B).

To develop hypotheses, potential motivations for IC reporting are reviewed with regards to agency theory and legitimacy theory in section 7.2, focusing on the IC reporting literature. In section 7.3, the methods are designed and the measures for IC value, mispricing and IC reporting are illustrated. The results of the content analysis of IC reporting and the statistical analysis are presented and discussed in section 7.4 to identify which factors are associated with IC reporting. The statistical analysis is separated in two parts. First, in section 7.4.1, IC reporting is investigated by IC categories, structural, relational, and human capital. Second, in section 7.4.2, IC reporting is analysed for reporting types, required, recommended, and voluntary IC reporting, being at the focus of this study. To test sensitivity of results, an additional analysis is conducted for the relationship of IC reporting and IC value in a propensity score matching approach, presented in section 7.5. The concluding discussion in section 7.6 interprets the findings regarding potential motivations for IC reporting.

7.2 Literature review

7.2.1 Calls for theory testing in the IC reporting literature

The review of literature on IC reporting in chapter 2 shows that previous IC reporting studies have referred to general theories of voluntary corporate disclosure. However, no strong results have been presented on which theory specifically explains IC reporting. Prior studies on IC reporting have been mainly exploratory and explanatory to understand how companies approach IC reporting in different countries (Guthrie & Petty, 2000; Guthrie et al., 2007; Striukova et al., 2008). The prevalent lack of direct linkages between theories and IC reporting in previous studies has been criticised and calls for theory testing and generalisations have been raised (Marr et al., 2003). To support theory testing, Mouritsen (2006) demanded more creative approaches to investigate IC reporting quantitatively. He argues that different theoretical approaches are possible. As Mouritsen (2006) admits that theory testing and generalisations may be difficult, he encourages creative and innovative research designs.

Since the calls for quantitative investigations have been raised, some IC reporting studies have empirically investigated the relationships between IC reporting and certain company criteria, such as company size, industry or ownership structure (Bozzolan et al., 2003; Bukh et al., 2005; García-Meca et al., 2005; Brüggen et al., 2009). The results across these studies diverge but general associations of IC reporting with industry and size seem to exist. However, reporting theories have not been tested in these empirical studies. A further area of empirical IC reporting investigations has established on the relationship of IC reporting and corporate governance (Cerbioni & Parbonetti, 2007; Li et al., 2008; Hidalgo et al., 2011). These studies examined aspects of the board of directors and ownership structures as characteristics of corporate governance. Mainly board size and structure seem to be associated with IC reporting. Again, these studies have not supported a particular theory to explain IC reporting.

The reporting theories suggested in the IC literature are theories of general disclosure. The theoretical background for an IC reporting study, based on these general reporting theories, requires further elaborations. Guthrie et al. (2004) tried to bridge theories of general disclosure to IC reporting, namely legitimacy theory and stakeholder theory. In their review, they conclude that theoretical developments are needed to enhance IC reporting research. Following their approach, theories of general disclosure can be further developed for the area of IC reporting research by logical argument to establish a framework for IC reporting. This theoretical framework for IC reporting can then be applied to investigate corporate motivations for IC reporting. This chapter considers theories of general disclosure which have been referred to in the IC literature to provide potential motivations for corporate IC reporting. Agency theory is of particular interest for this study, as the declared aim of the German regulation applicable to the management report is to ‘reduce the gap between information available to users […] and that available to management’ (GASC, 2010a, sec.3). To investigate motivations for corporate IC reporting, the concepts of agency theory are contrasted with the ideas of another reporting theory in this study. Theories suggested in prior IC reporting literature are briefly reviewed in the following sections to identify which theory serves the purpose of this study.

7.2.2 Potential motivations for IC reporting

7.2.2.1 Theories suggested to explain IC reporting motivations

Prior studies argue that IC reporting should be embedded in a 'story' of how IC contributes to value creation (Mouritsen et al., 2001; Holland, 2004), as outlined in chapter 2. Hence, IC reporting is mainly narrative as part of an encompassing value creation story that needs to be told. But whom the story is told to and how it is utilised, is not specified. Prior studies have suggested general theories to investigate IC reporting, such as agency theory, signalling theory, stakeholder theory or legitimacy theory, as reviewed in chapter 2. Prior studies have referred to these theories either directly or inherently without developing strong links to IC reporting (e.g. Beattie & Thomson, 2007; Brüggen et al., 2009; Hidalgo et al., 2011). The review in this chapter shows that potential motivations for IC reporting can be inferred from different theories. As the results from prior literature are opaque, it remains unclear which theory may best explain IC reporting. Moreover, IC reporting may vary depending on the communication channels, country, industry, regulation, and time frame under review, as discussed in chapter 2. Due to the complexity of IC reporting, the creative design demanded by Mouritsen (2006) for testing theories, needs to be constructed parsimoniously.

The IC literature suggests that IC represents a competitive advantage to support a company's value creation (Hall, 1992; 1993; Edvinsson & Malone, 1997; Roos et al., 1997). The question arises why a company would disclose information on this competitive advantage as it may be competitive sensitive (Singh & Van der Zahn, 2008; Mangena et al., 2010). One obvious reason why a company would report on IC is if IC reporting were mandatory. As outlined in chapter 3, IC reporting has been encouraged by international guidelines being only partly required in few countries, such as Germany. Despite IC reporting being mainly voluntary, prior research found that companies report on IC across many countries, as reviewed in chapter 2. The theories of general disclosure referred to in the IC reporting literature, mentioned in section 7.2.1, may provide explanations for voluntary coporate IC reporting. Several

suggestions have been made as to why companies are motivated to report on IC. The IC reporting may be explained by agency theory (Li et al., 2008), signalling theory (Singh & Van der Zahn, 2008), stakeholder theory, or legitimacy theory (Guthrie et al., 2004). These theories provide different potential motivations for IC reporting.

7.2.2.2 Agency theory to explain IC reporting motivations

Agency theory is concerned with the information gap between managers and owners (Ross, 1973). As owners bear the risk of a company but cannot directly interact in operating activities, reporting serves as a monitoring device (Fama, 1980). Mouritsen et al. (2001) argue that managers are encouraged to report on underlying corporate IC value in an IC statement. Their argument is considered in this study to support IC reporting being related to agency theory. Under this consideration, IC reporting may reduce the information gap between managers and owners by outlining how IC adds value to the company. Li et al. (2008) interpret the link between agency theory and IC reporting from the perspective of reducing uncertainty about intangible values for investors. In their study, they investigate corporate governance characteristics based on this argument. They conclude that an increasing number of independent directors monitor IC reporting to reduce the information gap.

7.2.2.3 Signalling theory to explain IC reporting motivations

According to the ideas of signalling theory, corporate communication is motivated by sending a signal to the market (Spence, 1973). The signals are chosen to distinguish the company from its competitors (Connelly et al., 2011). Signalling theory has been mentioned in IC reporting literature with no strong link of how IC reporting may act as a signal (Beattie & Thomson, 2010; Hidalgo et al., 2011). Singh and Van der Zahn (2008) investigate IC reporting in IPO prospectuses, applying the ideas of signalling theory. They use ownership retention, proprietary costs and governance structure to test for signals. According to their arguments, these signals have been established in IPO research. However, the link between IC reporting and signalling theory seems to require further strengthening. As their study is based on

the special event of an IPO, the applicability of signalling theory to regular IC reporting may be questionable. Furthermore, Singh and Van der Zahn (2008) conclude that signals with regards to IC are costly and not fully understood by the market. Signalling theory may be difficult to apply to regular corporate IC reporting. Hence, this study is not following the ideas of signalling theory.

7.2.2.4 Stakeholder theory to explain IC reporting motivations

Stakeholder theory suggests that companies use their reporting to respond to expectations of stakeholders (Friedman & Miles, 2002). Based on this idea, IC reporting serves the purpose of ensuring that stakeholder expectations are met (Guthrie et al., 2004). Additionally, IC reporting acts to attract stakeholders referred to in IC categories, such as employees or customers (van der Meer-Kooistra & Zijlstra, 2001). This might be interpreted as a marketing tool for the corporate reputation. Striukova et al. (2008) conducted a content analysis of IC reporting in different corporate documents and identified IC information provided to be differently balanced for diverse audiences. This would implicitly support stakeholder theory advocating reporting as response to stakeholder demands across different means of stakeholder communication. If identical text passages across documents were excluded from their examination, the reporting aim for different stakeholders would be more obvious. The approach by Striukova et al. (2008) indicates that stakeholder theory can be investigated in different communication channels with varying stakeholder needs. This approach is not reasonable for this study, as it focuses on corporate management reports. Testing stakeholder theory requires the identification of stakeholder groups and their expectations, going beyond this study.

7.2.2.5 Legitimacy theory to explain IC reporting motivations

According to legitimacy theory, corporate reporting is a means to legitimise a company's status (Deegan, 2001). Guthrie et al. (2004) argue that IC reporting is essential to justify IC value as the legitimisation of IC is not obvious from the financial statements. Hence, IC reporting may be intended to justify the company's

status. Another aspect of legitimacy theory suggests that corporate reporting is intended to justify the use of corporate resources (Deegan, 2001). This aspect can be applied to IC reporting because IC is not observable from the financial statements, as outlined in chapter 2. Following the ideas of legitimacy theory, IC reporting may be used to legitimise a company's market position and to justify investments in intangible IC-related resources. Hence, the concepts of legitimacy theory offer potential motivations for corporate IC reporting which are in contrast to agency theory. As outlined in section 7.2.2.2, the ideas of agency theory suggest that IC reporting is motivated to explain underlying corporate IC value and to reduce the information gap between managers and owners. To achieve the aim of this study, to investigate corporate motivations for IC reporting, the approach developed from legitimacy theory is used to contrast agency theory in this study.

7.2.3 Agency theory and IC reporting

7.2.3.1 The concepts of agency theory

The separation of management and ownership leads to a separation of decision making and risk bearing (Fama & Jensen, 1983). Due to this separation, an information asymmetry exists between managers and owners (Ross, 1973). According to this view of the firm, owners bear corporate risks but lack access to complete managerial information. Managers may exploit the situation for their own benefits regardless of harming the company. This situation causes costs for the company, defined as agency costs by Jensen and Meckling (1976). Based on their argument, owners have to assume that managers will act in their own interests rather than in the company's interests. Hence, owners reduce the payment to managers by accounting for the potential loss due to managers' actions guided by their self-interests. Furthermore Jensen and Meckling (1976) argue that the owners implement monitoring devices to ensure an efficient use of their resources. Watts and Zimmerman (1986) take the argument further and claim that managers are motivated to show that their actions are aligned with the company's aims to encounter payment reduction. Hence, managers voluntarily provide information to prove that the company is run in the owners' interests.

This line of thought that managers have an interest in publishing information to enable monitoring for owners has been developed in the literature on agency theory. Fama (1980) suggests that market devices encourage managers to prove that they work in the company's interests because a good reputation increases their opportunities in the market for managers. Therefore, managers would be motivated to provide additional information where the owners are facing an information asymmetry, as summarised by Deegan (2001). However, he also notes that it may be in the company's interests to withhold certain information which may be competitive sensitive. Combining this thought of data sensitivity with the argument of managers' incentives to report on how they serve the company's interests, adds an additional perspective to corporate reporting. One interpretation of this situation is that managers voluntarily report on opaque issues to enable monitoring as long as publishing the information does not harm the company. To conclude, agency theory suggests that managers have incentives to voluntarily reduce the information gap to owners to prove that their actions are aligned with the company's aims.

7.2.3.2 Linking agency theory to IC reporting

For IC reporting the agency theory view discussed in section 7.2.3.1 means that information on IC is voluntarily provided by managers to reduce the level of information asymmetry. The agency concepts allow the interpretation that managers attempt to reduce the information gap to avoid agency costs and to assure owners of the company's potential performance based on its IC value. The underlying assumption is that managers actually have information on underlying corporate IC value or at least more information than owners. This assumption seems realistic since information on IC value is not provided in financial reporting, as discussed in chapter 2. Managers, on the other hand, have insights into corporate activities such as investments in efficient structures, R&D, or human resources. These activities may support the creation and development of corporate IC value, as outlined in chapter 2. Hence, the situation of developing IC constitutes information asymmetries between managers and owners. Particularly, as IC comprises intangible resources, additional

information is encouraged to monitor the use of investments in the creation of IC value. To conclude, managers have incentives to voluntarily report on the development of IC value to assure the owners that their resources are used to create value.

According to the agency view, IC reporting is actively used to explain the role of IC in the value creation process, considering the associated costs. This explanation is intended to reduce the information gap between managers and owners. As IC is argued to constitute an important competitive advantage (Hall, 1992; 1993), the information published in IC reporting may be competitive sensitive. In their study, Singh and Van der Zahn (2008) found that companies are reluctant to report on IC in their IPO prospectuses when they enter highly concentrated markets. Hence, IC reporting is reduced with increasing proprietary costs in the situation of IPOs. On the other hand, IC reporting may reduce proprietary costs by providing a monitoring device for owners. Mangena et al. (2010) show a significant negative association of IC reporting with cost of capital. However, they admit that their approach may be limited because the univariate analysis does not account for other factors which may influence cost of capital. These studies show that the relationship is not clear between IC reporting and its associated costs. To account for potential consequences of proprietary costs, characteristics of proprietary costs are controlled for in this study, as further outlined in section 7.3.5.3. The hypotheses are developed in sections 7.2.3.3 and 7.2.3.4 for testing whether agency theory explains corporate IC reporting.

7.2.3.3 IC reporting to reduce information asymmetry

To investigate the information asymmetry, one aspect suggested in the literature on agency theory is the ownership structure of a company. If owners are involved more intensely in corporate management, the information gap and the amount of demanded additional information is reduced, as argued by Deegan (2001). This argument is based on the view that shareholders who are also managers or employees have access to internal data to circumvent the information gap. Hence, closely held shares enhance the monitoring process to ensure that resources are actually used for

the benefit of the company. The same is assumed to be true for family owners. On the other hand, owners who are lacking managerial insights require more reporting because they have less control over management activities. Therefore, high share ownership diffusion indicates information asymmetry as a high proportion of owners have limited influence on operating activities. As discussed in section 7.2.3.1, managers increase reporting to reduce agency costs involved in the information asymmetry. Following this idea, reporting increases with ownership diffusion to reduce the information asymmetry.

IC reporting research has applied this line of thought that an increasing percentage of free float shares represents an increased level of information asymmetry which entails increased IC reporting. Brüggen et al. (2009) use ownership diffusion as measure of information asymmetry with no significant results. They assume ownership diffusion to be positively related to IC reporting to reduce the information asymmetry. Li et al. (2008) interpret a high level of ownership concentration to reduce the information asymmetry with expected decreasing IC reporting. Their results show a significant negative association. The results of prior studies on IC reporting and information asymmetry, indicated by ownership structure, are not clear. The inconsistent results by Brüggen et al. (2009) and Li et al. (2008) may be due to different sample countries. Overall, prior studies used ownership structure as an indicator for information asymmetry to be related to IC reporting. The association can be stated in two ways; either IC reporting increases with ownership diffusion or decreases with ownership concentration. The first hypothesis of this study follows the ownership diffusion approach to test information asymmetry on IC reporting:

$H_{7.1}$: The extent of IC reporting is higher for companies with a higher percentage of outside shareholders in order to reduce the information gap.

7.2.3.4 IC reporting to explain IC value

With regards to IC reporting another aspect of information asymmetry exists. Section 7.2.3.2 outlines how the creation and development of IC value causes information

gaps because IC value is not obvious from the financial statements. Based on this reasoning, IC reporting serves the purpose of explaining the actions taken by managers to create and develop IC value. Williams (2001) attempted to investigate the relationship between IC performance and IC reporting. He argues that companies report on IC performance to reduce risk and to enable the assessment of wealth creation. Although Williams (2001) does not refer to agency theory, his argument is consistent with the agency theory approach to IC reporting stated in section 7.2.3.2. The results by Williams (2001) show no significant associations. However, his research design may not allow strong results for several reasons. First, a sample of 31 companies is relatively small for the regression analysis. Second, the time period under review 1996-2000 coincides with an increasing awareness of IC reporting as discussed in chapter 2, which may cause bias in the relationship between IC reporting and IC performance. Finally, the IC performance measure is based on Pulic's (1998) VAIC™ approach which is argued to have weaknesses in chapter 5.

According to the concepts of agency theory discussed in section 7.2.3.1 and based on the argument that IC value constitutes an information gap, managers have incentives to use IC reporting in order to explain IC value creation and utilisation. The information gap increases with a higher underlying corporate IC value. Hence, the level of corporate IC value represents an indicator for the information gap between managers and owners. If the level of corporate IC value is low, IC reporting is not required to be extensive. For higher levels of IC value, the information gap between managers and owners is bigger. Therefore, managers are encouraged to increase IC reporting to reduce the information gap for higher levels of underlying corporate IC value. Therefore, the second hypothesis states that IC reporting increases with the level of underlying corporate IC value:

$H_{7.2}$: *The extent of IC reporting is higher for companies with a higher level of IC value in order to explain IC value creation to shareholders.*

7.2.4 Legitimacy theory and IC reporting

7.2.4.1 The concepts of legitimacy theory

Legitimacy theory suggests a different view of corporate reporting compared to agency theory. According to legitimacy theory, companies are participants in a social system and have to act according to social rules, norms and values (Dowling & Pfeffer, 1975). Legitimacy can be defined as the perception that organisational activities are congruent with the values of a social environment (Suchman, 1995). To establish legitimacy, a company can follow several legitimacy strategies, as reviewed by Deegan (2001). One of these legitimacy strategies considers corporate reporting as a tool to appear congruent with social expectations. The approach of using corporate reporting for legitimacy purposes has been widely discussed in the area of social and environmental reporting research (Guthrie & Parker, 1989; Deegan, 2002; Bebbington et al., 2008). According to these studies, the societal implication for social and environmental reporting is relatively obvious. They argue that society requires companies to act in a socially and environmentally responsible way. Therefore, managers use corporate social and environmental reporting to legitimise the status as a socially and environmentally responsible company.

Other situations are discussed in the disclosure literature where corporate reporting is used for legitimacy purposes besides the overall idea of congruence between corporate activities and social values. Based on legitimacy theory, two main areas have been conceptualised: a legitimacy threat and a justification for the use of resources. First, corporate reporting is argued to be affected by a legitimacy threat caused by certain situations (Cunningham & Gadenne, 2003). In their study of Australian companies, Deegan et al. (2000) show that social and environmental reporting increased under legitimacy threats after incidents, such as oil spills. They interpret this reporting as an attempt to address the threat in order to maintain or regain corporate legitimacy. Second, following legitimacy theory, disclosure is intended to illustrate and justify corporate use of resources to ensure future access to further resources (Lounsbury & Glynn, 2001). Based on legitimacy theory, it is assumed that companies ‘are not considered to have any inherent right to resources’

(Deegan, 2001, p.255). According to this argument, the use of any resources requires a justification to be provided in corporate reporting.

