FINANCIAL NOTES REPORTING QUALITY

A Conceptualization and Empirical Analysis of
Financial Reporting Quality
Using the Example of Notes Reporting on
Intangible Assets under IFRS

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Financial Notes Reporting Quality

For many years, international financial reporting – and in particular the notes reporting – has been criticized in practice and academia for failing to provide information that is appropriate for its intended users. This criticism points to deficits with regard to the content and presentation and, thus, to the overall quality of the notes reporting. However, this criticism is predominantly anecdotal in nature as there is, as yet, scarcely any valid scientific evidence that supports these claims. This work addresses this research gap by elaborating what (notes) reporting quality is, what dimensions it consists of (*conceptualization*), how these dimensions can be measured (*operationalization*) and how they are empirically manifested (*empirical evidence*). For the latent construct of (notes) reporting quality, a formative measuring instrument to be used in an integrative content analysis is developed with which both dimensions of (notes) reporting quality – a content dimension (e.g., relevance) and a formal dimension (e.g., diction/readability) – can be measured and analyzed. This measuring instrument is validated both theoretically (argumentative reflection) and empirically (testing of hypotheses derivable from the underlying theories). The subsequent analysis of the notes reporting quality of a representative sample of German firms reveals that the above-mentioned criticism is well founded. Furthermore, the results point out both what specific deficits exist and where. The results of this work – the conceptualization, the operationalization and the empirical evidence – together form a starting point for developing, in the context of the (notes) reporting and its quality, valid insights/knowledge in research, 'best practice' solutions in practice and conceptually sound and target-oriented solutions in regulation.

Open access statement

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List of abbreviations

ACCA	Association of Chartered Certified Accountants
Aggr.	Aggregation
AK	Arbeitskreis (WG – working group)
ANC	Autorité des Normes Comptables
APC	Acquisition/production costs
ASBJ	Accounting Standards Board of Japan
BC	Business combination
CA	Cost approach
CAPM	Capital Asset Pricing Model
CAQ	Center for Audit Quality
CF	Cash flow
CFW	Conceptual Framework for Financial Reporting
CGU	Cash Generating Unit
c.p.	Ceteris paribus
DCF	Discounted cash flow
disc.	Discontinued
DPR	Deutsche Prüfstelle für Rechnungslegung (FREP – Financial Reporting Enforcement Panel)
EC	European Community
EFRAG	European Financial Reporting Advisory Group
EN	European Standard/Norm

ESMA	European Securities and Markets Authority
e. V.	Eingetragener Verein (registered association)
FASB	Financial Accounting Standards Board
FGM	Full goodwill method
FRC	UK Financial Reporting Council Accounting
FV	Fair value
FVLCD	Fair value less costs of disposal
H_0	Null hypothesis
IA	Income approach
IAS	International Accounting Standard(s)
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standard(s)
int.	Intangible
ISO	International Organization for Standardization
MA	Market approach
n	Number/quantity
OECD	Organization for Economic Co-operation and Development
OIC	Organismo Italiano di Contabilità
P_n	Nth percentile
PPA	Purchase price allocation
R&D	Research and development

Stand. dev.	Standard deviation
TOC	Table of contents
uneq. var.	Unequal variances
VIF	Variance inflation factor
ViU	Value in use
WG	Working group

Part 1: Introduction

1. Motivation, problem and objective

"Die Frage nach der Qualität der Rechnungslegung ist gewissermaßen die "Mutter aller Fragestellungen" in diesem Bereich (...)."[1]
["The question of the quality of accounting is, in a way, the 'mother of all questions' in this field (...)." Translation by the author]
(Alfred Wagenhofer, Ralf Ewert)

"The concept of adequate disclosure plays a central role in both accounting theory and practice."[2]
(Stephen L. Buzby)

These quotations illustrate that the question of the reporting quality of firms is an important issue in accounting research.

Within the field of accounting research, the classical theoretical framework for explaining **accounting** is the perspective of new institutional economics in the form of contract theory – according to this theory, accounting can be interpreted as an instrument for solving various issues in the context of, e.g., adverse selection and moral hazard.[3] Accordingly, accounting is basically an instrument that serves to reduce an asymmetrical distribution of information between more poorly informed external persons and more well-informed management through the provision of (predominantly financial) information.[4] This provision of information is especially important in the context of external financing, for which the capital providers – and the corresponding information intermediaries, such as analysts and rating agencies – request investment-related information from the management of the firm, which is better informed about the economic situation of the firm.[5]

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1 Wagenhofer/Ewert (2015), p. 109.

2 Buzby (1974), p. 38.

3 For a basic classification of contract theory, see, e.g., Rudolph (2006), in particular pp. 134-144 and Bolton/Dewatripont (2005), in particular pp. 1 ff. For a transfer to the accounting context, see, e.g., Christensen/Demski (2003) and Bolton/Dewatripont (2005), pp. 171 ff.

4 See Wagenhofer/Ewert (2015), pp. 5 f.; Pellens et al. (2017), pp. 2-4; Barth/Schipper (2008), p. 178; Christensen/Demski (2003), pp. 2 f.

5 See Healy/Palepu (2001), p. 407; Palepu et al. (2016), pp. 2-4; Christensen/Demski (2003), pp. 2 f. For a classification of information intermediaries, see Horsch (2008), pp. 80 ff.

This need for the provision of information defines the purpose and the functions of accounting. In this context, **reporting quality** is to be understood as the degree to which accounting information fulfills that purpose and those functions, e.g., regarding the supply of investment-related information for capital providers.[6]

According to which degree of fulfillment (i.e., which level of reporting quality) management chooses (or has to choose with respect to the relevant regulatory circumstances) – that is, to what extent the need for information of external users is met – different consequences will result. Reporting quality affects information uncertainty and, thus, ultimately affects the manifestations of typical capital-market characteristics or the information environment that is closely related to the capital market, e.g., regarding the quality of analyses by analysts, information distribution (asymmetry), capital market liquidity and the cost of capital – which illustrates the importance of reporting quality for various entities such as firms, users and regulators.[7]

In practice, several instruments for accounting-related reporting have evolved,[8] from which regulated financial reports or business reports (hereinafter: financial reports or annual reports) in particular represent an important source of information[9]. Specifically, the importance of financial reports follows from the benefits of a regulated, recurring, widely standardized and audited information supply provided by firms.[10]

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6 See the indirect definition derived from the definition of the measurement parameter in Singhvi/Desai (1971), pp. 129 f.

7 For the relation to quality of analyses by analysts, see, e.g., Paugam/Ramond (2015), Bozanic/Thevenot (2015), Hope (2003a), Hope (2003b) and Lang/Lundholm (1996). For the relation to capital market liquidity or information asymmetry, see, e.g., Balakrishnan et al. (2014), Bhattacharya et al. (2013), Bhattacharya et al. (2012), Miihkinen (2013) and Petersen/Plenborg (2006). For the relation to cost of capital, see, e.g., the overview and discussion of studies in Beyer et al. (2010), pp. 307-310 as well as the studies from Paugam/Ramond (2015), Bhattacharya et al. (2012), Francis et al. (2005a), Botosan/Plumlee (2002), Sengupta (1998) and Botosan (1997). See also the following statement in Amihud/Mendelson (1986), p. 246: "The higher yields required on higher-spread stocks give firms an incentive to increase the liquidity of their securities, thus reducing their opportunity cost of capital. Consequently, liquidity-increasing financial policies may increase the value of the firm. (…) In particular, phenomena such as 'going public' (compared to private placement) (…) and information disclosures may be construed as investments in increased liquidity."

8 Other instruments not considered in this work include, e.g., investor conferences. For an overview of the communication instruments, see, e.g., Lang/Lundholm (1993), pp. 253 f.

9 See Drake et al. (2016); Johansen/Plenborg (2013), pp. 617-620; ACCA (2012), p. 8; Gassen/Schwedler (2010), pp. 501 f.; Glaum/Friedrich (2006), pp. 163 f.

10 See the analysis and evaluation of literature in Cascino et al. (2013), p. 11 in conjunction with Cascino et al. (2014), p. 200.

In addition and against the backdrop of the growing internationalization of economic activities, increased demands are placed on the international comparability of financial reports, which have traditionally tended to be regulated on a country-specific basis.[11] To counter this divergence, the accounting landscape has undergone a transformation in recent decades toward a more unified, global standard setting.[12]

In this regard, the most important role in relation to their worldwide distribution is played by the International Financial Reporting Standards (IFRS) issued by the International Accounting Standards Board (IASB), which are now mandatory for firms in many countries[13], including capital-market-oriented (publicly traded) groups (i.e., firms that have to prepare consolidated financial statements) domiciled in the European Union (Regulation (EC) No 1606/2002). Due to its importance, the IFRS accounting regime will be examined.

In practice, IFRS reporting in Germany is limited to (firm) groups, even though other firms are permitted to adopt this accounting regime voluntarily.[14] Although group reporting under IFRS only accounts for a small share of the total amount of all firms and groups, they are of particular importance due to their size, in particular, though other reasons also play a role.[15] The larger number of business transactions and higher complexity to be expected as a result of their larger size makes groups that report under IFRS particularly suitable for analysis of their reporting quality. For these reasons, only IFRS financial reports issued by groups (consolidated financial reports) are considered in this work.

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11 See Pellens et al. (2017), p. 37.

12 See the statements in Pellens et al. (2017), pp. 37 ff. using the example of Germany.

13 See the presentation of the preparer spectrum in Pacter (2014). See also Schildbach (2011), p. 77, who sees IFRS "(…) auf dem Sprung zum internationalen Monopol (…)." ["(…) on the verge of becoming an international monopoly (…)." Translation by the author].

14 The analysis of the accounting regime of the last available financial year of groups domiciled in Germany in the Amadeus database (as of 7 June 2015) shows that all IFRS preparers have prepared consolidated financial reports.

15 The analysis of the Amadeus database (see footnote 14) shows that of approx. 1 million evaluable financial reports, approx. 5,000 are consolidated financial reports, of which 871 are IFRS consolidated financial reports. The median and mean values of the typical size indicators sales, total assets and number of employees in IFRS consolidated financial reports are at least twice as high as those in HGB (German GAAP) consolidated financial reports. A comparison of the size indicators of IFRS consolidated financial reports with a sample of 5,000 individual financial reports produces similar results.

In addition to the primary financial statement instruments, e.g., the statement of financial position and the statement of comprehensive income, the notes to the financial statements (hereinafter: notes) have to fulfill important information functions within IFRS financial reports.[16] The multifaceted criticism of recent years, however, raises doubts as to whether the notes fulfill these information functions.[17]

The constantly growing disclosure requirements – facilitated by the unsystematic integration of the materiality concept – have become the target of criticism because they lead, in particular, to external users being faced with increasing requirements for information processing.[18] This trend reinforces the 'information overload' problem and the associated risks of wrong decisions.[19] High-quality reporting, therefore, does not necessarily imply more extensive reporting. On the contrary, an expansion of disclosures that are not useful to capital providers tends to facilitate mispricing on the capital market.[20] Increasingly complex disclosure requirements also increase the risk of preparers reporting erroneously.[21] However, to reduce this criticism to 'too much' information is imprecise; rather, the criticism is better understood in such a manner that it is questionable whether an appropriate presentation of information – the amount of which is to be derived context-specifically from the respective accounting functions – is currently achieved in the notes.[22]

In the context of these problems, a fundamental reform of notes reporting has recently been discussed intensively by various accounting organizations, whereby this discussion is related to the revision of the "Conceptual Framework for Financial Reporting" (CFW)[23] that has been

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16 See the survey results in Johansen/Plenborg (2013), pp. 617–620 and Brüggemann (2007), pp. 66 f. With regard to IFRS, US-GAAP and HGB (German GAAP), see the results in Glaum et al. (2013b), pp. 100 f. Without reference to a specific accounting regime, see, on the topic of general importance, the survey results in Gassen/Schwedler (2010), pp. 501 f. and Glaum/Friedrich (2006), p. 165 as well as the analysis and evaluation of literature in Cascino et al. (2013), pp. 25 ff. in conjunction with Cascino et al. (2014), pp. 192 f.

17 See Johansen/Plenborg (2013), pp. 620-623, who find no satisfaction among users of annual reports regarding selected notes positions/items.

18 See ESMA (2014), pp. 2 f.; Lüdenbach et al. (2018), § 5, recitals 67-71; EFRAG et al. (2012), pp. 15 f. However, some authors note that this criticism is rather anecdotal in nature, i.e., that valid and reliable evidence is missing, see Cascino et al. (2013), p. 12; Barker et al. (2013).

19 See, for instance, Hirshleifer et al. (2009).

20 See Chung et al. (2012), p. 938.

21 This may be due, for example, to the fact that the construct of materiality is only insufficiently operationalized, see Lüdenbach et al. (2018), § 5, recitals 67 ff.

22 See, for example, Barker et al. (2013), in particular pp. 8-10 / 20.

23 For an overview, see, e.g., Pelger (2012), pp. 63 ff.

carried out by IASB and FASB since 2004.[24] As a consequence of the feedback, the IASB initiated a "Disclosure Initiative" project group in 2013 which addresses exclusively the further development of notes reporting.[25]

The question of reporting quality is particularly important with respect to intangible assets. In principle, intangible resources and intangible assets (i.e., the subset of intangible resources that is recognized in the statement of financial position) represent important success factors of firms.[26] Due to their immateriality, however, they feature high information uncertainty and information asymmetry.[27] Consequently, it is difficult to objectify intangible assets,[28] which is why supplementary disclosures are needed[29]. However, there are indications that the current disclosures (e.g., with respect to the goodwill impairment test) do not meet external users' requirements in practice and that the current disclosures result in disproportionately high costs.[30]

Therefore, there are many indications that there is a discrepancy between the importance and the quality of notes reporting overall, but especially with regard to notes reporting on intangible assets – which is also reflected in the prioritization of various enforcement institutions.[31] However, as will be shown in the following chapter, the respective state of research is incomplete. The **problem** that this work is based on is, therefore, the lack of knowledge regarding the quality of notes reporting.

In this context, the **objective** of this work is to provide a contribution to current knowledge in the form of a conceptualization and empirical analysis of notes reporting in order to enable an

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24 An overview of the various discussion papers, including those of the FASB and the EFRAG, can be found in IASB (2013a), pp. 24–30.

25 See IASB (2014), p. 8.

26 For the importance of intangible resources, see the literature overview in Biondi/Rebérioux (2012), p. 282. For the importance of intangible assets in a theoretical sense, see Reilly/Schweihs (1998), p. 30. Empirical evidence can be found, for example, in Ji/Lu (2014) and Ledoux/Cormier (2013). Hamberg/Beisland (2014) come to different results.

27 See Barth et al. (2001), p. 2.

28 For this reason, Moxter (1979), p. 1102 refers to intangible assets as "(…) ewige Sorgenkinder des Bilanzrechts (…)." [The "(…) eternal problem children of accounting law (…)." Translation by the author].

29 See the survey results in Fabi et al. (2014), p. 14, recital 28. See also the discussion on the usefulness of disclosures about the exercise of discretion in IFRS in Lüdenbach et al. (2018), § 5, recitals 62-66. Empirical indications of the capital market relevance (value relevance) of disclosures in IFRS notes about intangible assets can be found in Baboukardos/Rimmel (2014), Paananen (2008) and Brüggemann (2007), p. 152 / p. 173 / p. 183.

30 See Johansen/Plenborg (2013), pp. 626-628.

31 See DPR (2013); ESMA (2013).

in-depth discussion about its meaning, purpose, deficits and improvements. Due to their importance and particular characteristics of high information uncertainty and information asymmetry, this will be done using the example of intangible assets.

2. State of research and derived research questions

2.1. Systematization of the state of research

"An issue that has long plagued the research on voluntary disclosure and financial reporting quality is the appropriate empirical measures for those constructs. (…) we would like to emphasize that a sensible economic definition of voluntary disclosure / financial reporting quality and direct derivation of measures from that definition is missing from the literature. This lack of an underlying economic definition hinders our ability to draw inferences from this work, and we recommend that future research address this issue."[32]

(Anne Beyer, Daniel A. Cohen, Thomas Z. Lys, Beverly R. Walther)

A simple answer to the question of the quality of reporting within the context of accounting might read as follows: The extent to which accounting provides information that is appropriate to its purpose and its functions defines the level of reporting quality.[33] The above quote from a comprehensive literature review illustrates, however, that, hidden in the detail, numerous issues exist that current accounting research addresses. These issues will be elaborated in the following areas (Chapter 2.2.1-2.2.3):

(1) Conceptualization of reporting quality
(2) Measurement, manifestation and temporal development of reporting quality
(3) Influencing factors and consequences of reporting quality

Due to the relevance of the question, the related literature is very extensive. Therefore, the following elaboration of the state of research will be by no means complete, but rather oriented toward the delimitation of the research area, the identification of research gaps, and the derivation of research questions.[34] The focus will be on those questions that have been investigated to date, the questions that have not been investigated to date, and the questions that have been investigated insufficiently to date.[35]

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32 Beyer et al. (2010), p. 311.

33 See, for instance, Penman (2007), p. 35; Wagenhofer/Ewert (2015), p. 109.

34 See Smith (2017), p. 53.

35 See Smith (2017), pp. 52 f.

2.2. State of research

2.2.1. Conceptualization of reporting quality

The current starting points for discussing the state of research as it relates to the conceptualization of reporting quality include the discussions related to the IASB's and the FASB's revisions of their conceptual frameworks for the design of accounting information that have been carried out since 2004[36] and the development of a specific framework for the notes reporting carried out by various institutions since 2013[37]. The following statements first elaborate the state of research regarding the purpose, functions and users of accounting, before more detailed characteristics of information concerning content and presentation are considered.

Starting with the guiding purpose, it can first be stated that accounting serves the exchange of information between firms and users that are interested in these firms. The primary users are existing and potential equity and debt investors, who require information that enables them to draw conclusions about the future development of firms (i.e., a prediction or valuation function, which by nature tends to be prospective) and/or enables them to determine claims (determination or stewardship function, which tends to be retrospective in nature).[38] However, in the context of agency problems, accounting cannot fully comply with both functions concurrently, resulting in a dilemma.[39] The solution to this dilemma predominantly proposed in the literature is a compromise in the form of a balanced consideration of both functions.[40]

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[36] For an overview, see, e.g., Kirsch et al. (2012), Pelger (2012), pp. 63 ff. and Ballwieser (2014).

[37] For an overview, see, e.g., Kirsch/Gimpel-Henning (2013).

[38] See Beaver/Demski (1979); Christensen et al. (2005), p. 266; Beyer et al. (2010), p. 296; Cascino et al. (2013), p. 19 in conjunction with Cascino et al. (2014), p. 189; Wagenhofer/Ewert (2015), pp. 5-9.

[39] For this problem, see at a fundamental level Gjesdal (1981) and Paul (1992) as well as Christensen et al. (2005), who identify an incongruence of both functions. See also the empirical study by Ball et al. (2015), which found a significant reduction in the use of accounting figures in credit agreements in connection with the IFRS-induced increase in fair value measurement. See also the empirical investigation of Gassen (2008), who found a significant difference in accounting data with regard to the fulfillment of both functions. However, see also the deviating results from Drymiotes/Hemmer (2013).

[40] See Holthausen/Watts (2001), pp. 31 ff., but in particular pp. 51 f.; Coenenberg/Straub (2008), p. 24; Gassen et al. (2008), pp. 877 f. / p. 882; Pelger (2012), p. 266; the positions of EFRAG und FRC in EFRAG et al. (2013a), recital 31.

Similar strands of discussion (which, however, in essence always refer to the different functions of accounting) address the question of the 'correct' stakeholders[41] and the question of the 'correct' principles of accounting information, especially relevance, reliability, transparency[42] and prudence (or conservatism)[43].[44] Although there is a tendency in the literature to make similar statements about which set of principles accounting has to comply with, there is little clarity as to how the above-mentioned dilemma can be solved specifically.[45] In particular, there is also the question of whether the notes can solve this dilemma with regard to their frequently postulated information functions (i.e., interpretation function, disburden function and supplementation function)[46] and, if so, how this trade-off has to be made specifically.[47] Even though the increasing criticism of the content and presentation of the notes reporting of the last few years has led to initial regulatory-driven considerations of a holistic conceptualization of the notes reporting in the form of a specific framework, no consensus has been reached on this to date.[48] This is not surprising, since – despite its importance – no generally accepted concept for reporting quality has yet been established in accounting research.[49] The reasons for this are to be sought, in particular, in the high complexity and context sensitivity of reporting quality.[50]

Instead, the literature contains various requirements for the content and presentation of reporting, which, however, are not integrated into an overarching concept. At best, they are integrated into more narrowly focused partial concepts. For example, the content is often differentiated with regard to the reference object, the amount and the characteristics – including positive vs.

41 See, e.g., Buzby (1974), pp. 41 f.; Pelger (2009), pp.161 f.; Barker et al. (2013), pp. 12-14.

42 See, e.g., Barth/Schipper (2008).

43 See, e.g., Kirsch et al. (2012); Ballwieser (2014), pp. 461 ff.

44 See, e.g., Whittington (2008), pp. 156-160, who characterizes two competing views in this context, the "fair value view" and the "alternative view".

45 See representatively, for example, the discussion on the revision of the CFW in Whittington (2008), in particular pp. 164-166, Kirsch et al. (2012) and Ballwieser (2014).

46 See, e.g., Coenenberg et al. (2016a), p. 869.

47 See, e.g., Kirsch et al. (2012), p. 770; Barker et al. (2013), pp. 12-14.

48 See, predominantly, EFRAG et al. (2012), EFRAG et al. (2013b), FASB (2012), FASB/CAQ (2012), FASB (2014), IASB (2013b), IASB (2015), Barker et al. (2013) and Freiberg (2015).

49 See, e.g., Kühnberger (2014), in particular p. 446; Beyer et al. (2010), p. 311; Daske/Gebhardt (2006), pp. 466 f.; Collins et al. (2002), pp. 138-140; Wallace et al. (1994), p. 43.

50 See, e.g., Beattie et al. (2004), p. 230 and Barker et al. (2013), in particular p. 3.

negative, financial vs. non-financial, qualitative vs. quantitative and prospective vs. retrospective.[51] Knowledge of the bounded rationality[52] of users is used to deduce requirements for the volume of the content and its presentation, as these – volume and presentation – influence the information acquisition and/or information processing on the part of the recipients (i.e., the users) of the information.[53] Typical distinguishing features of the presentation are the readability – determined, among other things, by the layout or the formatting[54], the degree of information concentration[55], the text volume[56] and the wording complexity[57] – the tone[58] and the disclosure location[59].[60]

2.2.2. Measurement, manifestation and temporal development of reporting quality

The criticism of the reporting quality also raises the question of what possibilities exist to measure it. The diversity of existing approaches to reporting quality has facilitated the development of different measurement approaches in the literature that exist parallel to each other. These approaches can be classified into sender approaches, receiver approaches and observer approaches.[61]

Sender approaches measure the reporting quality on the basis of the assessment of the reporting firms, especially in the form of surveys.[62] Receiver approaches measure reporting quality based on the assessment of the users (i.e., addressees or recipients) of the reported information. Here,

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51 See, e.g., Beattie (2014), in particular p. 126; Beretta/Bozzolan (2008), pp. 341-343; Beretta/Bozzolan (2004), pp. 269-271; Beattie et al. (2004), pp. 216 f.

52 For an overview of the different definitions of the term ‘bounded rationality’, see, with further references, e.g., Wüstemann (2002), pp. 10-16.

53 For an overview, see Williams/Ravenscroft (2015), pp. 770 ff.; Gillenkirch/Arnold (2008), in particular pp. 131 f.

54 See, e.g., Hewitt et al. (2015); Clor-Proell et al. (2014); Tang et al. (2014); So/Smith (2004).

55 See, e.g., Bloomfield et al. (2015); Hodge et al. (2010).

56 See, e.g., Loughran/McDonald (2014); Merkley (2014).

57 See, e.g., Tan et al. (2014); Rennekamp (2012).

58 See, e.g., Tan et al. (2014); Merkley (2014).

59 See, e.g., Lachmann et al. (2015); Anandarajan et al. (2008); Hirst et al. (2004); Maines/McDaniel (2000).

60 See, e.g., Beattie (2014), in particular p. 126; Kelton et al. (2010).

61 On the following systematization, see Grüning (2011), pp. 76-78. Other systematizations can be found, for example, in Beattie et al. (2004), pp. 208 ff., who classify approaches into subjective and semi-objective, and in Barth/Schipper (2008), pp. 178 ff., who distinguish between market-based, accounting-based and analyst assessment-based approaches. Both systematizations exhibit instances of overlapping (i.e., they are not very precise) and are therefore not discussed further here.

62 See Grüning (2011), in particular pp. 76 f.; Johansen/Plenborg (2013); Smith (1996).

regular use is made of the actions and assessments of capital-market participants, in particular of investors, e.g., in the form of stock price reactions[63], and analysts, e.g., in the form of the forecast quality of analyst reports[64]. In addition to archival studies, survey studies[65] and laboratory studies[66] are also used.

Given the dependency on the motives or actions of the assessors associated with both approaches, observer approaches attempt to solve this issue by resorting to the assessment of third parties.[67] In principle, archival studies are used for this purpose. On the one hand, the (statistical) properties of financial statement items – e.g., the forecast quality of earnings items[68] – are analyzed. On the other hand, and especially for text-intensive financial statement instruments such as the notes, content analyses are frequently used, as these enable in-depth analysis of the reporting practice[69].[70] In the course of a content analysis, the content and presentation-related properties are measured and analyzed. The Disclosure Index method is frequently used for this purpose, in which a comparison is made between the report manifestations and a requirements catalogue, from which a ranked list of the firms' reporting is created.[71]

Although many studies use content analyses to analyze the notes reporting, these analyses only feature – analogous to the concept deficit already addressed – a limited measurement, i.e., a measurement of partial aspects of quality;[72] an accepted measurement parameter, therefore, does not exist.[73] In addition, each of the above-mentioned measurement methods is subject to

63 See, e.g., Baboukardos/Rimmel (2014) and the overview in Dechow et al. (2010), pp. 366 ff.

64 See, e.g., Chen et al. (2015b); Reeb/Zhao (2013); Arping/Sautner (2013).

65 See, e.g., Johansen/Plenborg (2013); Gassen/Schwedler (2010).

66 See, e.g., Bloomfield et al. (2015); Belzile et al. (2006).

67 See Grüning (2011), p. 78.

68 See, e.g., the overview in Dechow et al. (2010), pp. 350 ff.

69 See Brüggemann et al. (2013), p. 22.

70 See the overview in Beattie (2014) and Grüning (2011), pp. 81 ff. On fundamental issues pertaining to the method of content analysis, see Krippendorff (2013).

71 See Nell et al. (2015), p. 386; Marston/Shrives (1991). For an overview of selected studies using this method, see, e.g., Grüning (2011), p. 103, footnote 784.

72 As an exception, for example, the approaches of Armeloh (1998) in conjunction with Baetge et al. (2010) have to be mentioned, where a checklist is based on legal disclosure requirements (mandatory disclosures) that are adjusted in accordance with the users' preferences, which are obtained through surveys.