7.2.4.2 Linking legitimacy theory to IC reporting

IC reporting literature refers to legitimacy theory, suggesting that companies would report IC-related information to legitimise their status (Guthrie et al., 2004; Guthrie et al., 2007). If IC was included in the system of social norms and values, companies would be more likely to use IC reporting to legitimise their status. However, it has not been reasoned in the IC reporting literature whether and how an appreciation of IC creation is embedded in social systems. Therefore, the societal linkage to IC creation is further elaborated from a theoretical perspective for the purpose of this study. The question arises why society would impose IC-related norms. If society expected corporations to create and develop IC, efficient IC utilisation would be established within the framework of social norms and values. Then a company is highly likely to try and meet these expectations or to create an impression of well-managed IC value creation. First, arguments for societal importance of IC creation in general are developed in this section. Then the arguments are applied to the German setting of this study. Although the reasoning of society's interest in IC may generally be consistent with most societies, IC-related social expectations have to be considered within the societal setting of the IC reporting study. As Dowling and Pfeffer (1975) argue that social values are reflected in communications of society, writings from different institutions indicate the society's view on IC importance, such as regulatory standards or guidelines.

One interpretation of why IC creation may constitute a social value is presented in this paragraph. The following implications are drawn from the IC categories, structural, relational and human capital, introduced in chapter 2. First, structural capital considers efficient processes, the use and enhancement of research and modern technologies. Corporate achievements in research and technological advances promote progress and innovation and, therefore, are beneficial for society as a whole. Second, relational capital addresses the significance of relationships with

important stakeholders, such as customers, suppliers and business partners. In order to establish long-standing beneficial relationships, companies commit to fair and coequal treatment of stakeholders. A respectful engagement with stakeholders is also consistent with social norms and values. Thirdly, human capital highlights the value of employees and promotes their development and training. The appreciation of human resources as an essential part of IC is considered as socially valuable because society as a whole benefits from fostering human resources. Corporate investments in advanced training contribute to the overall level of education within a society. For the reasoning presented, IC can be argued to be embedded in social norms and values.

As this study investigates IC reporting in Germany, the German social setting for IC creation is considered. In Germany, IC-related social values are promoted on various levels. Governmental publications are consulted to elaborate the applicability of legitimacy theory for an IC reporting study in a German setting. A study initiated by the Federal Ministry of Economics and Technology highlights the perceived importance of IC creation in the German society (BMWi, 2010). The declared aim of the governmental study is to develop guidelines on IC management in order to establish a sound foundation for knowledge resources. In the study, IC is considered to enhance the development of a competitive advantage for the German market. Hence, the creation of IC can be argued to represent social values for the German society. Additionally, the management reporting regulation emphasises that German regulators deem IC to be important (GASC, 2010a). For voluntary IC reporting the legitimacy purposes of addressing a threat and justifying the use of resources, discussed in section 7.2.4.1, are hypothesised in the following sections.

7.2.4.3 IC reporting under legitimacy threat

Following the concepts of legitimacy theory, discussed in section 7.2.4.1, one reason, why a company voluntarily reports on IC, is a legitimacy threat. Deegan et al. (2000) investigated legitimacy threats in form of social and environmental incidents. For IC reporting, the literature has not established what kind of situations cause a legitimacy

threat. In this section, the reasoning is elaborated how corporate legitimacy is threatened with regards to IC value creation. Since IC value consists of intangible resources not fully presented in the financial statements, an appropriate evaluation of IC value is difficult for market participants, as argued in chapter 5. Given this situation, a potential legitimacy threat for IC creation is mispricing, defined as a deviation from the company's underlying long-run intrinsic value, described in further detail in chapter 5. Jensen (2005) introduces the idea that corporate mispricing causes the 'destruction of corporate and social value' (Jensen, 2005, p.5). This argument implies two different aspects of the consequences of mispricing: consequences for the company and for society. With regards to the company perspective, Jensen (2005) considers substantial overpricing in the light of agency theory. He argues that companies bear additional agency costs because managers are not able to meet expectations in the long term. Following this interpretation, overpriced companies report on IC, to explain the real value of IC to reduce the mispricing. However, this interpretation is based on substantial long-run mispricing which is not considered in this study.

Going further than Jensen (2005) on the aspect of social value, the idea of current mispricing allows bridging the concepts of legitimacy theory to IC reporting. Based on Jensen's (2005) idea of the consequences of mispricing, the second effect is an impact on society because overpriced companies destroy social value due to misallocation of resources. Following this idea, mispricing can be interpreted as a legitimacy threat for a company. Accordingly, currently overpriced companies use corporate reporting to address this threat in order to legitimise their market position. With regards to the legitimacy threat of being currently overpriced, voluntary IC reporting offers a great scope to explain to society that the company is not overpriced by reporting on IC creation and utilisation. The IC information is provided voluntarily to justify the current company value and to defend the allocation of resources to this company. Therefore, currently overpriced companies attempt to legitimise their status by increasing their voluntary IC reporting. This voluntary IC reporting is intended to create an image that the company's value is justified as the

company strongly engages with IC. This argument of current mispricing to represent a legitimacy threat leads to the third hypothesis of this study:

$H_{7.3}$: The extent of IC reporting is higher for currently overpriced companies in order to legitimise their market position.

7.2.4.4 IC reporting to legitimise intangible resources

The second aspect of how companies use their corporate reporting for legitimacy purposes, outlined in section 7.2.4.1, is the justification of resources. This argument can also be applied to intangible resources and IC. Society expects the utilisation of intangible resources to develop IC because corporate IC increases value for society as a whole, as discussed in section 7.2.4.2. Hence, companies are expected to justify their investments in intangible resources, particularly, as the financial statements do not provide a reasonable justification. As discussed in chapter 5, investments in intangible resources can be traced from some indicators in the financial statements which are considered as important features for developing IC. These indicators are: intangible assets recognised on the balance sheet, expenses in R&D, and advertising expenses (Villalonga, 2004). However, these indicators are insufficient in explaining whether the intangible resources are actually used to create corporate IC value. To justify IC value creation and development, IC reporting elaborates on the use of these intangible resources. Following this line of thought, IC reporting is seen as a tool to create an image of a well-managed corporation investing in intangible resources to build IC potential.

From the line of argument that IC reporting is intended to justify the use of intangible resources, a company is expected to report extensively on IC if the company invests into intangible resources. Therefore, this study examines the relationship between IC reporting and the indicators for IC in the financial statements. However, information on advertising expenses is rarely available and cannot be generally investigated. Hence, this study focuses on R&D expenses and intangible assets recognised on the balance sheet to investigate IC reporting. R&D and intangible assets represent

aspects of IC for which disclosure is partly required in many jurisdictions, as presented in the outline of the European Fourth Council Directive (European Commission, 2007) in chapter 3. Given that companies engaging with R&D and intangible assets are obliged to report on these issues, the IC reporting will certainly increase in this respect. In the German management reporting regulation, information on R&D and intangible assets is partly required and partly recommended. Voluntary IC reporting is not expected to repeat information on these intangible resources again. Therefore, the effect of R&D and intangible assets to justify intangible resources is particularly interesting for voluntary IC reporting. The final hypotheses of this study to test the justification of intangible resources are stated as follows:

$H_{7.4}$: The extent of IC reporting is higher for companies with expenses in research and development in order to legitimise the use of intangible resources.

$H_{7.5}$: The extent of IC reporting is higher for companies with a higher proportion of intangible assets in order to legitimise the use of intangible resources.

7.3 Research methods

7.3.1 Sample of German companies

German listed companies are required to publish a management report according to GAS 15 (GASC, 2010a), as discussed in chapter 3 on the German context. This standard on the management report also includes IC information being partly required and partly recommended. These requirements and recommendations create a unique research setting for corporate IC reporting in Germany. For this IC reporting study, management reports for the accounting year 2010 are investigated for IC information, following the revision of GAS 15 in 2010, as outlined in chapter 3. The sample comprises 428 companies located in Germany and listed on the German stock exchange on 30/12/2010, as described in the methodology overview in chapter 4. The sample is grouped into four industries according to the corporate business model: consumer, finance, pharmaceutical & technology, and industrial. For companies within each industry similar IC categories are assumed to be important and likely to be reported, as argued in the methodology overview in chapter 4.

Therefore, the industry grouping safeguards a certain level of comparability of corporate IC reporting within an industry.

7.3.2 Measures of IC value and mispricing

Research on measuring IC value has not provided generalisable IC value measures, as discussed in chapters 2 and 5. The results in chapter 5 on estimating a measure of IC value show that long-run value-to-book (LRVTB) serves as best estimator for underlying corporate IC value, compared to market-to-book ratios and Tobin's q. Therefore, this study applies the approach developed by Rhodes-Kropf et al. (2005) to estimate IC value and mispricing. Chapter 5 outlines the approach taken in this study in more detail. The approach by Rhodes-Kropf et al. (2005) decomposes market-to-book ratios into three components: firm-specific error, time-series sector error and LRVTB. The decomposition offers a measure of current mispricing, represented in the firm-specific error, while simultaneously considering intrinsic long-run value as indicator for IC value. For the measures of IC value and mispricing, model 2, as described by Rhodes-Kropf et al. (2005), is applied in this study. It uses book value of equity and income as accounting information. For mispricing, the antilog of the firm-specific error is computed to represent a ratio of mispricing above the value of one for overpriced companies. The measures are proposed as indicators of IC value and mispricing rather than providing actual monetary values. Therefore, the measure for IC value is grouped into deciles to analyse the effects of different levels of corporate IC value.

7.3.3 Content analysis of IC reporting

In the review of IC reporting literature in chapter 2, the common use of content analysis as a research method in IC reporting studies is discussed. This study conducts a content analysis of IC reporting in narratives of German management reports in German as the original language. The research framework for IC reporting applied in this study is developed in chapter 6 and is presented in Table 6.6. Words serve as units of analysis and measurement, including repetition. Numerical

information, graphs and tables are not considered apart from related narrative information. The IC reporting score is then scaled by total number of pages in the management report to account for reporting length. A computer-aided analysis is conducted, using *atlas.ti*, since it enables processing high volumes of narratives at a high level of consistency, as argued by Krippendorff (2004). The use of content analysis software can be justified for this study since in the German language compound words are commonly used and inherently indicate their context. This language-dependent situation ensures a relatively high level of reliability for correct coding within the IC context, as described in chapter 6.

7.3.4 Distinction of reporting types: required, recommended, voluntary

As agency theory and legitimacy theory apply to voluntary reporting, outlined in sections 7.1, 7.2.3, and 7.2.4, the voluntary IC reporting is important to answer the research question of this study. Therefore, the corporate IC reporting is distinguished for different reporting types: required, recommended and voluntary IC reporting. The German regulation applicable to the management report refers to IC-related information on different levels in GAS 15 (GASC, 2010a), as discussed in chapter 3. Different wordings imply that some information on IC is required and some is recommended. This regulation allows distinguishing the IC components into three groups of IC reporting types: required, recommended and voluntary IC reporting. To investigate reporting types, the IC components in the IC reporting research framework are separated for required or recommended and the remaining components are classified as voluntary reporting. According to GAS 15 (GASC, 2010a), required IC components refer to structural and relational capital, as presented in Table 7.1 Panel A. Recommended IC components are shown in Table 7.1 Panel B. The recommended IC components cover aspects of all three IC categories. Voluntary IC components are the remaining components in the research framework for IC reporting developed in chapter 6, presented in Table 6.6, which are neither classified as required nor recommended in Table 7.1.

Table 7.1 Required and recommended IC components in GAS 15

Panel A: Required IC components in GAS 15

Structural Capital	**Section**
Organisational structure, management & control functions, internal control system	37-39
Main products, impact of product mix	37, 56
Business processes, development of new processes	37, 83
Research and development	40-42
Internal control and risk management for reporting processes, internal audit	100-104
Internally generated intangible items	80
Risk management	91-92
Relational Capital	
Primary sales and purchase markets, development of new sales markets	37, 59, 83
Competitive position	37, 44

Panel B: Recommended IC components in GAS 15

Structural Capital	**Section**
Development of new products and services	155
Separation of functions; access rules of IT systems; dual control principle; manuals	174
R&D areas of activity and results	155
R&D cost ratio; R&D intensity; research productivity, product pipeline	156
Development of patents, licences, franchise agreements, computer software, intellectual property rights, industrial rights	53, 146, 155, 166
Restructuring and rationalisation	46, 59
Efficiency of production	59
Capacity utilisation	59
Quality assurance, product quality	59, 146, 173
Corporate culture	146
Throughput times	173
Reject rates per product, warranty expenses	173
Relational Capital	
Market share	44, 46, 173
Co-operation agreements, co-operations in R&D	46, 155
Acquisitions of businesses	46
Supply arrangements, specific suppliers and customers, supplier relationships	53, 59, 146
Customer base, portfolio	146
Customer satisfaction	146, 173
Customer retention rates; value added per customer	173
Social reputation	146
Human Capital	
Qualified staff	53
Personnel expenses	59
Employee turnover	146, 173
Employees' length of service	146
Remuneration system	146, 173
Vocational training	146
Professional development, employee training	146, 173
Internal incentive measures	146
Employees working in R&D	155

Notes

These tables show required and recommended IC-related components in the German regulation on the management report, GAS 15 (GASC, 2010a). Voluntary IC reporting refers to the remaining components compared to the research framework for IC reporting developed in chapter 6 and presented in Table 6.6.

7.3.5 Statistical analysis of IC reporting

7.3.5.1 Statistical regression model to test hypotheses

To test the proposed hypotheses $H_{7.1}$ to $H_{7.5}$, developed in sections 7.2.3 and 7.2.4, a regression analysis is conducted. The IC reporting scores from the content analysis, described in section 7.3.3, form the dependent variable. Hypotheses $H_{7.1}$ and $H_{7.2}$ are based on agency theory, as outlined in sections 7.2.3.3 and 7.2.3.4. Ownership diffusion ($H_{7.1}$) and an approximate measure for IC value ($H_{7.2}$) serve as independent variables to test these hypotheses. Hypotheses $H_{7.3}$ to $H_{7.5}$ are developed from the arguments of legitimacy theory in sections 7.2.4.3 and 7.2.4.4. The independent variables to test whether legitimacy theory explains IC reporting are an approximate measure for current mispricing ($H_{7.3}$), R&D expenses ($H_{7.4}$) and intangible assets ($H_{7.5}$). Additionally, control variables for company size and industry are added to the model, because prior studies found an association with IC reporting, as outlined in section 7.2.1. Equation 7.1 shows the regression model.

Equation 7.1

$$ICpp_j = \beta_0 + \beta_1 owner_j + \beta\ \ IC\ value_j + \beta_3 mispriced_j + \beta_4\, R\&D_j + \beta_5 intangibles_j + \beta_6 size_j + \sum \alpha_i\, industry_j + \varepsilon_j$$

ICpp is the IC reporting score scaled by page numbers of the management report. Alternatively, number of words has been considered to control for reporting length. IC reporting scores can be differentiated for IC categories (structural, relational and human) and reporting types (required, recommended and voluntary). The variable *owner* is the percentage of free float shares as a measure of ownership diffusion to represent information asymmetry to test $H_{7.1}$. The variable *IC value* represents deciles of LRVTB, outlined in section 7.3.2, as a measure for IC value to test $H_{7.2}$. To test $H_{7.3}$, the variable *mispriced* indicates a legitimacy threat of current corporate mispricing measured by the antilog of firm-specific error, described in section 7.3.2. To test hypothesis $H_{7.4}$, the variable *R&D* is a dummy variable, taking the value 1 if a company declares R&D expenses in the income statement, 0 otherwise. The variable *intangibles* represents a ratio for intangible assets scaled by total assets to test $H_{7.5}$.

The control variables in the regression model account for certain company characteristics which have previously been shown to be associated with IC reporting, as discussed in section 7.2.1. These characteristics are company size and industry group. The control variable *size* is measured by the natural logarithm of total assets. The control variable *industry* represents dummy variables for the four industry groups: consumer, finance, pharmaceutical & technology, and industrial. The industry group consumer serves as base industry. The industry groupings account for IC reporting differences based on different business models, as discussed in chapter 4. Table 7.2 shows descriptive statistics and correlation coefficients for the variables included in the regression analysis. The low correlation values suggest that the level of correlation is not worrying regarding multicollinearity. Hence, each variable represents a separate firm characteristic to investigate IC reporting.

7.3.5.2 Separate analyses regarding IC categories and reporting types

The statistical analysis, presented in section 7.3.5.1, is conducted in two ways. First, IC reporting is analysed by IC categories to enable comparability to prior research. The three IC categories, structural, relational, and human capital, have been developed and examined in prior exploratory studies, as discussed in chapter 2. Second, corporate IC reporting is analysed by the three reporting types: required, recommended, and voluntary IC reporting. Agency theory and legitimacy theory apply to voluntary IC reporting, as outlined in sections 7.2.3.2 and 7.2.4.2. Therefore, the results for voluntary IC reporting are important to answer the research question whether agency theory or legitimacy theory better explains IC reporting. Previous studies have not distinguished for required and voluntary IC reporting among the IC categories although information on intangible assets and R&D is required in many jurisdictions (European Commission, 2007). The distinction of required, recommended, and voluntary IC reporting enhances the investigations of this study. As the German regulation enables a distinction among these IC reporting types, it offers a unique research opportunity and allows an investigation of different aspects of IC reporting.