73 See, in general, the statements in Brüggemann et al. (2013), p. 22 and Beyer et al. (2010), p. 311.

distinct points of criticism to varying degrees of severity regarding their validity and reliability[74], which must be weighed against each other.

With reservations toward the concept and measurement deficits mentioned above, various studies exist that facilitate (primarily) isolated insights into the manifestations and temporal development of reporting quality in the notes. Phenomena that have regularly been investigated include disclosures related to impairment losses (with/without a focus on intangible assets), business combinations (with/without a focus on intangible assets) and disclosures related to intangible assets (without relation to a specific topic). With regard to the content of disclosures, many studies indicate that the target level of reporting (represented by legal or general reporting requirements) is not reached.[75] However, it is hardly possible to make a clear distinction between legal and general requirements, as IFRS, for example, contain many disclosure requirements that are subject to materiality-related discretion and are, therefore, often difficult to separate from voluntary disclosures.[76] It is therefore not surprising that the results also point out the significant heterogeneity of disclosures.[77] Nevertheless, the majority of longitudinal studies indicate that the content-related level of reporting has increased over time.[78]

In contrast, analyses regarding the manifestations and temporal development of the presentation of disclosures have been carried out less frequently. The few studies that analyze this aspect

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74 See, e.g., the overview in Beyer et al. (2010), pp. 311 f. and Hassan/Marston (2010), pp. 23 ff.

75 For non-compliance with legal disclosure requirements see, e.g., Müller/Reinke (2015); Frey/Oehler (2014), pp. 240 f.; Guthrie/Pang (2013); Glaum et al. (2013a); Glaum et al. (2007); Dreesen (2013), pp. 475 f.; ESMA (2013); Ruhnke/Schmidt (2013); Ott (2012), pp. 42 ff; Carlin/Finch (2011); Carlin/Finch (2010); Frey (2010); Frey/Oehler (2009); Kirsch et al. (2008a); Hager/Hitz (2007), pp. 210-212; Möller/Lenz (2006); Street et al. (1999). For non-compliance with general disclosure requirements resulting from legal disclosure requirements adjusted for the results of user surveys, see, e.g., Armeloh (1998) in conjunction with Baetge et al. (2010), in particular pp. 84 f. and Glaum et al. (2013b), in particular pp. 93 ff. See also Nell et al. (2015) and Tettenborn (2015), pp. 145 ff., who deduce their general disclosure requirements from typified user preferences.

76 See Nell et al. (2015), p. 385; Heitzman et al. (2010); Kirsch et al. (2008a), p. 97 in conjunction with Kirsch et al. (2008b), p. 193.

77 See, e.g., Tettenborn (2015), pp. 145 ff; Frey/Oehler (2014), pp. 240 f.; Guthrie/Pang (2013); Küting/Ellmann (2011); Frey (2010); Frey/Oehler (2009); Kirsch et al. (2008a); Hager/Hitz (2007); Armeloh (1998).

78 See, e.g., Müller/Reinke (2015); Guthrie/Pang (2013); Dreesen (2013); Glaum et al. (2013b) in conjunction with Baetge et al. (2010); Frey/Oehler (2009).

identify, for example, incomplete referencing via foot notes[79], the predominant use of text instead of tables[80] as well as the use of complex wording, with the latter tending to increase over time[81].

2.2.3. Influencing factors and consequences of reporting quality

The evidence shown for non-compliance with disclosure requirements or a poor level of quality raises the question of what determines reporting quality and what consequences follow from reporting quality. In the literature, this problem area has been analyzed in depth in the form of influence and effect analyses.[82] Although a separation of influences and effects seems desirable for the argumentation, it is, however, hardly feasible due to a frequently occurring circular reference. For example, influencing factors of reporting quality often cannot be analyzed independently of their consequences, because interactions between the anticipation of presumed consequences by actors and their actions (which are derived from and aligned with these presumed consequences) are to be expected.[83] This problem of causality and endogeneity is inherent in many studies and leads to results that, in most cases, indicate only a connection, the effect direction of which is not conclusively clear.[84] In addition, the hypothesis-forming theoretical approaches often lead to diametrical results (predictions), making analysis and interpretation more difficult.[85]

Taking these limitations into account, the main characteristics identified in the context of reporting quality are as follows. The starting point in the majority of studies carried out is the assumption that the management chooses its reporting behavior as the result of a cost-benefit analysis.[86] Incentives that inhibit reporting (disclosure) are set by reporting (disclosure) costs

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79 See Armeloh (1998), pp. 104 f.

80 See Nell et al. (2015), in particular pp. 388 ff.

81 See, e.g., Li (2008), in particular pp. 226-230.

82 See, e.g., the literature overview in Grüning (2011), pp. 148 ff. and Beyer et al. (2010).

83 See, e.g., Beyer et al. (2010), in particular p. 305 and p. 311; with further references Grüning (2011), p. 150.

84 See, e.g., Beyer et al. (2010), in particular p. 311 and Gassen (2014), p. 540 / p. 542. For criticism of frequently encountered methodical deficits in empirical accounting research in general, see Dyckman/Zeff (2014).

85 See Grüning (2011), pp. 170 ff., who shows the different assumptions in the literature using the example of the influence of the debt ratio on reporting quality. On the problem of the subjective selection of explanatory approaches in empirical accounting research in general, see Luft/Shields (2014), in particular pp. 554 f. See also Kühnberger (2014), in particular p. 446.

86 See, for example, the overview of analytical literature in Beyer et al. (2010), pp. 301 ff. See also Healy/Palepu (2001), in particular p. 411.

that can be incurred both directly, e.g., in connection with investor relations work, as well as indirectly as opportunity costs (lost benefits), e.g., in the form of proprietary costs resulting from the disclosure of competition-relevant information.[87] Incentives that facilitate reporting (disclosure) are set by reporting (disclosure) benefits, which can be achieved both directly, e.g., in the form of higher remuneration of the management, as well as indirectly as opportunity benefits (avoided costs), e.g., in the form of a reduction in the cost of capital.[88] Although this consideration forms the basis of the studies presented below, it is not suitable for their systematization. This is due in particular to the fact that indirect cost or benefit shares are difficult to measure, which is why their direct empirical analysis is only possible in rare cases.[89] The results can be more easily presented along the areas a) management incentives as well as b) firm characteristics and c) capital market characteristics and characteristics of different disciplining/monitoring institutions.[90]

Based on agency conflicts, a section of the literature analyzes relations between the (presumed) management incentives (a)) and reporting quality. A number of studies show that there is a positive relation between reporting quality and the dependence of management remuneration on the share price, which suggests that managers purposefully make reporting choices in order to maximize their share-based compensation.[91] Furthermore, several studies show that the quality of reporting increases when capital increases (e.g., by way of an initial public offering), a phenomenon attributed to the intended change in reporting to improve placement conditions.[92] In addition, firm performance – a central indicator that is communicated by management – is analyzed frequently in association with reporting quality. The problem, however, is that based on signaling considerations, the management can simultaneously communicate different

87 See, e.g., the literature overview in Beyer et al. (2010), p. 301 and Grüning (2011), pp. 150 ff.

88 See, e.g., the literature overview in Beyer et al. (2010), pp. 306 f. and Healy/Palepu (2001), pp. 420 ff.

89 For this reason, indirect reporting costs, for example, are analyzed, and in particular, in an analytical manner. See, e.g., the literature overview in Beyer et al. (2010), p. 301. For empirical analysis, see, e.g., Grüning (2011), pp. 159 ff.

90 See also Beyer et al. (2010), p. 305; for an alternative classification into influencing factors and consequences/effects of firm reporting uses, see, e.g., Grüning (2011), pp. 148 ff.

91 See, e.g., the overview in Beyer et al. (2010), p. 306. See also Hermalin/Weisbach (2012).

92 See, e.g., the overview in Beyer et al. (2010), p. 306. See also Iatridis (2008) and Lang/Lundholm (1993).

information about the firm's success to users, who in turn set potentially diametrical reporting incentives.[93] Accordingly, previous studies show highly heterogeneous results.[94]

The typical firm characteristics (b)) examined are size, industry and the importance of intangible assets, with the latter being especially relevant for the problem examined here. A positive association between size and reporting quality is identified in the majority of the studies, which is attributed to the related direct and indirect cost advantages.[95] The industry represents a special characteristic, since it indicates the situation of belonging to a group of firms with similar economic conditions, such as, e.g., competitive pressure, information environment, political costs as well as risk and success expectations.[96] Consequently, prior research indicates an undirected association.[97] For the reporting of intangible assets, in particular, prior results predominantly show a positive association between the importance of intangible assets and the related reporting quality, with that association in particular being attributed to an increased demand for information from the users.[98]

Further studies analyze the characteristics of the capital market and of enforcement/monitoring institutions (c)) in relation to reporting quality. On the one hand, the main focus is on the question of how reporting quality impacts capital market characteristics or characteristics of the related information environment of firms. Various studies indicate that, for example, a positive relation exists between reporting quality and the quality of analyses by analysts as well as capital market liquidity, while a negative relation exists between reporting quality and information

93 For example, the disclosure of a firm's performance that exceeds the expectations of the capital market will lead to a reduction in the cost of capital (disclosure-promoting incentive), but at the same time also to competition-induced costs (disclosure-inhibiting incentive). See, for example, the overview in Grüning (2011), pp. 203 ff.

94 See, e.g., the overview in Grüning (2011), pp. 203 ff., in particular pp. 210 f. and Ahmed/Courtis (1999), pp. 51 ff.

95 See, e.g., the overview in Grüning (2011), pp. 178 ff. See also, e.g., Singhvi/Desai (1971), p. 131 and Lang/Lundholm (1993), pp. 250 f.

96 See the overview in Grüning (2011), pp. 195 ff. See also, e.g., Botosan (1997), p. 327 and Cooke (1989), pp. 180 f.

97 See the overview in Grüning (2011), pp. 195 ff., in particular pp. 200 f.

98 See, e.g., Bepari et al. (2014); Glaum et al. (2013a).

asymmetries (between capital market participants), as well as the cost of capital.[99] On the other hand, the results of prior research indicate that these characteristics, in turn, set incentives for a change in reporting quality: If, for example, capital market liquidity falls as a result of an exogenous decline in the information supply by analysts, the management will, as a consequence, increase reporting quality, which in turn will lead to an increase in capital market liquidity.[100] Therefore, capital market characteristics can also be interpreted as an incentive/enforcement mechanism. Further enforcement mechanisms investigated include, in particular, competition and litigation costs, for which no consistent results exist.[101]

Analyses of monitoring mechanisms are based on considerations of different agency conflicts. Prior research indicates an association between ownership concentration and the quality of reporting, which tends to be positive for low concentration levels, but tends to be negative for higher concentration levels.[102] On the other hand, the risk of an enrichment of the owners to the detriment of the lenders (debt capital providers) and the resulting demand of the lenders for more extensive reporting is often used to deduce a positive association between the debt ratio

[99] For the relation to quality of analyses by analysts, see, e.g., Paugam/Ramond (2015), Bozanic/Thevenot (2015), Hope (2003a), Hope (2003b) and Lang/Lundholm (1996). For the relation to capital market liquidity or information asymmetry, see, e.g., Balakrishnan et al. (2014), Bhattacharya et al. (2013), Bhattacharya et al. (2012), Miihkinen (2013) and Petersen/Plenborg (2006). For the relation to cost of capital, see, e.g., the overview and discussion of studies in Beyer et al. (2010), pp. 307-310 as well as the studies from Paugam/Ramond (2015), Bhattacharya et al. (2012), Francis et al. (2005a), Botosan/Plumlee (2002), Sengupta (1998) and Botosan (1997).

[100] See, e.g., Balakrishnan et al. (2014). See also the following statement in Amihud/Mendelson (1986), p. 246: "The higher yields required on higher-spread stocks give firms an incentive to increase the liquidity of their securities, thus reducing their opportunity cost of capital. Consequently, liquidity-increasing financial policies may increase the value of the firm. (…) In particular, phenomena such as 'going public' (compared to private placement) (…) and information disclosures may be construed as investments in increased liquidity."

[101] See, e.g., the overview and discussion of studies in Beyer et al. (2010), p. 306 / p. 310.

[102] On the results and the following interpretation, see, with further references, Glaum et al. (2013a), in particular pp. 172 f. / p. 187. With a moderate ownership concentration, a positive association arises from the possibility and incentive for moderately invested equity investors to influence management with regard to the reduction of information asymmetries through reporting (disclosure). With very high ownership concentration, a negative association is attributed to the possibility and incentive for dominant equity investors to influence management with regard to the non-reporting (non-disclosure) of information. For a negative association, higher agency costs arising from lower ownership concentration and associated incentives for management to reduce these through increased reporting (disclosure) are also often stated: see, e.g., the statements and results with further references in Cooke (1989), pp. 177-179 / p. 188. See also the literature overview in Grüning (2011), pp. 162 ff.

and reporting quality, even though related results of empirical research are also quite heterogeneous.[103] In addition, various studies show a positive relationship between reporting quality and the structure of the supervisory board (or board of directors), e.g., with regard to the share of independent directors, which, inter alia, is ascribed to greater independence or fewer conflicts of interest among the board members.[104] Similarly, various studies show that reporting quality is positively associated with the size of the auditor firm, which is attributed, for example, to experience and reputation effects.[105] In addition, the results of several studies suggest that high-quality reporting is an effective tool for limiting earnings management.[106]

These studies at firm level are supplemented by studies at country level, which, e.g., in the context of enforcement and monitoring, report a positive association between reporting quality and the degree of investor protection and enforcement, respectively.[107] Analysis of the degree of enforcement also raises the question of the relationship between the accounting regime and the quality of reporting. In this respect, various studies show a positive association between the adoption of IFRS and the quality of reporting.[108] Some studies also indicate a positive association between the degree of compliance under IFRS reporting and reporting quality.[109]

These results predominantly indicate a positive association between IFRS regulation and reporting quality. Considering the criticism of the notes reporting under IFRS set out at the beginning, the question arises of whether this regulation could be improved. The question of whether and, if so, to what extent and in what form regulation of accounting and, thus, regulation of reporting quality can be useful is still unclear, which is attributed in particular to the complexity of the modeling and the strong context sensitivity of analyses, e.g., with regard to

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103 For example, Iatridis (2011), Francis et al. (2005a) and Hossain et al. (1995) find a positive association. Heterogeneous results can be found, e.g., in Reeb/Zhao (2013) und Dobler et al. (2011). Eng/Mak (2003), for example, find a negative association. No association is found, for example, by Bepari et al. (2014) and Wallace et al. (1994). See also Grüning (2011), pp. 170 ff., who regards the confirming literature as prevailing. See exactly the opposite view, however, in Street/Bryant (2000), p. 307, who see no convincing evidence of an association.

104 See, e.g., Seamer (2014); Reeb/Zhao (2013); Ernstberger/Grüning (2013).

105 See, e.g., Glaum et al. (2013a); Hodgdon et al. (2009).

106 See, e.g., Huang/Zhang (2012); Mouselli et al. (2012); Iatridis (2011).

107 See, e.g., Preiato et al. (2015); Brown et al. (2014); Glaum et al. (2013a).

108 See, e.g., De La Bruslerie/Gabteni (2014); Glaum et al. (2013b); Baetge et al. (2010); Daske/Gebhardt (2006). Analogous results with regard to the introduction of the Sarbanes-Oxley Act can be found, for example, in Arping/Sautner (2013).

109 See, e.g., Hodgdon et al. (2008).

the actual behavior of market participants.[110] What remains unclear is, above all, the extent to which a principles- and/or rules-based design of regulation can be appropriate.[111]

[110] See, for example, the overview in Beyer et al. (2010), pp. 315 ff., in particular the conclusion on p. 318; see also Schipper (2007), in particular pp. 302 f.

[111] See the discussions in Kirsch et al. (2014) and Barker et al. (2013), pp. 7 f. See also Healy/Palepu (2001), p. 414.

2.3. Derived research questions

The current state of research shows that unanswered questions exist in all identified areas. Due to the concept and measurement deficits identified, the focus of this work has to be on answering questions related to those deficits – it does not make sense to investigate influencing factors and consequences of something that is not understood in depth. The provision of answers to these questions will occupy this work considerably, so that an analysis of association hypotheses shall remain the subject of future research.

The problem and the state of research on the manifestation and temporal development of the quality of the notes reporting under IFRS reveal inadequately answered questions despite a variety of descriptive evidence – especially against the background of measurement parameters used in prior research that often lack a thorough conceptual foundation or where that foundation cannot be readily identified.[112] Against this background, the guiding research question of this work (with regard to intangible assets) is derived and is formulated as follows:

Guiding research question: *What is the manifestation of the quality of notes reporting with respect to intangible assets?*

The path to answering this guiding research question is marked by two essential sub-questions. In view of the conceptual deficits identified, clarification is required with respect to the conceptual design of the notes reporting as it relates to the requirements of users, i.e., with respect to how a conceptual framework for the notes reporting quality should be designed. In addition to developing, balancing and organizing principles, this also includes the concrete derivation of requirements for the content and presentation of this reporting. Due to the special economic characteristics of intangible assets, it is also necessary to clarify whether specific adaptations are needed in this respect. The related research sub-question is as follows:

Research sub-question 1: *What is an appropriate concept for notes reporting quality and are there specifics to be considered in connection with the reporting on intangible assets?*

[112] "(…) we know little about how mandatory IFRS adoption affects financial statements beyond the aggregate numbers retrieved from commercial databases (…). It is (…) still largely an open question whether financial statements have become more transparent and comparable following mandatory IFRS adoption, as measured by detailed financial reporting outcomes. To address this issue, we advocate more disclosure, compliance and accounting choice studies that rely on manually collected and thus finer data (…)." Brüggemann et al. (2013), p. 22.

The question of what constitutes a suitable operationalization of this construct also needs to be clarified. The second research sub-question is therefore as follows:

Research sub-question 2: How can the notes reporting quality be operationalized properly?

This work will thus elaborate what reporting quality is, what dimensions it consists of (conceptualization), how these dimensions can be measured (operationalization) and how these dimensions are empirically manifested (empirical evidence). In the context of this entire work, the paradigm of users' information requirements and their fulfillment, which is currently considered in accounting research as being accepted, is assumed – and accordingly, reporting quality is higher/better if the users (can) derive greater benefit from the information provided. This leads to the following relevant and predominantly open questions, the answers to which depend on the objective or perspective taken by the respective entity:[113]

- To what extent are improvement potentials for other entities such as firms or regulators to be identified? (Identification)
- To what extent can improvement potentials be realized? (Opportunity)
- Is this realization reasonable/desirable in the sense of a normative evaluative statement – e.g., in relation to a reduction of the cost of capital, avoidance of disclosure of competition-relevant information, a welfare maximization or other (political or moral) objectives such as equality of information provision? (Statement of what 'ought-to-be').

Highly relevant to different groups as they are, these interesting questions make it appear all the more astounding that science has failed to lay more than rudimentary foundations in its efforts to answer them, though solid foundations would seem essential to such endeavors. The task of answering these questions is therefore not the subject of this work, and deliberately so. Rather, the focus set out below is intended to create a foundation – missing to date but necessary – so that an in-depth discussion of the meaning, purpose, deficits and improvement of notes reporting becomes possible.

[113] On the ambiguity of the derivation of normative statements in the accounting context, see, e.g., Christensen/Demski (2003), pp. 429-431 and the analysis and evaluation of literature in Barker et al. (2013), pp. 6 ff. and Beyer et al. (2010), p. 304 / pp. 315 ff. See also the conclusions in Lambert et al. (2012), p. 20 in conjunction with Bhattacharya et al. (2012), p. 477 as well as the conclusions in Wüstemann (2002), pp. 169 f. See also the statements in the context of contract theory in Bolton/Dewatripont (2005), pp. 171 ff.

In this work, the results are diligently and comprehensively classified and documented. This enables each entity to place these findings in the context of its (individual) cost/benefit perspective or other perspectives, and to draw corresponding conclusions. Therefore, this work creates the opportunity for developing proposals for improving the practice and regulation of the notes reporting by elaborating the necessary conditions for their development.

3. Classification and approach

In order to work on the problem and answer the research questions, the following second part deals primarily with the elaboration of the **foundations** in the form of a clarification of the terminology (Chapters 1-3) and in the form of a clarification of the problem areas related to the depiction of intangible resources under IFRS (Chapter 4).

In the third part, a **concept for reporting quality** is developed for answering the first research sub-question by taking the main steps in concept specification, consisting of a nominal definition, meaning analysis and dimension analysis.[114] For this purpose, conclusions are drawn from existing theories, concepts and empirical studies, e.g., user surveys, in order to ensure the high validity of both the concept and the empirical analysis based on it.[115] This approach therefore features both deductive and inductive elements and can, thus, be understood as a mixed-methods approach.[116] Based on the purpose, functions and users of accounting (Chapter 1), a general concept for reporting quality is developed that is based on the principles of information content (Chapter 2) and information presentation/preparation (Chapter 3). The integration into an overall concept with special consideration of the notes is given in Chapter 4.

On the basis of this conceptual basis, the fourth part of this work provides an **empirical analysis of reporting quality in practice**. To this end, the research design is first developed (Chapter 1), with the operationalization of reporting quality, i.e., answering research sub-question 2, making up the largest part. At the beginning, the quality and classification criteria of the research design of scientific studies are developed in general, and the research design of this work is classified in detail (Chapter 1.1). Following on from the conceptual considerations in Part 3, the model for measuring reporting quality is determined in Chapter 1.2. In addition, the integrative content

[114] See Döring/Bortz (2016), pp. 224-228; Christophersen/Grape (2009), pp. 109-111.

[115] See Döring/Bortz (2016), pp. 223-228. See also the statements in Part 4, Chapter 1.1/1.2.

[116] See Döring/Bortz (2016), p. 35 / pp. 184 f. / pp. 222 f.; Smith (2017), pp. 22-25.

analysis is selected as a measurement method as a result of a discussion of various measurement options.[117] Following a selection and description of the sample to be examined (Chapter 1.3), indicators are specified, or rather a measuring instrument composed of indicators is specified for measuring reporting quality. To create transparency and traceability, but also to specify and ensure the high validity of the measuring instrument, this specification is not conducted in an exclusively deductive manner, i.e., derived from the developed concept, but also inductively on the basis of data from a sample (data-based inductive revision), which is not part of the investigation sample to be analyzed later (Chapter 1.4).[118] Subsequently, the quality of the measuring instrument/design is evaluated (Chapter 1.5). In Chapter 2, to answer the guiding research question of this work, the empirical manifestation of notes reporting quality in practice is analyzed. Overall, this work can therefore be classified as positive accounting research within the user information paradigm (the paradigm of users' information requirements and their fulfillment).[119]

The fifth part concludes with a **summary** of the findings gained in the course of this work and an **outlook** that highlights implications for different accounting research interest groups.

An overview of the approach of this work can be found in Figure 1 and Figure 2.

[117] On the definition of qualitative, quantitative and integrative content analysis, see Früh (2017), pp. 66-68.

[118] This procedure is proposed for the development of an appropriate category system: see Döring/Bortz (2016), pp. 557 f. and Früh (2017), in particular pp. 66-68.

[119] On the linked concepts of normative and positive research, see, e.g., Smith (2017), p. 40.