Table 7.2 Descriptive statistics of regression variables

Panel A: Definitions of variables

Variable	Definition	Function
ICpp	IC reporting scores from content analysis scaled by number of pages	Dependent variable
owner	percentage of free float shares	Test hypothesis $H_{7.1}$
IC value	deciles of LRVTB based on Rhodes-Kropf et al. (2005)	Test hypothesis $H_{7.2}$
mispriced	antilog of firm-specific error based on Rhodes-Kropf et al. (2005)	Test hypothesis $H_{7.3}$
R&D	dummy variable: 1 if R&D expenses declared, 0 otherwise	Test hypothesis $H_{7.4}$
intangibles	intangible assets scaled by total assets	Test hypothesis $H_{7.5}$
size	natural logarithm of total assets	Control variable
industry	dummy for industry groups: consumer, finance, pharma & tech, industrial; consumer serves as base variable	Control variable

Panel B: Descriptive statistics

	Continuous variables					Dummy frequency	
	N	mean	sd	min	max	0	1
ICpp	428	8.87	3.55	0.00	30.96		
owner	428	0.53	0.29	0.00	1.00		
IC value	418	5.49	2.87	1	10		
mispriced	418	0.00	0.65	-3.13	2.74		
R&D	428					236	192
intangibles	428	0.17	0.18	0.00	0.95		
size	428	12.65	2.40	6.79	21.36		

Panel C: Correlations

N=418	*ICpp*	*owner*	*IC value*	*mispriced*	*R&D*	*intangibles*	*size*
ICpp	1	0.02	0.24 *	0.11 *	0.28 *	0.34 *	0.04
owner	0.04	1	0.01	-0.08	0.19 *	0.14 *	0.13 *
IC value	0.23 *	0.01	1	-0.02	0.15 *	0.16 *	-0.06
mispriced	0.13 *	-0.06	0.03	1	0.08	0.08	0.15 *
R&D	0.29 *	0.19 *	0.15 *	0.09	1	0.21 *	0.17 *
intangibles	0.29 *	0.07	0.10 *	0.07	0.09	1	-0.08
size	0.06	0.14 *	-0.05	0.06 *	0.15 *	-0.07	1

Notes

These tables show definitions (Panel A), descriptive statistics (Panel B) and correlations (Panel C) of variables used in the regression analysis of IC reporting. In the correlation table (Panel C), Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. Overall, the correlation level between regression variables is low and does not imply multicollinearity.

7.3.5.3 Considerations of proprietary costs

A further consideration of the statistical model is related to costs for publishing IC-related information which is potentially competitive sensitive, as discussed in section 7.2.3.1. Proprietary costs represent a possible indicator of these costs. Singh and Van der Zahn (2008) use a Herfindahl Index as a measure to proxy for proprietary costs. This measure of industry concentration compares a company's sales to the sales of all companies within an industry. Alternatively, an industry sales concentration ratio of the four largest companies within an industry is used as proxy for proprietary costs in disclosure research (Luo et al., 2006). Overall, these proxies can be summarised to account for a company's sales and industry. A company's sales can also be interpreted as a measure of size. The control variables for size and industry in the statistical analysis of this study are seen to capture features of proprietary costs. Therefore, proprietary costs are not included separately in the analysis of this study.

7.4 Results

7.4.1 Analysis of IC reporting by IC categories

7.4.1.1 Descriptive results by IC categories

A cross-sectional analysis of IC reporting is conducted for management reports of 428 German companies grouped into four industries for the accounting year 2010. The analysis of IC categories enables comparability with prior IC reporting research. In Table 7.3 Panel A, the descriptive results of the content analysis by IC categories show that IC reporting can be found in German management reports across all four industry groups. The IC reporting scores can be distinguished for the three IC categories: structural, relational, and human capital. On average, 8.87 words are related to IC on every page of the management report, varying between zero and 30.96 words per page. The IC scores can be compared across the four industry groups. For each industry group, the contribution of IC in the value creation process is expected to differ due to different business models. The results indicate that significant industry differences exist for mean IC reporting scores, as can be seen in the test of different means in Table 7.3 Panel B.

Table 7.3 Descriptive results of IC content analysis by IC categories

Panel A: Descriptive results of IC reporting scores

		IC	SC	RC	HC
Total	mean	8.87	3.82	3.28	1.78
N=428	% of total		43%	37%	20%
	sd	3.55	1.65	1.80	0.81
	min	0.00	0.00	0.00	0.00
	max	30.96	12.33	15.98	6.06
Consumer	mean	8.71	3.46	3.56	1.69
N=123	% of total		40%	41%	19%
	sd	3.71	1.36	2.15	0.82
	min	1.63	0.80	0.43	0.17
	max	30.96	8.92	15.98	6.06
Finance	mean	6.27	2.88	2.13	1.26
N=62	% of total		46%	34%	20%
	sd	2.44	1.28	1.34	0.55
	min	0.00	0.00	0.00	0.00
	max	12.61	7.31	6.52	2.44
Pharma & Tech	mean	10.93	4.89	3.93	2.11
N=116	% of total		45%	36%	19%
	sd	3.59	1.94	1.69	0.87
	min	4.85	1.37	0.77	0.40
	max	22.06	12.33	9.84	4.65
Industrial	mean	8.43	3.64	2.96	1.83
N=127	% of total		43%	35%	22%
	sd	2.69	1.22	1.35	0.71
	min	3.45	0.84	0.31	0.36
	max	17.63	6.44	7.47	4.24

Panel B: T-test of differences of means across industries for IC reporting scores

	Comparing means to	t-statistic	degrees of freedom	Pr(|T|>|t|)
consumer	finance	4.6815	183	0.000
	pharma & tech	-4.6935	237	0.000
	industrial	0.6865	248	0.493
financial	pharma & tech	-9.1432	176	0.000
	industrial	-5.3255	187	0.000
pharma & tech	industrial	6.1757	241	0.000

Notes

These tables show descriptive results of the content analysis conducted on German management reports for the accounting year 2010 of a sample of 428 German companies grouped into 4 industries. The findings in Panel A represent occurrences per page of the three IC categories, structural, relational, and human capital, for the total sample and industries: consumer, finance, pharmaceutical & technology, and industrial. Panel B shows the results of a t-test of differences of means across industries for total IC reporting scores. The t-test results show that across most industries, except consumer and industrial, the means are significantly different.

The average occurrences of IC reporting per page are highest for pharmaceutical & technology for all three categories. This is consistent with the findings by Brüggen et al. (2009) that companies in the healthcare and IT sectors report most on IC. Pharmaceutical & technology comprises companies with business models relying on intangible rather than tangible assets, such as software and pharmaceutical companies. Therefore, a higher level of IC reporting compared to other industries may intrinsically be required by their business model. The industrial sector shows the highest percentage of human capital reporting scores compared to total IC reporting. Companies operating in the financial sector report least on IC for every IC category. Two potential reasons for the low level of IC reporting in the financial sector exist. On the one hand, reporting is highly regulated for the financial sector with particular requirements on risk reporting according to GAS 5-10 and GAS 5-20 (GASC, 2010c; GASC, 2010d). This may encourage the companies to focus on risk reporting rather than IC reporting. On the other hand, the sample for financial companies is relatively small compared to the other industry groups which may cause biased results.

For three out of four industries structural capital is referred to most often, followed by relational capital with lower reporting scores on human capital. The only industry referring most frequently to relational IC components is the industry group consumer. As the consumer industry is strongly reliant on customers' perceptions, IC reporting may focus more intensely on describing the company's efforts to establish a solid customer presence. IC components such as brand building and corporate image may be more important compared to other industries. Prior literature found that relational capital is most frequently reported on, even across different countries (Guthrie & Petty, 2000; Vergauwen & van Alem, 2005; Vandemaele et al., 2005). Hence, the question arises whether the distinctive proportion of structural capital reporting in Germany may be driven by other factors. As the regulation of the German management report requires some information that is classified as structural capital in this study, the high score of IC reporting on structural capital may be caused by required IC reporting. This is further investigated in section 7.4.2.1 below.

7.4.1.2 Results of regression analysis by IC categories

The results for the statistical analysis of IC reporting by the three IC categories, structural, relational and human capital, are presented in Table 7.4. The regression analysis is conducted with IC reporting scores scaled by page numbers and, alternatively, by number of words. The IC reporting findings scaled by number of words show similar results. These results are not presented here as an interpretation of IC reporting scores per page is easier to follow compared to percentages of total words in small decimal numbers. Alternative measures for company size, such as market value or sales are also tested. As the results are similar, they are not shown here. The coefficients for the industry groups, finance, pharmaceutical & technology, and industrial, compare IC reporting to the base industry consumer. Significant results indicate how IC reporting is associated with the respective variables. The six columns show the results for different model specifications. First, total IC reporting is investigated with different specifications of the statistical model focusing on certain variables. Then, IC reporting is examined for the three IC categories: structural capital (SC), relational capital (RC), and human capital (HC). For this analysis, IC reporting scores of the respective category act as dependent variables.

The independent variables *owner*, *IC value*, *mispriced*, *R&D* and *intangibles* serve to test hypotheses $H_{7.1}$ to $H_{7.5}$, as discussed in section 7.3.5.1. H_1 and H_2 investigate the relationship between IC reporting and information asymmetry based on ownership diffusion and IC value. Hypotheses $H_{7.3}$ to $H_{7.5}$ are developed from legitimacy theory in sections 7.2.4.3 and 7.2.4.4. They examine two aspects of legitimacy theory for IC reporting: a legitimacy threat of current mispricing and the justification of intangible resources. These two legitimacy aspects can be tested separately with the statistical model by adding only the respective variables to the regression model. Therefore, different model specifications are presented for total IC reporting in columns (1) to (3). First, the regression analysis is conducted with all independent variables. Second, the analysis considers only the legitimacy threat of mispricing. Third, the model focuses on the justification of resources for R&D and intangible assets. Then reporting on the individual IC categories is examined.

Table 7.4 Regression results by IC categories

	(1) **IC**	(2) **IC**	(3) **IC**	(4) **SC**	(5) **RC**	(6) **HC**
constant	4.760***	4.838***	4.673***	2.282***	1.661***	0.817***
	(4.99)	(5.07)	(4.88)	(5.14)	(3.23)	(3.50)
owner	-0.372	-0.075	-0.472	-0.215	-0.125	-0.031
	(-0.70)	(-0.14)	(-0.88)	(-0.87)	(-0.43)	(-0.24)
IC value	0.066	0.053	0.061	0.010	0.046	0.010
	(1.12)	(0.90)	(1.05)	(0.36)	(1.46)	(0.67)
mispriced	0.545**	0.676***		0.177	0.259*	0.108*
	(2.22)	(2.72)		(1.55)	(1.96)	(1.81)
R&D	1.158***		1.230***	0.731***	0.259	0.168*
	(3.28)		(3.49)	(4.45)	(1.36)	(1.94)
intangibles	2.612***		2.773***	1.249***	1.195**	0.169
	(2.93)		(3.10)	(3.00)	(2.48)	(0.77)
size	0.233***	0.291***	0.240***	0.060*	0.112***	0.061***
	(3.34)	(4.21)	(3.44)	(1.84)	(2.98)	(3.56)
industry						
finance	-1.764***	-2.658***	-1.730***	-0.171	-1.185***	-0.408***
	(-3.18)	(-5.08)	(-3.11)	(-0.66)	(-3.96)	(-3.01)
pharma & tech	2.020***	2.508***	2.016***	1.281***	0.325	0.414***
	(4.61)	(5.81)	(4.58)	(6.28)	(1.37)	(3.86)
industrial	-0.717*	-0.581	-0.723*	-0.043	-0.707***	0.033
	(-1.70)	(-1.41)	(-1.71)	(-0.22)	(-3.11)	(0.32)
Model summary						
R^2	0.272	0.238	0.263	0.266	0.179	0.168
Adj. R^2	0.256	0.225	0.248	0.250	0.161	0.150
N	418	418	418	418	418	418

Notes

This table shows results for the regression analysis of IC reporting scores for total IC and the categories structural, relational, and human capital. IC reporting is measured as occurrences related to IC in German management reports for the accounting year 2010 scaled by the number of pages. Columns (1)-(6) denote different model specifications. Columns (1) and (4)-(6) show the findings for total IC reporting and the IC categories with the IC reporting scores for each category as respective dependent variable. Columns (2)-(3) repeat the regression on total IC reporting with different model specifications omitting variables for testing hypotheses $H_{7.3}$-$H_{7.5}$. T-statistics are given in parenthesis underneath values for coefficients. Asterisks indicate the level of significance: * 10% significance, ** 5% significance, *** 1% significance.

$$ICpp_j = \beta_0 + \beta_1 owner_j + \beta\ IC\ value_j + \beta_3 mispriced_j + \beta_4\ R\&D_j + \beta_5 intangibles_j + \beta_6 size_j + \sum \alpha_i\ industry_j + \varepsilon_j$$

The regression results show that ownership diffusion and IC value have no significant relationship to IC reporting for any IC category. These results do not support hypotheses $H_{7.1}$ and $H_{7.2}$. Hence, IC reporting is not motivated to reduce the information gap. In studies on other countries, the relationship of ownership diffusion and IC reporting has also been non-significant (Brüggen et al., 2009; Hidalgo et al., 2011). However, Li et al. (2008) found a significant association of IC reporting with concentrated ownership. Their approach to ownership initiated a variation for this research project to test ownership concentration, squared ownership, and dummy variables, with no significant results. A potential reason for the non-significant relationship in Germany is the management reporting regulation. Owners may rely on IC reporting to follow the regulatory requirements and recommendations without questioning what additional IC information may be relevant. For IC value, different variations are also tested for rankings and LRVTB ratios with no significant results. Hence, IC reporting does not seem to be intended to explain underlying corporate IC value.

Mispricing shows significant results for total IC reporting for the different model specifications. This suggests that overpriced companies report significantly more on total IC, supporting hypothesis $H_{7.3}$. Accordingly, legitimacy theory seems to explain IC reporting since overpriced companies report more on IC to avoid a legitimacy threat, discussed in section 7.2.4.3. However, mispricing is only slightly significantly associated with relational and human capital reporting, not significant for structural capital. Hypotheses $H_{7.4}$ and $H_{7.5}$ are supported by the significant results of *R&D* and *intangibles* for total IC and structural capital. As *R&D* and *intangibles* both test whether IC reporting justifies the use of intangible resources, a differentiation of the effects of R&D expenses and intangible assets may be difficult. For relational capital, only the results for *intangibles* but not *R&D* are significant. A potential reason is that certain components of relational capital can be included in intangible assets, such as acquired customer bases and brands. Human capital reporting is not fully explained by the analysis as *mispriced* and *R&D* show only slightly significant results. A potential reason for these relationships may be that human capital reporting also refers to employees working in R&D.

The variable *size* controls for the positive association of company size with IC reporting which has been found in prior research, outlined in section 7.2.1. The coefficients are relatively small for all IC categories, structural, relational and human capital. Hence, larger companies tend to report slightly more on IC. The findings also indicate that after controlling for company size, industry differences, as indicated by the descriptive results in section 7.4.1.1, continue to exist. Hence, reported IC information is affected by the industry which the company operates in and the underlying business model. The industry groups also influence IC reporting on a categorical level. Financial companies report significantly least on total IC, relational and human capital. The mainly significant outcomes for pharmaceutical & technology show that IC reporting is higher for companies with a stronger dependence on intangible assets. The industry pattern is consistent with the findings by Brüggen et al. (2009). Their results suggest that IC reporting is higher for companies operating in healthcare and IT which is mostly congruent with pharmaceutical & technology in this study. However, the industry pattern seems ambiguous as some categories are significantly and some are non-significantly higher or lower compared to the base industry consumer. To examine industry patterns for IC reporting, further investigations are needed.

As agency theory and legitimacy theory are theories of voluntary corporate disclosure, outlined in sections 7.2.3 and 7.2.4, the analysis for IC categories may be biased. Hence, the findings of this regression analysis by IC categories cannot be interpreted to represent robust answers to the question whether agency theory or legitimacy theory better explains IC reporting. However, the analysis by IC categories provides an indication for testing hypotheses $H_{7.1}$ to $H_{7.5}$. Since $H_{7.1}$ and $H_{7.2}$ are not supported, agency theory does not seem to provide a theoretical explanation for IC reporting on a categorical level. These results are surprising because the declared aim of the German regulation is consistent with the concepts of agency theory, outlined in sections 7.1 and 7.2.1. Furthermore, prior literature argued that agency theory explains IC reporting motivations, as reviewed in section 7.2.2.2. The significant results supporting $H_{7.3}$ to $H_{7.5}$ suggest that legitimacy theory

elucidates IC reporting. The findings imply that corporate IC reporting serves the purpose of legitimising a company's market position rather than explaining IC value to reduce the information asymmetry. In order to apply the theories of voluntary corporate disclosure to IC reporting, the following analysis by reporting types (required, recommended, and voluntary) is conducted to separately investigate voluntary IC reporting. This analysis by reporting types may provide better insights to answer the question whether agency theory or legitimacy theory explains IC reporting.

7.4.2 Analysis of IC reporting by reporting types

7.4.2.1 Descriptive results by IC reporting types

Descriptive results for IC reporting by reporting types required, recommended and voluntary IC reporting, for each IC category are shown in Table 7.5. The distinction of IC reporting types is based on the German regulation GAS 15 (GASC, 2010a), as outlined in section 7.3.4. The findings show that IC reporting is mostly voluntary in total and for all three IC categories, exceeding the management reporting regulation. As suggested in section 7.4.1.1, structural capital shows a high proportion of required IC components. Hence, the reporting scores for structural capital seem to be driven by regulatory considerations. Relational capital shows the highest proportion of voluntary reporting. Although several components of relational capital are required or recommended, the average and maximum reporting frequencies of these required and recommended components of relational capital are low. This may be due to data sensitivity for the required and recommended relational capital components, such as information on primary sales markets and customer bases. Although information on human capital is partly recommended and not required, the companies under review report on human capital to a relatively high extent.

Table 7.5 Descriptive results of IC reporting by reporting types

N=428		Total	Required	Recommended	Voluntary
Total IC	mean	8.87	1.45	1.27	6.15
	% of total		16.3%	14.3%	69.4%
	sd	3.55	0.70	0.67	2.74
	min	0.00	0.00	0.00	0.00
	max	30.96	7.25	4.32	25.67
Structural Capital	mean	3.82	1.31	0.61	1.90
	% of total		34.3%	16.0%	49.7%
	sd	1.65	0.68	0.47	0.93
	min	0.00	0.00	0.00	0.00
	max	12.33	7.11	3.23	7.25
Relational Capital	mean	3.28	0.14	0.20	2.93
	% of total		4.4%	6.2%	89.4%
	sd	1.80	0.12	0.16	1.68
	min	0.00	0.00	0.00	0.00
	max	15.98	0.83	0.89	15.27
Human Capital	mean	1.78		0.45	1.33
	% of total			25.5%	74.5%
	sd	0.81		0.29	0.67
	min	0.00		0.00	0.00
	max	6.06		2.13	4.41

Notes

This table shows descriptive results of the content analysis conducted on German management reports for the accounting year 2010 of a sample of 428 German companies grouped into 4 industries. The findings represent occurrences per page of IC categories, structural, relational, and human capital, for total, required, recommended, and voluntary IC reporting. The distinction of reporting types, required, recommended and voluntary IC reporting, is based on Table 7.1 in section 7.3.4.

7.4.2.2 Results of regression analysis by IC reporting types

For the IC reporting types total, required, recommended, and voluntary reporting, the regression results are presented in Table 7.6. The same regression model is applied as in section 7.4.1.2 with the IC reporting scores for total, required, recommended, and voluntary IC reporting per page as dependent variables. The columns show different model specifications with three analyses on voluntary reporting focusing on certain variables. After the IC reporting analysis for IC categories showed surprisingly no association for *owner* and *IC value* in section 7.4.1.2, agency theory did not seem to explain IC reporting. Again, the variable *owner* shows no significant results for any type of IC reporting. Moreover, *IC value* is not significantly associated with any IC reporting type at a 5%-significance level. However, for voluntary IC reporting, the corporate IC value shows a slightly significant association with IC reporting scores at a 10%-significance level. This relationship indicates that IC value may be relevant for the IC reporting motivations for voluntary reporting. However, the significance level is too low for generalisability. Therefore, a sensitivity test is appropriate. Propensity score matching is conducted as sensitivity test for the relationship between IC value and IC reporting in the following section 7.5.

Overpriced companies and companies with investments in R&D and intangible assets voluntarily report more on IC to justify their market positions and resources. The variable *mispriced* shows a significant association with IC reporting. However, the association of *mispriced* with IC reporting is not significant for all reporting types. Overpriced companies report significantly more for total and for voluntary IC reporting. Required and recommended IC reporting scores are not significantly associated with *mispriced*. The voluntary reporting seems to be responsible for the significant relationship of mispricing and total IC reporting. The results are consistent with the expectations stated in section 7.2.4.3 and support hypothesis $H_{7.3}$. Companies voluntarily report more on IC under a legitimacy threat of being currently overpriced. The results hold for different model specifications, with and without *R&D* and *intangibles* in columns (4) and (5). Therefore, legitimacy theory explains voluntary IC reporting for a legitimacy threat of mispricing.

Table 7.6 Regression results by types of IC reporting

	(1) IC	(2) Required	(3) Recommended	(4) Voluntary	(5) Voluntary	(6) Voluntary
constant	4.760***	0.968***	1.195***	2.597***	2.705***	2.530***
	(4.99)	(4.69)	(6.40)	(3.45)	(3.62)	(3.35)
owner	-0.372	-0.163	-0.012	-0.196	-0.004	-0.273
	(-0.70)	(-1.42)	(-0.12)	(-0.47)	(-0.01)	(-0.65)
IC value	0.066	-0.004	-0.008	0.077*	0.068	0.074
	(1.12)	(-0.28)	(-0.71)	(1.67)	(1.46)	(1.60)
mispriced	0.545**	0.070	0.058	0.417**	0.503***	
	(2.22)	(1.31)	(1.21)	(2.15)	(2.58)	
R&D	1.158***	0.237***	0.227***	0.693**		0.749***
	(3.28)	(3.11)	(3.30)	(2.49)		(2.69)
intangibles	2.612***	0.320*	0.378**	1.914***		2.037***
	(2.93)	(1.66)	(2.16)	(2.71)		(2.89)
size	0.233***	0.021	-0.006	0.218***	0.254***	0.224***
	(3.34)	(1.40)	(-0.45)	(3.95)	(4.67)	(4.05)
industry						
finance	-1.764***	0.088	-0.326***	-1.527***	-2.129***	-1.501***
	(-3.18)	(0.74)	(-3.00)	(-3.49)	(-5.18)	(-3.42)
pharma & tech	2.020***	0.482***	0.384***	1.154***	1.467***	1.151***
	(4.61)	(5.10)	(4.48)	(3.34)	(4.33)	(3.31)
industrial	-0.717*	0.093	-0.061	-0.750**	-0.695**	-0.754**
	(-1.70)	(1.03)	(-0.74)	(-2.25)	(-2.15)	(-2.26)
Model summary						
R^2	0.272	0.137	0.218	0.240	0.215	0.232
Adj. R^2	0.256	0.118	0.201	0.224	0.202	0.217
N	418	418	418	418	418	418

Notes

This table shows results for the regression analysis of IC reporting scores for total, required, recommended, and voluntary IC reporting. IC reporting is measured as occurrences in German management reports for the accounting year 2010 related to IC scaled by the number of pages. Columns (1)-(6) denote different model specifications. Columns (1)-(4) show the findings for the different IC reporting types with the IC reporting scores for each type as respective dependent variable. Columns (5)-(6) repeat the regression on voluntary IC reporting with different model specifications omitting variables for testing hypotheses $H_{7.3}$-$H_{7.5}$. T-statistics are given in parenthesis underneath values for coefficients. Asterisks indicate the level of significance: * 10% significance, ** 5% significance, *** 1% significance.

$$ICpp_j = \beta_0 + \beta_1 owner_j + \beta\ IC\ value_j + \beta_3 mispriced_j + \beta_4\ R\&D_j + \beta_5 intangibles_j + \beta_6 size_j + \sum \alpha_i\ industry_j + \varepsilon_j$$

R&D and *intangibles* are significant for all types of IC reporting although only required and recommended IC components refer to these intangible resources. A potential explanation for the significant associations of *R&D* and *intangibles* with required and recommended IC reporting is that these reporting types are intended to comply with the regulation. No effect for voluntary reporting is expected from a regulatory perspective as R&D activities and intangible assets are covered in the required and recommended IC reporting. The significant associations of *R&D* and *intangibles* with voluntary IC reporting support hypotheses $H_{7.4}$ and $H_{7.5}$ that voluntary IC reporting is used to legitimise the use of resources. These findings again support that legitimacy theory may better explain IC reporting compared to agency theory. An alternative interpretation exists for the significant relationships of *R&D* and *intangibles* with voluntary IC reporting. Companies with R&D expenses and investments in intangible assets are more aware of IC and consequently also increase voluntary reporting on other IC components. This may be in the process of an active IC reporting management or as a side effect of engaging with some required or recommended IC components.

In comparison to the significant findings for company size for each IC category in section 7.4.1.2, *size* is only significant for total and voluntary IC reporting in this regression. The extent of required and recommended IC reporting is not associated with company size. This non-significant association means that all companies refer to these IC components with about the same frequency, regardless of size. This shows that the association of IC reporting with company size may be due to additional voluntary reporting for larger companies. A weak industry pattern is apparent with companies in the pharmaceutical & technology sector reporting most on total, required, recommended, and voluntary IC components, similar to IC reporting by categories. The financial sector reports least on total, recommended, and voluntary IC. However, financial companies non-significantly report more on required IC components. This finding supports the suggestion in section 7.4.1 that companies operating in the financial sector may focus on additional reporting requirements rather than actively engaging in IC reporting. Further detailed investigations are required to shed light on industry patterns for IC reporting types.

7.5 Sensitivity test

7.5.1 Propensity score matching approach

A sensitivity test is appropriate for this new approach to IC reporting for two reasons: the regulation requires reporting on sustainable value creation and the model specifications show differences for IC value. First, the German regulation on the management report, GAS 15, requires the companies to follow the principle to 'focus on sustainable value creation' (GASC, 2010a, sec.30–35). Given this regulatory approach, companies are expected to report on underlying IC value in order to fulfil the requirements. Therefore, the non-significant relationships between IC value and IC reporting in sections 7.4.1.2 and 7.4.2.2 are surprising. In order to confirm that corporate IC reporting is not related to IC value, despite the management reporting regulation, a sensitivity test is reasonable. Second, the variable for IC value shows a slightly significant association with voluntary IC reporting in only one model specification in section 7.4.2.2. Therefore, a sensitivity test on the relationship of IC value and IC reporting is needed. This sensitivity test ensures the robustness of the results of this study with regards to the association of IC value with IC reporting.

This study applies propensity score matching to test the sensitivity of results for IC value. Propensity score matching controls for company characteristics related to high IC value which may also affect IC reporting. The propensity score matching approach has been developed in experimental and observational studies (Rosenbaum & Rubin, 1983; Caliendo & Kopeinig, 2008). In the regression analysis described in section 7.3.5, the relationship is investigated between certain characteristics of all sample units, the independent variables, and the output under review. According to propensity score matching, the sample units are assigned to a treatment and a control group with regards to a certain binary characteristic, high or low IC value. This grouping allows investigating the association of the binary characteristic with the output, IC reporting. The propensity score is estimated based on the probability that a unit shows this binary characteristic of high IC value given its other features. Then the units are matched from the treatment and control group according to the

propensity score. In doing so, bias is reduced as similar units are compared for the effect on their IC reporting given the binary characteristic, high or low IC value.

To test the effect of a high underlying IC value on IC reporting, first, the probability is estimated to have a high level of underlying IC value. The logistic regression to estimate the probability of having a high IC value uses variables which have been reviewed to be associated with IC value in chapter 5. The logistic regression model to compute the propensity score is presented in Equation 7.2 below. To ensure robust results, several matching estimators are applied: radius, kernel, and nearest neighbour with one to five neighbours (Caliendo & Kopeinig, 2008). The estimators are used with replacement to utilise most of the sample and to satisfy the condition of high data availability for propensity score matching (Heinrich et al., 2010). For this study, high IC is defined as the three upper deciles of LRVTB. This definition of high underlying IC value allows a larger control group compared to the treatment group with more robust matching. Accordingly, about one third of the sample is classified as treatment group with high IC value. The IC reporting scores for voluntary IC reporting are considered as the output under review.

Equation 7.2

$$IC\ value\ dummy_j = \beta_0 + \beta_1 intangibles_j + \beta_2 R\&D_j + \beta_3 age_j + \beta_4 payment_j + \beta_5 concentrated\ ownership_j + \beta_6 leverage_j + \beta_7 size_j + \sum \alpha_i\ industry_j + \varepsilon_j$$

IC value dummy represents the binary variable to distinguish between treatment and control group whether a company has a high or low level of IC value. It is measured as the three upper deciles of LRVTB. *Intangibles* shows intangible assets recognised on the balance sheet scaled by total assets. *R&D* is a dummy variable taking the value 1 if a company declares R&D expenses in the income statement, 0 otherwise. The variable *age* measures the company age as the years since the company was founded. For motivational payment, *payment* is a dummy variable that takes the

value 1 if the average payment per employee is above the industry average, 0 otherwise. *Ownership* captures the percentage of shares closely held by family members and employees. *Leverage* is the percentage of debt compared to total capital and *size* is the natural logarithm of total assets. The control variable *industry* is a dummy variable for the four industry groups: consumer, finance, pharmaceutical & technology, and industrial. The industry group consumer serves as base variable. The descriptive statistics and correlations for the variables used in the logistic regression are presented in Table 7.7. The correlation coefficients between the variables are relatively low and do not imply multicollinearity.

7.5.2 Propensity score matching results

The propensity score matching is conducted as a sensitivity test to compare companies with similar characteristics for developing a high underlying level of IC value in a treatment and control group. To estimate the propensity scores, the probability of a company to have a high level of IC value is computed in a logistic regression, as illustrated in section 7.5.1. The binary variable for high IC value is defined as the three upper deciles of LRVTB. Several matching estimators are applied to ensure robust results. For investigating the association of high IC value with IC reporting in the treatment and control group, the outcome of IC reporting is considered for voluntary IC reporting scores. As the results in section 7.4.2.2 indicate differences for IC value across model specifications of voluntary IC reporting, this differentiation may provide additional insights. The results of the propensity score matching are presented in Table 7.8.

Table 7.7 Descriptive statistics for propensity score matching

Panel A: Definitions of variables

Variable	Definition
IC value dummy	dummy variable: 1 if LRVTB in upper 3 deciles, 0 otherwise
intangibles	intangible assets scaled by total assets
R&D	dummy variable: 1 if R&D expenses declared, 0 if no R&D expenses
company age	company age as years since company was founded
payment	dummy variable: 1 if payments per employee above industry average, 0 otherwise
ownership	percentage of shares held by family members and employees
leverage	percentage of debt to total capital
size	natural logarithm of total assets
industry	dummy for industry groups: consumer, finance, pharma & tech, industrial; consumer serves as base variable

Panel B: Descriptive statistics

		Continuous variables				Dummy frequency	
	N	mean	sd	min	max	0	1
IC value dummy	428					293	135
intangibles	428	0.17	0.18	0	0.95		
R&D	428					236	192
company age	428	16.31	17.67	1	252		
payment	417					220	197
ownership	428	19.45	25.75	0.00	96.00		
leverage	416	0.54	0.22	0.02	1.00		
size	428	12.65	2.40	6.79	21.36		

Panel C: Correlations

N=406	*IC value*	*intangibles*	*R&D*	*age*	*payment*	*ownership*	*leverage*	*size*
IC value dummy	1	0.09	0.07	-0.05	0.07	0.09	-0.05	-0.05
intangibles	0.06	1	0.19*	-0.14*	0.07	0.04	-0.13*	-0.11*
R&D	0.09	0.09	1	0.09	0.12*	-0.09	-0.14*	0.16*
company age	-0.08	-0.15*	0.09	1	-0.02	-0.24*	0.25*	0.38*
payment	0.05	0.09	0.12*	-0.02	1	0.01	-0.04	-0.04
ownership	0.10*	0.03	-0.11*	-0.16*	0.01	1	-0.23*	-0.31*
leverage	-0.05	-0.12*	-0.13*	0.16*	-0.05	-0.19*	1	0.46*
size	-0.06	-0.07	0.15*	0.28*	-0.04	-0.29*	0.51*	1

Notes

These tables show definitions (Panel A), descriptive statistics (Panel B), and correlations (Panel C) of variables used in the logistic regression analysis for propensity score matching to estimate the probability of having a high underlying IC value. In the correlation table in Panel C, Pearson correlations are given in the lower left-hand corner and Spearman correlations are shown in the upper right-hand corner. Asterisks indicate a 5%-significance level. Overall, the correlation level between variables is low and does not imply multicollinearity.

The findings of the propensity score matching show that there is no significant difference in voluntary IC reporting for companies with high and low IC value. The companies with a similar probability to have a high level of underlying IC value are compared across the treatment and control groups. No significant differences in IC reporting can be found for having a high or low level of IC value. For applying different matching estimators, such as radius, kernel and nearest neighbour matching, the findings remain non-significant. These findings are consistent with the results in sections 7.4.1.2 and 7.4.2.2 that the level of IC value is not associated with IC reporting. Therefore, this sensitivity test supports the interpretation that IC reporting is not provided to explain the actual underlying IC value. This result confirms that agency theory does not explain IC reporting with regards to the underlying IC value. Hence, IC reporting is not motivated to report on actual underlying IC value.

Table 7.8 Propensity score matching results for voluntary IC reporting

		ATT		t-statistics	N	
Matching Estimators	Treatment	Control	Difference	(ATT)	Treatment	Control
Radius, caliper δ = 0.01	6.914	6.540	0.374	0.99	122	283
Radius, caliper δ = 0.001	6.851	6.379	0.472	0.80	58	283
Kernel	6.914	6.578	0.336	0.96	122	283
1 nearest neighbour	6.916	6.576	0.340	0.79	123	283
2 nearest neighbours	6.916	6.741	0.175	0.45	123	283
3 nearest neighbours	6.916	6.616	0.300	0.79	123	283
4 nearest neighbours	6.916	6.641	0.275	0.75	123	283
5 nearest neighbours	6.916	6.650	0.266	0.74	123	283

Notes

This table shows the results of the propensity score matching as sensitivity test to investigate the association of IC value with voluntary IC reporting. The binary dummy variable for IC value is based on the upper three deciles of LRVTB. The average treatment effect on the treated (ATT) shows the difference in IC reporting between the treatment and control group. To ensure robust results, several matching estimators are applied: radius, kernel and nearest neighbour matching. The findings show no significant association between matched units from the treatment and control groups at the 5%-significance level. This supports the regression results in sections 7.4.1.2 and 7.4.2.2 that IC value is not related to IC reporting for voluntary reporting. To estimate the propensity score, the following logistic regression model is applied:

$$IC\ value\ dummy_j = \beta_0 + \beta_1 intangibles_j + \beta_2 R\&D_j + \beta_3 age_j + \beta_4 payment_j + \beta_5 ownership_j + \beta_6 leverage_j + \beta_7 size_j + \sum \alpha_i\ industry_j + \varepsilon_j$$

7.6 Conclusion

The aim of this study is to apply agency theory and legitimacy theory to IC reporting to test which theory better explains IC reporting. Given the German management reporting regulation with the declared aim to reduce the information gap (GASC, 2010a, sec.3), the ideas of agency theory are important to examine corporate IC reporting in Germany. To investigate motivations for corporate IC reporting, agency theory is contrasted with the concepts of legitimacy theory in this study, focusing on voluntary IC reporting. This study accepts the challenge to statistically test IC-related hypotheses, thereby contributing to IC reporting research. The statistical analysis innovatively incorporates measures developed in mergers and acquisition research to estimate IC value and mispricing. Management reports of 428 German listed companies are investigated for the accounting year 2010 for this study. The proposed hypotheses are based on agency theory and legitimacy theory. According to agency theory, IC reporting has been suggested to reduce the information asymmetry between managers and owners, discussed in section 7.2.3. To test whether IC reporting is motivated to reduce the information asymmetry, the relationships of IC reporting to ownership diffusion and IC value are examined. Based on the concepts of legitimacy theory, IC reporting is motivated to legitimise the company's status, as outlined in section 7.2.4. An approximate measure for current mispricing is investigated to test IC reporting under a legitimacy threat. Justification of intangible resources is analysed as another aspect of legitimacy theory using expenses in R&D and intangible assets to test these hypotheses.

The findings suggest that mispricing ($H_{7.3}$), R&D expenses ($H_{7.4}$) and intangible assets ($H_{7.5}$) are significantly associated with IC reporting, as discussed in sections 7.4.1.2 and 7.4.2.2. Ownership structure ($H_{7.1}$) and IC value ($H_{7.2}$) show no significant relationship to IC reporting across IC categories and reporting types. Hence, legitimacy theory seems to better explain IC reporting compared to agency theory. Additionally, the relationship between voluntary IC reporting and IC value is tested for sensitivity by applying propensity score matching in section 7.5. As outlined in section 7.5.1, a sensitivity test for the relationship between IC value and

IC reporting is reasonable for two reasons: the declared aim of the German regulation and variations in model specifications. As the German regulation requires companies to report on sustainable value creation (GASC, 2010a, sec.30–35), an association of IC value with IC reporting is expected. The non-significant findings are surprising and require an additional test. Furthermore, the model specifications in section 7.4.2.2 show slightly different results for IC value which give reasons for a sensitivity test. The findings of the sensitivity test in section 7.5.2 show that no significant relationship exists between IC value and voluntary IC reporting. The approach of propensity score matching considers several company characteristics which may enhance a high IC value. The results indicate that companies are not motivated to voluntarily report on IC in order to explain underlying IC value.