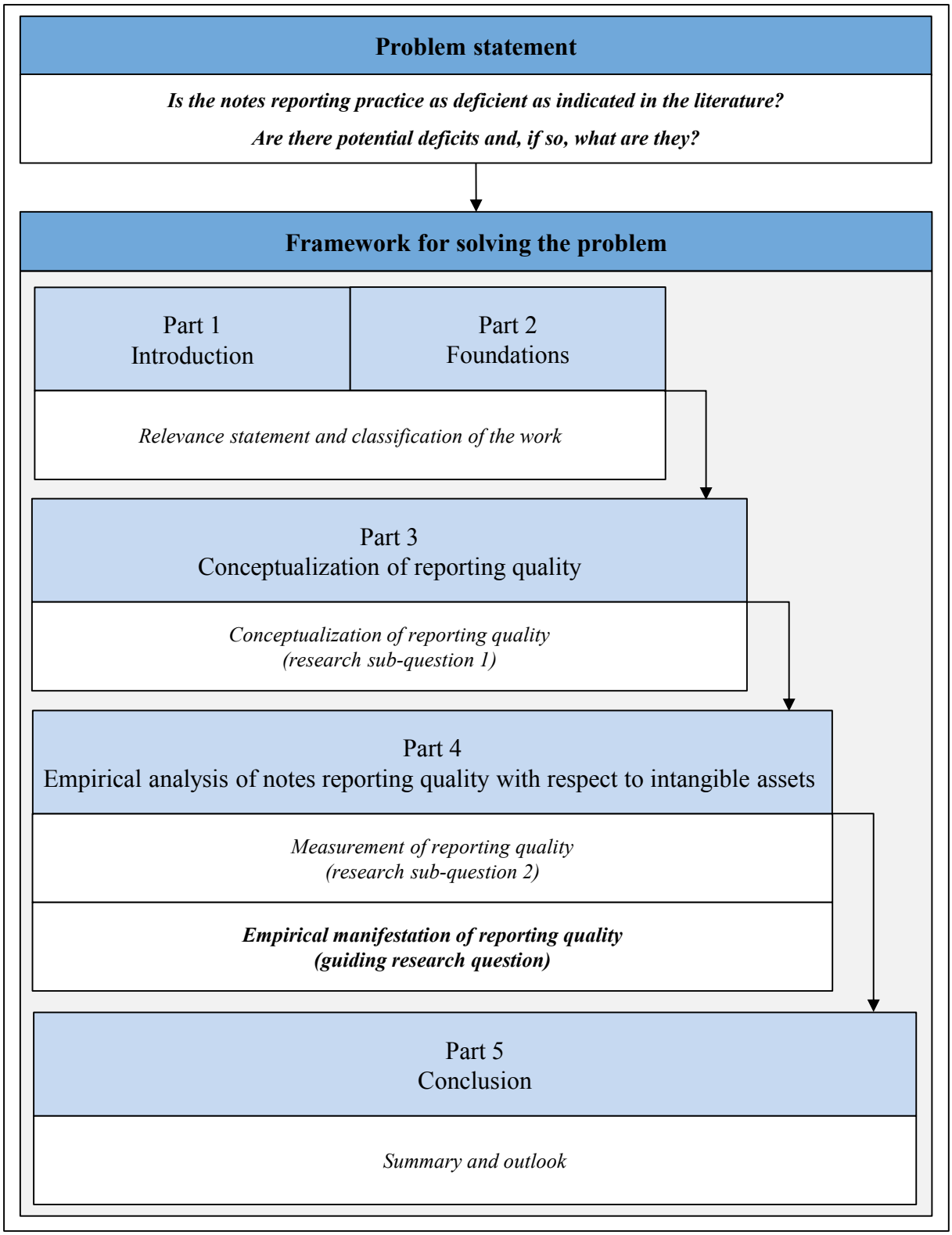

Figure 1: Approach of the work (epistemic goals)

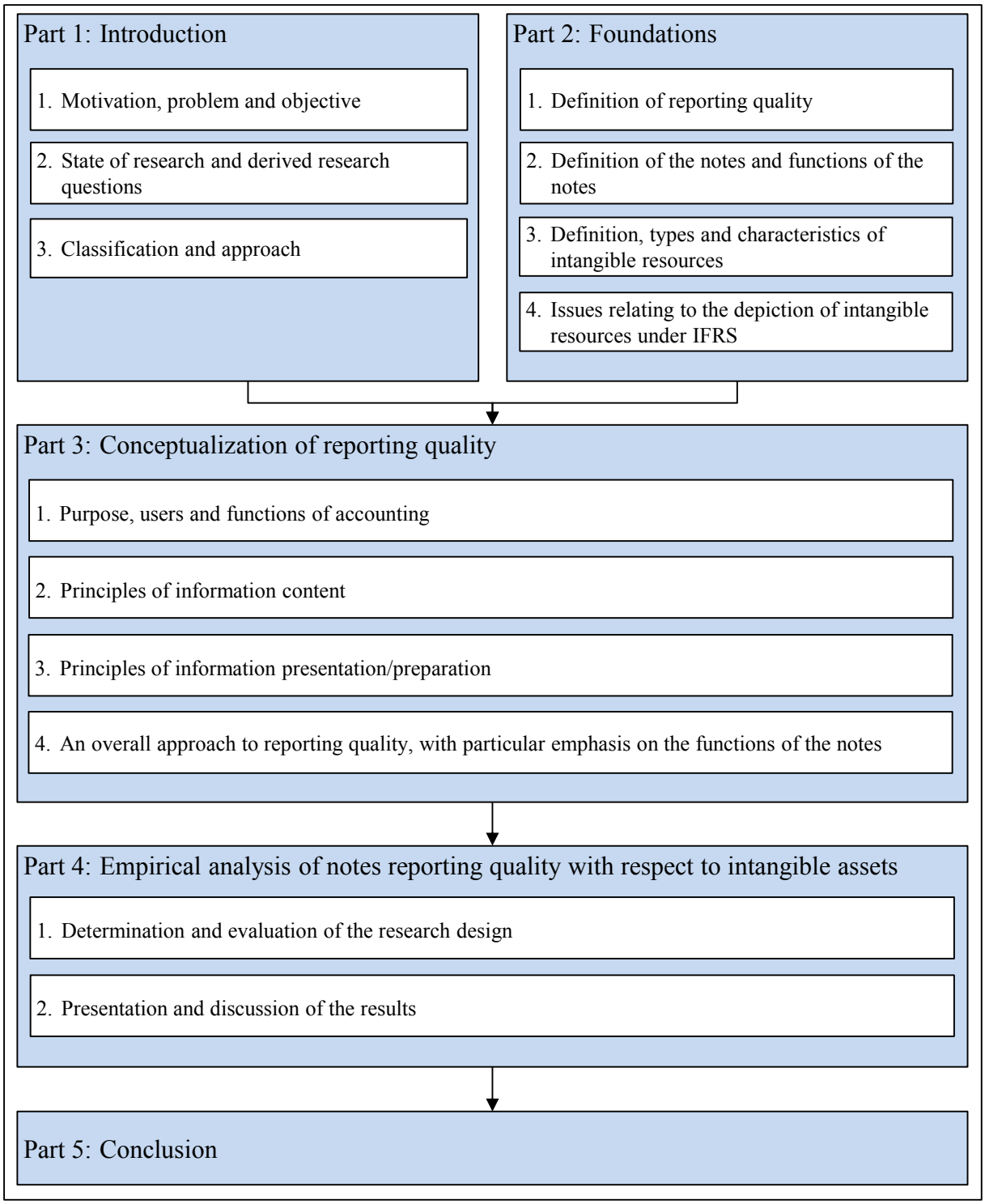

Figure 2: Approach of the work (outline)

Part 2: Foundations

1. Definition of reporting quality

"Quality – degree to which a set of inherent characteristics of an object fulfils requirements."
(EN ISO 9000:2015, 3.6.2)

"Accounting, as I see it, is a product and products are a matter of design. The design – and the quality of the product – should be judged on how well it serves the customer."[120]
(Stephen H. Penman)

The meaning of the term "quality" is basically understood in the same way in different disciplines such as the engineering sciences, economics and information technology, and can be described by the keywords fulfillment of requirements or "fitness for use".[121] This understanding is also followed by the **definition** of ISO (International Organization for Standardization), which, due to its general character, is to be taken as a basis here. According to this, quality exists if requirements for inherent characteristics of a reference object are fulfilled (see the first quotation). Due to the objective of this work, the **reference object** is the notes reporting on intangible assets. For further determination and measurement of reporting quality, two questions need to be answered:

(1) What are the requirements to be derived from, and who imposes the requirements?
(2) To which inherent characteristics do the requirements relate and how are these requirements manifested in this respect?

For example, requirements can be defined as follows: A requirement is a "(...) need or expectation that is stated, generally implied or obligatory" (EN ISO 9000:2015, 3.6.4). As an important **derivation basis** for requirements, different groups such as, e.g., firms and customers can be adduced,[122] whereas the focus on the customer forms the core of the quality concept and

[120] Penman (2007), p. 35.

[121] See, e.g., Masing (2014), pp. 5 f.; Miller (1996), p. 79; Wang/Strong (1996), p. 6; Coenenberg et al. (2016b), pp. 641 ff.

[122] See, e.g., Geiger/Kotte (2008), p. 154.

is therefore assumed in the following.[123] Transferred to accounting and reporting, all recipients/addresses (users) of reporting can be understood as customers of the financial information provided.[124] This concept becomes clear in the second quotation.

In practice, however, the identification of these customer requirements is problematic. It is thus that ISO, for example, points out that the above definition contains requirements which may be unknown to the customer until (non-)fulfillment (EN ISO 9000:2015, 3.6.4 note 5 in conjunction with 3.9.2 note 1). This problem of the direct, ex ante capture of all customer preferences also arises in accounting research in such a way that instead of a direct, user-based determination of requirements, indirect approaches predominate, which are based on typified functions of accounting.[125] Such typifications, however, are problematic against the background of likely differences with regard to the individual decision contexts of users,[126] since corresponding requirements cannot entirely be formulated in a specific and optimal manner for all users at the same time.[127] Due to these limitations, requirements are always to be developed both directly and indirectly and have to be weighed against each other, taking into account the partly diverging functions of accounting.[128]

At this point, it already becomes clear that quality statements are always statements that refer to a specified framework of requirements and are, therefore, relative in this aspect. Admittedly, this specific requirements framework can be checked with regard to the 100 % level. Due to the incomplete knowledge of the entire requirements framework, however, it is factually impossible to derive absolute statements. Quality is therefore not to be interpreted absolutely, but rather relatively as a degree of compliance with specific requirements.

Inherent characteristics are defined as "existing in something, especially as a permanent characteristic" (EN ISO 9000:2015, 3.10.2 note 1). Unlike the engineering sciences, where natural laws can be drawn upon, the measurement of these characteristics poses a greater problem in

123 See, e.g., Masing (2014), pp. 5 f.; Miller (1996), p. 79; Wang/Strong (1996), p. 6; Coenenberg et al. (2016b), pp. 641 ff.

124 See, e.g., Pellens et al. (2017), pp. 4-7.

125 See AICPA (1994), p. 6.

126 See Dechow et al. (2010), p. 344.

127 See Wagenhofer/Ewert (2015), pp. 47 ff., in particular pp. 83 f.; Pellens et al. (2017), pp. 14 f.

128 See Buzby (1974), pp. 40-42.

economics in general and in accounting in particular, since, for example, the meaning of narrative reporting can only be estimated through interpretation.[129]

Given these problems in determining requirements and characteristics, it is not surprising that several authors should argue that no generally accepted definition of reporting quality has emerged in the accounting literature to date.[130] However, these statements need to be put into perspective in the light of the foregoing information. There is a generally accepted definition, but it is too general to directly derive concrete requirements for concrete characteristics, or, to use a different formulation: there is no problem of definition at the conceptual level, but there is at the measurement level and, to a large extent, there is also a problem of definition between these levels. This suggests that the stated lack of a definition for reporting quality does not refer to the general understanding of the term, but rather its specification.

Overall, it can therefore be stated that reporting quality can generally be defined as the degree to which accounting fulfills its purpose and its functions.[131] The purpose, users and functions of accounting serve as reference entities for the target level of reporting. Due to the nature of a general definition, however, this definition still leaves many questions unanswered as to its specification within the context of this work. In particular, it is still unclear what requirements the users impose on reporting, how these requirements can be measured, and in relation to what characteristics. Finding answers to these questions is the central subject of this work (in particular in Part 3 and Part 4).

[129] For a detailed discussion, see, e.g., Williams/Ravenscroft (2015).

[130] See, e.g., Beyer et al. (2010), p. 311; Botosan (2004), p. 289.

[131] See also Singhvi/Desai (1971), Buzby (1974), Möller (2005), p. 61 and Wagenhofer/Ewert (2015), p. 109.

2. Definition of the notes and functions of the notes

In many accounting regimes, information in the individual and consolidated financial reports are partitioned into the financial statements and the notes, e.g., under IFRS at the international level and under HGB (German GAAP) and US GAAP at the national level.[132] For the consolidated financial reports addressed in this work, the financial statements include the statement of financial position, income statement[133], statement of cash flows and statement of changes in equity.[134]

These financial statements generally contain information of a quantitative nature that is relatively highly aggregated.[135] However, users also require more detailed and qualitative information in order to, for example, better assess the operating firm performance or its asset structure, as well as whether discretion has been exercised by the management, to what degree this has been done, and in relation to what accounting decisions, topics, etc.[136] Based on the assumption of the limited information-processing abilities of users, a limitation of the depiction of this information in the financial statements and, instead, a depiction in another instrument – the notes – is often suggested.[137] In order to fulfill these requirements, the following three functions are assigned to the notes:[138]

(1) Related to recognition in the financial statements:
   a) An **explanation or interpretation function** to provide information relating to items in the financial statements; in particular, information about the application of accounting policies and the making of accounting choices (i.e., exercising accounting

[132] See, e.g., Coenenberg et al. (2016a), pp. 853 ff.

[133] According to IFRS and US GAAP, this means either a statement of comprehensive income or a separate statement of profit or loss and statement of other comprehensive income. According to HGB, this refers to the statement of profit or loss. See, e.g., Coenenberg et al. (2016a), pp. 515 ff.

[134] See, e.g., Lüdenbach et al. (2018), § 5, recital 1; Coenenberg et al. (2016a), p. 853.

[135] See, e.g., Lüdenbach et al. (2018), § 5, recital 14; Coenenberg et al. (2016a), p. 853.

[136] See, e.g., Brüggemann (2007), pp. 32-34. As an example of the information requirements of users in the context of financial (statement) analysis, see, e.g., Palepu et al. (2016), pp. 194 ff.

[137] See, e.g., Coenenberg et al. (2016a), pp. 853 ff., in particular pp. 850 f. and Brüggemann (2007), p. 36.

[138] See, e.g., Lüdenbach et al. (2018), § 5, recital 15; Coenenberg et al. (2016a), pp. 853 ff.; EFRAG et al. (2012), pp. 22-24; Brüggemann (2007), pp. 35 ff. For accounting under the HGB, in particular, the notes also serve a corrective function, whereby any conflicts that may arise between compliance with the individual rules and the general norm have to be healed by appropriate disclosures. See, e.g., Coenenberg et al. (2016a), p. 856 / pp. 862 f.

options, discretionary decision making), such as disclosure of reasons for the goodwill recognized.

b) A **supplementation function** for the provision of information that is not recognized in the financial statements, e.g., information on contingent liabilities.

(2) Related to the reporting location: A **disburden function** to reduce the amount of information in the financial statements, e.g., disaggregation of intangible assets that are reported as a class in the statement of financial position.

In this way, the notes are intended to expand the information supply of the financial statements, whereby the focus is on historic or retrospective information.[139] Prospective information is only included to the extent that it is reflected either in the amounts of the financial statement items or the disclosure of other events in the past that are not allowed to be recognized, such as contingent liabilities.[140] Direct information about the future, e.g., in the form of forecasts for financial statement items, do not meet the generally stricter objectification requirements on financial statements and the notes and are therefore not included in the notes, but in a separate management report (e.g., the German 'Lagebericht' or the US equivalent 'Management Discussion and Analysis (MD&A)'), which generally contains a presentation and discussion of the economic situation of the firm from the management's perspective.[141]

3. Definition, types and characteristics of intangible resources

The literature does not provide an all-encompassing, positive **definition** of immaterial resources.[142] Instead, there is an extensive diversity of terms, definitions and categorizations.[143] However, there are certain characteristics that are mentioned repeatedly. Accordingly, intangible resources are without physical substance, non-monetary and embody value/future economic benefits.[144] However, the demand for immateriality does not imply that intangible resources

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139 See, e.g., Hague et al. (2006), p. 266.

140 See EFRAG et al. (2012), pp. 22 f.; FASB (2014), pp. 12-17; IASB (2015), recital 7.4.

141 See Müller/Stawinoga (2013), recitals 46 ff.; Stute (2013), recitals 3 ff.; Withus (2013); Hague et al. (2006), pp. 266 f.

142 See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), p. 67.

143 See, for example, the literature overviews in Choong (2008) and Kaufmann/Schneider (2004).

144 See, e.g., Choong (2008), in particular pp. 628-632; Smith/Parr (2005), p. 13; AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), p. 67; Lev (2005), pp. 299 f.; Lev (2001), p. 5.

have no material existence at all. Rather, the value of immaterial resources, unlike material resources, does not derive from their physical properties, but mainly from their immaterial properties; for example, a patent printed on paper is to be understood as immaterial, since the material property only serves documentation purposes.[145]

However, according to the definition, not all resources whose values are based on immateriality are regarded as intangible resources. Monetary components, such as receivables and investments, are explicitly excluded. These embody rights to tangible, intangible and monetary resources in the possession of other firms and, thus, only generate indirect benefits, which justifies their separate recognition – separately from non-monetary intangible resources which are owned by the firm and, thus, represent direct benefits, e.g., patents.[146] In addition, monetary resources will regularly be subject to less uncertainty,[147] so that exclusion seems appropriate.

In the literature, this distinction/definition is assigned to various terms; in addition to intangible resources, these include intellectual capital, intangibles and intangible values.[148] Representatively, the term 'immaterial resources' is used in this work, as it underlines the positive orientation of the definition toward economic benefits.

Instead of a positive, abstract indication of the content of the term, various descriptions or **categorizations** exist in literature.[149] The reasons for this are to be found in the diversity of distinctions and the inherent abstractness of immaterial resources, which hinder an exhaustive list of categories and clear classification.[150] According to a frequently used categorization of the *Working Group "Accounting and Reporting of Intangible Assets"*, intangible resources are, for instance, divided into "innovation capital" (e.g., software and product patents), "human capital" (e.g., employee know-how and management skills) and "customer capital" (e.g., customer lists and long-term sales contracts).[151] Following a similar categorization according to

[145] See, e.g., AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), p. 67; Heyd/Lutz-Ingold (2005), p. 3; Reilly/Schweihs (1998), p. 10.

[146] See Heyd/Lutz-Ingold (2005), p. 4.

[147] See Biondi/Rebérioux (2012), p. 283; Lev (2001), p. 39.

[148] See, e.g., Walker (2009), pp. 304 f.; Choong (2008); AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), p. 67; Lev (2001), p. 5.

[149] See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), p. 68. For an overview, see Choong (2008) and Kaufmann/Schneider (2004).

[150] See, e.g., Reilly/Schweihs (1998), p. 20.

[151] See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2005), pp. 68 f. Further categories are supplier, investor, process and location capital.

Reilly/Schweihs that is also frequently used, these resources are recorded in the categories "data processing-related resources", "engineering-related resources", "human capital-related resources" and "customer-related resources", respectively.[152]

In addition to the positive characteristic of having outstanding significance for the value of firms[153], intangible resources in the literature are associated in particular with two negative characteristics[154] – uncertainty[155] and information asymmetries. These negative characteristics are examined in more detail below.

Reasons for **uncertainty** in connection with intangible resources are limited/weak property rights or control, firm specificity and heterogeneity as well as variability in the production process.[156] Of these, limited property rights or limited control are one of the most distinctive features of intangible resources, as a result of which the (long-term) use and exclusion of others from use may only be enforceable to a limited extent; for example, because the firm is not allowed to acquire ownership rights to employees with know-how such that they can leave the firm, or because patent rights cannot be fully enforced against competitors such that they can imitate innovations.[157] The management is therefore exposed to uncertainty regarding the applicability and expropriation of intangible resources.[158]

Intangible resources are often created by firms in the form of specific competencies for the exploitation of opportunities and the generation of specific competitive advantages.[159] As a result, intangible resources often have to be characterized as firm-specific, novel and/or heterogeneous, which means that corresponding investment processes are normally subject to a low

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152 See Reilly/Schweihs (1998), pp. 19 f. Further categories are marketing-related, technology-related, artistic-related, contract-related, location-related and goodwill-related resources.

153 See, e.g., Smith/Parr (2005), p. 13; Reilly/Schweihs (1998), p. 30. For a detailed consideration of the value-driving characteristics, see, e.g., Lev (2001), pp. 22-31.

154 See, e.g., Barth et al. (2001), p. 2.

155 The term uncertainty refers to both quantifiable uncertainty and non-quantifiable uncertainty. See Perridon et al. (2017), pp. 117-120 and, at a fundamental level, Knight (1921), pp. 19 f.

156 See, in particular, Hunter et al. (2012), pp. 110 f. in conjunction with Webster (1999).

157 See Hunter et al. (2012), pp. 110 f.; Martins/Alves (2010), p. 89; Lev (2005), p. 301; Lev (2001), pp. 33 ff., in particular pp. 33 f.

158 See Hunter et al. (2012), pp. 110 f.

159 See, e.g., the overview in Biondi/Rebérioux (2012), p. 282. See also Lev (2005), pp. 301 f.; Webster (1999), pp. 16 f.

degree of standardization.[160] Production processes will also lead to less standardized output with the increasing use of intangible resources, in particular human capital.[161] Specificity and lack of or low standardization of investments and outputs are further reasons for uncertainty in the context of intangible resources.[162]

In addition, intangible resources can only rarely be identified and valued in isolation without considering other resources, since they usually only make their value contribution in specific interaction with other resources.[163] This is also typical of relationships between different intangible resources.[164] In conjunction with the above-mentioned reasons for uncertainty, these interdependencies result in the identification and valuation of intangible resources being subject to considerable discretion, which means that their measurement/valuation regularly exhibits considerable limitations with regard to reliability and validity.[165] As a result, there is often a lack of active and organized markets for intangible resources, i.e., their tradability is often subject to restrictions and market prices are rarely available, which further limits the validity and reliability of their valuation.[166]

Important reasons for the fact that the information environment associated with intangible resources is characterized by high **information asymmetries** are the lack of active and organized markets, and – given the background of limited property rights or control – the incentive for management to not disclose information about intangible resources in order to protect its own

[160] See Hunter et al. (2012), p. 110 in conjunction with Webster (1999), pp. 37 ff., in particular p. 52; Aboody/Lev (2000), pp. 2749 f.; see also Biondi/Rebérioux (2012), pp. 282 f. with other references.

[161] See Hunter et al. (2012), p. 110 in conjunction with Dosi (1988).

[162] See Webster (1999), p. 52; Lev (2001), pp. 38 ff.

[163] See, e.g., Biondi/Rebérioux (2012), pp. 282 f. with other references; OECD (2006), p. 8.; Smith/Parr (2005), p. 13; Lev (2005), p. 303; Lev (2001), p. 7.

[164] See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2013), p. 37.

[165] See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2013), pp. 37-39. Moxter (1979), in particular p. 1104, speaks in this context of "Unsicherheit und Willkür (…)." ["Uncertainty and arbitrariness (…)." Translation by the author].

[166] "Whereas investors can derive considerable information from prices of traded tangible and financial assets concerning their values at the firm level (…), there is no direct price-based information on firm-specific changes in the value and productivity of R&D." Aboody/Lev (2000), p. 2750. See also Biondi/Rebérioux (2012), p. 283, Lev (2005), pp. 301 f. and Barth et al. (2001), p. 6.

competitiveness (or, rather, to protect the competitiveness of the firm).[167] These considerations are illustrated in Figure 3 below.

[167] "In fact, the usual agency theory approach, which is based on ownership and external markets, appears to be at odds with business models that rely on intangibles whose ownership and market values, if they exist at all, are blurred. (…) In a nutshell, innovation and intangibles exacerbate the asymmetry between insiders and outsiders (…)." Biondi/Rebérioux (2012), pp. 283 f. See also Martins/Alves (2010), in particular p. 89 and Aboody/Lev (2000), p. 2748 / p. 2750.

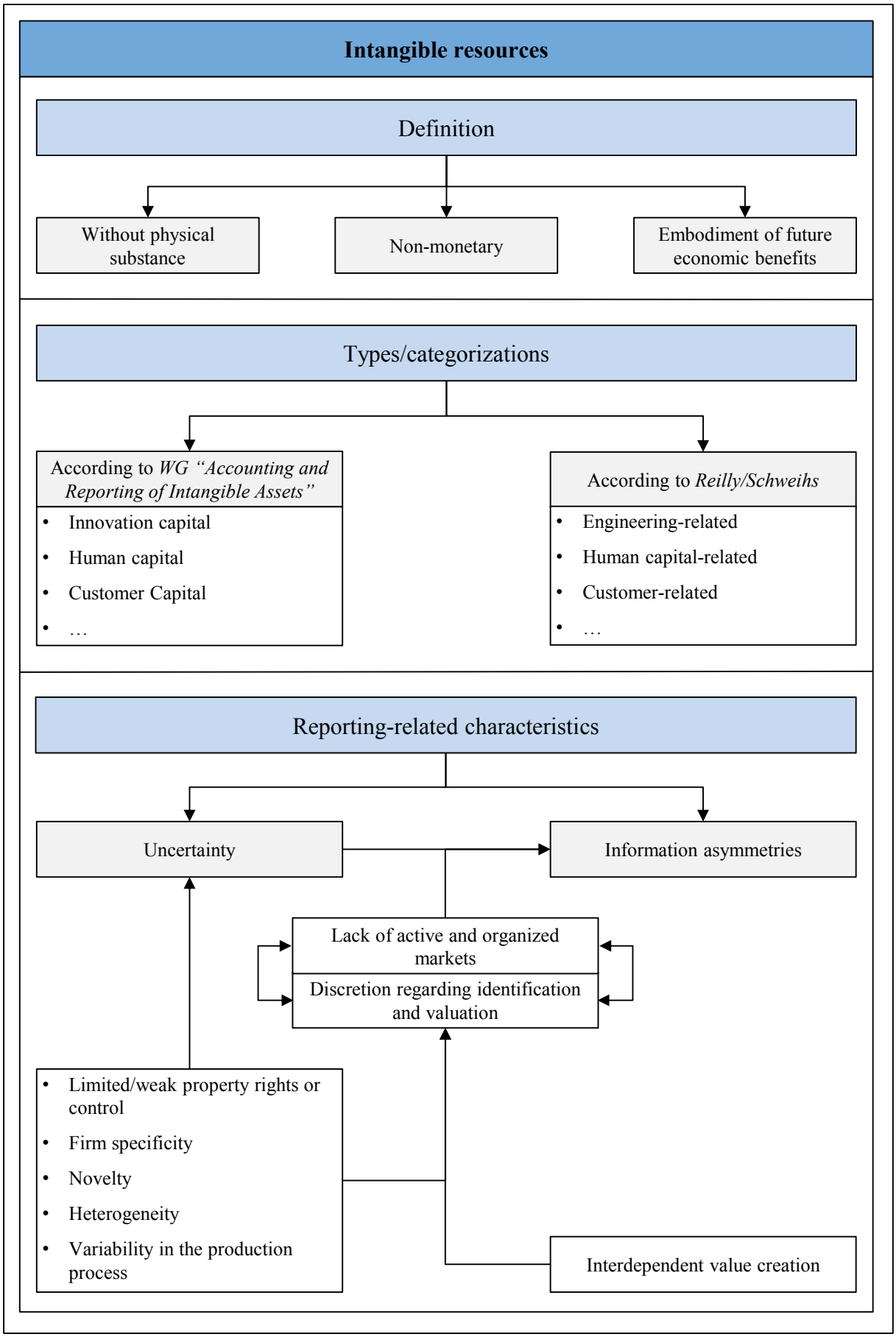

Figure 3: Definition, types and characteristics of intangible resources

4. Issues relating to the depiction of intangible resources under IFRS

In principle, distinctive objectification requirements of accounting in conjunction with the characteristics of intangible resources elaborated in the previous chapter lead to the fact that intangible resources are only depicted restrictively in accounting.[168] Despite the restrictive depiction, uncertainty and information asymmetries remain – albeit at a lower level – to a considerable extent, as the following remarks are intended to show.

Under IFRS, only a portion of management's investments in intangible resources is **recognized** and, thus, depicted as intangible assets. The non-recognizable portion must be recognized directly as an expense (IAS 38.48; IAS 38.68).[169] Intangible assets may be acquired by the firm separately, in a business combination, or may be generated internally. In principle, the following requirements must be met cumulatively for the recognition of intangible assets:

(1) Intangible assets in general (CFW 4.4 (a); CFW 4.38)
    a) Controlled by the firm
    b) Result of past events
    c) Probable inflow of future economic benefits
    d) Reliable measurability (of its cost or value)
(2) Intangible assets specifically (IAS 38.8; IAS 38.12)
    a) Identifiable, i.e., separable or arising from (contractual or other legal) rights
    b) Non-monetary
    c) Without physical substance

In the case of business combinations and internal generation, the examination of the existence of an intangible asset, as opposed to a separate acquisition, is characterized by uncertainty and considerable discretion due to a lack of separately allocated objectified purchase prices.[170] In the case of business combinations, the search for intangible assets, the examination of their realizability or separability and the clarification of the existence of control are difficult and

168 See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2013), pp. 40 f.

169 Based on the empirical analysis of the reporting year 2014 carried out in this work (the reporting year ends between 31 December 2014 and 31 March 2015), the following presentation of accounting standards refers to the standards to be applied by the firms in this period.

170 See, e.g., Rogler et al. (2014); AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2009), pp. 12 ff.; Heyd/Lutz-Ingold (2005), pp. 36 ff.

context-specific; this applies in particular if there are no contractual or similar records.[171] Non-identifiable intangible resources are recognized collectively as derivative goodwill (positive difference) (IFRS 3.10; IAS 38.11) or recognized as an income-increasing element in the statement of profit or loss as 'bargain purchases' (negative difference) (IFRS 3.34-3.36). The requirements of a probable inflow of future economic benefits and reliable measurability are always considered to be satisfied (IAS 38.33).

In the case of internally generated intangible assets, explicit prohibitions on recognition as intangible assets must be noted, for example, with regard to internally generated brands and customer lists (IAS 38.63). In addition to the above criteria, recognition as an intangible asset is only possible from the beginning of the development phase if additional requirements are met, such as demonstration of the technical feasibility of completing the intangible asset for subsequent use or disposal (IAS 38.57). The expenses of the research phase shall not be recognized as an intangible asset (IAS 38.54). Although these requirements serve to specify the general recognition criteria (IAS 38.51 f.), uncertainty and discretion are considerable both in the separation of the research and the development phase and in the examination of the recognition criteria.[172]

As with the examination of the recognition criteria, the **initial measurement** of intangible assets acquired in business combinations and internally generated intangible assets is problematic. In business combinations, identifiable assets and liabilities shall be measured at their fair values on their date of acquisition (IFRS 3.18). Against the background of regularly incomplete market parameters for intangible assets and although the use of directly observable input parameters shall be maximized (IFRS 13.61), indirect valuation methods/techniques often have to be used that are characterized by considerable uncertainty and numerous opportunities for discretion.[173] Due to its residual determination, this also applies to goodwill (IFRS 3.32) and bargain purchases (IFRS 3.34-3.36), respectively, in particular if the acquiring firm decides to measure any existing non-controlling interests at their fair value (i.e., applying the so called 'full goodwill

[171] See Rogler et al. (2014), pp. 577 ff.

[172] See Rohleder (2015), pp. 176 ff.; Behrendt-Geisler/Weißenberger (2012); Heyd/Lutz-Ingold (2005), pp. 38 ff.

[173] See, e.g., Tettenborn (2015), pp. 53 ff., in particular pp. 89 ff.; Frey/Oehler (2014), pp. 243-245; AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2009), pp. 33 ff., in particular pp. 74 ff.; Beyer/Mackenstedt (2008).

method') (IFRS 3.19; IFRS 3 B44).[174] In the case of internal generation, the identification of expenses in the development phase in accordance with IAS 38.57 (f) in conjunction with IAS 38.66 causes considerable problems in a similar manner.[175]

In principle, the **subsequent measurement** of intangible assets can either be based on their costs, taking into account scheduled depreciation (amortization) and unscheduled depreciation (impairment losses) in accordance with the cost model (IAS 38.74), or, provided an active market exists, it can similarly be based on its fair value (revalued amount) in accordance with the revaluation model (IAS 38.75). Since active markets for intangible assets rarely exist, subsequent measurement in practice is predominantly based on the cost model.[176] Intangible assets whose useful lives can be determined shall be amortized on a systematic basis using an appropriate method (IAS 38.88; IAS 38.97). Uncertainty and discretion are characteristic for the determination of useful lives and the selection of appropriate amortization methods for intangible assets because of their intangible nature.[177]

Irrespective of this, intangible assets are generally to be tested for impairment if there is any indication that impairment may have occurred (IAS 36.9). In particular, intangible assets with indefinite useful lives, unfinished intangible assets and goodwill have to be tested for impairment losses at least annually (IAS 36.10). These impairment losses must be recognized to the extent that the recoverable amount, represented by the higher of the fair value less costs of disposal (FVLCD) and value in use (VIU), is lower than the carrying amount (IAS 36.18; IAS 36.59). As with the initial measurement of intangible assets acquired in business combinations, the determination of FVLCD and VIU is subject to considerable distortions with regard to uncertainty and discretion.[178] In the event that interdependencies of intangible assets prevent a separate valuation of the recoverable amount, the valuation must be carried out at the level of

[174] See, e.g., Tettenborn (2015), pp. 127 ff., and in particular pp. 132 f.; Bader/Schreder (2012), in particular p. 279. For problems associated with the measurement of non-controlling interests at fair value in the context of a bargain purchase, see, for example, Lüdenbach et al. (2018), § 31, recitals 135 ff.

[175] See, e.g., Rohleder (2015), pp. 187 ff., in particular p. 188.

[176] See, e.g., KPMG (2015), recital 3.3.280.20; Coenenberg et al. (2016a), p. 192.

[177] See, e.g., Smith/Parr (2005), in particular p. 219; Garland (2004); Rohleder (2015), pp. 194 f.; Tettenborn et al. (2013).

[178] See, e.g., Kasperzak (2011); Lonergan (2010).

cash-generating units (CGUs) (IAS 36.22; IAS 36.66). This procedure, in turn, involves significant uncertainties and opportunities for discretion, which has been intensively discussed in recent years, particularly in the context of the subsequent measurement of goodwill.[179]

In the rare case of a subsequent measurement in accordance with the revaluation model (IAS 38.75), the timing and amount of the revaluations are also questionable, although they are likely to be less problematic due to existing market prices.

The **presentation** of intangible assets in the statement of financial position and related income items in the statement of comprehensive income is only regulated in a rudimentary manner. There is only one concrete individual rule for the presentation of intangible assets in the statement of financial position (IAS 1.54 (c)). Rather, the presentation and, in particular, the disaggregation follow the general norm of providing decision-useful information (IAS 1.15 in conjunction with CFW QC1; IAS 1.29; IAS 1.55; IAS 1.85) and is, thus, fundamentally at management's discretion. In the sense of the disburden function of the notes, the disaggregation may also be made in the notes (IAS 1.77; IAS 1.97).

Further **disclosure requirements** for intangible assets in the notes result, in particular, from the specific rules on business combinations (IFRS 3.B64 ff.), intangible assets (IAS 38.118 ff.) and impairments (IAS 36.126 ff.), whereby these are subject to an explicit materiality relativization (IAS 1.31). In the same way, the presentation and structure of the disclosures follow the primacy of decision usefulness and are, therefore, at the discretion of management (IAS 1.113 ff.).[180] In addition, various proposals stand in parallel without a clearly recognizable hierarchical order. For example, a parallel disaggregation of intangible assets is required at various points – into "major classes" based on *Reilly/Schweihs*,[181] e.g., "marketing-related" and "customer-related" intangible assets (IFRS 3 IE18 ff.); into "classes", e.g., brand names and software (IAS 38.119); and by type of addition or definiteness of useful lives (IAS 38.118).[182]

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179 See, e.g., Laschewski (2015); Scheren/Scheren (2014); Kasperzak (2011). For a discussion on the example of a trademark with an indefinite useful life, see Zülch/Stork genannt Wersborg (2012).

180 See Lüdenbach et al. (2018), § 5, recital 17 / recital 82.

181 See Reilly/Schweihs (1998), pp. 19 f.

182 See also the discussion and empirical analysis in Tettenborn (2015), pp. 111-115 / pp. 150 ff. and Nell et al. (2015).

These considerations show that decisions regarding the presentation and provision of disclosures relating to intangible assets are highly discretionary. In this context, information asymmetries are, therefore, the rule.[183]

Such discretion, resulting from principles-based regulation, is not limited to presentation and disclosures. Rather, firms may generally refrain from applying rules if they classify the effects associated with their application as immaterial (IAS 8.8) or uneconomic/inefficient (i.e., the application imposes costs that are not justified by its benefits) (CFW QC35 ff.); in this way, materiality and cost-benefit considerations may prevent the identification and, hence, separate recognition of intangible assets.[184] Although the IFRS do refer, by way of example, to possibilities for measuring materiality (e.g., IAS 36.134: carrying amount of the intangible asset in question in relation to the total carrying amount of intangible assets), however, there is no general guideline on operationalization of and reporting on this, which in turn allows reporting firms considerable discretion.[185]

[183] See, e.g., Tettenborn (2015), pp. 147 ff.; Nell et al. (2015).

[184] See, e.g., Rogler et al. (2014), pp. 579 f.; Behrendt-Geisler/Weißenberger (2012), p. 62; AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2009), pp. 14 f.

[185] See AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2009), pp. 14 f. On the operationalization of materiality, see, e.g., Toebe/Lorson (2012).

Part 3: Conceptualization of reporting quality

1. Purpose, users and functions of accounting

The purpose of accounting is to reduce information asymmetries between the management, which is better informed about the economic situation of the firm, and a broad group of external stakeholders (i.e., users) that is less well informed on this matter, consisting of equity and debt investors, corresponding information intermediaries such as analysts and rating agencies, other lenders such as suppliers and employees as well as the government and society in general.[186] Two **functions** serve as a means of fulfilling this purpose.

On the one hand, accounting has to provide information that enables users to draw conclusions about the future economic development of firms, i.e., accounting has to fulfill a **prediction** (or valuation) **function**, which tends to be prospective.[187]

On the other hand, users also regularly require information that enables both the determination of contractual or legal claims and the monitoring, assessment and behavior control (through incentivization)[188] of the acting management in the context of potential agency problems;[189] consequently, accounting also has to fulfill a **determination** (or stewardship) **function**, which tends to be retrospective.[190]

According to the prediction function, information serves users in particular in their estimation of valuation parameters in direct association with capital allocation decisions, which is why this function or the corresponding information are also frequently associated with valuations[191] or decisions[192] in the literature, and are named accordingly. In this work, the **term prediction function** is used because, on the one hand, it clearly emphasizes the prospective character of

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186 See, e.g., Palepu et al. (2016), pp. 2-4; Pellens et al. (2017), pp. 3-7; Coenenberg et al. (2016a), p. 1025.

187 See Beaver/Demski (1979); Christensen et al. (2005), p. 266; Beyer et al. (2010), p. 296; Cascino et al. (2013), p. 19 in conjunction with Cascino et al. (2014), p. 189; Wagenhofer/Ewert (2015), pp. 5-9.

188 See Gjesdal (1981), pp. 213 f., who regards behavior control as an essential reason for the monitoring of management actions by investors.

189 See, in general, Wagenhofer/Ewert (2015), pp. 7 f.

190 See Beaver/Demski (1979); Christensen et al. (2005), p. 266; Beyer et al. (2010), p. 296; Cascino et al. (2013), p. 19 in conjunction with Cascino et al. (2014), p. 189; Wagenhofer/Ewert (2015), pp. 5-9.

191 See Christensen/Demski (2003), pp. 143 ff., in particular pp. 172 ff.; Christensen et al. (2005), p. 266; Gassen (2008), p. 14; Pelger (2012), pp. 60 f.

192 See Gjesdal (1981), p. 208; Ballwieser (2014), p. 466; Gebhardt et al. (2014), p. 110.

the information demand. On the other hand, this avoids the appearance that information in accordance with the determination function has no decision-related character. For example, the degree of compliance with credit agreements (covenants) can be determined decisively on the basis of information according to the determination function, which can also influence capital allocation decisions of debt-capital investors.[193] Decision-related character can thus be attributed to information of both functions, and should therefore not be emphasized in only one of the two terms.[194] In addition, by rejecting the term 'decision', it is taken into account that users do not necessarily have to take actions in the sense of decisions on the basis of the information provided, but rather are to be put in a position to make appropriate assessments of the firms providing the information.[195]

Since information in accordance with the determination function is not directly related to, e.g., capital allocation decisions, the literature often associates this information with the terms contract design[196], stewardship/accountability[197] and coordination[198]. The term **determination function** highlights the fact that the reliable determination of claims, management performance, etc. is the essential feature of information of this type.[199]

These functions generally entail **different requirements** for the information to be reported. In the context of agency problems, in particular, accounting cannot completely fulfill both information functions.[200] For example, information that is particularly suitable for estimating future cash flows (prediction function) will regularly not meet the higher reliability requirements that

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193 See, e.g., Ball et al. (2015); Cascino et al. (2013), p. 10 in conjunction with Cascino et al. (2014), pp. 187-189 / pp. 197 f. For a definition of the term 'covenant' see, e.g., Perridon et al. (2017), pp. 459 f.

194 So also, e.g., Gassen et al. (2008), p. 876 and Pelger (2012), p. 61.

195 On the discussion of whether decisions form the correct point of reference, or whether judgments should be used instead (independently from actions), see, e.g., Shwayder (1968) and Williams/Ravenscroft (2015).

196 See Christensen/Demski (2003), pp. 143 ff., in particular pp. 229 ff.; Beaver/Demski (1979); Christensen et al. (2005), p. 266.

197 See Gjesdal (1981), p. 208; Gassen (2008), p. 15; Pelger (2012), pp. 61 f.; Ballwieser (2014), p. 466; Gebhardt et al. (2014), p. 110.

198 See Pellens et al. (2017), pp. 6-8.

199 See, e.g., Wagenhofer/Ewert (2015), p. 8.

200 On the fundamentals of this problem, see Gjesdal (1981) and Paul (1992) as well as Christensen et al. (2005), who find an incongruence of both functions. See also the empirical study by Ball et al. (2015), who find a significant reduction in the use of accounting figures in credit agreements in connection with the IFRS-induced increase in fair value measurement. See also the empirical investigation by Gassen (2008), who finds a significant difference in accounting data with regard to the fulfillment of both functions. However, see also the deviating results from Drymiotes/Hemmer (2013).

users impose to determine their claims (determination function) – and vice versa.[201] Other significant differences are identified with respect to the requirements for information about past transactions, transitory items or items not under management's control – and the timeliness of such information.[202] In order to answer the question of the consequences of this mismatch, there are various proposals, ranging from a dual approach with equal priority[203] to a more prediction-oriented accounting system[204] and on to a more determination-oriented accounting system[205].

This conflict of functions is often also discussed as a proxy at the level of the **users**, as is probably most evident in the classic discourse on the differences between "(equity) investor-oriented" and "creditor-oriented" accounting.[206] Since each user group has preferences for one and/or the other information function or concrete information to be derived from this,[207] it is not necessary to differentiate between individual user groups, provided that the differences between the two functions are taken into account. This can be illustrated by the decisions or assessments/judgments which users make on the basis of accounting information as follows.

Primary users are existing and potential **investors** (and corresponding information intermediaries) who are interested in investment-related information that enables them to make appropriate decisions in the context of their capital allocation[208] and in the context of the other management of their investment, e.g., with regard to the appropriateness of dividend proposals[209]. For this, both groups – equity and debt investors – need information according to both functions.[210]

The information requirements of the **other lenders** are largely congruent with this, since, for example, suppliers only sell on credit if information on the solvency of the purchasing firm is

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201 See Ball et al. (2015), in particular pp. 917 f.; Gebhardt et al. (2014), p. 110; Beyer et al. (2010), p. 297, in particular footnote 1; Wagenhofer (2014), pp. 549 f.; Wagenhofer/Ewert (2015), pp. 8 f.

202 See Gebhardt et al. (2014), p. 110; Coenenberg/Straub (2008).

203 See Holthausen/Watts (2001), pp. 31 ff., but in particular pp. 51 f.; Coenenberg/Straub (2008), p. 24; Gassen et al. (2008), pp. 877 f. / p. 882; Pelger (2012), p. 266; the positions of EFRAG and FRC in EFRAG et al. (2013a), recital 31; Barker et al. (2014), p. 176.

204 See the positions of DRSC and OIC in EFRAG et al. (2013a), recital 31.

205 See Williams/Ravenscroft (2015), in particular p. 784, and the position of the ANC in EFRAG et al. (2013a).

206 See, e.g., Pellens et al. (2017), pp. 19-23; Pelger (2009), p. 162 with further references.

207 See, e.g., Cascino et al. (2013) in conjunction with Cascino et al. (2014); Johansen/Plenborg (2013), in particular pp. 617-620; AICPA (1994), pp. 15 ff.

208 See, e.g., Pelger (2012), pp. 60 f.; Ball et al. (2015), in particular p. 917.

209 See, e.g., Wagenhofer/Ewert (2015), pp. 7 f.

210 See, e.g., Cascino et al. (2013) in conjunction with Cascino et al. (2014).

available and indicates a low probability of insolvency; analogously, employees will analyze their employer with regard to its ability to settle guaranteed pension claims.[211] The **government** also has equivalent information needs, e.g., with regard to information required for determining taxes.[212] However, due to its special role, e.g., with respect to the usually separate reporting for tax authorities, the government is not considered further.

Likewise, **society** in general does not fall within the group of users considered here, as society needs, in particular, information on the exercise of corporate social responsibility, which is provided by corporate social responsibility reporting outside the financial (notes) reporting.[213]

Therefore, equity and debt investors as well as other lenders remain as users, with the term 'capital provider' also used synonymously.

As the users in their entirety require accounting to fulfill both functions in order to reduce their information asymmetries, both functions are justified. Against the backdrop of this heterogeneous distribution of interests, a singular solution does not seem reasonable,[214] which is why a dual orientation is assumed and pursued in this work. This means that not all individual preferences can be fully satisfied at the same time.[215] Rather, a trade-off is necessary, in the context of which the notes can play a balancing and supportive role.[216] Figure 4 provides an overview of the aspects addressed in this chapter.

In the following, accounting principles are to be developed to further specify reporting quality. First of all, principles are developed that enable a determination of the information content, whereby problems of bounded rationality are deliberately not addressed. Thus, in essence, the question is one of what information has to be reported ("(…) what is said (…)."[217]). Only then

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211 See, e.g., Pellens et al. (2017), p. 5; Coenenberg et al. (2016a), p. 1025; Brösel (2017), pp. 43-45.

212 See, e.g., Brösel (2017), pp. 43 f.

213 See the general classification in Murphy/O'Connell (2017), in particular pp. 13 ff.

214 See Whittington (2008), in particular p. 166: "Perhaps the time has come for them (the standard-setters, author's note) to stop trying to work financial miracles (such as deriving a universal 'best' measurement method (…)."

215 See, e.g., Wagenhofer/Ewert (2015), p. 109; Pellens et al. (2017), pp. 19-23; EFRAG (2014), in particular recital 5 c).

216 See, e.g., Kirsch et al. (2012), p. 770; Barker et al. (2013), pp. 12-14.

217 Division according to and quotation from Grice (1982), p. 46. It should be noted that the information-limiting maxim ("Do not make your contribution more informative than is required.", Grice (1982), p. 46) is discussed in the course of information presentation/preparation due to its proximity to considerations relating to cost-benefit trade-offs and bounded rationality.

is the focus explicitly placed on information processing by individuals, so that principles of information preparation can be developed. This question is therefore particularly concerned with the presentation of information ("(…) how what is said is to be said (…).")[218]).

[218] Grice (1982), p. 46.

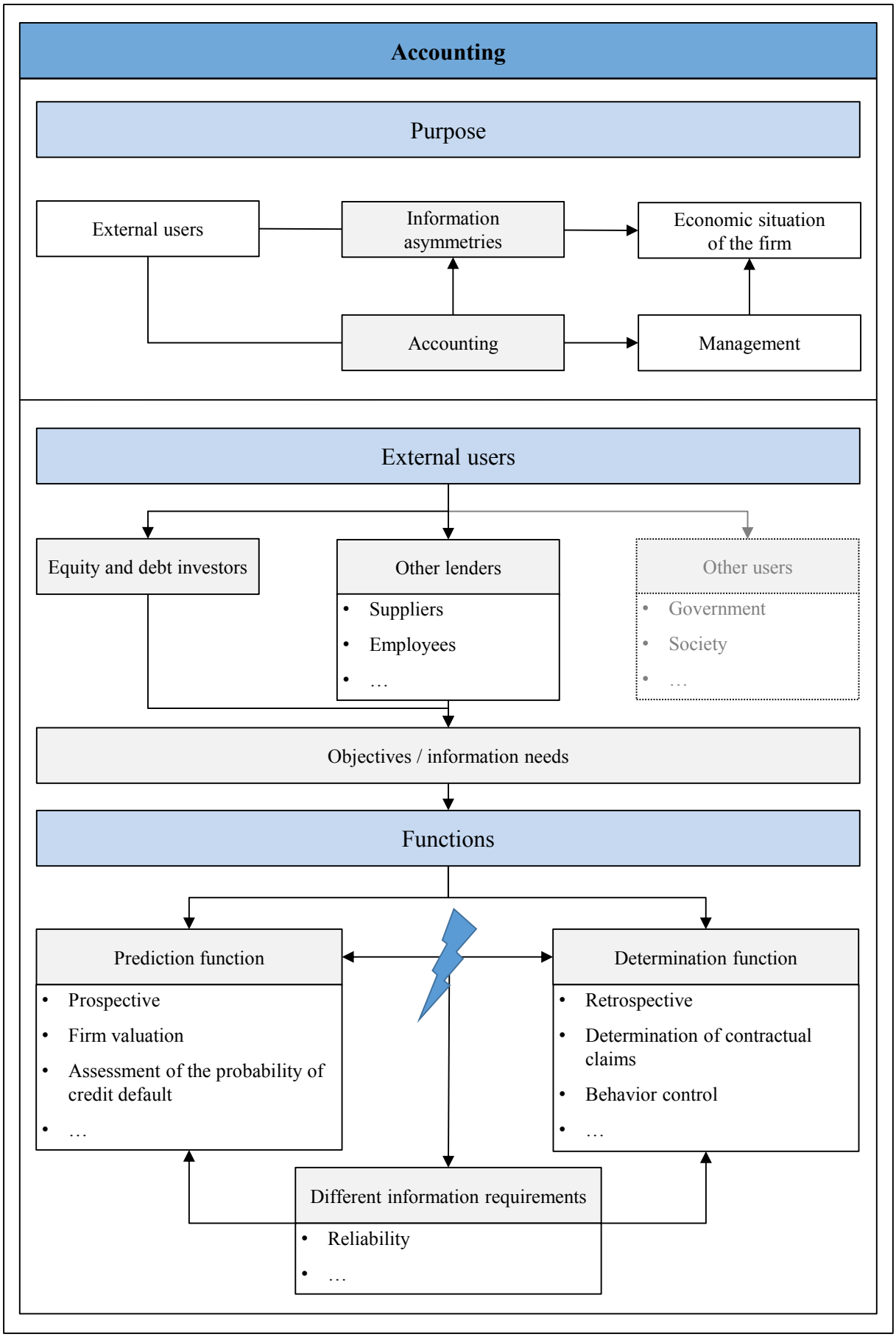

Figure 4: Purpose, users and functions of accounting

2. Principles of information content

2.1. Relevance

"A measure is more relevant if it is closer to the actual information which the user wishes to know, or (...) if the information is related to the matter at hand."[219]

(Michael Kirschenheiter)

"Under the category of RELATION I place a single maxim, namely, 'Be relevant'. Though the maxim itself is terse, its formulation conceals a number of problems that exercise me a good deal: questions about what different kinds and focuses of relevance there may be (...)."[220]

(H. P. Grice)

In order to answer the question of what information is to be reported, the principle of relevance must first be addressed. The above quotations illustrate that relevance is not to be understood absolutely, but relatively: in order to be able to achieve their objectives, users need information that is suitable for this, i.e., they need information that has a **relation to their objectives** – and the extent of this relation determines the extent of the information's relevance.[221] This abstract insight is self-explanatory, but causes some difficulties if concrete requirements for relevant information must be derived from this. Other concretizations, some of which are common in accounting research, such as prediction relevance, are at their core the result of focusing on the prediction function[222] without naming more concrete attributes of relevance and, therefore, do not represent a solution.

To answer the main question of what information is to be reported, the following two partial questions can be identified within the framework of purpose, functions and users already defined, with the answers to the partial questions used to concretize relevance:

- On which topics is information needed? (Question about information topics)
- How must the information be structured, or what properties is the information required to have? (Question about information design)

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219 Kirschenheiter (1997), p. 50.

220 Grice (1982), p. 46.

221 See also, for example, Shwayder (1968), Buzby (1974), p. 41, Botosan (2004), p. 291 and Kadous et al. (2012), p. 1336. See also the remarks on Grice's maxim of relation in Bloomfield (2012), p. 359.

222 See, similarly, Ballwieser (2002), p. 117, who sees the prediction or valuation relevance as a subset of decision relevance. See also Coenenberg/Straub (2008).

Required **information topics** can be derived from the epistemic goals of financial (statement) analysis. In essence, users **primarily** need information that enables them to draw conclusions about the success potential, success and liquidity of firms when conducting strategy-related, performance-related (income-related) and liquidity-related financial analyses, which require fundamental information, e.g., on corporate strategy, net income and cash flow.[223] Since accounting information is only a depiction of reality,[224] it must also be reported **secondarily** how this depiction is made, so that users can assess, for example, under what conditions and to what extent intangible resources are shown and, in particular, what uncertainty this depiction is subject to.[225] This opens up opportunities for identifying factors that may explain certain firm characteristics, such as the volatility of cash flows – factors that are closely related to the business model and operating environment of the firm vs. factors that are linked to the special characteristics of the generation of accounting information.[226]

The **design of information** within these topics depends on several aspects. Taking into account the objectives pursued by users, it is possible to formulate the demand for **timeliness** of information: only when information is current and regularly updated can it be useful to users in their decisions or assessments.[227]

Even without considering incentive conflicts, which will be addressed in the following chapter, it can be concluded that users need detailed or **disaggregated** information due to uncertainty

[223] See, e.g., Coenenberg et al. (2016a), pp. 1021 ff.; Palepu et al. (2016), pp. 2-15; Hope (2003b), in particular p. 239; Bhattacharya et al. (2012), in particular pp. 454-456 in conjunction with the (formal-) analytical modeling of reporting/information signals in Lambert et al. (2012) and Lambert/Verrecchia (2015).

[224] "The firm's accounting system provides a mechanism through which business activities are selected, measured, and aggregated into financial statement data." Palepu et al. (2016), p. 4. See also De Franco et al. (2011), in particular p. 899.

[225] See, e.g., Barker et al. (2013), pp. 5 f. and the statements on intangible resources in Part 2, Chapter 3. See also, in general, the survey results in Johansen/Plenborg (2013), in particular pp. 617-620, and the recommendations in AICPA (1994), p. 76. See also Palepu et al. (2016), pp. 4 ff. and Hope (2003a), in particular pp. 298 f.

[226] See, for example, the disaggregation in Bhattacharya et al. (2012), pp. 457 f. into innate and discretionary factors. See, similarly, the disaggregation of information uncertainty in Lu et al. (2010), p. 2266. See, similarly, the disaggregation of the risk premium in Taylor/Verrecchia (2015).

[227] See, e.g., Abraham/Shrives (2014), pp. 93-95; AICPA (1994), pp. 21 f.

and information asymmetries regarding the firm's economic situation and management performance, as well as due to their heterogeneous information demands (already described) in order to be able to conduct their analyses in a differentiated manner.[228]

Thus, despite the knowledge advantages of management, the mere reporting of the firm value, of the probability of a future payment default, of the (aggregated) net income, etc. is frequently not sufficient, as the underlying assessments are per se uncertain and, thus, require a large number of assumptions to be made which, from the point of view of individual users, may not be aligned with their own preferences and are, therefore, worthy of revelation.[229] Extensive insights into the function and characteristics of the information to be included are also required, e.g., to enable causal analyses regarding the involvement of operating, investing and financing activities.[230] Moreover, comparisons of different opportunities and predictions are difficult without detailing information.[231]

In addition to detailing or disaggregating, the grouping or **classification** of information is also relevant, since this reveals management's knowledge of commonalities and differences in the information provided – e.g., with regard to the accounting policies applied.[232]

These examples show that users need both specific[233] and comparable[234] information for their analyses. The problem, however, is that **specificity** and **comparability** are generally in conflict with each other.[235] So, for example, due to the variety of categorization possibilities already illustrated, different firms will group intangible assets in different ways, which on the one hand

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228 See, e.g., Chen et al. (2015a); Barker et al. (2014), p. 175 in conjunction with Barker et al. (2013); Bauman (2013); Ballwieser (2002), p. 119; AICPA (1994), pp. 22 f. / pp. 76-78.