The findings indicate that companies are motivated to use voluntary IC reporting to legitimise their market positions and to justify intangible resources. The intentions for the increased voluntary IC reporting by currently overpriced companies are related to a legitimacy threat, as outlined in section 7.2.4.3. However, an alternative interpretation is possible. Alternatively, the association may imply that markets misinterpret IC reporting which results in mispricing. The causation of reporting and market reactions cannot be concluded from this study. Moreover, the results show significant relations between IC reporting and company investments in R&D and intangible assets. If a company invests in R&D activities and intangible assets, IC reporting significantly increases across all reporting types and all IC categories, except human capital. As IC information on R&D and intangible assets is mainly required and recommended, voluntary IC reporting is not expected to be related to these intangible investments. A reason, why a company voluntarily increases IC reporting with R&D and intangible assets, is to justify the use of intangible resources to appear legitimate, as discussed in section 7.2.4.4. Alternatively, the findings can be interpreted in the light of increased awareness of IC reporting. A company with R&D and intangible assets may be more aware of IC reporting due to required R&D and intangible components and may actively report also on other components.

Company size and industry are found to be significantly related to IC reporting. Industry-specific results show that companies relying on intangible rather than tangible assets report more on IC. Furthermore, industry differences exist on a categorical level for structural, relational, and human capital. These reporting differences for IC categories confirm that a different IC emphasis is reflected in IC reporting for industry-related business models, as argued in chapter 4. The findings show that financial companies tend to report least on any category and reporting type of IC information. As the required IC information is non-significantly positive for the financial sector, financial companies may focus more on required reporting rather than actively engaging in IC reporting, as suggested in section 7.4.1.1. Overall, the industry-specific IC reporting may be related to the business model. However, industry patterns for IC categories and types of IC information are not very clear, as discussed in sections 7.4.1.2 and 7.4.2.2. Detailed investigations on the relation between IC reporting and industries offer research opportunities for future research.

The contribution of this study lies in analysing IC reporting in the light of agency theory and legitimacy theory. This study has elaborated how agency theory and legitimacy theory as theories of voluntary disclosure can help to explain IC reporting motivations. Prior IC reporting literature has called for concepts to explain potential motivations for IC reporting, as reviewed in section 7.2.2. The theoretical elaborations contribute to the IC reporting literature by linking agency theory and legitimacy theory to IC reporting in sections 7.2.3 and 7.2.4. Furthermore, this study contributes to the IC reporting literature by offering a creative approach for investigating IC reporting empirically. The quantitative measures for IC value and mispricing are innovatively introduced from mergers and acquisitions research. This approach can be developed and applied to test further previously untested hypotheses on IC reporting. An additional contribution of this study is that legitimacy theory has been shown to better explain IC reporting compared to agency theory. This finding allows drawing inferences about IC reporting motivations. Based on the concepts of legitimacy theory, IC reporting is motivated to legitimise a company's status under the threat of mispricing and to justify the use of intangible resources. This

contributes to the IC reporting literature because motivations for IC reporting have not previously been investigated by contrasting the concepts of two theories.

The findings of this study, subject to its limitations, lead to suggestions for future research. First, further investigations are needed why companies are not motivated to increase IC reporting in order to reduce the information gap. To find reasons why companies do not use IC reporting in order to explain IC value, a separate study with a different research design is needed. Potential reasons may be that the owners do not actively demand IC reporting because they may rely on the regulation, as outlined in section 7.4.1.2. An investigation of the reasons may shed light on the needs of IC reporting users and their evaluation of IC reporting. Second, the area of mispricing in IC reporting research requires further investigations. The interpretation of the findings of this study suggests that IC reporting may conversely influence mispricing, leading to other applicable theories, such as behavioural finance approaches. The relationship of IC reporting and mispricing with regards to market reactions offers research opportunities which could be conducted in a long-run study. Furthermore, mispricing may be affected by intangible resources, such as R&D, although multicollinearity is not implied in this study. Investigating the relationship between mispricing and intangible resources may contribute to the evaluation process of IC components and eventually to IC value measures. Finally, mispricing could be interpreted in an agency theory framework for substantially long-term overpriced companies, as discussed in section 7.2.4.3. The mispricing measure of short-term deviation used in this study bridges the application of mispricing to legitimacy theory. The agency perspective of long-run mispricing offers new research opportunities.

Practical implications of the findings presented in this study can be inferred regarding the German regulation for management reports GAS 15 (GASC, 2010a). IC-related information is partly required and partly recommended to be disclosed in German management reports as a supplement to the financial statements. Therefore, the results for IC reporting can provide guidance on how the regulation may be improved with regards to IC reporting. Improved regulations may require companies

to focus on actual underlying IC value. The recommendations in the 2010 version of GAS 15 (GASC, 2010a) provide general examples related to structural, relational and human capital without a particular emphasis on the relation of IC to corporate business models or strategies. The recommendations regarding IC reporting could be enhanced by encouraging companies to highlight the IC value creation, development and utilisation in the individual corporate value creation process. This would enrich IC reporting to explain underlying IC value rather than using IC reporting as a legitimisation tool for the company's market position and for justification of intangible resources.

The findings of this study have additional practical implications regarding a revision of the German regulation applicable to the management report in 2013. The new German standard GAS 20 shows a change in the declared aim of the management report (DRSC, 2013), as outlined in chapter 3. In 2010, the aims were to reduce the information gap between users and management (GASC, 2010a, sec.3) and to 'focus on sustainable value creation' (GASC, 2010a, sec.30–35). These aims are consistent with the ideas of agency theory to reduce information asymmetry and to report on underlying IC value. The aim of GAS 20 introduced in 2013 is to report on the use of the group's resources (DRSC, 2013, sec.3), being in line with the concepts of legitimacy theory. The findings of this study show that companies have not followed the concepts of agency theory but their IC reporting is motivated by the ideas of legitimacy theory. Hence, the change of the aim of the management report is in accordance with the findings of this study. Therefore, this study may contribute to a justification of the new approach to IC reporting by the German standard setters. Furthermore, the consultation draft for international integrated reporting considers IC reporting within an approach to reporting on 'the capitals' (IIRC, 2013, sec.2B), as outlined in chapter 1. The findings of this study may provide a basis for further discussions regarding the aims and motivations of reporting on 'the capitals' in an integrated reporting model.

Chapter 8:
Conclusions

8.1 Introduction

The aim of this research study is to investigate potential motivations of corporate intellectual capital (IC) reporting. The findings of this study are of interest beyond the IC reporting literature, as standard setters may use the insights provided by this study as a basis for further discussions. The new German regulation (DRSC, 2013) and the consultation draft for integrated reporting (IIRC, 2013) approach IC reporting with different motivations which are both investigated in this study. The main research question scrutinises whether agency theory or legitimacy theory better explains IC reporting. Based on agency theory, this study proposes that IC reporting serves to provide information on IC values to reduce the information gap between managers and owners. In contrast, following the concepts of legitimacy theory, this study suggests that IC reporting is used to legitimise the company's market position. In the process of testing these theories, methodological issues arise on measuring underlying corporate IC value and IC reporting. Measures for corporate IC value and IC reporting are necessary in order to test their relationships based on the concepts of agency theory. To examine these methodological issues of the IC reporting research, two projects are conducted on measuring underlying corporate IC value and IC reporting. The findings of the methodological projects allow testing hypotheses on IC reporting, developed from agency theory and legitimacy theory, to answer the main research question. From the results of the final project on applying IC theories, potential motivations for IC reporting can be inferred.

This study is structured into three empirical research projects. The first research project within this study investigates how underlying corporate IC value can be measured. The second project examines how an IC content analysis can be designed

parsimoniously to establish an IC reporting score for measuring IC reporting. The findings of projects one and two provide the input data on a basis that is methodologically defensible for testing whether agency theory or legitimacy theory better explains IC reporting. Project one compares three measures for IC value: market-to-book (MtB), Tobin's q and long-run value-to-book (LRVTB). Project two develops a research framework for a content analysis of IC reporting. In project three, IC-related hypotheses are tested based on agency theory and legitimacy theory. The results show that legitimacy theory better explains IC reporting compared to agency theory. This finding allows inferences on corporate motivations for IC reporting. Following the concepts of legitimacy theory, IC reporting is motivated to address a legitimacy threat of being mispriced and to justify the use of resources.

This concluding chapter presents a summary of the research study, an overview of the key findings, the contribution of this study, limitations and suggestions for future research. The chapter is structured as follows. Section 8.2.1 summarises the research objectives of this study and section 8.2.2 consolidates the overall research approach with explanations for each project and an outline of the dataset. The key findings are discussed for each of the three empirical research projects in section 8.2.3. Then the contribution of this research study is outlined in section 8.3 regarding its contribution to the literature and implications for policy and practice. Finally, section 8.4 recapitulates limitations of this study together with suggestions for future research which have emerged in the course of this study.

8.2 Summary and discussion

8.2.1 Summary of research objectives

The overall research objective of this study is to investigate potential motivations for IC reporting, as presented in chapters 1 and 4. To achieve the overall objective, this study infers potential motivations for corporate IC reporting from reporting theories. Reporting theories are introduced in the main research objective of this study. The main research objective is to test whether agency theory or legitimacy theory better explains IC reporting. To test theories on IC reporting, methodological issues arise of

how to measure underlying corporate IC value and IC reporting. This study bridges the gaps in prior IC literature in the areas of approaches to measure IC value and parsimonious designs of an IC content analysis, as identified in chapter 2. The methodological issues regarding IC value measures and IC content analysis are addressed in separate research objectives in this study, as outlined in chapter 1. Subordinate objectives are introduced to investigate methodological approaches for measuring underlying corporate IC value and analysing contents of IC reporting. The three research objectives are raised to address gaps in the IC reporting literature which have been identified in the review of IC reporting literature in chapter 2.

The research objectives of this study lead to the following research questions, as presented in chapters 1 and 4:

(1) How can underlying corporate IC value be measured?
(2) How can a content analysis of IC reporting be designed parsimoniously?
(3) Does agency theory or legitimacy theory explain corporate IC reporting?

8.2.2 Summary of research approach

8.2.2.1 Overview of research approach

To achieve the overall research aim of investigating potential motivations for corporate IC reporting, three research questions have been introduced at the beginning of this study in chapter 1 and summarised in section 8.2.1. This study has addressed the three research questions in three individual research projects. The sequence of the three research projects of this study to achieve the overall research aim is outlined in chapter 4. To answer the question of potential motivations for corporate IC reporting, reporting theories are consulted to infer motivations. The regulation for the German management report suggests that companies should report on IC to reduce the information gap (GASC, 2010a, sec.3), as discussed in chapter 3. Consequently, corporate IC reporting should follow the concepts of agency theory. To investigate potential motivations for corporate IC reporting, this study contrasts agency theory with legitimacy theory. These theories have been suggested in the IC reporting literature to explain IC reporting, as discussed in chapter 7. Based on the

concepts of agency theory, this study hypothesises a positive relationship between IC reporting and IC value. In order to test this hypothesis, methodological issues to approach IC reporting and IC value need to be considered.

The first two research projects analyse methodological approaches to measure IC value and to design a content analysis of IC reporting. The findings of projects one and two provide the input data for answering the main research question, to test agency theory and legitimacy theory for IC reporting. The results of testing theories allow inferring motivations to address the overall research aim of this study. The research approach of this study additionally intended interviews for a triangulation of results, as described in chapter 4. However, interview requests were refused due to time constraints, data sensitivity and the absence of a central IC reporting management. Therefore, this study focuses on the three research projects to answer the research questions of this study.

8.2.2.2 Project one: estimating a measure of IC value

A measure of underlying corporate IC value is estimated in project one. This project compares three potential estimators of underlying corporate IC value in a regression analysis: MtB, Tobin's q and LRVTB. The LRVTB measure has been developed by Rhodes-Kropf et al. (2005) in the area of mergers and acquisitions research. Rhodes-Kropf et al. (2005) decompose MtB into three components of company valuation: firm-specific error, industry-specific error and LRVTB. The first two components represent estimators of mispricing of a company or an industry. The LRVTB component is argued to represent a company's long-run growth opportunities. In the search for measures of underlying corporate IC value, the IC literature has characterised IC to represent a company's long-run growth opportunities to establish a competitive advantage, as discussed in chapter 5. However, prior literature has focused on individual IC components, MtB or Tobin's q as measures for IC value. This study realises the similarities between the described characteristics of IC and the argued characteristics of LRVTB. Therefore, this study innovatively applies the LRVTB measure to the area of IC research. This project compares the measures for

underlying corporate IC value suggested in the literature, namely MtB and Tobin's q, with the newly introduced LRVTB measure.

To test which measure serves as best estimator for IC value, a regression analysis is conducted with corporate performance in terms of profitability measured as return on equity (ROE) and return on assets (ROA). The IC literature argues that IC value contributes to a higher level of corporate performance (Hall, 1992; 1993; Edvinsson & Malone, 1997). Therefore, the profitability measures ROE and ROA are regressed on the estimators of IC value: MtB, Tobin's q and LRVTB. The estimator with the highest explanatory value of the regression analyses is considered to serve as best estimator of IC value. Using Vuong's closeness test, LRVTB is identified as best IC value measure with significantly highest explanatory values for both specifications with ROE and ROA. As LRVTB is found to serve as best estimator of IC value, compared to MtB and Tobin's q, LRVTB is then used to answer the main research question in project three.

The newly identified measure of corporate IC value, LRVTB, is also applied within project one to test IC-related hypotheses on potential determinants of IC value. The IC literature, reviewed in chapter 5, suggested the following potential determinants of IC value: intangible assets recognised on the balance sheet, expenses in research and development (R&D), motivational payment to employees, concentrated ownership, leverage, company age, and company size. A regression analysis of LRVTB on these seven factors is conducted to identify which determinants are associated with IC value. The associations of IC value with concentrated ownership and leverage have previously been untested. The findings of this analysis contribute to the literature of IC management, as relevant determinants can be considered for developing IC value in the IC management process.

8.2.2.3 Project two: designing a parsimonious framework for IC content analysis

The parsimonious design of a research framework for an IC content analysis is examined in project two. In chapter 6, a comparison of research frameworks used in

prior content analysis studies of IC reporting shows that previously used checklists of IC components vary. The review of research frameworks for IC content analyses identifies a long list of potentially relevant IC components. Some IC components seem to be more important as they appear in the majority of prior research frameworks. A suggestion from prior studies is that the research framework for IC reporting should be adjusted to the research setting due to potential country-specific differences (Guthrie & Petty, 2000). However, no guidance is found how to adjust a research framework to a new research setting. The variations across research frameworks for IC reporting and a lack of guidance for adjusting the research framework for new research settings, create an ambiguous situation for following researchers. To address this situation, this project investigates three aspects of an IC content analysis: approaching IC reporting in a new research setting, designing an IC research framework parsimoniously, and comparability of prior studies.

First, IC reporting in a new research setting is approached in Germany, where IC content analyses have not been conducted in prior studies, as discussed in chapter 3. A pilot study is performed with ten annual reports to develop a research framework for IC reporting, grounded in actual reporting practices. This pilot study approach shows to be practical in order to adapt the research framework to the respective research setting. Second, a correlation analysis is applied to investigate how a research framework for IC reporting can be designed parsimoniously. Based on the review of research frameworks used in prior literature, a ranking of the most widely-used IC components is compiled for each IC category, structural, relational, and human capital. A content analysis of the individual most widely-used IC components is completed. Then the reporting scores for the most widely-used IC components are subsequently accumulated to form investigation units. The reporting scores for the investigation units are correlated to examine whether additional IC components add information about corporate IC reporting and how a research framework for IC reporting can be designed parsimoniously. Third, comparability of prior studies is investigated in a correlation analysis of reporting scores for selected prior research frameworks applied to the German dataset. The established research framework for

the IC content analysis is then used in project three to answer the main research question whether agency theory or legitimacy theory explains corporate IC reporting.

8.2.2.4 Project three: applying agency theory and legitimacy theory

The third project consults agency theory and legitimacy theory to infer motivations for corporate IC reporting. According to the German management report regulation, reporting should aim to reduce the information gap between managers and users (GASC, 2010a, sec.3). Based on this aim, agency theory is applied to IC reporting in this study. To contrast different potential motivations for corporate IC reporting, legitimacy theory is chosen for this study. Therefore, agency theory and legitimacy theory as theories of general voluntary disclosure are reviewed and linked to IC reporting in chapter 7. Based on the concepts of agency theory, this study suggests that IC reporting is intended to reduce the information gap between managers and owners. To examine this suggestion, two aspects of the information gap are used as measures: ownership diffusion and the underlying corporate IC value. IC reporting is argued to increase with ownership diffusion and the level of corporate underlying IC value. Following the idea of legitimacy theory, IC reporting is used to legitimise a company's status. This study reasons that IC reporting follows two purposes of legitimacy: addressing a legitimacy threat and justifying the use of intangible resources. The idea of mispricing to represent a legitimacy threat is developed from the argument by Jensen (2005) that overpriced companies destroy social value due to a misallocation of resources. For the aspect of justifying intangible resources, expenses in R&D and intangible assets are tested for associations with IC reporting.

The focus of this analysis is on voluntary IC reporting, as agency theory and legitimacy theory are theories of general voluntary disclosure. The German regulation allows differentiating IC reporting for reporting types: required, recommended, and voluntary IC reporting. A regression analysis is conducted with the IC reporting scores for these reporting types. Ownership diffusion and the level of underlying corporate IC value represent variables to test whether agency theory explains IC reporting. Mispricing, R&D expenses and intangible assets investigate

whether the concepts of legitimacy theory apply to IC reporting. The regression analysis for voluntary IC reporting allows testing whether corporate IC reporting is better explained by agency theory or legitimacy theory. The findings of projects one and two form the methodological basis for approaching this research question in project three. A measure of the level of underlying corporate IC value is identified in project one. The research framework for a content analysis of IC reporting, which is developed in project two, provides the IC reporting scores. The German regulation on the management report with requirements and recommendations offers a unique research setting to differentiate between IC reporting types. In doing so, the voluntary IC reporting can be distinguished to enable testing agency theory and legitimacy theory for voluntary IC reporting. The findings of the regression analysis in project three allow inferences to achieve the overall research aim of investigating motivations for corporate IC reporting.

8.2.2.5 Dataset

This research study uses data of listed German companies. Germany offers a unique research setting for IC reporting studies due to a mandatory management report with IC information being partly required and partly recommended, as discussed in chapter 3. According to GAS 15, the mandatory management report aims to provide information on corporate performance and sustainable value creation (GASC, 2010a, sec.30–35). This study utilises the research setting in Germany to answer the research questions of this study. As the regulation for the management report was reviewed in 2010, the accounting year ending in 2010 is of interest for this IC reporting study (GASC, 2010a). GAS 15 had been in place since 2005. In the revision in 2010, IC-related requirements remained constant compared to 2005 but further examples for recommended IC components were added in the appendix of GAS 15. Therefore, reporting bias due to a newly introduced regulation can be ignored. The sample selection and industry grouping are described in chapter 4. For measuring IC value, the panel data consists of 7,728 firm years of companies listed on the German stock exchange between 2000 and 2010. For the IC reporting investigations in projects two and three, the sample comprises 428 companies listed

on the German stock exchange in 2010. As discussed in chapter 4, the samples are grouped into four industries: consumer, finance, pharmaceutical & technology, and industrial.

8.2.3 Discussion of key findings

8.2.3.1 Estimating a measure of IC value

Research question (1), how to measure underlying corporate IC value, is addressed in project one. The research approach applied in project one is summarised in section 8.2.2.2. Chapter 5 presents the findings of this project on estimating a measure of underlying corporate IC value to test its determinants. A comparison is conducted of three potential measures of IC value: MtB, Tobin's q and LRVTB. Corporate performance in terms of profitability is regressed on the three IC value measures for the four industry groups: consumer, finance, pharmaceutical & technology, and industrial. The measure LRVTB, developed by Rhodes-Kropf et al. (2005), is identified as the IC value measure with the highest explanatory value. For the financial sector, an increasing level of IC value is significantly negatively related to corporate performance. This finding is unexpected as IC value has been argued in chapters 2 and 5 to represent a competitive advantage leading to higher performance. The negative relationship of corporate IC values and performance for companies in the financial industry group cannot be explained by the findings of this study. Additional investigations on the role of IC value in the financial sector are needed, offering opportunities for further research.

The newly identified IC measure LRVTB is applied in an analysis of IC value determinants. Motivational payments to employees and leverage are significantly positively associated with the level of corporate IC value. The significant positive relationship between leverage and IC value may be particular to the German setting because banks represent strong influential stakeholders in the German corporate environment, as outlined in chapter 4. Further investigations are needed to generalise the relationship between IC value and leverage, particularly as the influence of leverage on the level of IC has previously been untested, as reviewed in chapter 5. In

contrast to the IC literature, company size is significantly negatively related to the level of corporate IC value. A potential reason for this unexpected relationship is that larger companies may lose efficiency in the creation and development of IC value with more complex structures. Further investigations may shed light on size effects on corporate IC value. The IC literature also suggests positive relationships between intangible assets recognised on the balance sheet, expenses in R&D, concentrated ownership, and company age. However, the findings show no significant associations of IC value with these factors.

8.2.3.2 Designing a parsimonious content analysis for IC reporting research

The second research project approaches research question (2), how a content analysis of IC reporting can be designed parsimoniously. Section 8.2.2.3 summarises the research approach of project two. The findings of project two are presented in chapter 6. A review of prior content analysis studies of IC reporting provided long lists of IC components for research frameworks of IC content analyses (e.g. Guthrie & Petty, 2000; Bontis, 2003; Bukh et al., 2005). The variety of IC components in the research frameworks for IC reporting results in an opaque environment of content analysis designs. In a correlation analysis of IC reporting scores for different numbers of IC components, the results highlight the importance of the widely-used IC components. For relational and human capital, IC reporting can be captured with the three most widely-used components. IC reporting on structural capital can be investigated by focusing on the eight most widely-used components. These results show that a research framework for a content analysis of IC reporting can be designed parsimoniously. Furthermore, the suggested approach to structure IC categories with meaningful sub-groupings and indicators seems to be feasible. This study encourages future IC research frameworks to follow this approach.

In addition to the parsimonious design of an IC content analysis, the findings of this project are relevant for content analysis studies of IC reporting in three dimensions: approaching IC reporting in a new setting, framing a definition of IC reporting from a corporate perspective, and investigating comparability of prior studies. First, this

project on the design of IC content analysis suggests that a pilot study approach, grounded in actual reporting practices, is reasonable to design a research framework for IC reporting in a new research setting. The pilot study provides valuable insights to familiarise with corporate IC reporting in the new research setting. Second, the results of the analysis for parsimony in designing a research framework are interpreted to indicate the definition of IC reporting from a corporate perspective. Companies focus on the most widely-used IC components in their IC reporting. This reporting pattern is seen as an indication how companies define IC reporting. Third, the findings of the correlation analysis of selected prior research frameworks applied to the German dataset give an answer to the question of comparability regarding prior research frameworks. Due to the variety of approaches for IC content analyses, the comparability of previous studies has been questioned in the IC reporting literature (Beattie & Thomson, 2007). The results show that prior content analyses of IC reporting are comparable if the most widely-used IC components are included in the research frameworks.

8.2.3.3 Applying agency theory and legitimacy theory to IC reporting

The findings for research question (3), whether agency theory or legitimacy theory better explains IC reporting, are discussed in chapter 7. A summary of the research approach used in this final research project is outlined in section 8.2.2.4. The analysis of this project focuses on voluntary IC reporting because agency theory and legitimacy theory are theories of voluntary disclosure. The regression results show a significant association of voluntary IC reporting with mispricing, R&D expenses and intangible assets. In contrast, voluntary IC reporting is not related to ownership diffusion and only marginally significantly positively related to the level of underlying corporate IC value. To further investigate the marginal relationship between IC reporting and IC value, propensity score matching is conducted as a sensitivity test with no significant results. Based on the concepts of agency theory, ownership diffusion and underlying corporate IC value represent measures for the information gap between managers and owner. The non-significant results for these measures indicate that voluntary IC reporting is not utilised to reduce the information

gap. Regarding ownership diffusion, the findings suggest that voluntary IC reporting is not used to explain IC to diffuse shareholders.

Following the concepts of legitimacy theory, this study suggests that voluntary IC reporting is intended to legitimise the company's market position and to justify the use of intangible resources. The voluntary IC reporting is significantly positively associated with the variables to test the hypotheses based on legitimacy theory: mispricing, R&D expenses and intangible assets. This study reasons that mispricing represents a legitimacy threat because it may destroy social value due to a misallocation of resources. To address this threat, overpriced companies significantly increase their voluntary IC reporting. The significant results for mispricing indicate that IC reporting is used to legitimise the company's position. For expenses in R&D and intangible assets, the significant findings suggest that voluntary IC reporting is used to justify the use of intangible resources. The results of testing the hypotheses based on agency theory and legitimacy theory show that legitimacy theory better explains IC reporting as mispricing, R&D expenses and intangibles are significantly positively associated with IC reporting. These findings allow inferences on the motivations for corporate IC reporting based on the concepts of legitimacy theory. Hence, IC reporting is used to legitimise the corporate status and investments in intangible resources rather than to report on IC in order to reduce the information gap between managers and owners.

8.3 Contribution of research

8.3.1 Contribution to the literature

This study contributes to the IC reporting literature in several dimensions. Each of the three projects has its own value and contribution to different areas of IC reporting research: measuring underlying corporate IC value, designing research frameworks for IC content analysis, and applying theories to IC reporting. With regards to IC measurement, the first project of this study sheds light on a new approach for measuring IC values. A new measure to estimate IC value is identified in the area of mergers and acquisitions research and innovatively applied to IC research. This new

LRVTB measure allows testing previously untested IC-related hypotheses. The applicability is established in an analysis of potential determinants of IC value. This analysis shows that the new IC measure can be used for research in the area of IC development and creation. The findings of research project one can also be incorporated into the IC management literature. The results indicate that IC value is significantly positively related to motivational payments to employees and leverage and significantly negatively associated with size. These findings contribute to strategies for managing and developing IC value. Hence, the findings of the first research project contribute to a broad area of IC literature, such as measurement and management.

The results of the second research project contribute to the literature in the area of content analysis of IC reporting. The findings support a parsimonious IC content analysis design and specify how many widely-used IC components are important to focus on in a research framework for IC reporting. The procedures in project two seem feasible for approaching IC reporting in a new research setting. The suggested approach and the parsimonious design contribute to the literature of content analyses of IC reporting as they enhance comparability of future research frameworks for IC reporting. The findings of the second research project also allow a judgement on the comparability of prior content analysis studies of IC reporting. According to the results of the correlation analysis, prior studies are comparable if the most widely-used IC components are included in the research frameworks. This result contributes to the literature of content analysis of IC reporting because new hypotheses and theories on IC reporting can be inferred based on a meta-analysis of prior studies. Additionally, the findings shed light on a potential definition of IC reporting from a corporate perspective as companies focus on the most widely-used IC components. This contributes to establishing a less vague definition of IC reporting from a company's perspective.

The contribution of the final research project lies in testing IC-related theories to infer the motivations for corporate IC reporting. As the aim of the German regulation, applicable to the management report, is to reduce the information gap

between managers and users (GASC, 2010a, sec.3), agency theory is applied in this study. To contrast the potential motivations for corporate IC reporting based on the concepts of agency theory, legitimacy theory is chosen in this study. This study develops links from the concepts of agency theory and legitimacy theory to voluntary IC reporting. The elaborations and arguments constitute a theoretical contribution of this study to apply theories to voluntary IC reporting by developing IC-related hypotheses from a broad theoretical background. Following agency theory, a company's motivation for voluntary IC reporting is to reduce the information gap between managers and owners. In contrast, the ideas of legitimacy theory suggest that voluntary corporate IC reporting is used to legitimise a company's position in the market and to justify intangible resources.

The final project of this study shows that testing theories on IC reporting is possible with proxy measures. However, to establish measures for testing IC-related hypotheses, a certain level of creativity is needed, as demanded by Mouritsen (2006) and Marr et al. (2003). The findings of the regression analysis for voluntary IC reporting show that legitimacy theory better explains voluntary corporate IC reporting compared to agency theory. According to the findings, voluntary corporate IC reporting is used to legitimise a company's market position and to justify the use of intangible resources. These findings shed light on IC reporting as they allow inferences on the motivations for corporate IC reporting. They contribute to IC reporting research as agency theory and legitimacy theory have not been applied to voluntary IC reporting nor compared in prior literature to investigate potential motivations for IC reporting.

8.3.2 Implications for policy and practice

Besides the contribution to the literature, this research is of interest to policy makers and on a practical level. For the German setting with a regulation on the management report requiring and recommending to publish IC-related information, the findings can be useful for reviewing the regulation GAS 15 (2010a). The results show that companies utilise IC reporting within the management report for legitimising their

market position rather than reporting on underlying IC values. To provide information on sustainable value creation, as required in GAS 15 (GASC, 2010a, sec.30–35), corporate IC reporting could focus more on underlying IC values and their role in the value creation process. For improved IC reporting, corporate reporting on actual values could be promoted. Furthermore, information on IC is mainly recommended and is primarily outlined in the appendix of GAS 15, as reviewed in chapter 3. The question arises whether companies are aware of these IC reporting recommendations in the appendix of the standard. To encourage active IC reporting on underlying IC values, the concepts of IC could be stated more explicitly with links to strategy and the business model. However, the new standard GAS 20 shows that the GASC has chosen an alternative modification of the regulation (DRSC, 2013).

The new German standard GAS 20 on corporate management reporting reveals a transformation in the German approach to IC reporting (DRSC, 2013), as outlined in chapter 3. The German Accounting Standards Committee (GASC) changed the declared aim of the management report and abandoned the principle to 'focus on sustainable value creation' (GASC, 2010a, sec.30–35). In GAS 15 in 2010, the aim of the management report was to reduce the information gap between users and management (GASC, 2010a, sec.3). The aim of GAS 20 introduced in 2013 is to report on the use of the group's resources (DRSC, 2013, sec.3). Considering the findings of this study, companies have not followed the aim to reduce the information gap and to report on value creation, as found in chapter 7. In order to approach this discrepancy between the declared aim and reporting practices in 2010, two obvious options arise: encouraging companies to follow the aim or changing the aim according to corporate practice. Apparently, the GASC has changed the aim of the management report according to corporate IC reporting practice (GASC, 2010a; DRSC, 2013). The findings of this study support that corporate IC reporting is consistent with the new aim to report on the use of resources following the concepts of legitimacy theory, as argued in chapter 7. Therefore, this study may be of interest for standard setters in Germany to justify their new approach to IC reporting.

The findings of this study also have implications for international IC reporting policies. The International Accounting Standards Board has been working on a practice statement for a management commentary (IASB, 2010a). In paragraph 30, the practice statement explicitly refers to 'human and intellectual capital' (IASB, 2010a, para.30) but it does not provide further information on how to approach IC reporting. The international policy should encourage and support IC reporting on actual underlying IC values with some guidance on what IC comprises. According to paragraph IN1, the practice statement has a non-binding character (IASB, 2010a, para.IN1). The findings of this study in a regulatory German setting show that binding regulations do not seem to encourage companies to report on actual IC values in the business model. Hence, the findings of this study have an implication for the international approach. Including IC components in a traditional model of regulated management reporting may not encourage IC reporting on actual IC values.

The findings of this study may also contribute to the discussion on new reporting models mentioned in chapter 1, such as the integrated reporting model (IIRC, 2011). The results of this study may give an indication on the feasibility of the approach to reporting on 'the capitals', as published in the consultation draft on international integrated reporting in 2013 (IIRC, 2013). The description of 'the capitals' in the consultation draft mentions various forms of corporate capital, including IC with human capital and relationships as separate forms of capital (IIRC, 2013, sec.2B). Compared to the discussion paper in 2011, the IIRC has changed the approach to IC reporting focusing more on stocks and flows of capitals and their value contribution (IIRC, 2011; IIRC, 2013), as discussed in chapter 1. The consultation draft declares that the aim of reporting on the various forms of 'the capitals' is to provide information on value creation (IIRC, 2013, sec.2D). The findings of this study show that companies may not follow that aim but may use the reporting to legitimise their market positions and to justify the use of resources. The results of this study, together with the change in the German management reporting regulation in 2013 (DRSC, 2013), show that companies are unlikely to follow the declared aim to report on IC in order to explain value creation. Therefore, the findings of this study may provide a basis for further discussions on the consultation draft on integrated reporting.

8.4 Limitations and suggestions for future research

The suggested areas for future research have emerged in two ways over the course of this study: from prior literature and from the results of this research study. Several unanswered questions have been identified in the review of IC reporting literature in chapter 2. Three of these unanswered research questions are approached in this study. The remaining unanswered questions constitute potential interesting research questions for future research in the area of IC reporting. One major area for IC research is the conceptualisation of IC. In the literature, IC is widely outlined as constituting a competitive advantage for a company, as reviewed in chapters 2 and 5. An analysis of potential differences between IC and competitive advantages may support a clearer conceptualisation of IC which may support a stronger definition. Furthermore, the review of IC reporting literature disclosed that IC reporting studies have collected unutilised information. An analysis of how additional IC reporting information regarding reporting type, tone, and location could be utilised, would add to IC reporting research. Future research could address questions regarding IC reporting type, tone and location in a discourse analysis to account for complexity of corporate IC reporting.

The findings of this research study indicate possible ways forward for the research area of IC reporting. The theoretical contribution of this study is to apply agency theory and legitimacy theory to IC reporting. For future research, other theories which are related to IC reporting could be investigated, such as stakeholder theory. The question, whether corporate IC reporting is influenced by stakeholders, offers research opportunities on stakeholders' information needs regarding IC information. Furthermore, the investigations of market perceptions of IC reporting and analysts' views could enhance IC reporting research. To develop IC-related theories, the findings of this study suggest that the results of prior content analysis studies can be consulted and compared. Accordingly, a meta-analysis can be conducted to infer new IC theories. This study found in a cross-sectional analysis that IC reporting is used to address the legitimacy threat of being currently overpriced. As corporate IC reporting

may also cause mispricing, further investigations are needed on market reactions to IC reporting. For future research, a long-term investigation of IC reporting with panel data allows examining changes in reporting and their association to the corporate status.

The findings in chapter 7 regarding the significant positive relationship between IC reporting and R&D expenses as well as intangible assets may have an alternative interpretation. Reporting on R&D activities and intangible assets is required, and further details are recommended in the German regulation on management reporting, GAS 15 (GASC, 2010a), and in many European jurisdictions (European Commission, 2007). Hence, companies with activities in the area of R&D and investments in intangible assets may be more aware of IC reporting. With an increased awareness, the reporting on required IC components may entail further voluntary IC reporting on other IC components. The IC reporting may then be a side effect of reporting regulations rather than following a certain purpose. If companies are not entirely aware of IC reporting or if IC reporting is only a side effect of reporting regulations, IC reporting research may make hasty judgements on corporate IC reporting. To enhance IC reporting research and to validate interpretations and inferences of this study, further research is encouraged to examine how important companies deem IC reporting.

Corporate IC reporting patterns, as found in chapter 6, lead to further research questions. Companies focus on the most widely-used IC components which could be explained by several potential reasons. First, companies may not follow an active IC reporting strategy. In this case, IC reporting may be a side effect of the management reporting regulation including some IC components. Accordingly, companies are obliged to report on some of the most widely-used IC components which may encourage them to also report on other components. Second, companies may focus on the most widely-used IC components as a practical approach to define IC reporting. Third, the companies may believe that the few most widely-used IC components represent the most valuable IC items. To approach this question, deeper insights into IC reporting practices are required. Future research can gain these

insights in case studies or interviews. As outlined in chapter 4, this study intended to conduct interviews but the requests were refused. The refusals show that access is important to design a study based on interviews and case studies, particularly as IC is seen to constitute a competitive advantage, as discussed in chapters 2 and 5.

Three potential questions arise from the companies' negative responses to interview requests, namely time constraints, data sensitivity and the absence of a central IC reporting management. The stated reasons for refusing the interview requests represent a starting point for further research. First, the issue of data sensitivity can be investigated. Second, if no central IC reporting management existed, the companies' awareness of IC reporting can be examined. Third, if companies were not aware of IC reporting, the question of an academic utopia which may have been established in IC reporting research, as stated by Beattie and Thomson (2010), requires further examinations. The findings of this study suggest that companies report on IC but their motivations may differ from the academic perception of reporting on value creation. The results of the second project on the parsimonious design of an IC content analysis in chapter 6 show that corporate IC reporting focuses on widely-used IC components regardless of industries. Hence, companies may not actively engage with IC reporting to explain value creation in line with their business models, strategies and objectives. Future research could investigate to what extent approaches to IC reporting diverge in academia and in practice.