229 See, e.g., Barker et al. (2013), pp. 5 f.; AICPA (1994), pp. 76-78. See also the statements in Barker et al. (2014), pp. 165 f., which emphasize the particularities of accounting measurement parameters with regard to subjectivity and uncertainty. See also, in the context of fair value measurement, Kühnberger (2014), Lu/Mande (2014) and Rzepka/Scholze (2012). See also the study results in Hewitt et al. (2015), which suggest a justified interest of analysts in information on assessment uncertainty.

230 See Palepu et al. (2016), pp. 200 ff. See, in principle, on the necessity of the operating-financing distinction, e.g., Barker (2010).

231 See, e.g., Chen et al. (2015a); Fairfield et al. (1996); Hope (2003b); Nell/Schmidt (2016); Bauman (2013); AICPA (1994), p. 29.

232 See Glover (2012), p. 376; Bloomfield (2012), p. 369. See also Barker et al. (2014), pp. 171 ff., who consider this aspect under the principle of information presentation/preparation.

233 See, e.g., Abraham/Shrives (2014), pp. 93 f.

234 See, e.g., De Franco et al. (2011).

235 See in this regard and taking into account a different use of terms, e.g., Barker et al. (2014), pp. 176 f. and the overview in Cole et al. (2012), pp. 115-118.

enables the users to gain insights into the management's perspective: however, on the other hand, it impedes comparisons with other firms.[236] A comparison at the level of intangible assets in general, without considering the individual components, appears to be unproblematic because it creates the impression of uniformity, but due to the lack of specificity it hardly permits any knowledge about the possibly deviating composition; such unspecific information is therefore often referred to with a negative rating as "boilerplate".[237]

Consequently, a trade-off is required that generally takes into account the relation to facts, meaning and situation, i.e., the **context**, considering various points of reference such as countries, industries, firms, transactions, uncertainties, mandatory and applied accounting rules as well as points in time and time periods.[238] Although this requirement is quite broad, it must be taken into account that due to the boilerplate considerations, firm specificity plays a more important role than, for example, industry specificity.[239] The demand for inter-firm and inter-temporal comparability frequently postulated in the literature is covered by, among other things, the reference points 'firm' and 'time' and, consequently, is to be understood as a subset of this context requirement.[240]

If restrictions in connection with cost-benefit considerations and bounded rationality are initially ignored (these issues are discussed in Chapter 3), it is also necessary to ensure a **complete** supply of relevant information (minimum criterion).[241] Figure 5 illustrates the relevance considerations.

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236 See, e.g., Glover (2012), p. 377.

237 See, e.g., Cole et al. (2012), p. 116; Abraham/Shrives (2014), p. 93-95.

238 See, e.g., the survey results in Cole et al. (2012), in particular pp. 126 ff. See also Abraham/Shrives (2014), pp. 93 f. / pp. 97 f., who, for example, distinguish between general, industry-specific and firm-specific disclosures. See also AICPA (1994), pp. 16 f. / pp. 20 f.

239 See, e.g., Abraham/Shrives (2014), in particular p. 97, who characterize general and industry-specific disclosures as "symbolic", whereas they characterize firm-specific disclosures as "substantive", and thus classify the latter as preferable. See also AICPA (1994), p. 45 and FRC (2012), p. 38.

240 On the requirement of comparability, see, e.g., the overview in Cole et al. (2012), pp. 115 ff. and Bentele (2004), pp. 19 f.

241 "(…) Make your contribution as informative as is required (for the current purposes of the exchange)." Grice (1982), p. 45. See also Bentele (2004), p. 16.

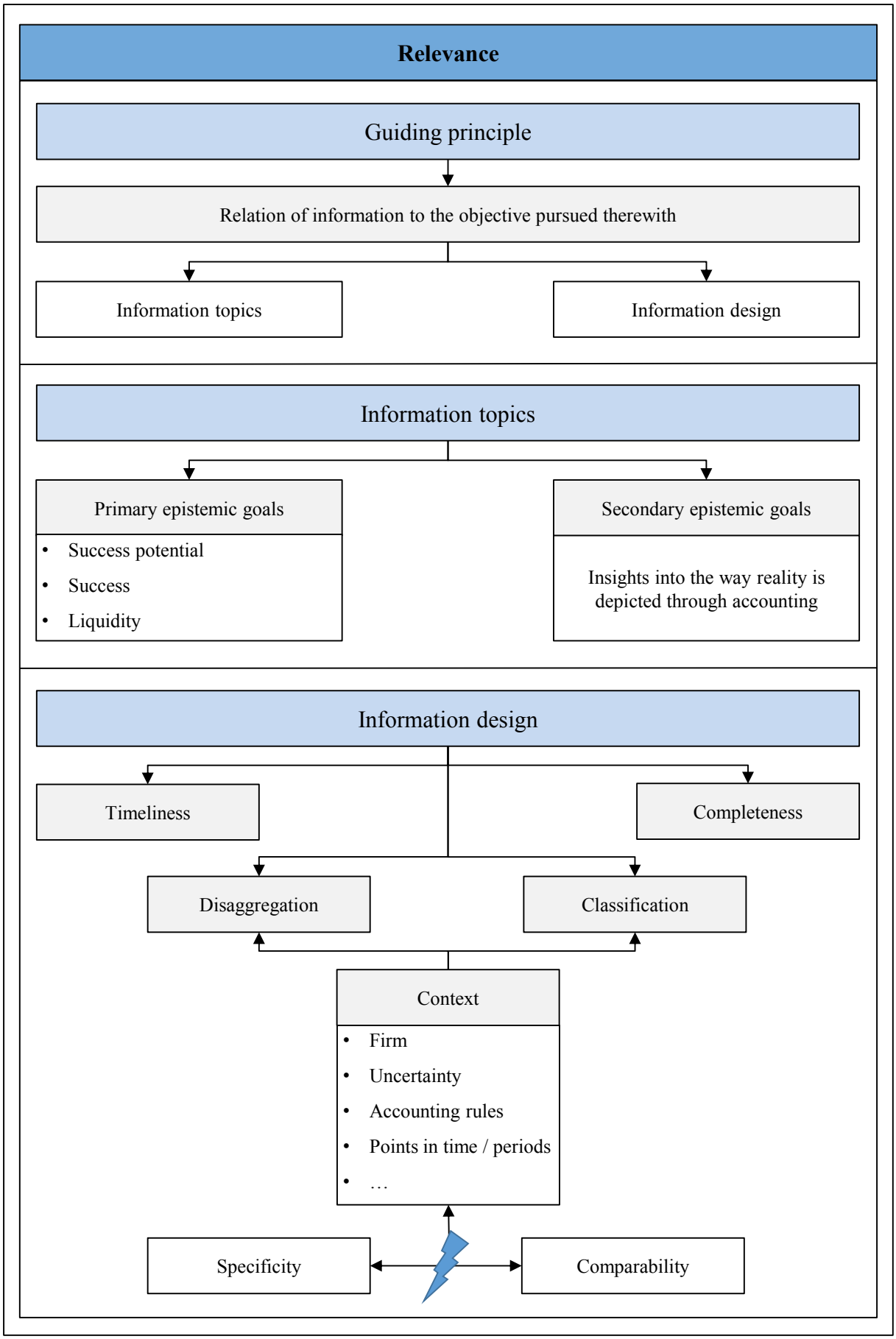

Figure 5: Relevance principle

2.2. Reliability

"Under the category of QUALITY falls a supermaxim – 'Try to make your contribution one that is true' – and two more specific maxims:

1. *Do not say what you believe to be false.*
2. *Do not say that for which you lack adequate evidence."*[242]

(H. P. Grice)

"Relevance addresses the pertinence of an economic construct to a user's decision. Reliability addresses how well that economic construct, or phenomenon, is depicted or measured."[243]

(Kathryn Kadous, Lisa Koonce, Jane M. Thayer)

"(…) one measure is more reliable than another if the user of the information can put more trust or faith in the information. Hence reliability is a function of the estimation process, independent of its impact on the true asset value."[244]

(Michael Kirschenheiter)

As a second pillar, the information principle of reliability determines the information content in addition to relevance. The above quotations emphasize that users demand true information or a **truthful depiction** of reality from management.[245]

Accounting is a collection of claims about reality that can either be established as true or false independently of the feelings and attitudes of the preparers and receivers/interpreters of accounting information, or are dependent on the feelings and attitudes – the former are based on objective facts and are epistemically objective, while the latter are based on subjective opinions and judgments, and are epistemically subjective.[246]

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242 Grice (1982), p. 46.

243 Kadous et al. (2012), p. 1336.

244 Kirschenheiter (1997), p. 50.

245 Fundamentally to this, see, e.g., Ng/Stoeckenius (1979), p. 5. On the term 'truth', see Kant (2015), p. 118 (AA 79): "(…) *Was ist Wahrheit?* Die Namenerklärung der Wahrheit, dass sie nämlich die Übereinstimmung der Erkenntnis mit ihrem Gegenstande sei wird hier geschenkt und vorausgesetzt (…)." ["(…) What is truth? The explanation of the term 'truth', namely that it is the conformity of knowledge to its object, is given and presupposed here (…)." Translation by the author].

246 See, in principle, on the definition of epistemically objective and subjective statements, Searle (2005), p. 4 and the following quotation (also p. 4): "Epistemically objective statements are those that can be established as true or false independently of the feelings and attitudes of the makers and interpreters of the statement. Those that are subjective depend on the feelings and attitudes of the participants in the discourse. Epistemic objectivity and subjectivity are features of claims."

Epistemically objective accounting information includes information that relates to immediately observable results of actions, such as the exercise of a recognition or presentation option, the results of which can be objectively observed by each individual in the annual report, for example, if the cash flow statement is prepared according to the direct or indirect method. In a world of uncertainty and information asymmetries, different individuals will make different judgments about the uncertain conditions in question,[247] for example, when the true useful life of an asset, the true future cash flows of a CGU, etc. are to be determined ex-ante. As long as these judgments are corroborated by facts "that (...) are independent of anybody's attitudes or feelings about them"[248], they are epistemically objective, too. Furthermore, epistemically objective information also includes unobservable facts, e.g., the manager's knowledge of having told the truth, or rather, not having lied.[249] However, **epistemically subjective** accounting information might also exist, for example, if management chooses a valuation method by mere preference (e.g., 'the CAPM is the best model') rather than based on objective facts and discloses this reason (and this reason alone).

It has to be noted, however, "that the contrast between epistemic objectivity and epistemic subjectivity is a matter of degree."[250]. Furthermore, the classification of information into one of these two categories may be of an ambiguous nature. For example, see the above example of making judgments about uncertain conditions which – by its very nature – implies the tasks of the (ex-ante) assessment of probabilities and the assignment of these to the uncertain conditions. This, however, can be done by using "objective-statistical probabilities" which are defined as being a "subject-independent characteristic of reality" and relate to conditions/events that are "repeatable", or by using "subjective probabilities", which are defined as being a "degree of rational belief of a given epistemical subject" and relate to "particular/singular conditions/events".[251] If the condition to be assessed is interpreted as being 'repeatable', probability judgment statements would fall into the category 'epistemically objective', because this statement (about probabilities) can be established as true or false independently of subjective beliefs

247 See Whittington (2008), pp. 164 f. in conjunction with Hicks (1946), p. 171 and Beaver/Demski (1979).

248 Searle (1995), p. 8.

249 See also the following example in Searle (1995), p. 9: "(…) the statement 'I now have a pain in my lower back' reports an epistemically objective fact in the sense that it is made true by the existence of an actual fact that is not dependent on any stance, attitudes, or opinions of observers."

250 Searle (1995), p. 8.

251 All quotes from Schurz (2014), pp. 99 f. (translation by the author).

(in the future). However, whether this is also the case when considering 'singular conditions/events' would be debatable and, in view of the objective of this work, it was considered better to not discuss this issue any further but, instead, to stress the point that this task of classification is of an ambiguous nature.

Instead, consider now the financial reporting setting that users face. Users largely view reality through the lens of a depiction of reality determined by management. For the users, however, the degree to which the truth content of the depiction is questionable depends on the manifestations of the following influencing factors:[252]

(1) Knowledge deficits of management due to general (fundamental) uncertainty (general error potential)
(2) Competence deficits of management (individual error potential)
(3) Incentive conflicts or management incentive congruence in association with discretionary accounting (potential for bias or potential for opportunistic behavior)
(4) Incompleteness of the depicted reality, which goes beyond management's knowledge deficits (information asymmetry, which influences the truth content)
(5) Incompleteness of the users' knowledge with regard to the extent of the aforementioned influencing factors, e.g., knowledge deficits with regard to management competence (information asymmetry influencing the assessment of the truth content)

From the perspective of an omniscient observer, the influencing factors (1 – 4) alone are decisive for the truth content of the depiction. However, from the perspective of the users, i.e., on the perceived truth content, influencing factor (5) should also exert an influence.

These influencing factors act on different levels. General **uncertainty** and **information asymmetries** are influencing factors at the level of the information environment. Competence and congruence of incentives represent the **trustworthiness of management** and are influencing factors at the level of management. At the level of accounting, stronger manifestations of these influencing factors, in isolation and in combination, have the effect that users do not include

[252] See, e.g., Kadous et al. (2012), in particular the literature overview on p. 1340 and the different forms of experiment design on p. 1342 (competence or potential for error) and p. 1348 (potential for error and bias). See also Song et al. (2010), Mercer (2004) and Fischer/Verrecchia (2000). See also the modeling of reliability through absence of error in agency models in, e.g., Kirschenheiter (1997) and Pelger (2012), in particular pp. 153 f. This narrow modeling can only reflect a partial aspect of reliability, and is due, rather, to measurability, see Pelger (2012), p. 154.

accounting information, or do so with less weight, in their assessment or decision-making, since they attribute to this information a higher **potential for error and/or bias** and, therefore, a lower degree of reliability.[253]

The reliability is increased if these potentials or resulting distortions of depiction can be detected and assessed by the users. For this, users need verifiable information.[254] **Verifiability** means intersubjective observability and 'testability' (i.e., the quality of being testable) of information, as is the case, for example, with market prices.[255] The core idea of the verifiability concept is being able to or to have the opportunity to test that a hypothesis, claim or claiming statement is true.[256]

The activity of **verification** or monitoring is usually carried out by different actors. In addition to the users, these include external and internal governance actors, such as auditors and supervisory board members.[257] However, several studies in recent years suggest that this alone does not solve the problems and that users have a strong demand for information that enables them to verify the provided information for themselves.[258] Verification on the basis of external information – e.g., for the valuation of intangible assets – is often not possible because, for example, (historical) market data is not available.[259] Verifiability therefore depends, in particular, on accounting information, i.e., the extent and nature of information generated by accounting determine decisively to what extent this information can be verified.

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253 See, e.g., Fischer/Verrecchia (2000); Wagenhofer/Ewert (2015), pp. 6-9. See also the empirical results in Song et al. (2010) based on the example of fair value measurement. See also the results of the experimental studies in Hewitt et al. (2015) and Du et al. (2014).

254 See, e.g., Stocken (2000) and Penman (2007), p. 41. See also AICPA (1994), p. 28 and the overview in Beyer et al. (2010), pp. 303 f.

255 On the definition (in a similar manner, but using the term 'objectivity'), see, e.g., Ijiri/Jaedicke (1966), p. 476, in particular footnote 12. The term 'objectivity' is not used here, because – when looking at it from the perspective of epistemology – objectivity could be mistaken for meaning 'truth'. However, as will be shown later on, verifiability is a necessary condition of establishing or acknowledging truth, but verifiability is not truth itself. In particular, being able to verify a statement or claim can only be an uncertain criterion of truth.

256 See Schurz (2014), p. 98.

257 See, for example, the considerations on governance actors in Song et al. (2010) and Mercer (2004), in particular pp. 189 f.

258 See, for example, the empirical results in Filip et al. (2015) and Ramanna/Watts (2012). See also the results of a survey of professional investors and analysts in Gassen/Schwedler (2010), in particular p. 505 / p. 507, which imply that mark-to-model fair values are considered less useful for decision-making by users because they are less verifiable than mark-to-market fair values.

259 See Bertomeu/Marinovic (2016), p. 1; Barker et al. (2014), pp. 165 f. See also the statements on intangible resources in Part 2, Chapter 3.

The question is whether **verifiability through accounting** is possible for both epistemically objective and epistemically subjective information. In the case of epistemically objective information – e.g., in the form of a claim by management that a generally known estimation method such as CAPM was used to determine the cost of capital – the fact that management uses or used the CAPM would be intersubjectively observable and testable, which establishes its verifiability. On the other hand, epistemically subjective information – e.g., the manager's claim that a certain valuation model is 'the best' model – would not be verifiable, because if it would, one would have to think of a way of intersubjectively observing and testing the truth content of something that is dependent on the individual feelings and attitudes of the maker of the statement. However, under the assumption of a minimum degree of realism, which is assumed here, this is not possible, because realism necessitates that the truth of a statement/claim applies/holds independently of subjective feelings, attitudes, etc.[260] Of course, one could ask the management to explain their preference and, if they were to do so, e.g., by stating that they chose the CAPM because it is a commonly used model, this would alter the statement by introducing epistemically objective information, which can be verified. This is an example for a revelation of reasons that enables verification.

In essence, the revelation of reasons is the revelation of premises that support/corroborate a conclusion. Consequently, extensive disclosure (i.e., transparency) regarding epistemically objective information facilitates verification. However, two kinds of truth have to be differentiated: formal truth and contentual truth. With the disclosure of all premises, the conclusion can be reproduced by anyone and tested for its **formal truth**, i.e., with regard to its logical formation. This, however, does not mean that a statement has yet been made as to the extent to

[260] See Schurz (2014), pp. 26 f.

which the conclusion also corresponds to its assumed reality of meaning, i.e., embodies contentual truth (e.g., 'what has been determined here corresponds to the true cost of capital').[261]

The discovery of **contentual truth** is (also) facilitated by extensive disclosure (i.e., transparency). For epistemically objective information (e.g., 'the CAPM was used'), contentual truth (or its degree) can be established independently of individual opinions and judgments, provided the respective fact is observed. This includes facts that manifest themselves in the future, i.e., future manifestations of ex-ante judgments about uncertain repeatable conditions/events in the future. In this case, the future has yet to reveal if the ex-ante judgments made by management are true, i.e., the act of establishing truth can only be carried out in the future by observing that very fact/manifestation. For epistemically subjective information (e.g., 'the CAPM is the best model'), external users can – at least – consider the extent to which this information matches their (subjective) assessments, industry assessments (in which information from other firms is also represented), etc. Thus, by disclosing this epistemically subjective information, the users are able to better estimate the extent to which different claims about reality are consistent or contradictory with each other. Whether this, in turn, allows for conclusions to be drawn about the truth content of this information is debatable and, at its core, dependent on the issue of which theory of truth is assumed. In this work, the correspondence theory of truth is assumed.[262] Therefore, it is assumed that only epistemically objective information allows for the establishment of truth content.

Consequently, even with extensive disclosures (i.e., transparency), there may remain reasonable doubts about the truth content of financial reporting in the point of the time of disclosure if there are problems regarding verifiability (in cases of epistemically subjective disclosures)

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[261] See in this respect the distinction between formal-logical and contentual truth in Kant (2015), p. 119 (AA 80): "Denn obgleich eine Erkenntnis der logischen Form völlig gemäß sein möchte, d. i. sich selbst nicht widerspräche: so kann sie doch noch immer dem Gegenstande widersprechen. Also ist das bloß logische Kriterium der Wahrheit, nämlich die Übereinstimmung einer Erkenntnis mit den allgemeinen und formalen Gesetzen des Verstandes und der Vernunft, zwar die *conditio sine qua non*, mithin die negative Bedingung aller Wahrheit: weiter aber kann die Logik nicht gehen, und den Irrtum, der nicht die Form, sondern den Inhalt trifft, kann die Logik durch keinen Probierstein entdecken." ["For although knowledge may be fully in accordance with the logical form, i.e. may not contradict itself: it may still contradict the object. So the merely logical criterion of truth, namely the agreement of knowledge with the general and formal laws of understanding and reason, is indeed the *conditio sine qua non*, and thus the negative condition of all truth: but logic cannot go any further, and logic cannot discover the fallacy, which does not relate to the form but to the content, by means of any touchstone." Translation by the author].

[262] For the topic of theories of truth, see, e.g., Brühl (2017), pp. 31 ff.

or, for example, if the future has yet to reveal whether the ex-ante judgments made by management are true.

Verifiability is a necessary condition for establishing the truth content (today or in the future), and is therefore a core element of the reliability of reporting. Whether this truth content is or will be established in the future, however, is subject to the act of verification and, thus, a totally different matter. Moreover, a lack of verifiability does not have to mean an untrue statement. A statement may be true or false regardless of its verifiability. From the point of view of accounting, however, a non-verifiable true statement may be of subordinate benefit to the user compared to an easily verifiable 'unsecure' statement, since the user orientation focuses on the assessment of the truth content by the users.

The considerations so far have been based on the objective of truthful and undistorted accounting. Limiting the potential for bias on the part of the management, for example, aims to curb reporting that is biased or one-sided to the detriment of users, i.e., to facilitate truthful reporting.[263] However, untruthful or distorted reporting may well be in the interest of users. One example is when this reduces false incentives or provides management with opportunities to communicate its private knowledge – management's discretion is therefore not negative per se.[264] Another example is the principle of prudence, which also leads to distorted reporting. Prudent (or conservative) accounting does indeed create an asymmetric and, thus, distorted depiction of uncertainty, which results in a systematic undervaluation of assets or overvaluation of liabilities – however, this prudent depiction often proves to be optimal for dealing with uncertainty in specific situations, and is therefore predominantly perceived in the literature as preferable to an undistorted depiction.[265]

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263 See, e.g., the overview in Barker (2015), p. 517.

264 For example, the desire for a complete prevention of earnings management can be achieved by remuneration of management that is independent of accounting data. This in turn leads, to the detriment of the investors, to the manager taking no action, see Dye (1988), in particular p. 200. See also, for example, Arya et al. (1998), who show that manipulated, i.e. untruthful, reporting can lead to restrictions of owner interventions (replacement of management), and can therefore be in the interest of the owners. See also the discussion in Wagenhofer/Ewert (2015), pp. 347 f.

265 "Accounting is prudent if, as a result of a higher threshold of verifiability for the recognition of economic gains than economic losses, the economic value of an entity's equity exceeds its book value." Barker (2015), p. 518. See, e.g., Wagenhofer/Ewert (2015), pp. 155 ff., in particular p. 160 / p. 201; Wagenhofer (2012), in particular pp. 1383 f.; Ballwieser (2014), pp. 463-466.

These considerations allow the following conclusions to be drawn. Equating reliability with an undistorted depiction is not useful, since, for example, a prudent and, thus, by definition, distorted depiction can be quite useful.[266] However, the opposite extreme of a completely false or distorted depiction is not useful either, since corresponding possibilities in turn create false incentives for the management, and run counter to the considerations of relevance.[267] Consequently, it is required that accounting information present an appropriately true depiction. In order to emphasize this, it seems reasonable to abandon the term 'truth' and other terms encountered in accounting literature, such as transparency and (non-)opacity that, as has been shown above, only reflect partial ideas of the general concept of reliability, and instead use the term 'reliability' with the concretizations **potential for error and bias** on the one hand, and **verifiability** on the other.[268]

This specification of reliability is still too general to enable the recognition of specific information needs in it, which is why a further concretization is necessary. This concretization is carried out with the help of the preceding considerations on relevance. For users, it is often information that is particularly relevant that relates to the future, embodies the private knowledge of management, is not observable on the market, etc., and is therefore particularly susceptible to reliability deficits, as the discussion on the depiction of intangible resources in Part 2 has exemplified. It is this conflict between relevance and reliability that forms the dilemma of accounting.[269]

With regard to the positive effects of reliable accounting, which can consist, for example, in a reduction of cost of capital and incentive conflicts,[270] it has to be emphasized that the solution to this dilemma lies neither in a one-sided preference for relevance nor in a one-sided preference for reliability, but rather in **balanced accounting** as the result of a trade-off between relevance and reliability.[271]

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266 "(…) financial accounting is not a system for the neutral measurement of economic value, (…) conservatism is thereby an intrinsic system property." Barker (2015), p. 516.

267 See, e.g., Ng/Stoeckenius (1979).

268 On the terms transparency and opacity, see Barth/Schipper (2008) and Anderson et al. (2009), in particular p. 209.

269 See, e.g., Ballwieser (2002), p. 118. See also the statements in Part 2, Chapter 3 and Chapter 4.

270 See, e.g., the overview in Song et al. (2010), pp. 1380 f.

271 See, e.g., Ballwieser (2014); Wagenhofer (2014); Kirsch et al. (2012).

Reliability therefore represents a filter in the depiction of the real world by accounting. Relevant information is only a useful part of accounting insofar as it meets the reliability requirements of the users. A general definition of a 'target reliability level' seems impossible in light of the weighing-up (or judgment) problems shown, so that case-specific weighing-up processes have to be applied.[272] For example, restrictions on **firm specificity** of information have to be imposed because individual firm estimates – such as those used to determine level 3 fair values – cannot be observed on the market, embody management's private knowledge and, thus, seem to be particularly susceptible to reliability deficits without the disclosure of verifiable information.[273]

In principle, however, it should be borne in mind that low **verifiability** of information from the users' point of view is, per se, less problematic than **information asymmetries with regard to verifiability**, and that these in turn are less problematic than **information asymmetries with regard to reliability** as a whole.[274] Thus, for example, the fact that certain intangible assets are difficult to verify is less problematic than the users' lack of knowledge about this. However, it is particularly problematic if the users also have to be concerned that errors and bias may be contained in the information about intangible assets, and are, therefore, uncertain as to the reliability of this information. The latter is likely to be the rule in practice.[275]

These considerations make it possible to further refine the information content (more precisely: The requirements for the information content). Thus, users also need information that enables them to assess the reliability of information.[276] As discussed earlier, relevant information should

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[272] "Welcher Grad an Verlässlichkeit zu fordern ist, (…) lässt sich kaum allgemein beschreiben; es lassen sich allenfalls Extremfälle abgrenzen." ["What degree of reliability has to be demanded (…) can hardly be described in general terms; only extreme cases, at best, can be delineated." Translation by the author] Ballwieser (2002), p. 118.

[273] See, e.g., Penman (2007), in particular p. 41. Even if the fair value is determined from the point of view of the market participants, managements must make typifying assumptions about this. On the example of the value in use, see similarly, e.g., Kirsch et al. (2010), in particular pp. 203-205 / p. 207.

[274] On this, see the statements in Glover (2012), pp. 374 f. with further references in conjunction with Glover et al. (2005). "(…) limited verifiability of particular measurements may not be as significant of a problem as large information asymmetries about verifiability. Rather than verifiability, the focus should probably be on (…) hardness – the dispersion in measurements carried out under conditions of diverse incentives (…) information asymmetries about hardness tend to be more problematic than information asymmetries about verifiability." Glover (2012), p. 375. "Hardness" can be understood as being close to reliability in the sense of this work – see Glover et al. (2005), in particular p. 4 / p. 13.

[275] See, for example, the general considerations on liquidity and information uncertainty in association with fair values in Ryan (2012), in particular p. 311.

[276] See, e.g., the literature analysis in Kühnberger (2014), pp. 442 ff.

be, inter alia, **detailed** and **specific** about the underlying uncertainty and depiction rules of accounting. It follows from this that users need information regarding which cases a depiction is based upon – for example, on level 3 fair values (reduction of information asymmetries with regard to verifiability) – and regarding which valuation premises were chosen (reduction of information asymmetries with regard to reliability) in order to be able to make individual adjustments to the information set to limit reliability deficits.[277] This also applies analogously to information regarding the extent of distortions in accounting, and precisely because, for example, prudent depiction means that lower verification hurdles are set for the recognition of expenses (or economic losses),[278] making reliability deficits unavoidable and, therefore, worth detecting.

Figure 6 illustrates the reflections on the principle of reliability. The effect of each factor on reliability is indicated by a sign in square brackets.

[277] See, e.g., the empirical results in Bens et al. (2016) and Lu/Mande (2014), which indicate that such reporting is reasonable. See also the literature analysis in Kühnberger (2014), pp. 442 ff. See also, e.g., AICPA (1994), p. 20 / p. 45. On the example of the value in use, see Kirsch et al. (2010), in particular pp. 206 f. On the example of earnings forecasts, see Hirst et al. (2007).

[278] See, e.g., Barker (2015), p. 518.

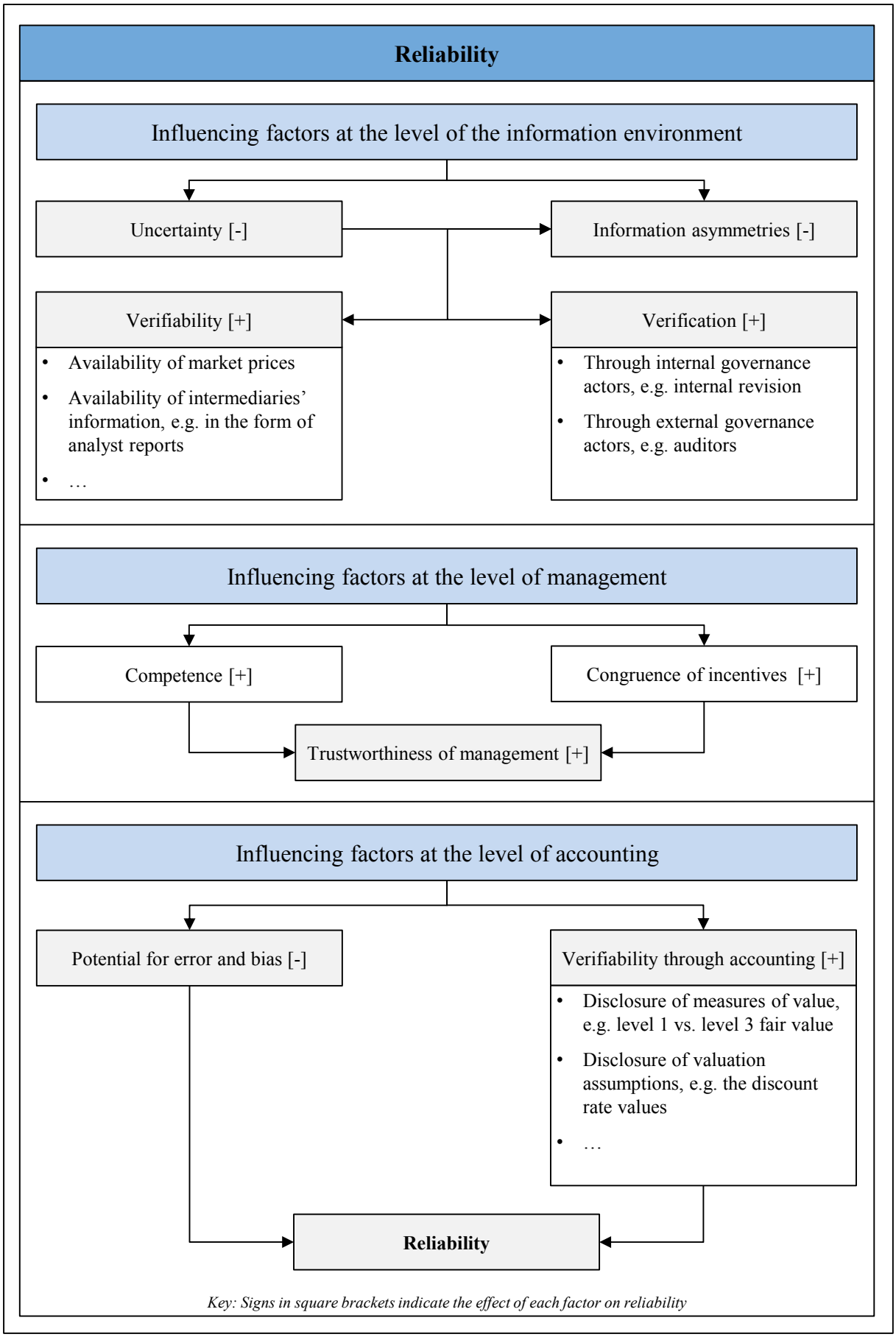

Figure 6: Reliability principle

3. Principles of information presentation/preparation

3.1. Behavioral economics as a foundation for the development of principles of information presentation/preparation

The preceding chapters have illustrated the requirements users place on the information content of accounting. However, this information content needs to be made available or prepared in such a way that the reader can also find and process the content, from which requirements for information presentation/preparation can be derived. These considerations are formalized in the theory of bounded rationality as transaction costs of information acquisition and processing, and are used as an initial approach to the conceptualization of information presentation/preparation before further insights of behavioral economics are subsequently drawn upon.

This raises the question of whether, in addition to these transaction costs, further reporting costs also have to be included in the quality analysis to be conducted here. At **firm level**, direct costs for the reporting process and indirect costs resulting from negative consequences of disclosing, e.g., competition- and litigation-relevant information are incurred.[279] These costs are also incurred indirectly by the users and, in particular, the owners – that is, they are passed on.[280] In addition, there are costs incurred directly at the **user level** and, in particular, for the acquisition and processing of information.[281]

When considering all costs, including, e.g., the costs of publishing an annual report, it follows that the quality defined in this way includes both benefits and costs in its entirety and is, therefore, to be understood as efficiency or productivity and not – as defined in Part 2, Chapter 1 – as a strict measurement parameter of output. Although this interpretation of quality as a cost-benefit relation can be categorized under the definition "degree of fulfillment of the users' requirements", it deviates from the predominant output-oriented use of the term in research and practice and,[282] due to the focus on a factual understanding of the concept of quality set out in

[279] "(…) restricted communication is a way of capturing real-world considerations such as rights to privacy and the cost of communicating both data and how the data is to be interpreted (…)." Arya et al. (1998), p. 27. See also, e.g., Lev (1992), p. 21 and the literature overview in Beyer et al. (2010), p. 301 as well as Grüning (2011), pp. 150 ff. See also the empirical results in Fabi et al. (2014), p. 42, recital 130 (e) and Johansen/Plenborg (2013), in particular pp. 623 ff.

[280] See Schipper (2010), pp. 319 f.; AICPA (1994), pp. 33 ff.

[281] See, e.g., Schipper (2010), pp. 317 f.; AICPA (1994), pp. 37 f.

[282] In the context of the "magic triangle" (cost, time and quality), see, e.g., Masing (2014), pp. 5 f. See also Reichmann et al. (2017) p. 363 / pp. 399 f. and Coenenberg et al. (2016b) pp. 641 ff.

this work, is to be rejected as it does not lead to the desired result. Going to the opposite extreme, on the other hand, where no costs are considered at all (including disregarding the transaction costs of the acquisition and processing of information by the users), then the considerations on the information presentation/preparation would become void. This would mean that an essential conceptual component of quality – which has emerged in different scientific disciplines such as philosophy, psychology, economics and information technology in connection with similar reference objects such as information, communication and reporting – would not be considered.[283]

After weighing up these arguments and following the usual understanding, only the direct transaction costs of the acquisition and processing of information by the users, which are influenced by the presentation/preparation of information, are understood as a component of reporting quality in the context of this work, and further specified. The starting point for the specification is the **theory of bounded rationality** outlined in the following quotation.

> *"(…) the task is to replace the global rationality of economic man with a kind of rational behavior that is compatible with the access to information and the computational capacities that are actually possessed by organisms, including man, in the kinds of environments in which such organisms exist."*[284]
>
> *"Bounded rationality (…) assumes that the decision maker must search for alternatives, has egregiously incomplete and inaccurate knowledge about the consequences of actions, and chooses actions that are expected to be satisfactory (attain targets while satisfying constraints)."*[285]
>
> *(Herbert A. Simon)*

Originally conceived to bring neoclassical behavioral assumptions to practical application, the theory of bounded rationality assumes that due to limitations in terms of information access and cognitive abilities, although individuals may want to behave rationally, they are only able to make limited (bounded) rational decisions, which in this understanding are not optimal, but only "good enough" ("satisficing").[286] It is therefore rational for individuals to stop searching

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283 On philosophy, see, e.g., the category "manner" in Grice (1982), in particular pp. 46 f. On information technology, see the category "representational information quality / data quality" in Floridi (2013) and Wang/Strong (1996). On psychology and economics, see the further statements in this chapter.

284 Simon (1955), p. 99.

285 Simon (1997), p. 17.

286 On the complete works of Herbert A. Simon, see the statements in Barros (2010) with further references.

for information if the information already obtained meets their "stop criterion".[287] Such rational behavior can, for example, be attributed to the consideration of **information costs** in the sense of the above-mentioned costs of information acquisition and processing on the part of firms and users.[288] Information costs are seen as an important cause of the actuality whereby the validity of the market efficiency hypothesis – even in its semi-strong and weak forms – could not be substantiated and is, therefore, called into question.[289] Overall, the concept of bounded rationality integrates non-quantifiable uncertainty, information asymmetries and information costs into the rationality principle.[290]

This has serious implications for accounting. For example, limited attention and limited processing power lead to the fact that more prominent (or salient) forms and forms of presentation that are easier to process favor the perception and consideration of information when making decisions.[291] In this context, an increasing amount of information has a distracting effect and,

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287 See Barros (2010). This brings the concept of rationality closer to reality, but at the expense of specificity: "(…) bounded rationality broadens the scope of the concept, in the sense that a greater set of economic situations can be treated as rational, presumably more realistically, too. On the other hand (…) bounded rationality implies, in practice, a loss of specificity of the concept of rationality." Barros (2010), p. 470. This is also reflected in the considerable heterogeneity of the use of this term in the economic literature, see Klaes/Sent (2005), in particular p. 49.

288 "Inattention seems foolish in our setting, as inattentive investors lose money by ignoring aspects of the economic environment. However, if time and attention are costly, such behavior may be reasonable." Hirshleifer/Teoh (2003), p. 339. See also Bloomfield (2002), in particular p. 234 / p. 236. "(…) extraction costs reflect the cash costs of identifying, collecting, compiling, printing and processing data, or hiring others to do so. (…) Another perspective is that extraction costs reflect the cognitive difficulty of extracting information from data that has already been identified and collected." Bloomfield (2002), p. 236.

289 See Hirshleifer et al. (2009), the overview in Libby et al. (2002), p. 777 and Bloomfield (2002), in particular p. 233 f.: "The academic community is showing increasing dissatisfaction with the EMH [Efficient Market Hypothesis, note by the author], swayed partly by evidence that prices underreact to large earnings changes, (…) and other statistics derived from fundamental accounting analyses. (…) I present an alternative to the EMH called the 'Incomplete Revelation Hypothesis' (IRH). The IRH asserts that statistics that are more costly to extract from public data are less completely revealed in market prices." On the fundamentals of the efficient market hypothesis, see Fama (1970).

290 See Wüstemann (2002), pp. 14 f. and the literature referred to there.

291 See, e.g., Hirshleifer/Teoh (2003). However, it is unclear which process step of judgment (making), consisting of information acquisition, evaluation and weighting, is affected by this. See, e.g., the results in Maines/McDaniel (2000), which indicate an influence on the weighting of information, and Hirst/Hopkins (1998), which indicates an influence on the acquisition of information depending on the form of presentation.

thus, facilitates misjudgments (or delayed reactions).[292] Therefore, the **presentation** of accounting information, or more generally its **preparation**, is important for reporting quality.

The decision-making process of individuals, i.e., their formation of expectations, judgments and preferences, is of particular importance in this context and is the essential research object of **behavioral economics**, built specifically, as it is, on insights from cognitive psychology and detaching itself (at least partially) from neoclassical assumptions of rationality or seeking to refine them further.[293] Corresponding results indicate, for example, that individuals use complexity-reducing heuristics in decision-making situations under conditions of uncertainty, which often lead to good outcomes but occasionally cause serious and systematic errors.[294] This illustrates why users have an interest in obtaining verified or verifiable accounting information from the management that enables them to estimate the potential for error, even though they themselves are naturally exposed to bounded rationality too.

In addition, behavioral economics has also identified **irrational behaviors**, e.g., in the form of the certainty effect (the disproportionate weighting of secure outcomes in comparison with the weighting of uncertain outcomes), which cannot be explained – or can only be insufficiently explained – using the neoclassical rational weighing up of information costs and benefits, whereby the boundaries between bounded rationality and irrationality are blurred.[295]

Overall, these findings lead to the following conclusion. For both the effectiveness and the efficiency of decisions (considering users' transaction costs of information acquisition and processing), it is not only the information content but also the presentation/preparation of this content that is important. These considerations on the presentation/preparation of information are further concretized in the following chapters by means of the principles of **materiality** and

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[292] See, e.g., Hirshleifer et al. (2009), in particular p. 2323: "(…) most work on attention documents the neglect of public signals, the extent to which salient publicity draws more attention *to* some signal (…). Implicit in such tests is the idea that other calls on cognitive resources overwhelm investors, limiting investors' response to the public signal in question. (…) Our tests focus on the competing information signals that draw investor attention *away* from a given firm." See also, e.g., the results in Fanning et al. (2015), which indicate that management can effectively use the amount of information to conceal unfavorable information.

[293] For overview and classification see, e.g., Koonce/Mercer (2005), Gillenkirch/Arnold (2008), Libby et al. (2002) and Hirshleifer (2001).

[294] See Tversky/Kahneman (1974).

[295] At a fundamental level on the certainty effect and the prospect theory, see Kahneman/Tversky (1979). On the discussion about the dividing line between (bounded) rationality and irrationality see, e.g., Bloomfield (2002), pp. 239-241 and Tversky/Kahneman (1981), p. 458. On the concept of irrationality, see the following statement: "(…) a man could be judged irrational either because his preferences are contradictory or because his desires and aversions do not reflect his pleasures and pains." Tversky/Kahneman (1981), p. 458.

clarity (in the context of understandability). Within the principle of materiality, classical information amount (information overload) problems are addressed, whereas within the principle of clarity, classical information presentation problems (format, etc.) are addressed.

3.2. Materiality

"QUANTITY relates to the quantity of information to be provided, and under it fall the following maxims:

1. *Make your contribution as informative as is required (for the current purposes of the exchange).*
2. *Do not make your contribution more informative than is required.*

(The second maxim is disputable; it might be said that to be overinformative is (...) merely a waste of time. However, (...) such overinformativeness may be confusing (...); and (...) the hearers may be misled as a result of thinking that there is some particular POINT in the provision of the excess of information. (...)).")[296]

(H. P. Grice)

This quotation highlights that the information content has to be constrained in favor of the information presentation/preparation. The sub-principle of completeness, postulated in the context of relevance as a minimum criterion for information content (1.), has to be supplemented by a **maximum** criterion (2.), thus imposing limits on completeness. This is justified by the previous findings on information costs with particular regard to behavioral economics. Under the conditions of the real world, a complete provision of information is therefore not possible; moreover, it is also not reasonable, since this completeness consideration is opposed by cost-benefit considerations, and especially against the background of bounded rationality. Thus, 'too much' information has a negative effect on quality by making it more difficult for users to see what is essential, which is also reflected in the above quote and is expressed in the form of "overinformativeness".[297]

These considerations can be subsumed under the principle of **materiality**. Accordingly, information provided must be limited to relevant components, and these, in turn, to components of particularly high relevance. Materiality therefore represents a filter according to which

[296] Grice (1982), pp. 45 f.

[297] On this, see Bernstein (1967), pp. 87 f. and Buzby (1974), p. 44 as well as the literature overview in Hirshleifer et al. (2009), pp. 2294 f.

irrelevant information and information of low relevance for the users are to be winnowed out.[298] Relevance is therefore a necessary but not a sufficient condition for materiality.

The selection of material information is based on qualitative and quantitative considerations of the users within their individual decision-making context, and it is obvious that material information can therefore be specified on a case-by-case basis, at best.[299] Both literature and practice focus – to some extent – on quantitative materiality which, however, is more due to the need for operationalization than to questioning the economic reasonableness of the qualitative dimension.[300] For example, the knowledge about the existence or lack of intangible resources in knowledge-intensive industries, such as the pharmaceutical industry, is material regardless of their quantitative manifestation. In this context, small quantitative manifestations in particular represent important information, but would be omitted if the materiality threshold was determined in a quantitative manner alone. Therefore, neglect of the qualitative component does not make sense in principle.[301]

Although a generally valid determination of materiality thresholds is problematic, boilerplate information can be characterized as particularly worthy of filtering (at least by means of typification), since this information represents the smallest common denominator of knowledge and, consequently, appears insignificant or non-material in comparison with firm-specific new information.[302]

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298 The result is the same as that from Bentele (2004), p. 15.

299 See, e.g., Buzby (1974), pp. 44 f.; AK "Immaterielle Werte im Rechnungswesen" der Schmalenbach-Gesellschaft für Betriebswirtschaft e. V. (2009), pp. 14 ff. See also the overview in Toebe/Lorson (2012), in particular pp. 1200 f. On the impossibility of a generally valid determination of materiality, see, e.g., Ro (1982), in particular pp. 404 ff.

300 See, e.g., the overview in Toebe/Lorson (2012), in particular pp. 1200 f.

301 On the significance of the qualitative component, see also the following statement: "(…) if an item is not material, it is not material no matter how large its ex ante magnitude is. In a world of uncertainty, a large number of an item is not necessarily considered more material than the item's smaller magnitude since the former is not always more informative (…) than the latter, and vice versa." Ro (1982), p. 400.

302 "(…) a large portion of most corporate disclosure is devoted to (…) information that is redundant with prior understanding. Some of the prior understanding comes from facts that have been true for all firms for many years, while some comes from prior disclosures by the firm about matters that change only rarely. As a typical example, Apple's 2010 10-K filing begins with hundreds of words of boilerplate information (…) cautioning the readers about the unreliable nature of 'forward-looking statements.' While this knowledge is important, it is part of any investor's prior understanding, since it applies to every company." Bloomfield (2012), pp. 363 f. See also the results of analyst interviews in Bean/Irvine (2015), in particular p. 612.

3.3. Clarity in the context of understandability

"(...) under the category of MANNER, which I understand as relating not (...) to what is said but, rather, to HOW what is said is to be said, I include the supermaxim – 'Be perspicuous' – and various maxims such as:

1. *Avoid obscurity of expression.*
2. *Avoid ambiguity.*
3. *Be brief (avoid unnecessary prolixity).*
4. *Be orderly.*

And one might need others."[303]

(H. P. Grice)

As already elaborated, findings in behavioral economics indicate that users are more likely to perceive information and consider it in their decisions if it is presented in a salient and easy-to-process manner. This expresses the closely related constructs of clarity and understandability that need to be distinguished.

Clarity is determined by a salient and easy-to-process form of the presentation of information.[304] In the context of text-intensive reporting, clarity is often referred to synonymously as readability.[305] The above quotation illustrates the complexity of this term, which is also reflected in the extensive literature in the accounting context.[306]

Understandability, on the other hand, includes not only a clear presentation of the information to be processed, but also other constructs that lie outside the scope of reporting – though they influence the quality of decisions nonetheless. These include, in particular, the individual characteristics of the users, such as their knowledge and skills (**professionalism**) and the complexity of the (analytical) tasks performed by the users (**task complexity**).[307] This multidimensionality is also reflected in a more complex definition. Understandability is achieved if the perception and consideration of information is appropriate (in terms of efficiency or effectiveness), i.e., if

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303 Grice (1982), p. 46.

304 In this context, see the following quotation as a proxy: "(…) research in psychology has shown that information will not be used unless it is both available *and* readily processable (i.e., clear)." Hirst/Hopkins (1998), p. 48.

305 See, e.g., Lundholm et al. (2014); Tan et al. (2014).

306 See, e.g., the overview in Barker et al. (2013), pp. 9 f.

307 See, e.g., Barth/Schipper (2008), p. 178; Jones/Smith (2014), in particular the overview on pp. 184 f.; Hard/Vanecek (1991). In addition, there are other factors, such as the task environment (e.g., time restrictions during task processing or interruptions during task processing), which have an influence on understandability – see, e.g., the overview in Kelton et al. (2010), pp. 93 f.

the decision-making processes required to accomplish the task are congruent with the decision-making processes made possible by the problem representation.[308] The problem representation consists of both an external (clarity) and an internal (professionalism) component.[309]

These factors – clarity of presentation, professionalism of the users and complexity of the tasks – exert an interdependent influence on understandability, according to which clarity tends to improve understandability, and especially in those cases in which the tasks to be carried out are complex and individual characteristics of the users are unfavorable to them.[310]

In the context of the analysis of accounting information, specifically, and in particular with regard to the notes, the complexity of the tasks is likely to be high since a great deal of information has to be processed, connections have to be recognized, these connections (may) contradict each other when examining different information, etc.[311] In addition, clarity and understandability should lead to lower information costs for professional and non-professional users.[312] Clarity and understandability should, therefore, represent important requirements of the users of the notes reporting.

Thus, the following aspects apply with regard to the **relationship between clarity and understandability**. Understandability is a fundamental requirement of the users, as it has a decisive influence on the effectiveness and efficiency of their economic decisions. The reference object of understandability is the quality of the decision. Understandability depends on clarity but is not identical to it, since clarity is one of several factors influencing understandability. The reference object of clarity is not the quality of the decision, but the quality of the presentation of a basis for the decision (e.g., in the form of the notes reporting). For the question that is relevant in the context of this work, clarity is therefore the construct that needs to be further specified, and not understandability. Drawing on the literature, in particular, three concretizing construct dimensions of clarity can be identified: Format, diction (readability) and coherence.

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308 See, e.g., the overview in Kelton et al. (2010), in particular pp. 81 f.

309 See, e.g., the overview in Kelton et al. (2010), in particular pp. 81 f.

310 See, e.g., the overview in Kelton et al. (2010). See also the results in Dilla et al. (2014), Dilla et al. (2013), So/Smith (2004) and Ohlert/Weißenberger (2015). See also the results in Maines/McDaniel (2000) in connection with the complexity classification in Elliott et al. (2007).

311 See, e.g., Elliott et al. (2007), in particular pp. 141 f. / pp. 143-148; So/Smith (2004), pp. 292-294; Hard/Vanecek (1991), p. 39 f.; EFRAG et al. (2014); Barker et al. (2013).

312 See, e.g., Dilla et al. (2013); Miller (2010).

The **format** aims to achieve clarity with visual means. These include tables/graphics, bold and italic type, headings/subtotals, paragraph layout, and interactive visualization[313].[314] However, previous findings suggest that depending, in particular, on the complexity of the tasks and the professionalism of the users, different format characteristics can facilitate clarity, i.e., that no universally optimal format exists.[315]

Diction encompasses the linguistic component of clarity. Both a diminishing complexity of words and sentence structure and a diminishing abstractness of the formulation have a demonstrably positive effect on the clarity of the presentation.[316] In addition, other linguistic properties, such as the tone of the formulation, have an influence on the perception of information and its consideration in decisions.[317]

Coherence, however, targets the logic behind the information presentation/preparation and the connection of such information as facilitated by its presentation/preparation. When analyzing information in annual reports, users are regularly confronted with more information than they can process properly at the same time. To accomplish this task, they divide the total amount of information into subsets, analyze these separately, and then combine the partial results to find an overall solution (a so-called "divide-and-conquer" strategy).[318] This process is facilitated if the required information subsets for solving sub-problems can be found in their entirety and isolated in separate locations, are conceptually connected in each location, are labeled with meaningful headings or categorizations, and are referenced between different locations.[319] These considerations are illustrated in Figure 7.

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313 See, e.g., the results in Tang et al. (2014) and the overview in Dilla et al. (2010).

314 See, e.g., Tan et al. (2014); Rennekamp (2012); Wu/Yuan (2003).

315 See, e.g., Vessey (1994), in particular p. 116 and the overview in Kelton et al. (2010), in particular pp. 83-90 and the following statement on p. 89: "However, findings consistently show that one format does not fit all tasks and that a universally 'best' format does not exist." This is similar to what applies for professionalism: see Kelton et al. (2010), pp. 95-97 and the results in Ohlert/Weißenberger (2015), in particular p. 73.

316 On the influence of the complexity of words and sentence structure see, e.g., Tan et al. (2015), De Franco et al. (2015), Lundholm et al. (2014), Lehavy et al. (2011) and Miller (2010). On the influence of the abstractness of the formulation, see Riley et al. (2014).

317 On the influencing factor of tone see, e.g., Tan et al. (2014) and Davis et al. (2012). On further influencing linguistic properties see, e.g., the overview in Beattie (2014), in particular pp. 126 f. and Rennekamp (2012), pp. 1343 f.

318 See Bloomfield et al. (2015), pp. 509 f. with further references in conjunction with Shanteau (1988), p. 208.

319 See Bloomfield et al. (2015) in conjunction with Lipe/Salterio (2002), Clor-Proell et al. (2014) and Tarca et al. (2008). See also Maines/McDaniel (2000), in particular pp. 186-188, Hodge et al. (2004) and Hodge et al. (2010).