The approach and the findings in the first empirical research project in this study on IC value measures, presented in chapter 5, offer further research opportunities. The innovative approach to compare different measures of IC value, in order to identify the best estimator of underlying corporate IC value, may be influenced by external factors related to the corporate market value. Hence, further investigations to confirm the LRVTB measure as a robust estimator for IC value are required. To further investigate LRVTB as a measure of corporate IC value, several approaches are possible, such as different research settings, long-run studies or experimental settings given in IPOs or bankruptcy situations. The findings on the determinants of IC value in chapter 5 indicate that IC value is significantly negatively related to company size

and significantly positively related to leverage and motivational payment to employees. Future research could explore potential reasons for these relationships. The outcomes could guide IC management for creating and developing IC value.

Finally, the industry grouping approach of this IC reporting study can be investigated in future research. For this study the sample is grouped into four industry groups, as outlined in chapter 4. This grouping approach follows the idea that IC is related to the corporate business model. Future research could investigate the relationship between IC and the corporate business model on a deeper level. This addresses the question of how to classify samples for IC reporting research into industry groups. The findings of research project one indicate that IC is negatively related to corporate performance in the financial sector. This result is surprising as in chapters 2 and 5 IC is argued to constitute a competitive advantage leading to increased performance. In order to explain this situation, further investigations of the relationship between IC value and performance are required. Moreover, companies in the financial sector report least on IC for structural, relational, and human capital, as found in chapter 7. The financial sector seems to have a special role in IC reporting research which requires more detailed examination.

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Appendix

List of IC components in English and German resulting from pilot study

Panel A: Structural Capital

Intellectual assets	intellektuelle Vermögenswerte
intellectual property	geistiges Eigentum, Intellectual Property
intellectual property	Intellectual property
intellectual property management	IP management
intellectual property protection	Schutz des geistigen Eigentums
patents	Patente, Patent, Patentlandschaft
patent granting procedure, families	Patenterteilung, -sverfahren, Patentanmeldung, Patentamt, Patentfamilien
patent protection, infringement	Patentschutz, patentrechtlich, Patentrecht, Patentdurchsetzung, Patentverletzung
patent position, strategy, research	Patentposition, Patentstrategie, Patentrecherche, Patentarbeit, Patentanalyse
trademarks	Schutzrecht
copyrigths	Verlagsrecht, Copyright
trademark registration, tradename	Schutzrechtsanmeldung, Warenzeichen
domain	Domain, Domäne
approvals	Zulassung, Zulassungen, Zulassungserteilung
approval efforts, requirements, process	Zulassungsbemühung, Zulassungsantrag, -voraussetzung, -prozess, -verfahren
approval risks	Zulassungsrisiken
intangibles	immaterielle Vermögenswerte
goodwill	Geschäfts- oder Firmenwert, Goodwill
royalty business	Lizenzgeschäft
concessions, licences	Lizenzen, Konzession, …-Lizenz
licensee, licenser, agreements, licensed	Lizenzinhaber, -nehmer, -geber, (ein)/(aus)lizenziert, -vereinbarung, -vertrag, -erwerb
franchising	Franchising, Lizenzvergabe
income from royalties, royalties expenses	Lizenzeinnahmen, -erträge, Provisionseinnahmen, Lizenzaufwand, -kosten, -budget

Panel A: Structural Capital - continued

Processes	Prozesse
management processes	Managementprozesse
control, controlling	Kontrolle, Controlling, Steuerung
control mechanism, programme	Steuerungsinstrument, -werkzeug, -konzept, -größe, -system, …-Steuerung
monitoring process	Überwachungs-, Kontrollprozess, -mechanismen, -ziele, -maßnahmen, Prozesskontrolle
corporate monitoring	Unternehmensüberwachung, -steuerung, -kontrolle, -aktivität, -tätigkeit, Überwachung
early-warning character	Frühwarncharakter, Frühwarnmechanismus
accounting and auditing process	Rechnungslegungsprozess
risk management, risk controlling	Risikomanagement, Risikocontrolling, Risikomonitoring, Risikokontrolle, Risikostrategie
strategic planning	strategische Planung, strategischer Plan
planning process, bottom-up, top-down	Planungsprozess, Unternehmensplanung, Planung, bottom-up, top-down
business processes, workflow	Führungsprozess
management tool, structure, benchmarking	Führungsinstrument, -werkzeug, Führungsstruktur, Management-Tool, Benchmarking
process optimisation	Prozessoptimierung
optimisation	Optimierung (von Geschäftsprozessen, von Arbeitsabläufen), optimierte Abläufe
modernisation process	Modernisierungsprozess, verbesserte, moderne, implementierte (Geschäfts-)Prozesse
efficient, structured, standardised processes	effiziente, strukturierte, standardisierte, definierte, etablierte, verzahnte, Prozesse/Abläufe
process coordination	Prozessharmonisierung, -koordinierung
improvement process	Verbesserungs-/Optimierungs-, -prozess(schritte), -programm, -maßnahmen,
data flow optimisation	Datenflussoptimierung
securing process operations, quality	Sicherstellung der Prozessabläufe, Prozessverbesserung, Prozessqualität
restructuring	Re/Umstrukturierung, Re/Neuorganisation, -strukturierung, -ordnung
restructuring programme	Restrukturierungsprogramm, -maßnahmen, -aufwand, -effekt, neu strukturiert, restrukturiert
change management	Veränderungsprozess, Änderungsmanagment, Änderungsmaßnahmen
productivity	Produktivität
efficiency, throughput times, rationalisation	Effizienz, Durchgangszeit, Wirtschaftlichkeit, Ressourceneffizienz, ...-Effizienz, Rationalisierung
efficiency enhancement, performance process	Effizienzsteigerung, Effizienzprüfung, Produktivitätssteigerung, Leistungsprozess, Leistungsfähigkeit
production method	Herstellungsverfahren, -prozess, neue/moderne/optimierte/effiziente Verfahren(stechnik)
production results, rate, capacity utilisation	Produktions-/Fertigungsergebnisse, -rate, -quote, -rekord, Kapazitätsauslastung
production flexibility, flexibilisation potential	Produktionsflexibilität, -prozesse, Flexibilisierung, Flexibilitätspotenzial

Panel A: Structural Capital - continued

Systems	Systeme
information system	Informationssystem
planning and control system	Planungs- und Kontrollsystem
analysing system, variance analysis	Soll-Ist-Vergleich, Abweichungsanalyse
early risk detection system	(Risikofrüherkennungs-)System, Frühwarnsystem
KPI system	Kennzahlensystem, ...-kennzahlen, Key Performance Indicators, KPI System
monitoring system	Überwachungs-/Monitoring-/Controlling-/Revisions-, -system, -programm
management control system	Unternehmenssteuerungssystem, Managementsystem
system flexibility, quality, capacity	Systemflexibilität, flexible Systeme, Systemqualität, Systemkapazität
dual control, access restriction	Funktionstrennung, 4-Augen-Prinzip, Zugriffskontrolle, Zugriffsbeschränkung
eporting	Reporting
risk report, chances report	Risiko-/Chancenbericht, -reporting, Reportingsystem, Berichtsstruktur, -wesen, -erstattung
accounting system	Rechnungslegungssystem
technological systems	Technologiesysteme
IT systems	IT-Systeme, EDV-Systeme, IT-Einrichtung
IT service, user support	IT-Service(leistungen), Informationstechnologie, IT-Infrastruktur, Anwendersupport
hardware, computer centre	Hardware, -entwicklung, -beschaffung, -ausstattung, -komponenten, Rechenzentrum
ERP system	ERP-System, Enterprise Resource Planning System
system development and maintenance	Systementwicklung, -pflege, Systemausfall, IT-Sicherheitsmanagement
computerised, computer-aided	computergestützt, computerunterstützt, IT-gestützt
software development	Softwareentwicklung
software solutions, environment	Softwarelösungen, Softwareunterstützung, Softwaretool, Softwareumfeld
standard software, antivirus software	Standardsoftware, Virenschutzsoftware
data processing	Datenverarbeitung
back-up systems, data safety	Back-up Systeme, Daten-Backup-Strategie, Datenspiegelung, -sicherheit, verlust(risiko)
database, data processes, storage, loss	Datenbank, -netz, -prozess, -haltung, -verlustrisiko, …-Dokumentation, Archivsystem
data collection system	Datenerhebungssystem, Datenerhebungssoftware, Datenerhebung

Panel A: Structural Capital - continued

Philosophy and communication	Philosophie und Kommunikation
corporate culture	Unternehmenskultur
business policy, corporate policy	Unternehmenspolitik, Geschäftspolitik, Führungspolitik
guideline, principles, internal regulation	Richtlinienwesen, ...-Richtlinie, …-Leitlinie, …-Handbuch, Verhaltensregeln, Leitgedanke
standardisation, integration project	Vereinheitlichung, Standardisierung, Integrationsprojekt, Harmonisierungsprojekt
risk policy, risk management guidelines	Risikopolitik, Risikomanagementgrundsätze
value management	Wertemanagement, Wertebarometer, Unternehmensgrundsätze
management structure	Führungsstruktur
organisational structure	Organisations-/Firmenstruktur, (Unternehmens-)Hierarchie, Hierarchiestufen, -ebenen
management culture, practice	Führungskultur, Unternehmensführungspraktiken, vertrauensvolle Unternehmensführung
responsibility for results and management	Ergebnis-, Führungsverantwortung
corporate quality	Unternehmensqualität
strategic orientation/direction, goals, process	strategische Ausrichtung/Ziele, Strategieprozess, Unternehmens-/Konzernziele, -strategie
sharing of knowledge and information	Wissensaustausch
know-how transfer	Know-how-Transfer
interconnections, networking system	Schnittstellen, Vernetzung, Netzwerktechnik
transfer of knowledge/experience	Wissenstransfer, Wissensaustausch, Erfahrungsaustausch
synergies, economies of scale	Synergien, Synergieeffekte, Synergiepotenzial, -nutzung, Skaleneffekte, Größenvorteil
communication	Kommunikation, Austausch
communication policy, technology	Komminkationspolitik, -technik, -technologie, Intranet, Netzwerktreffen, Dialogworkshop
regular meetings	Besprechungen, regelmäßige Meetings, Gesprächsrunde, Managementmeeting
information policy, safety, requirement, flow	Informationspolitik, -sicherheit, -anforderungen, -veranstaltung, -pflicht, -austausch, -fluss
information supply, quality	Informationsquelle, -versorgung, -umfang,-grundlage, -stand, -bereitstellung, -qualität
information management	Informationsmanagement, -weg, -aufwand, -wesen, -kosten

Panel A: Structural Capital - continued

Research activities	Forschungsaktivitäten
research and development (R&D)	Forschung und Entwicklung (FuE, F&E, F+E), Erforschung
R&D projects	F&E-Projekte, -vorhaben, -arbeit, schwerpunkt, -fokus, -pläne, Tätigkeit
R&D activities, focus	F&E-Tätigkeiten, -Schwerpunkte, -Bereich, -Themen, -Fokus, -Roadmapping, -programm
research initiative, project, intensity	Forschungs-/Entwicklungsinitiative, -projekt, - vorhaben, -arbeit, -aktivität, -arbeit, -intensität
drug development, basic research	Arzneimittel-/Medikatment-/Wirkstoffentwicklung, Grundlagenforschung
research facilities	Forschungseinrichtungen
laboratory	Labor, Laborräume, -technik, -ausstattung, -material, …-Labor
research centre, resources, researcher	Forschungs-/Entwicklungs-, -zentrum, -einrichtung, -Materialien, Forscher/innen
R&D results	F&E-Ergebnisse
R&D goals, strategy, performance	Forschungs-/Entwicklungsziele, -strategie, -phase, -stand, -stadium, -leistung
R&D report, budget, rate, expenses, portfolio	F&E-Bericht, F&E-Etat, F+E-Quote, FuE-Aufwand, -Kosten, -Komitee, -Portfolio
research pipeline, drug pipeline	Forschungspipeline, Wirkstoffpipeline, Medikamentenpipeline, Entwicklungspipeline

Panel A: Structural Capital - continued

Product performance	Produktleistungsfähigkeit
product development	Produktentwicklung
product competencies	Produktkompetenz
product concept, strategy, performance	Produktkonzept, -strategie, -eigenschaften, -ausstattung, -leistung(sfähigkeit), -variante
service portfolio, standards, service oriented	Leistungsspektrum, -standards, leistungs-/produktorientiert
product range	Produktrange, -palette, -angebot, -linie, -serie, -portfolio, -sortiment, -gruppe, -mix
product creation process, analysis	Produktentstehung(sprozess), Produkt-Entstehungs(-Prozess), Produktanalyse
product improvement	Produktverbesserung
product launch, pipeline	Produkt(neu)einführung, -zulassung, -pipeline, Marktzulassung, neue/attraktive Angebote
product innovation, novelty	Produktinnovation, Produktneuheit, neue Kollektionen
product development	Produktentwicklung, Produktneuentwicklung
product development cycle, project	Produktentwicklungszyklus, -phase, -plan, -projekt, -prozess, -kosten, -aktivität
product/application/technology development	Technologie-/Anwendungs-/Sortimentsentwicklung, -kompetenz, entwickelte Technologie
key products, main products	Schlüsselprodukte, Hauptprodukte
innovation	Innovation
creativity	Kreativität, kreativ
design, new business ideas	Design, -idee, -team, Industriedesigner, Designer, Designpreis, -auszeichnung, neue Geschäftsideen
innovative strength/energy, structure, skills	Innovationskraft, -struktur, -fähigkeit, -fördernd, Innovator, innovativ, -management, -prozess
idea management, potential	Ideenmanagement, Ideenpotenzial
quality	Qualität
quality management	Qualitätsmanagement(prozess)
quality standards, report	Qualitätsstandards, -anspruch, -anforderungen, -verfahren, -system, -risiko, -bericht, -report
quality control, enhancement	Qualitätskontrollmaßnahme, Qualitätskontrollanlagen, -steigerung, Qualitätsaudit
quality assurance, indicator	Qualitätssicherung, -maßnahmen, -programm, -indikator, -merkmal
reject rates per product, warranty expenses	Rückweisquote, Gewährleisungsaufwand
premium-quality workmanship	hochwertig, höchstwertig, erstklassig, Topleistung
product and service quality	Produktqualität, Servicequalität, Strukturqualität, Ergebnisqualität, Programmqualität
functionality	Funktionalität, funktional
durability, precision, accuracy	Langlebigkeit, langlebig, Präzision, hochpräzise
product flexibility, all-in-one solutions	Produktflexibilität, Komplettlösungen

Panel B: Relational Capital

Customers (patients, users)	Kunden (Patienten, Nutzer)
costumer relation management	Beziehungsmanagement
customer value, customer benefits	Kundennutzen, Nutzen für unsere Kunden
customer focus, potential	Kundenfokus, Fokus auf unsere Kunden, Kundenpotenzial
customer relations	Kundenbeziehungen, Beziehungen zu unseren Kunden
customer structure	Kundenstruktur
customer base, customer groups, customer portfolio	Kundenkreis, -bestand, -basis, -gruppen, -liste, -stamm, -portfolio, Zielgruppe
core customer, wholesale customer, key customer	Schwerpunktkunden, Großkunden, Handelskunden, Schlüsselkunde, Stammkunde
customer orientation, patient orientation	Kundenorientierung, kundenorientiert, patientenorientiert, Patienten(orientierung)
customer care, patient care	Kundenversorgung, Patientenversorgung
CRM-system	Customer Relationship Management, CRM
customer contact, contact person, customer service	Kundenkontakt, Kundenansprache, Kundenservice, Servicenetzwerk
customer acquisition	Kundengewinnung, Gewinnung neuer Kunden, Kundenakquise, Neukunde(ngewinnung)
complaint management, customer risk	Beschwerdemanagement, Kundenrisiko
maintenance contracts, customer engineering	Wartungsvereinbarungen, -verträge, Wartungsdienst
customer involvement	Kundeneinbeziehung
customer loyalty, customer retention rate	Kundenbindung(sdauer)
customer loyalty programme	Kundenbindungsprogramm, Bindung unserer Kunden, Kundeneinbindung, Kundensicht, -seite
closeness to customers	Kundennähe, kundennah, Nähe zu unseren Kunden
customer trust	Vertrauen der Kunden, Kundenvertrauen
readiness to engage in dialog	Dialogbereitschaft
value added per customer	Wertschöpfung pro Kunde
customer expectations	Kundenerwartungen
customer demands, needs, requirements	Bedürfnisse unserer Kunden, Kundenwünsche, Kundenanforderungen
customer survey, feedback	Kundenumfrage, Feedback, Resonanz, Kundenbefragung
customer/patient satisfaction	Kundenzufriedenheit, Patientenzufriedenheit
customised, agreement with customers	kundengerecht, -spezifisch, zugeschnitten auf unsere Kunden, Abstimmung mit den Kunden
customer training	Kundenschulung
product instructions/training, trial equipment	Produktschulung, Probestellung
customer workshops, demonstration room	Kundenworkshops, Workshop für unserer Kunden, Trainingsraum, Vorführraum

Panel B: Relational Capital - continued

Distribution network	Vertriebsnetzwerk
Distribution channels	Vertriebskanäle
sales channels	Absatzkanäle, Vertriebswege
branch network, branches, stores	Vertriebsbüro, Filialen, Filialnetz, -geschäft, -fachgeschäft, -fachhandel, Stores
factory outlet	Factory-Outlet, Fabrik-/Werksverkauf
retail	Einzelhandel, Retail, Retailstore, -geschäft, -portfolio, -aktivitäten, -partner, -umfeld
wholesale	Großhandel, Großhandelspartner, Großmarkt
eCommerce	E-Commerce, elektronischer Handel, Online-Verkäufe
direct selling, house-to-house distribution	Direktvertrieb, Direktvertriebsorganisation, Distributionsstrategie
structure of distribution, distribution strategy	Vertriebsstruktur, Vertriebsgesellschaft, -tochtergesellschaft, -niederlassung, -präsenz
dealer network	Händlernetz, Vertriebsnetzwerk, Handelsstruktur
sales force	Vertrieb(skraft)
sales representative, sales productivity	Außendienstmitarbeiter, -arbeiter, -produktivität, Außendienst, Außendienststelle
sales activities, potential	Vertriebsarbeit, Vertriebs-, Außendienstaktivitäten, Vertriebspotenzial
sales management, organisation, expenses	Vertriebssteuerung, Vertriebsorganisation, Vertriebskosten, -aufwand
sales approach, sales structure, service network	Vertriebsansatz, Vertriebsaufbau, Servicenetz
sales licence	Vertriebslizenz
sales rights	Vertriebsrechte, Rechte für den Vertrieb
logistics	Logistik
logistical processes, infrastructure, competencies	Logistikprozesse, Logistikkette, -infrastruktur, Logistikkompetenz
network of suppliers and distributors	Lieferantennetzwerk
supply chain (management)	Supply Chain (Management)
distributor network, distributors, distribution partners	Distributornetzwerk, -partner, Lieferantenportfolio, Vertriebshändler, -partner, Distributoren,
suppliers, supply chain	Lieferanten, Zulieferanten, Zulieferer, Schlüssellieferanten, Lieferkette, …-Lieferant
delivery/supply agreement, supplier check	Liefer-/Abnahme-/Rahmen-/Vertriebsverträge, -vereinbarungen, Lieferantenprüfung
supplier relations, loyalty	Liefer(anten)beziehungen, Lieferantenwechsel, Liefertreue
supply shortage, quality, readiness, source of supply	Lieferengpass, -problem, -qualität, -bereitschaft, -verzögerung, -quelle
network of excellence	Kompetenznetzwerk
purchase and supplier know how	Einkaufs-Know-how, Zulieferer-Know-how, Know-how bei unseren Zulieferern
procurement management, delivery times, capacity	Beschaffungs-/Einkaufs-, -prozess, -management, -organisation, Lieferzeiten, Lieferfähigkeit

Panel B: Relational Capital - continued

Brand building	Markenbildung
marketing	Vermarktung, Marketing
marketing strategy	Vermarktungsstrategie, Marketingstrategie
marketing success, potential	Vermarktungserfolg, Marketingerfolg, Vermarktungspotenzial
marketing resources	Marketing-/Vermarktungsressourcen, -budget, -aufwand, -kosten
marketing, advertising	Marketing, Werbung, Marketingaktivität, -initiative, -organisation, Werbestrategie, -kampagne
unique selling point	Alleinstellungsmerkmal, Unique Selling Point
bestseller, trend setter, flagship	Bestseller, Verkaufsschlager, Trendsetter, Flaggschiff, …-Flaggschiff
key product	Schlüsselprodukt, Kernprodukt
persuasive power	Überzeugungskraft
brand awareness	Markenbekanntheit
brand image	Markenimage
brand positioning, appearance	Markenpositionierung, Markenauftritt, …-Marke, Markenpräsenz, -artikel, Handelsmarke
brand vision, philosophy, experience	Markenvision, Markenprofil, Markenphilosophie, Markenerlebnis
brand communication, promise	Markenkommunikation, Markenversprechen
brand desire/demand	Markenbegehrlichkeit, Markenbegehrtheit
brand recognition value	Wiedererkennungswert, Wiedererkennungseffekt, Bekanntheitsgrad
brand strategy	Markenstrategie
umbrella brand	Dachmarke, Dachmarkenstrategie
corporate brand, brand portfolio	Konzernmarke, Markengesellschaft, Markenportfolio
brand specific	markenspezifisch
brand protection	Markenschutz
brand protection commissioner	Markenschutzbeauftragte/r
brand name, value	Markenname, Markenwert
brand registration	Markeneintragung, Markenanmeldung

Panel B: Relational Capital - continued

Corporate image building	Imagebildung
public relations	Public Relations, Öffentlichkeitsarbeit
corporate design	Corporate Design
logo	Logo, Firmenzeichen, …-Logo
corporate image	Image, Firmenimage
publicity	Öffentlichkeit
road show, congress, symposium, forum	Road Show, Informationsveranstaltung, Kongress, Messe, Symposium, Forum, Konferenz
social media	Social Media, Soziale Medien
internet presence	Internetauftritt, Internet-Auftritt, Webauftritt, Internetportal, Webpräsenz
communication campaigns	Kommunikations-, Informationskampagnen, -offensive, Kampagnenmanagement
public relations activities, sponsoring	Public-Relations-Aktivitäten, Publicity, Sponsoringprojekte, Sponsoring
luminaries	Meinungsbildner, Meinungsbild, Meinungsbildung(sprozess), meinungsbildend
reputation, social reputation	(gesellschaftliche) Reputation, Unternehmensruf
uniqueness	Einzigartigkeit, einzigartig
experiential/developmental edge, industry experience	Erfahungsvorsprung, Entwicklungsvorsprung, …-Vorsprung, Branchen-/Industrieerfahrung
quality offensive	Qualitätsoffensive
reference centre	Referenzzentrum
pioneer, specialist	Pionier, Pionierrolle, Pioniergeist, Pionierunternehmen, Spezialist
investor relations, IR	Investor Relations, Investorenbeziehungen, IR-…
financial contacts	Finanzbeziehungen, -kontakte
financial sources, partners	Finanzierungsquellen, Finanzierungspartner, Bankpartner
banking portfolio	Bankenportfolio, Partnerbank, Kooperationsbank, Bankkontakt
credit ranking	Bonitätsranking
investor events	Investorenveranstaltung
equity forum, investor conference	Eigenkapitalforum, Investorenkonferenz
investors' trust	Vertrauen der Anleger, Investorenvertrauen, Anlegervertrauen
stock market presence	Börsenpräsenz
conference call	Conference Call

Panel B: Relational Capital - continued

Business partnering	Geschäftspartnerschaften, Verpartnerung
partnership	Partnerschaft, Partner
partner cooperations	Partnerkooperationen
business partners	Geschäftspartner, Kooperationspartner, externe Partner, Geschäftsbeziehungen
partnering relations	Verbundbeziehungen
partnering contract/agreement	Partnervertrag, Kooperationsvertrag, -vereinbarungen, Partnerschaftsverhandlungen
joint ventures	Joint Ventures
cooperation	Kooperation, Zusammenarbeit mit Partnern
cooperation management	Kooperationsmanagement
selection of partners	Partnerauswahl, Partnerselektion
contracting partner/partnerships	Vertragspartner, Vertragsbeziehung
cooperations with universities	Kooperationen mit Hochschulen/Universitäten, Hochschulkooperationen
partner network	Partnerverbund, Verbundpartnerschaft, Partnernetz
production partner	Produktionspartner, Produktpartnerschaft, Produktionskooperation, -vertrag, -vereinbarung

Panel B: Relational Capital - continued

Market positioning	Marktpositionierung, Positionierung im Markt
market situation	Marktgegebenheiten
market needs, market demand	Marktanforderung
pattern of demand	Nachfragestruktur
marketability, market oriented	Marktnähe, Nähe zum Markt, marktorientiert, -nah, -bezogen, -gerecht
market penetration, success, cultivation	Marktdurchdringung, -erfolg, -bearbeitung, -penetration, -ausweitung
market launch	Markt(neu)einführung(skosten), -budget, -aufwand, -reife, Launch, Neugeschäft
key markets	Schlüsselmarkt, Kernmarkt, Zielmarkt, Absatzmarkt, Einkaufsmarkt
market conditions	Marktverhältnisse
market position, structure	Marktposition, Marktstellung, Marktstruktur, -infrastruktur, -situation
internationalisation, globalisation	Internationalisierung, internationale Präsenz
market research, competitive analysis	Marktanalyse, Branchenanalyse, Industrieanalyse, Wettbewerbsanalyse
growth potential	Wachstumspotenzial
strategic growth area, growth opportunities	Wachstumsfeld, Wachstumschancen, Wachstumstreiber, wachsender Markt, Marktchance
strategic acquisition	strategische/gezielte Akquisition
market growth , growth perspective, strategy	Marktzuwachs, Marktwachstum, Wachstumsmarkt, -perspektive, -strategie
market potential, emerging market, opening market	Marktpotenzial, Marktschöpfungspotenzial, Zukunftsmarkt, Markterschließung, -öffnung
value added	Wertschöpfung, Wertschöpfungskette, value added
competitive position	Wettbewerbsposition, Wettbewerbssituation
competitive environment	Wettbewerbsumfeld, Marktumfeld, Branchenumfeld
competitive advantage, differentiation	Wettbewerbsvorteil, Marktvorteil, Differenzierung
degree of competition	Wettbewerbsintensität, -faktor, -stärke, intensiver Wettbewerb, wettbewerbsstark, -fähig
market entry barrier	Markteintrittsbarriere, Markteintrittshürde, Hürde/Barriere des Markteintritts
market share	Marktanteil
access to the market	Marktzugang
market/industry/quality/innovation/technology leader	führend, Branchen-/Industrie-/(Welt)Markt//Qualitäts-/Innovations-/Technologieführer

Panel C: Human Capital

Education and vocational qualification	Bildung und Ausbildung
apprenticeship, vocational qualification	Ausbildung, Berufsausbildung
apprentices, trainees	Auszubildende, Trainees
apprenticeship openings	Lehrstellen
phase of training	(Berufs-)Ausbildungsabschnitt, -phase, Abschnitt der Ausbildung
company that takes on trainees, training company	Ausbildungsbetrieb
educational concept	(Berufs)Ausbildungskonzepte, -gänge, -angebot, Ausbildungsberufe
education quality	Ausbildungsqualität, Qualität der (Berufs)Ausbildung/Ausbildungsbetriebs
training curriculum	(Berufs)Ausbildungscurriculum, -programm, -inhalt, -ablauf
education budget	(Berufs)Ausbildungsbudget, -kosten, -aufwand
graduates	Absolventen, Universitäts-/Hochschulabschluss, Akademiker
intern, internships, placement	Praktikant, Praktika, Praktikum
diploma project	Diplomarbeit, Abschlussarbeit
programme of study	Studienprogramm, Studiengänge, Studium
qualification	Qualifikationen
qualified	qualifiziert, gut ausgebildet, hochqualifiziert
qualification profile	Qualifikationsprofil
qualificational schedule	Qualifikationsfahrplan
basic knowledge	Basiswissen

Panel C: Human Capital - continued

Competencies	Fachkompetenz
know how	Know-how
core competencies, key competencies	Kernkompetenzen, Schlüsselkompetenz
competence centre	Kompetenzzentrum, Kompetenzbündelung, Zentrum für Kompetenzen
competent	kompetent, Kompetenzen, …-Kompetenz, Kompetenzmodell
skills	Fertigkeiten, Fähigkeiten
entrepreneurial skills, leadership qualities/skills	Führungsqualitäten, Managementqualität, Führungsstärke, führungsstark
knowledge	Kenntnisse, Fachkenntnisse, Wissen, Fachwissen, Wissensstand
soft skills	soziale Kompetenz, Soft Skills
personnel quality	Mitarbeiterqualität
experience	Erfahrungen
expertise	Expertise
experts	Führungs-/Fachkräfte, -(mit)arbeiter, -personal, fachkundig, -männisch, Schlüsselkräfte
professionalism	Professionalität, Professionalisierung
practical experience	praktische Erfahrung
several years of experience	mehrjährige Erfahrung, Berufserfahrung, Branchenerfahrung, Industrieerfahrung
competence development/expansion	Kompetenzausbau
expert teams	Expertenteams
team work	Teamarbeit, Zusammenarbeit im Team
ability to work in teams	Teamfähigkeit, teamfähig
team spirit	Teamgeist
team	Team
sales team, design team, management team	Verkaufs-/Vertriebsteam, -mannschaft, Designteam, Managementteam
team leader	Teamleiter
competence team	Kompetenzteam

Panel C: Human Capital - continued

Training and development	Personalweiterentwicklung
training	Schulung, Training
employee training	Mitarbeiterschulung, Mitarbeiterweiterbildung
continuing education	Fortbildung, Personalweiterentwicklung, Mitarbeiterweiterentwicklung
educational project	Bildungsprojekt, -programm
training budget	Weiterbildungs-/Personalentwicklungs-/Fortbildungsbudget, -kosten, -aufwand
demand in training	Fortbildungs-/Weiterbildungs-/Personalentwicklungsbedarf, Bedarf an Fortbildung
advanced training course	Fortbildungs-/Weiterbildungs-/Personalentwicklungsveranstaltung
training hours, participant	Trainingsstunden, Trainingsumfang, Trainingsteilnehmer
training arrangements	Fortbildungsmaßnahmen, Schulungsmaßnahmen
training centre	Trainingscenter/-zentrum
training contents	Weiterbildungs-/Fortbildungs-/Personalentwicklungsinhalte
training/qualification module	Schulungs-/Qualifikations-/Qualifizierungsmodul, -abschnitt, -einheit
coaching	Coaching
training programme	Trainingsprogramm
development	Personalentwicklung, -weiterentwicklung
training opportunities	Weiterbildungsmöglichkeiten, -maßnahmen
training offers	Weiterbildungsangebot, Fortbildungsangebot
learning progress	Lernfortschritt
qualification measure	Qualifizierungsmaßnahme
learning objectives	Lernziele
qualification and development measures	Qualifizierungs-/Personalentwicklungs-, -maßnahmen, -programm, -angebot

Panel C: Human Capital - continued

Efforts related to working environment	Bemühungen im Arbeitsumfeld
working safety	Arbeitssicherheit
working climate, atmosphere	Arbeitsklima
working environment, range of duty	Arbeitsumfeld, Arbeitsgebiet
working hours	Arbeitszeit, Arbeitszeitmodell
labour conditions	Arbeitsbedingungen
employment quality	Arbeitsplatzqualität
working equipment	Ausstattung des Arbeitsplatzes
absenteeism	Abwesenheit, Abwesenheitsrate, Abwesenheitsquote
rate of illness	Krankheits-Quote, Krankheitsrate
work life balance	Work Life Balance
occupational safety, worker protection	Arbeitsschutz, Arbeitssicherheit
occupational safety committee	Arbeitsschutzausschuss, Arbeitsschutzbeauftragte
injury rate, risk	Verletzungsrate, Verletzungsquote, Verletzungsrisiko
occupational accident, deaths	Betriebsunfall, Todesfälle, tödliche Unfälle
equality issues	Gleichbehandlung
diversity	Diversität, Diversity
proportion of females	Frauenquote, -anteil, -rate, Mitarbeiterinnen, Kolleginnen, Arbeitnehmerinnen
promotion of females	Frauenförderung, Förderung von Frauen
equal opportunities, discrimination	Chancengleichheit, Diskriminierung
employee structure	Mitarbeiterstruktur, Personalstruktur
personnel infrastructure	Personalinfrastruktur
age/gender distribution, pattern, structure	Altersverteilung, Geschlechterverteilung, Altersstruktur
disability	Behinderung, behinderte Mitarbeiter, beeinträchtigte Mitarbeiter
diversified employees	diversifizierte Belegschaft
internationality	Internationalität, Ausländeranteil

Panel C: Human Capital - continued

HR policies	Personalpolitik
recruitment policies	Einstellungspolitik, Rekruitingspolitik
junior employees	Nachwuchskräfte
succession planning	Nachfolgeplan(ung), Nachbesetzung, Nachbesetzungsquote
young professionals, talent management, talent pipeline	Nachwuchskraft, -management, Top-, Talente, -management, -pipeline, Begabungen
promotion of young professionals	Nachwuchsförderung, Führungsnachwuchsprogramm
recruitment	Rekrutierung, Personalbeschaffung, Neueinstellungen, Neuanstellungen
personnel policy, decision, chances, opportunities	Personalpolitik, Personalentscheidung, Personalchancen, -möglichkeiten
recruitment stage, applicant	Rekrutierungsphase, -portal, -prozess, -möglichkeit, Bewerber
human resource planning, situation, capacity	Personalplan(ung), -aufbau, -situation, -stand, -kapazität, -bestand, Mitarbeiterstand
human resources, HR management, department	Personalarbeit, -führung, -management, -wesen, -abteilung, -bereich, HR-Abteilung
human resources marketing	Personalmarketing
human resources controlling, personnel risk	Personalcontrolling, Personalkennzahlen, Personalrisiko
personnel expenditure, personnel measure	Personalaufwand, -kosten, -investition, Personalmaßnahme
attractive employer	attraktiver Arbeitgeber, Arbeitgeberattraktivität
employer image, prospecting	Arbeitgeberimage, Arbeitgebermarke, Mitarbeitergewinnung
education attractivity	Ausbildungsattraktivität, Attraktivität der Ausbildung/als Ausbildungsbetrieb
career opportunities	Karrieremöglichkeiten
career	Karriere, Karriereweg, Karrierepfad
support, encouragement	Karriereförderung, karrierefördernd, berufliche Förderung
promotion, development plan	Beförderung, -prozess, -chance, maßnahmen, -politik, -möglichkeit, Förderprogramm
opportunity for advancement	Aufstiegsmöglichkeiten, Karrieremöglichkeiten, Aufstiegschancen
development potentialities	berufliche/persönliche Entwicklung(smöglichkeiten/-chance)
analysing personal potential, key positions	Potenzialanalyse, Potenzialträger, Schlüsselposition
performance oriented	leistungsorientiert
performance review, goal, objective system	Mitarbeiter-/Personalbeurteilung(sgespräch), Leistungsziel, Zielvereinbarungssystem
performance orientation, feedback culture	Leistungsorientierung, Feedbackkultur
performance and competencies appraisal	Leistungs-/Kompetenzbeurteilung(sdaten)
performance-based, success-related	leistungsabhängig, erfolgsabhängig
remuneration system	Vergütungssystem

Panel C: Human Capital - continued

Employee relations	Arbeitnehmerbeziehungen
employees	Mitarbeiter, Mitarbeiteranzahl, Beschäftigtenzahl, Arbeitnehmer, Kollegen
employee loyalty	Loyalität, Mitarbeiterbindung
employee involvement	(Ein)Bindung der Mitarbeiter, Bindungswirkung, Mitarbeiterbeteiligung(sprogramm)
employee trust	Vertrauen der Mitarbeiter, Mitarbeitervertrauen
willing to modify/change/amend, flexibility	Veränderungsbereitschaft, flexible Mitarbeiter
commitment	Engagement, persönlicher Einsatz
passion, passionate, collegial	Leidenschaft der Mitarbeiter, leidenschaftliche Mitarbeiter, kollegial
enthusiasm	Begeisterung(sfähigkeit) der Mitarbeiter, Enthusiasmus
employee motivation	Mitarbeitermotivation, Motivation der Mitarbeiter, motivierte Mitarbeiter
employee survey	Mitarbeiterbefragung, -umfrage
employee meeting	Mitarbeiterversammlung
staff turnover	Mitarbeiterfluktuation, Personalwechsel, Personalveränderung
fluctuation	Fluktuation
fluctuation rate	Fluktuationsrate, -quote, Gesamtfluktuation
brain drain	Abwanderung von Mitarbeitern
security of employment	Arbeitsplatzsicherheit
period of employment/long years of service	Betriebszugehörigkeit

Notes

These tables show the list of IC components resulting from the pilot study on ten German annual reports, as discussed in chapter 6, for the IC categories: structural capital (Panel A), relational capital (Panel B), and human capital (Panel C). The pilot study was conducted in German (second column) and then the resulting list of relevant IC components was translated into English (first column).