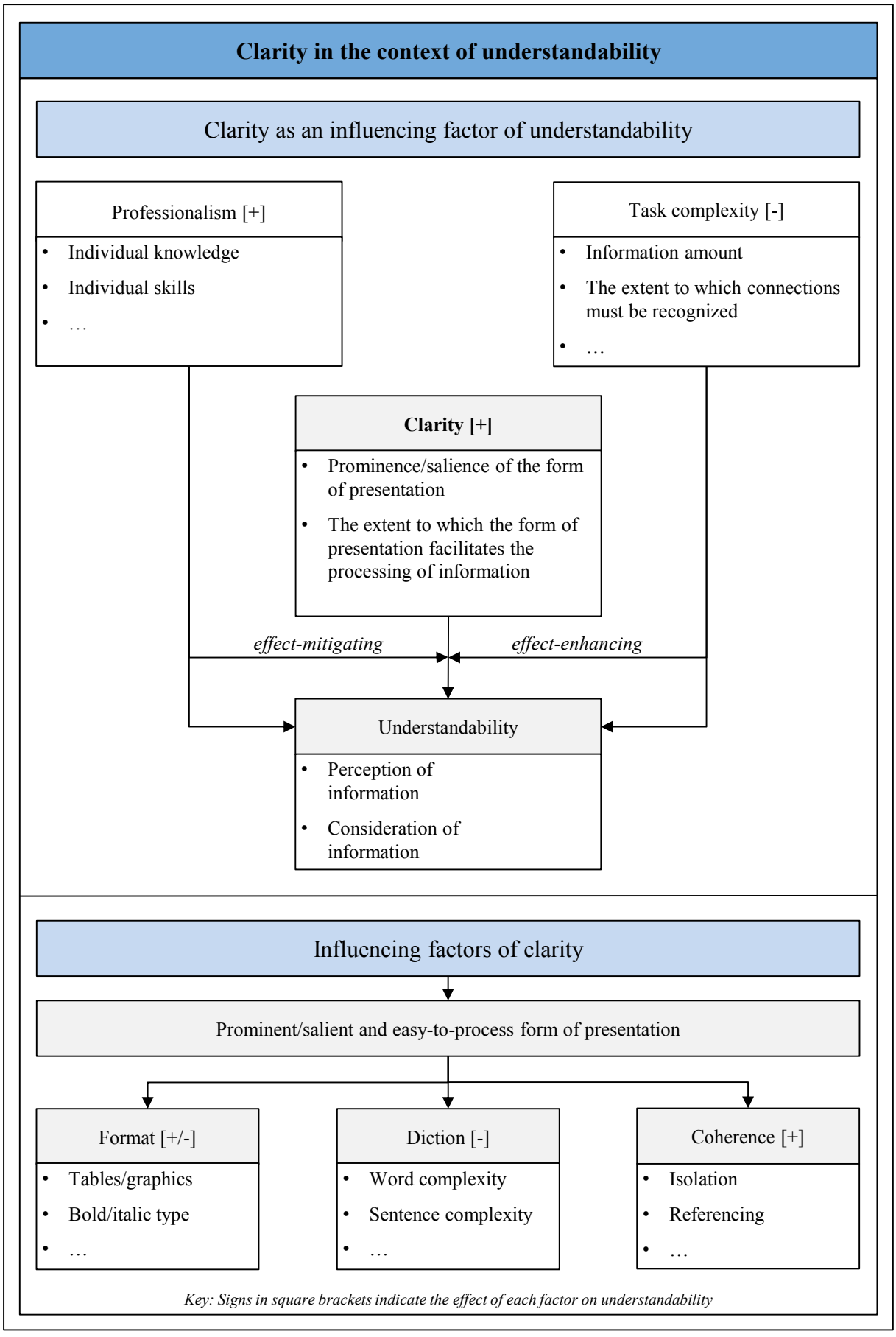

Figure 7: Principles of clarity and understandability

4. An overall approach to reporting quality, with particular emphasis on the functions of the notes

The previous explanations have shown that users are exposed to various frictions of the information environment. These include, in particular, uncertainty, verifiability and verification deficiencies as well as information asymmetries. The depiction of reality through accounting serves to reduce these frictions. The better this is achieved, the higher the quality of the accounting and reporting, i.e., the higher the quality level of the depiction of reality that is achieved through accounting. The decisive factor for this is the fulfillment of the information principles developed with regard to information content and presentation/preparation.

This conception is by no means to be understood in a monocausal manner, since various trade-offs are necessary. Although uncertain information is relevant in general, it lacks reliability (or, rather, the possibility for the user to assess the truth contained therein) without opportunities for verification, making it useless to users. Consequently, a trade-off between relevance and reliability within the information content is necessary. With regard to information costs and bounded rationality, further restrictions in the context of information presentation/preparation are also reasonable, e.g., by avoiding the reporting of boilerplate information.

The considerations in Part 2 have also shown that the above-mentioned frictions and associated information problems apply to intangible assets in particular, which is why these are an appropriate object of study for the subsequent empirical analysis. Figure 8 illustrates this overall concept of reporting quality, which relates to **accounting information in general**.

For the **notes**, in particular, their functions are closely linked to the above information principles. The explanation, interpretation and supplementation functions reflect the principles of information content, since these include information on depiction rules, discretion and composition of items in the financial statements, for example with regard to the underlying measures of value, the significance of which has already been elaborated in conjunction with the principles of relevance and reliability. Analogously, the principles of information presentation/preparation are reflected in the disburden function, since this subsumes an appropriate allocation of information between the financial statements and the notes, the significance of which has already been discussed in connection with the principles of materiality and clarity.

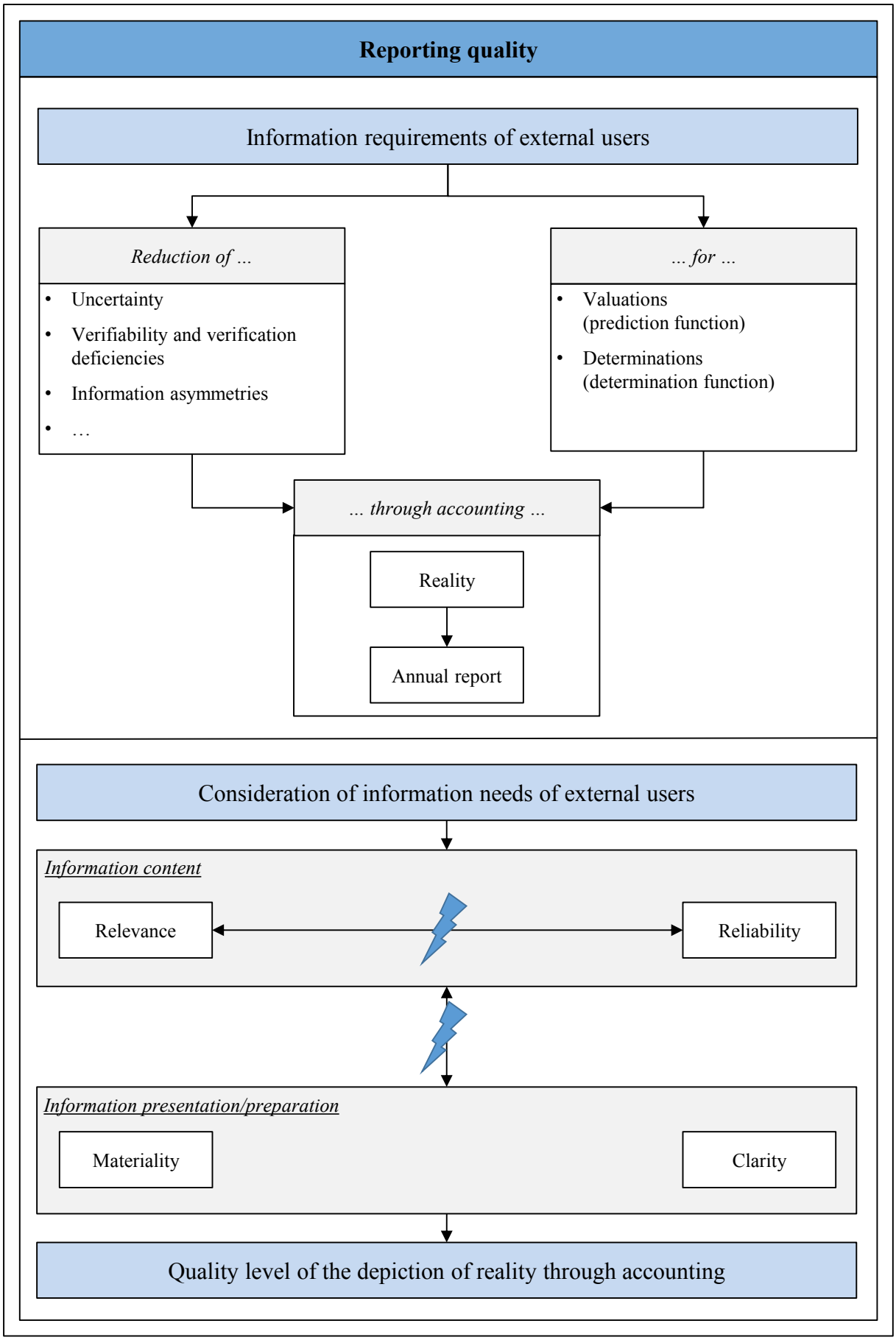

Figure 8: Overall concept of reporting quality

The notes thus play a central role in solving the above-mentioned trade-off problems. By disclosing alternative measures of value, it is possible, for example, to balance different reliability requirements and, thus, reduce the gap between information according to the prediction function and information according to the determination function. Whether this can be achieved in the interests of the users is crucially dependent on the (perceived) reliability deficits and information costs of this information, which in turn can be reduced by designing the notes reporting in accordance with the above principles.[320]

Overall, these considerations underscore the importance of expanding the supply of information provided by the financial statements in the notes in order to achieve high reporting quality in annual reports. Figure 9 illustrates these considerations on reporting quality in the notes.

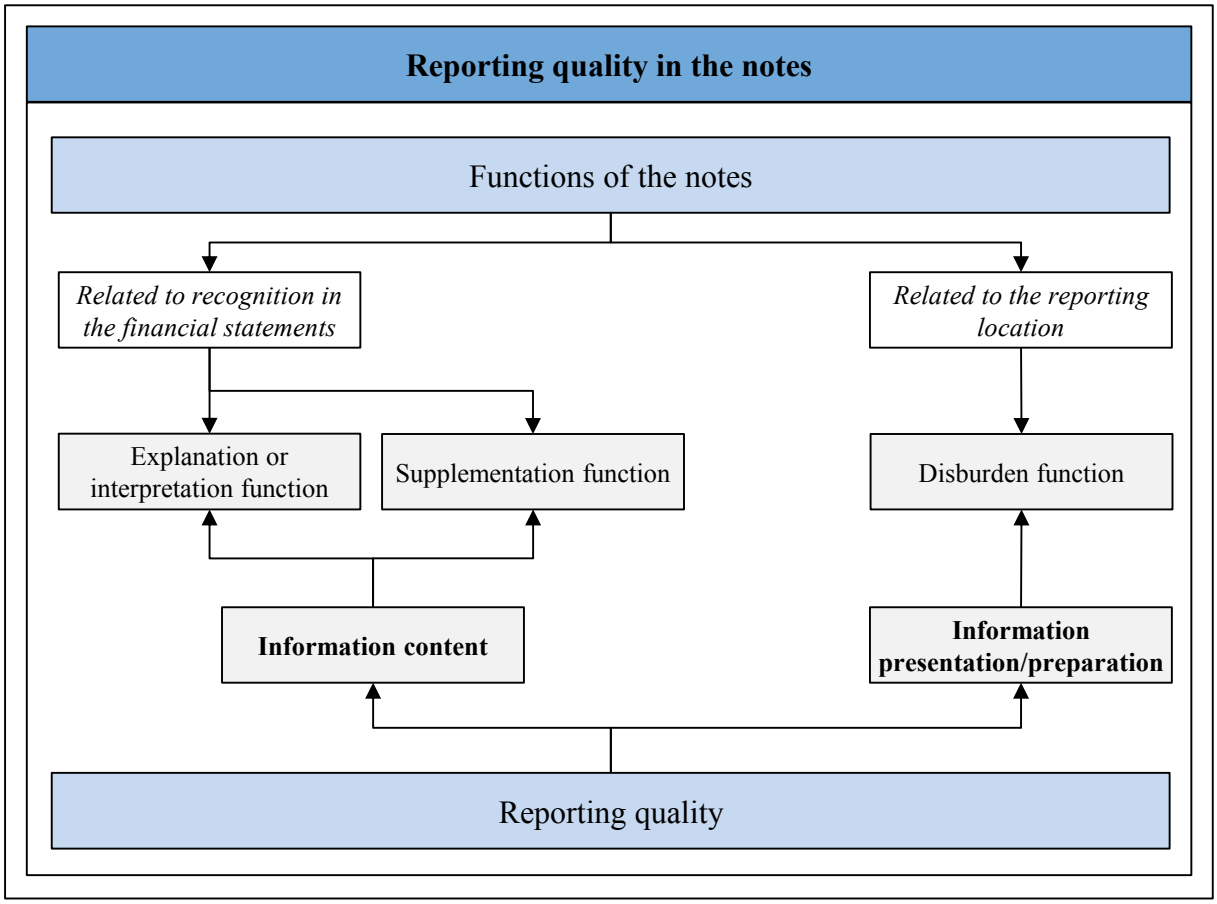

Figure 9: Reporting quality in the notes

[320] The 'recognition-vs.-disclosure' literature shows that measures of value that are disclosed outside of the financial statements – and especially in the notes – are taken into account to a lesser extent by users if the (perceived) reliability is low and information costs are high: see, e.g., the results in Müller et al. (2015) and Israeli (2015) as well as the overview in Libby/Emett (2014). The concrete design of the notes reporting is not analyzed in these studies. A reduction of these negative effects depending on the design of the notes reporting is shown by the results in Bens et al. (2016) with regard to reliability (information content) and the results in Bloomfield et al. (2015) with regard to information costs or clarity (information presentation/preparation).

Part 4: Empirical analysis of notes reporting quality with respect to intangible assets

1. Determination and evaluation of the research design

1.1. Classification and quality criteria of the research design of scientific studies and classification of this work

The research design describes the methodical approach of scientific studies and has to be determined depending on the research problems to be solved.[321] For the question of reporting quality in the IFRS notes to be addressed in the context of this work, a number of determinations can already be made at this point with regard to the research design and the quality criteria, which will be further examined in detail in subsequent chapters. In the following, the determination of the research design of this work is first discussed on the basis of corresponding **classification criteria** (see Table 1) before the associated quality criteria are discussed.[322]

At the core of this work is the development of an in-depth understanding of the composition of reporting quality and its generalization. While the problem of understanding speaks for a qualitative research approach, the generalization problem points to a quantitative research approach, which is why a combination of both approaches in the form of a **mixed-methods approach** is chosen for this work.[323] This profile also suggests that requirements of both **exploratory** studies (i.e., studies describing the investigation's object of interest) and **descriptive** studies (i.e., studies describing the population) must be met.[324] This imposes conflicting requirements on the research design including, inter alia, with regard to sampling, which must be taken into account in the further course of this work.[325]

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321 See Döring/Bortz (2016), pp. 182 ff.

322 Depiction and systematization of the research design in close reference to Döring/Bortz (2016), pp. 182 ff.

323 "(…) a researcher may want to both generalize the findings to a population as well as develop a detailed view of the meaning of a phenomenon or concept for individuals." Creswell/Creswell (2018), p. 19. See also Döring/Bortz (2016), pp. 184 ff. / p. 554.

324 See Döring/Bortz (2016), pp. 182 ff., in particular pp. 192 f.

325 See Döring/Bortz (2016), pp. 184 ff.

Table 1: Classification of the research design according to *Döring/Bortz*[326]

Classification of the research design	
Classification criteria	Manifestations
Research approach	- Purely quantitative study - Purely qualitative study - Mixed-methods study
Epistemic goal	- Basic research study - Applied research study
Subject matter	- Empirical study a) Original study b) Replication study - Methodological study - Theoretical study
Data basis	- Primary analysis - Secondary analysis - Meta analysis
Epistemic interest	- Exploratory study (object descriptive/theory building) - Descriptive study (population descriptive) - Explanatory study (hypothesis testing)
Research location	- Laboratory study - Field study
Number of investigation times (Chapter 1.3)	- Non-experimental study with and without repeated measurements a) Cross-sectional study b) Trend study c) Longitudinal/panel study
Number of investigation objects (Chapter 1.3)	- Group study a) Sample study b) Total population study - Single participant/case study

[326] See Döring/Bortz (2016), pp. 182 ff.

In view of the current state of research on the measurement of reporting quality, which reveals, in particular, conceptual deficits, this work is based on a self-developed research design (**original study**) and the use of self-collected data (**primary analysis**).[327] In order to answer the questions raised, the work is therefore **empirically** oriented, although the operationalization of reporting quality also includes elements of a **methodological** study.[328]

The insufficient empirical evidence available to date on the manifestation and development of reporting quality also requires that the empirical analysis should relate to 'real' financial reports, which is why the analysis takes place under natural conditions (**field study**).[329] The question of evaluation of the notes reporting and the associated limitation of the degrees of freedom of the research design by existing practical conditions led to the classification of the analysis in the field of evaluation research as **applied research**.[330] Resulting losses in the possibilities for explaining cause-and-effect relationships are acceptable, as the objective of this work is to explore and describe characteristics of reporting quality and not to analyze its causes and effects.[331] Decisions on the number of investigation times and objects are considered in detail as part of the sample selection in Chapter 1.3.

In view of this research design, **quality criteria** of quantitative and qualitative research are generally appropriate. However, the focus of this work tends to be on quantifying reporting quality, which is why quality criteria developed specifically for quantitative research are considered in the following.[332] For quantitative-empirical studies, the quality of the research design (or, more precisely, of the findings obtained from correspondingly conducted studies) is described by the guiding criterion of **validity**, which describes the degree of truth of scientific statements.[333]

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327 See Döring/Bortz (2016), pp. 186-192.

328 See Döring/Bortz (2016), pp. 186 ff.

329 See Döring/Bortz (2016), pp. 205-208.

330 On the topic of evaluation research, in particular, see Patton (2015), pp. 169 ff. See in general Döring/Bortz (2016), pp. 185 f. / pp. 976 ff.

331 See Shadish et al. (2002), pp. 96-102, in particular p. 100; Döring/Bortz (2016), pp. 205-208.

332 For an overview of criteria developed specifically for qualitative research, see, e.g., Döring/Bortz (2016), pp. 106 ff.

333 "Validity is that quality of research results that leads us to accept them as true, as speaking about the real world of people, phenomena, (…)." Krippendorff (2013), p. 329. See, on a fundamental level, Shadish et al. (2002), p. 34 and, on classification, Döring/Bortz (2016), p. 93.

Validity is usually systematized through two different approaches – conceptual, or with regard to the test methods to be applied. The conceptual systematization serves above all the understanding and qualitative discussion of the meaning/implication of scientific studies. The test-related systematization has been developed with a view to testing methods to be applied for the purpose of a quantitative evaluation of validity, in particular, whereby the corresponding criteria are frequently related to the evaluation of measuring instruments and are partly described as test quality criteria.[334] Both systematizations are important for the specification and evaluation of the research design and are therefore presented one after the other – starting with the conceptual systematization – and placed in the context of this work.

Conceptually, validity in the *Campbell* tradition is determined by the four quality criteria of external validity, construct validity, internal validity and statistical validity.[335] **External validity** is granted to the extent that the results can be generalized to other places, times, investigation objects etc., which is why in particular the research design, sample selection and construct validity have a significant influence on this.[336] **Construct validity** is granted if the applied measuring instruments and investigation conditions and thus, furthermore, the collected data of the study properly represent the underlying theoretical constructs.[337] Decisive factors for this are both a construct or concept specification that is as exact as possible, the result of which is a model for measuring the construct, and a corresponding operationalization of this construct, the result of which is an instrument for measuring the construct, including investigation conditions.[338] Both forms of validity therefore describe generalizations: From the measuring instrument and the investigation conditions to the construct to be measured (construct validity) as well as from the sample to the generality (external validity).[339]

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334 For overview and classification see, e.g., Himme (2009), in particular p. 485 and Döring/Bortz (2016), pp. 440-448.

335 See in detail, e.g., Campbell (1957) and Shadish et al. (2002), in particular pp. 33-102. For overview and classification see, e.g., Döring/Bortz (2016), pp. 93 ff. This distinction is not without criticism: see, e.g., the discussions in Reichardt (2011) in conjunction with Shadish (2011), in particular pp. 110-112 and Shadish et al. (2002), pp. 462 ff.

336 See Campbell (1957), in particular p. 297; Shadish et al. (2002), p. 83 / pp. 91-95. See also the overview by Himme (2009), pp. 496 ff., which uses the term 'generalizability'.

337 "Construct validity involves making inferences from assessments of *any* of the sampling particulars in a study to the higher-order constructs they represent." Shadish et al. (2002), p. 70. See also Shadish et al. (2002), pp. 38 f. / pp. 64 f. and Döring/Bortz (2016), pp. 97-99.

338 See Shadish et al. (2002), p. 69; Döring/Bortz (2016), pp. 98 f.

339 See Shadish et al. (2002), pp. 37 f.

Internal validity is granted to the extent that the knowledge gained allows conclusions to be drawn about causal (cause-and-effect) relations.[340] This requires the exclusion of alternative effects (competing hypotheses), which must be ensured in particular by the choice of the research design, especially in the form of controlled laboratory experiments.[341] This requirement of controlled conditions is fundamentally contrary to the requirements of external validity, which is why there is generally a conflict between attaining internal and external validity.[342] **Statistical validity** exists when statistical data analyses have been applied correctly, so that the relations of interest are correctly assessed with a high degree of certainty with regard to statistical over-randomness (significance) and effect size, and is thus an important prerequisite for internal validity.[343]

The focus of the research design of this work on an explorative-descriptive field study means that construct validity and external validity are prioritized at the expense of internal validity, which seems appropriate in view of the research questions to be answered.[344]

In addition to this conceptual systematization of the quality criteria, the need for a quantitative evaluation of validity has given rise to a second test-related systematization of quality criteria within the framework of test and measurement error theory, which is essentially based on the criteria of objectivity, reliability and validity.[345] **Objectivity** is understood to mean the independence of the measurement results from the persons carrying out the measurements (so-called

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340 See, at a fundamental level, Campbell (1957), in particular p. 297 and Shadish et al. (2002), in particular pp. 53 ff.

341 See, e.g., Shadish et al. (2002), pp. 1 ff. / p. 53; Smith (2017), p. 40.

342 See, at a fundamental level, Campbell (1957), in particular p. 297 and Shadish et al. (2002), pp. 96-102. See also the following statement in Smith (2017), p. 40: "If we have *internal validity* then we are able to eliminate rival hypotheses with confidence because we can specify causal relationships; we know what is causing what because we are controlling for all other influential factors. This scenario only precisely fits experiments under laboratory conditions, conducted under strict control and perhaps based on unrealistic assumptions. The findings may have no *external validity* whatsoever; they cannot be generalised to the 'real world' because they only apply in the laboratory."

343 See Shadish et al. (2002), pp. 42 ff. / p. 63; Döring/Bortz (2016), pp. 97 ff.

344 For classification and justification, in particular against the background of the frequently misunderstood "sine qua non" statement regarding internal validity, see the remarks in Shadish et al. (2002), pp. 97-102, in particular the following statement on p. 98: "Internal validity can have high priority only if a researcher is (…) interested in a descriptive causal question from among the many competing questions (…). Such competing questions could be about how the problem is formulated, (…) how best to measure something, (…) how meanings should be attached to findings (…). Experiments rarely provide helpful information about these questions, for which other methods are to be preferred."

345 See Döring/Bortz (2016), pp. 440-447.

"test users"); **reliability** is understood to mean the exclusion of random measurement errors in terms of reproducibility with regard to the relation of measured values to manifestations of the characteristics among the persons that exhibit these (manifestations of) characteristics (so-called "test subjects or takers").[346] Both criteria thus aim at an evaluation of the extent to which the generated measured values correspond to the actual manifestations of the characteristics among the persons that have these (manifestations of) characteristics. The fulfillment of both criteria is a necessary but not sufficient condition for achieving **validity**, which is defined as truth identical to the statements made above.[347] This means that due to the mere fact that, for example, the same manifestations of the characteristics among the same persons that have these (manifestations of) characteristics are converted from different persons to the same measured values at different points in time (so-called "test-retest reliability"[348]), no statement can be made about the truth content of these measured values in relation to the construct. In addition, an increasing degree of objectivity/reliability is usually accompanied by a loss of validity.[349]

Due to the syntactic similarity to the terms used in the accounting context in Part 3, a brief classification of these terms follows here.[350] Reliability in the context of accounting corresponds to validity/accuracy in the sense of the test/measurement error theory, since these terms express the proximity to the 'true' value. According to test/measurement error theory, the difference between the observed measured value and the 'true' value is due to a systematic error (bias) and a random error.

In the accounting context, **systematic errors** are reflected, for example, in the potential for bias and error due to differences in competence and incentive congruence of the manager, the prudence principle of accounting, etc. Furthermore, for example, the generation of information in the context of intangible assets (in comparison with tangible assets) is likely to show systematically larger deviations from the true value due to their different economic characteristics. The theoretical test terms objectivity and reliability can basically include systematic distortions, i.e., systematic influencing of the measurement by factors that are, for example, directly attributable

346 See overview and classification in Döring/Bortz (2016), pp. 442-445 and Himme (2009), pp. 485 ff.

347 See Krippendorff (2013), pp. 267-270, whereby it should be noted that objectivity is subsumed under reliability. See also Döring/Bortz (2016), pp. 444 f.

348 See, e.g., Döring/Bortz (2016), p. 444; Himme (2009), pp. 487 f.

349 See Krippendorff (2013), p. 270; Früh (2017), p. 120; Döring/Bortz (2016), p. 445.

350 On the following classification of the term, see the remarks in Part 3, Chapter 2.2, Himme (2009), pp. 485 ff. and Döring/Bortz (2016), pp. 440 ff.

to the test user or the test subjects (e.g., lying, setting of incentives not covered by the construct, or changes in characteristics between the measurement points in time). Since, however, the presence of systematic errors is addressed exclusively by validity testing methods, reliability tests focus only on random errors. Objectivity, on the other hand, is not tested separately at all, but is indirectly tested together with reliability as a necessary condition for reliability in the context of test theory.

In the context of test/measurement error theory, **random errors** are represented by the precision of the measured values and in the accounting context by verifiability, since this addresses the reproducibility of measurements. For example, counting money (epistemically objective) will have a lower dispersion and, thus, better verifiability than 'guesses' on successful technology trends in the next 100 years (epistemically subjective). Such errors can also be caused by other random factors, such as the attention paid by the people involved. In this sense, the theoretical terms objectivity and reliability (as they pertain to test theory) also address such random errors (along with the systematic errors). In the sense of classical test theory, however, systematic errors are excluded, so that tests for reliability theoretically aim solely at an assessment of random measurement errors, which is why reliability is sometimes also referred to as 'measurement accuracy'. If a deviation is detected during the repetition of a measurement, it must always be questioned whether this deviation is due to a systematic error (different test conditions, different manifestations of characteristics, etc.) or a random error (randomly distributed comprehension problems of the test users, etc.) – the test values alone do not facilitate statements on this matter.[351]

This clarification of terms shows that different semantics are used depending on the perspective (accounting-related or test-related). For better comprehensibility – in the sense of a direct reference to the practice of the use of terms in literature – this separation is maintained in the following. In the accounting context, for example, the term '(accounting-related) reliability' is used, while in the evaluation/testing context, on the other hand, the term '(test-related) reliability' is used, and each with the different meanings presented here.

As part of the **testing of these quality criteria**, **measurement/test methods** are applied which, even under ideal conditions, can naturally only partially measure objectivity, reliability and

[351] On this point, see Himme (2009), pp. 487 f.

validity and which are also subject to a large number of application premises which are considered to be not or less fulfilled in many applications, e.g., in the case of the existence of formative measurement models (see Chapter 1.2).[352] Due to the imparting of a semblance of the complete testability of validity, the traditional division of methods – e.g., in methods for testing content, construct and criterion validity – has been regarded as improper and misleading for several decades.[353] Nevertheless, evaluation in practice is often reduced to a schematic application of this traditional canon of methods, where a comparison of the results with unfounded standard (or rule of thumb) values is used to assess the quality of measuring instruments.[354] This approach does not do justice to the holistic understanding of evaluation, which should be based on the evaluation of the generated knowledge of a study (i.e., interpretations and conclusions made in the light of the results) and not only the evaluation of the measuring instrument.[355] In order to arrive at an appropriate overall assessment of the quality of the results, interpretations and conclusions, a reasonable selection of the test methods to be applied must be made, the results of which must be supplemented by qualitative considerations. Meanwhile, the selection depends on the concrete purpose of use, and may also be performed in the sense of limiting the test methods to be applied.[356]

The following specification and evaluation of the research design reflects this understanding. Due to the orientation as an original study, there are increased risks and, at the same time, opportunities with regard to the validity of the study, which is why the quality evaluation in Chapter 1.5 plays an important role.[357]

Figure 10 illustrates the relationships between the criteria as well as their consideration in this work.

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[352] See Döring/Bortz (2016), p. 277 / pp. 440 ff.; Himme (2009), p. 489; Krippendorff (2013), pp. 331-333.

[353] See overview and classification in Newton/Shaw (2013) and Döring/Bortz (2016), p. 442.

[354] See Döring/Bortz (2016), pp. 440-442.

[355] See Newton/Shaw (2013); Döring/Bortz (2016), pp. 440-442; Krippendorff (2013), pp. 331-333.

[356] See Newton/Shaw (2013), in particular pp. 313-316; Döring/Bortz (2016), p. 99 / pp. 440 ff. with further references. In this context, see also the criticism on the application of methods of empirical validity testing in Rossiter (2002) and Rossiter (2005).

[357] See also the following statement in Smith (2017), p. 39: "Ideally, an established construct will already be in existence to measure exactly what we want – this is the best of both worlds: reliability and construct validity. More often we are faced with a dilemma: either use an established construct which does not quite hit the target (threatening construct validity) or develop a new or adapted instrument (…) which does hit the target (threatening reliability). The former trade-off is the one most likely to be encountered in the accounting literature, though we might argue that we would prefer to see more of the latter." See also Healy/Palepu (2001), pp. 426 f.

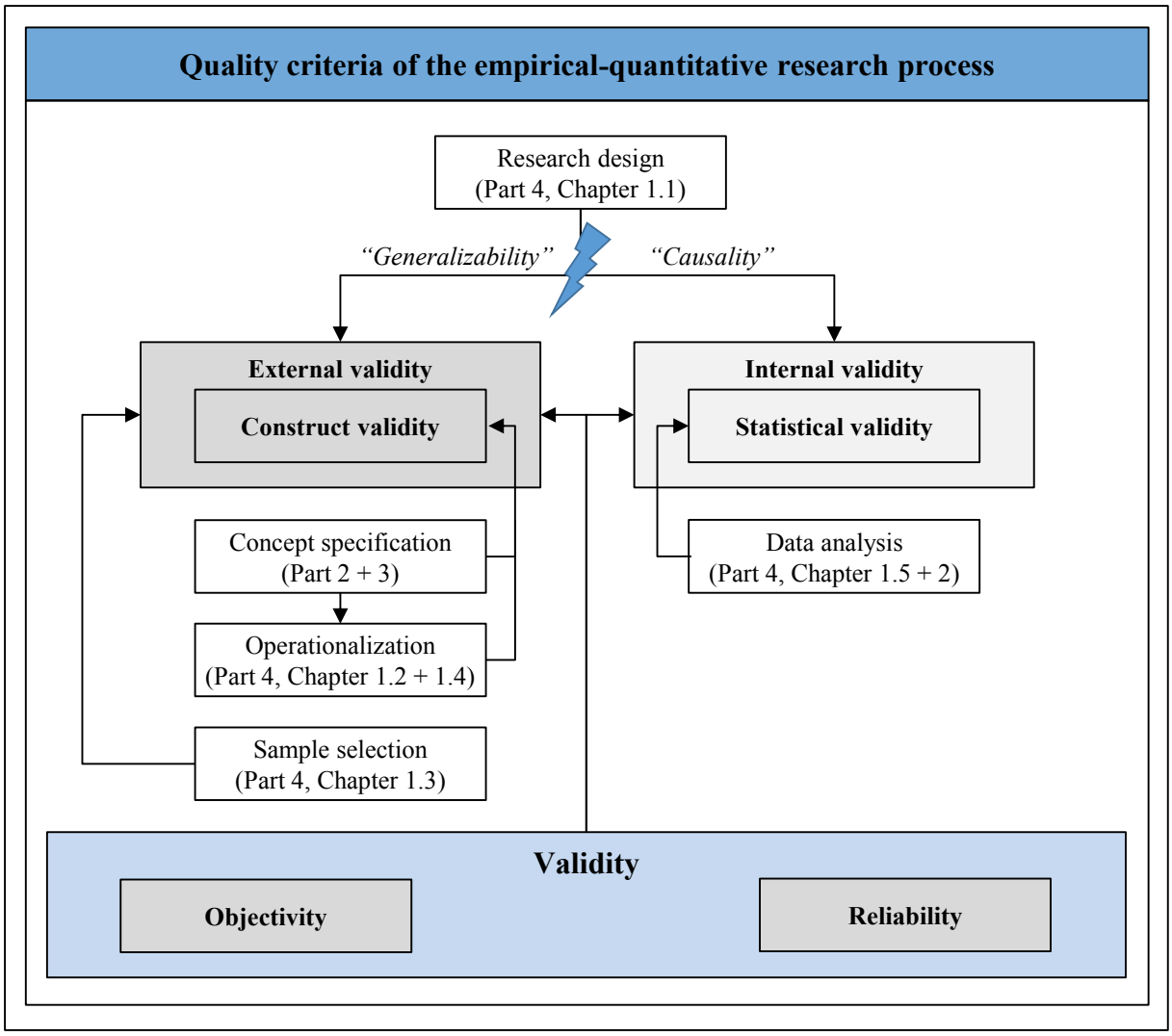

Figure 10: Quality criteria of the empirical-quantitative research process and their consideration in this work

1.2. Determination of the measurement model and the measurement method

Like many constructs in the social sciences, reporting quality is neither directly measurable nor observable, i.e., it is a **latent construct**.[358] For the measurement, therefore, directly observable indicators must be used that have causal relationships to the construct of interest that are ascertained as accurately as possible.[359]

The starting point of the measurement is the **construct or concept specification**, in the context of which the construct or concept is concretized by working out definitions and pointing out relations between associated aspects.[360] This specification has already been carried out in Part 2 and, in particular, in Part 3.

The resulting modeling of associations between indicator variables and the latent variable describes the **measurement model**, whereby reflective measurement models (in which the latent construct is modeled as the cause of the indicators) and formative measurement models (in which the indicators are modeled as the cause of the latent construct) are to be differentiated depending on the directions of effect/causality.[361] The findings of the concept specification of reporting quality suggest a formative measurement model,[362] since the identified construct dimensions (e.g., relevance) and the indicators still to be developed for these dimensions determine reporting quality, and not vice versa. The more relevant an item of information is, for example, the greater the quality of reporting, ceteris paribus. The reversal of this statement does not make sense because reporting quality is not an exogenous variable – i.e., one that may be considered to be separate from relevance – that determines the relevance of information. Reporting quality is therefore to be measured with a formative measurement model using various influencing indicators in the dimensions of relevance, reliability, etc. that still need to be developed.

The specification of a formative measurement model has far-reaching consequences for further **operationalization** and quality evaluation. In the case of formative measurement, there is no redundant measurement of the construct dimensions, which is why an index instead of a scale

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358 See Christophersen/Grape (2009), p. 103; Shadish et al. (2002), pp. 64 f. See also the statements on the measurability of reporting quality in Part 2, Chapter 1.

359 See Christophersen/Grape (2009), pp. 103 f.

360 See Döring/Bortz (2016), pp. 222-228; Christophersen/Grape (2009), pp. 109-111.

361 See Christophersen/Grape (2009), pp. 104-106; Döring/Bortz (2016), pp. 229 f.

362 See also the test schema in Christophersen/Grape (2009) with further references, pp. 109-111.

is required for operationalization and why the application of classical test theory and, thus, the use of many test methods and key figures used in the literature (e.g., Cronbach's alpha) is inapplicable for quality testing (see also the explanations in Chapter 1.5.1).[363]

To measure the construct within the specified framework, consisting of concept specification and measurement model, further operationalization has to be carried out according to the following steps:[364]

(1) Determination of the **measurement method**, i.e., answering the question of which data collection method is used, e.g., receiver or observer approaches;
(2) Determination of the measurable **indicators**, i.e., answering the question as to which manifestations of the theoretical construct of the objects of investigation are captured by which means, e.g., share price movements or disclosures about the exercise of discretion;
(3) Determination of the **measuring instrument**, i.e., answering the question of how numerical values are assigned to indicator manifestations and aggregated to an overall measured value for the construct, e.g., in the form of a weighted or unweighted index formation.

The further statements in this Chapter concern the determination of the measurement method. The determination of indicators and the measuring instrument is, due to the extent required, the subject of Chapter 1.4.

The determination of the **measurement method** must depend on the extent to which it is suitable for answering the research question of interest regarding the manifestation of notes reporting quality and regarding the research design already determined.[365] In view of the tendency toward a quantitative orientation of this work, more qualitatively oriented methods, e.g., the case study method,[366] are less suitable, and are therefore not considered further. The different variants of laboratory studies were already excluded in Chapter 1.1. In the area of field studies, it is therefore necessary to select from quantitatively oriented methods of survey, observational or archival studies, whereby survey studies examine persons, observational studies examine the

[363] See Döring/Bortz (2016), pp. 277 ff.; Himme (2009), p. 489.
[364] See, e.g., the overview in Döring/Bortz (2016), pp. 228 ff. and Christophersen/Grape (2009), pp. 111-114.
[365] See, e.g., Brosius et al. (2016), pp. 134 f.; Smith (2017), p. 72.
[366] See Smith (2017), pp. 162-177, in particular pp. 167-170 and, at a fundamental level, Yin (2018).

behavior of persons and archival studies examine documented results or 'traces' of human behavior as objects that have (manifestations of) characteristics.[367] A measurement of reporting quality in an observational study indicates the need for a reflective measurement model. Since this work is based on a formative measurement model, only archival and survey study methods will be examined further in the following.

In accounting research in archival studies, reporting quality is measured from a conceptual approach that is either market-based or accounting-based.[368] **Market-based** measurement is carried out indirectly by capturing price-related (e.g., bid-ask spread, trading volume) and intermediary-related (e.g., analyst following, analyst forecast error) characteristics of the information environment, whereby an effect of the construct reporting quality on these characteristics is assumed in the sense of a reflective measurement model.[369] Market-based direct studies, on the other hand, examine relationships between accounting information and market variables in order to conclude from this (the degree of) value relevance, conservatism/prudence, comparability, etc. as assumed indicators of reporting quality.[370]

In a negative sense, the following limitations must be considered for market-based archival studies. On the one hand, indirect measurement does not provide an answer to the research question of this work about the concrete manifestation of reporting quality (and its dimensions), since it is precisely the dimensions of reporting quality that these methods do not aim to measure, but rather their assumed effects. Analogously, market-based direct measurement methods also offer hardly any starting points for analyzing the manifestation of the information provided by reporting that is in question.[371] On the other hand, the premises of market-based methods

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367 On the definition, categorization and discourse with regard to the classification of studies, see Döring/Bortz (2016), p. 329 / p. 349 / p. 533, Brosius et al. (2016), pp. 183 ff. and Smith (2017), pp. 143 ff. / pp. 179 ff.

368 On this classification, see Francis et al. (2004), pp. 972 f. and Schipper (2010), pp. 321 f. In this work, analyst-based methods are subsumed under market-based methods.

369 See, e.g., Arping/Sautner (2013), in particular p. 1133; Reeb/Zhao (2013); Upadhyay (2014).

370 See, e.g., Lin et al. (2012), De Franco et al. (2011), Anderson et al. (2009), in particular pp. 209 f., Reeb/Zhao (2013) and the overview in Dechow et al. (2010).

371 See, e.g., Daske/Gebhardt (2006), p. 462 and the following statement in Früh (2017), p. 51: "Viertens setzt jede Wirkungsanalyse (…) zunächst die Beschreibung dessen voraus, was als Ursache aller Ergebnisse dieser Kommunikationsbeziehungen vorliegt. Wenn man keine näheren Angaben über eine Mitteilung macht, kann man z. B. auch nicht sinnvoll ihre Wirkungen spezifizieren." ["Fourthly, any impact analysis (...) first requires a description of what the cause is of all the results of these communication relationships. If one does not provide further details about a message, one is also unable, for example, to specify its effects in a meaningful way." Translation by the author].

and their fulfillment in practice are to be criticized, e.g., with regard to the intended value relevance of reporting and the efficiency of capital markets and/or omitted variables, which is why the construct validity or internal validity of these methods is clearly doubtful.[372] For these reasons, market-based methods are not used in this work.

Archival studies with **accounting-based** direct measurement of reporting quality consider published information from annual reports or similar reporting instruments in isolation from market variables. On the one hand, statistical properties of financial statement items are examined, i.e., their time series and accruing properties for the assessment of forecast suitability, earnings management, etc.[373] and, on the other hand, the content and presentation-related manifestation of reporting, e.g., with regard to the extent, topics and tabular presentation/preparation of the information provided[374].

Against the background of the conceptualization of reporting quality in Part 3, **statistical properties** are not convincing indicators of reporting quality, as users, for example, are not universally interested in a well-predictable net income or undistorted financial reporting, which is why the measurement of these characteristics can only be insufficiently interpreted as a measurement of reporting quality, with the result that construct validity is doubtful.[375] Moreover, there is no direct link between financial statement items with certain statistical properties and the quality of reporting in the notes, which underlines this reasoning.

The analysis of the **manifestation of reporting** utilizes the quantitative document/content analysis as a measurement method, in the course of which the manifestations of characteristics (that are research-relevant, i.e., relevant in relation to the research question to be answered) in documents, such as certain topics in annual reports, are coded according to a previously developed standardized category system (coding scheme), i.e., converted into measured

372 See Holthausen/Watts (2001); Bloomfield (2002); Williams/Ravenscroft (2015); Kühnberger (2014), p. 433; Wagenhofer/Ewert (2015), pp. 129 f. / pp. 160-163. On the problem of 'omitted variables' and its 'solution' see, for example, Patatoukas et al. (2015), in particular p. 2451 / p. 2454.

373 See, e.g., Lin et al. (2012) and the overview in Dechow et al. (2010).

374 See, e.g., Singhvi/Desai (1971); Beattie et al. (2004); Beattie et al. (2008); Merkley (2014); Abraham/Shrives (2014).

375 See, e.g., Ewert/Wagenhofer (2015); Wagenhofer/Ewert (2015), pp. 113-116; Kühnberger (2014), pp. 431 f. with further references; Williams/Ravenscroft (2015).

values.[376] Since, in addition to content analysis, only the quantitative survey remains as a potential measurement method within the framework of survey studies, a direct comparison of both methods is suitable, and it is summarized in Table 2.[377]

Table 2: Comparison of quantitative content analysis and quantitative surveys

Comparison of quantitative content analysis and quantitative surveys		
Criteria	Quantitative content analysis	Quantitative surveys
Content		
Capture of directly observable or documented situations	+	-
Capture of not-directly observable or undocumented situations	-	+
Capture of individual assessments	-	+
Capture of complex situations	+	-
Capture of past situations	+	-
Capture process		
Reactivity	+	-
Dependence on individual assessments	+	-
Observability	+	-
Degrees of freedom of sampling	+	-
Efficiency		
Effort related to the collection of raw data	+	-
Coding and training costs	-	+

[376] On content analysis see, at a fundamental level, Krippendorff (2013), Früh (2017) and the overview in Döring/Bortz (2016), pp. 553 ff. Quantitative content analyses can also be applied to qualitative documents that are collected, for example, as part of an interview. Due to the research design of this work, however, the quantitative content analysis is considered within the framework of a genuine document analysis, i.e., based on existing documents. See Döring/Bortz (2016), p. 534 and Smith (2017), pp. 184 f.

[377] See also the comparison of corresponding characteristics in Döring/Bortz (2016), pp. 553 f. and Brosius et al. (2016), p. 152.

The main advantages of quantitative surveys are based on the possibility of capturing undocumented facts while taking individual assessments into account.[378] However, this may also be viewed negatively, as this limits the (test-related) objectivity/reliability of the capture process.[379] This problem also exists with content analyses, but is transferred to the researcher, enabling the researcher to counter this problem more effectively.[380] Moreover, complex issues can be more difficult to capture through surveys, e.g., because answering questions would take too long.[381] Further disadvantages of surveys are that, in contrast to content analyses, they do not rely directly on existing raw data, but instead on research-generated data in the form of questionnaires, as a result of which the capture process influences the data material (reactivity) and the data collection – with regard to the resulting data quality – is not observable or is less observable for the researcher.[382] Due to the desired independence of the assessment from the motives or actions of actors directly involved in the communication process, content analyses are therefore also classified as observer approaches.[383] Moreover, as a result of higher data availability in the context of content analyses of annual reports, there are advantages with regard to the extended possibilities of appropriate sampling, because the number and composition of the analysis objects are not dependent on the achieved response rate of a survey.[384] In addition, past situations can also be analyzed, which is only possible to a very limited extent in surveys, e.g., due to the dependency on the respondents' ability to remember.[385] The higher data availability in the context of content analysis also offers advantages in terms of the generally lower

[378] See Döring/Bortz (2016), pp. 533 f. / p. 398.

[379] See Brosius et al. (2016), pp. 90 ff. / pp. 133-135 / p. 151; Döring/Bortz (2016), pp. 533 f.

[380] See Früh (2017), pp. 47-51 / pp. 127 f.; Brosius et al. (2016), p. 151.

[381] See Brosius et al. (2016), p. 134. See also Döring/Bortz (2016), p. 398 and Smith (2017), pp. 148 f.

[382] See Döring/Bortz (2016), p. 399 / pp. 533 f.; Brosius et al. (2016), pp. 110 ff. / p. 134 / p. 151. In the context of third party-generated data in databases such as Compustat and the AIMR database, see Smith (2017), pp. 179-181 and Healy/Palepu (2001), pp. 426 f.

[383] See Grüning (2011), p. 78. On the discussion of whether the content analysis can be regarded as a manifestation of an observational study or as a separate study category, see Brosius et al. (2016), pp. 183 ff., in particular pp. 185 f. and Döring/Bortz (2016), p. 329 / p. 349 / p. 533.

[384] See Döring/Bortz (2016), p. 537; Brosius et al. (2016), pp. 110 ff. / p. 151; Smith (2017), pp. 144 f. / pp. 153-155; Früh (2017), p. 43. However, there are also disadvantages with regard to representativeness, as not all firms prepare IFRS annual reports. This work is therefore limited to capital market-oriented groups. See, in general, Döring/Bortz (2016), p. 538 and Smith (2017), p. 180.

[385] See Brosius et al. (2016), p. 150; Döring/Bortz (2016), p. 537; Früh (2017), p. 43.

effort involved in collecting raw data, which, however, are usually offset by higher coding and training costs.[386]

The research focus of this work is on the generalized but nevertheless detail-resolving capture of reporting quality. The complexity of the construct to be measured, the necessity of the analysis of historical data as well as the need for an objectified/more well-objectified and detail-resolving measuring instrument lead – against the background of the advantages described in this regard – to the **preference** of the **quantitative content analysis** over the quantitative survey.

The classical content analysis is carried out manually, which in comparison with computer-aided approaches, in particular on the basis of artificial intelligence,[387] reduces on the one hand the analyzable sample size due to higher collection costs, thus weakening the external validity of the results, and on the other hand weakens the (test-related) objectivity/reliability of the results due to the error susceptibility or subjectivity of human action.[388] These disadvantages are often mentioned in comparison with measurement methods that rely on more readily available data, e.g., market-based measurement methods.[389] A manual content analysis, however, offers in return the chance of a significant strengthening of the construct validity of the results.[390] In the context of this conflict, construct validity is preferred in this work, which is why the manual quantitative content analysis is selected.[391]

For this purpose, the category system must be developed in a fundamentally transparent, well-documented and well-founded way, whereby particular attention must be paid to a theory/ concept-based deductive as well as a data-based inductive construction involving several

386 See Döring/Bortz (2016), p. 398 / pp. 537 f.; Smith (2017), pp. 151 f.

387 See, e.g., Grüning (2011), pp. 104 ff.

388 See Beattie et al. (2004), p. 233; Healy/Palepu (2001), p. 427; Krippendorff (2013), pp. 208 ff., in particular pp. 209-213; Brosius et al. (2016), pp. 179-181.

389 See, e.g., Beyer et al. (2010), in particular p. 311.

390 See Krippendorff (2013), pp. 208 ff., in particular pp. 209-213; Früh (2017), pp. 275 ff.; Brosius et al. (2016), pp. 179-181; Beattie et al. (2004), p. 233; Healy/Palepu (2001), p. 427.

391 This also appears justified in the light of the following statement: "(…) we know little about how mandatory IFRS adoption affects financial statements beyond the aggregate numbers retrieved from commercial databases (…). It is (…) still largely an open question whether financial statements have become more transparent and comparable following mandatory IFRS adoption, as measured by detailed financial reporting outcomes. To address this issue, we advocate more disclosure, compliance and accounting choice studies that rely on manually collected and thus finer data (…)." Brüggemann et al. (2013), p. 22.

data-gathering persons (coders), whereby the development process is to be characterized as iterative.[392] This combination of a deductive and inductive approach corresponds, with regard to the category development, to a combination of the quantitative and qualitative research processes, which is why the method thus understood is more accurately referred to as **integrative content analysis**.[393] The considerations made here are to be taken into account when determining the measuring instrument in Chapter 1.4.

Since in content analysis, due to its approach, the coder represents both the test user (the person responsible for carrying out the data collection and data analysis) and the test subject (the person responsible for generating the data) in the sense of test theory, the term 'objectivity' is subsumed in the following under the term '(test-related) reliability'.[394]

1.3. Selection and description of the samples

In Germany alone, there are currently approx. 700 to 750 IFRS preparers, excluding banks and insurance firms.[395] In view of the considerable effort involved in integrative content analysis, a total population study is not feasible and the analysis must, therefore, be based on a sample.[396] The focus is placed on the differences in reporting between firms at a certain point in time in order to gain detailed insights into the manifestations of reporting quality; longitudinal effects or trends are not considered by this design, which favors a detailed analysis.[397] In addition to the statements in Chapter 1.1, the research design of this work can therefore be characterized as a **cross-sectional study without repeated measurements** along with a **sample study**.[398] When choosing the point in time of the analysis, the extent to which this is an outlier (e.g.,

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392 See Döring/Bortz (2016), pp. 555-559; Früh (2017), pp. 66-68 / p. 97.

393 On the delimitation of qualitative, quantitative and integrative content analysis, see Früh (2017), pp. 66-68. See also the differentiation into a "Data-Driven Approach", "Theory-Driven Approach", "Prior-Research Driven Approach" and "Hybrid Approach" in Boyatzis (1998), pp. 29 ff.

394 On the delimitation of the terms see, e.g., Döring/Bortz (2016), pp. 442-445, the discussion in Chapter 1.1 and the delimitation of (test-related) reliability in Krippendorff (2013), pp. 267-270.

395 The analysis of the accounting regime for the financial years 2012 to 2014 of groups (excluding banks and insurance firms) domiciled in Germany in the Amadeus database (as on June 7, 2015) shows that an average of 731 firms (2012: 754; 2013: 751; 2014: 688) have prepared IFRS consolidated financial statements. For verification, see also Küting/Lam (2011), p. 992, which estimates the total number of capital market-oriented firms in Germany at around 1,000 in 2009.

396 See Döring/Bortz (2016), p. 538; Früh (2017), p. 98.

397 See also the argumentation in Botosan (1997), pp. 326 f., where the epistemic interest is primarily explanatory, however, which is why the analysis is further focused on one industry.

398 See Döring/Bortz (2016), pp. 210 f. / pp. 214 f.

against the background of possible regulatory changes) must be taken into account.[399] The following events were identified as potentially influencing in the context of the problem/research question of this work: the mandatory application of IFRS 13 for reporting years beginning on or after January 1, 2013 (IFRS 13 C1) and changes in impairment-related disclosure requirements for reporting years beginning on or after January 1, 2014 (IAS 36.140J). In order for this work to make a contribution to the distribution of the current reporting quality, it seems reasonable to limit the point in time to reporting years starting from January 1, 2014. The only firms selected were those whose complete (i.e., twelve-month) consolidated financial reporting year ended between December 31, 2014 and March 31, 2015 (reporting year 2014).

In integrative content analysis, three samples have to be selected from the target population: one development sample, one test sample and one examination sample.[400] The development with regard to the inductive revision of the category system first requires the selection of sample material within the framework of a **development sample**, which is not the subject of the main investigation.[401] The aim is the illustration and calibration of the category system to ensure high construct validity.[402] Therefore, this work relies on purposeful selection/sampling in the form of a qualitative sampling plan, according to which the sample material is to be selected in such a way that the range of manifestations of characteristics that are particularly important for the examined issue is as wide as possible.[403]

In contrast, the **examination sample** serves to generalize the findings, which is why a random selection in the form of a proportionally stratified random sample is used.[404] The strata are to be formed analogously to the qualitative sampling plan on the basis of relevant characteristics for the research problem.[405] The **test sample** in turn is randomly selected from the identified

399 On the importance of this assessment, see Dyckman/Zeff (2014), p. 697.

400 See Döring/Bortz (2016), pp. 556-558.

401 See Döring/Bortz (2016), p. 557. Some researchers propose a selection from the examination sample: see Früh (2017), pp. 149 f.

402 See Früh (2017), pp. 148 ff., in particular p. 150; Döring/Bortz (2016), p. 557.

403 See Döring/Bortz (2016), pp. 302-304. Another possibility would be to select a representative sample, e.g., in the form of a stratified random sample: see Früh (2017), pp. 99-101 / p. 148.

404 See Döring/Bortz (2016), pp. 312-314; Früh (2017), pp. 100 f. See also the criticism of the (barely existent) discussion of the manner of sampling in accounting research in Dyckman/Zeff (2014), in particular pp. 701-703, which recommends stratified random samples using experimental studies as an example. On this subject, see also the general remarks in Shadish et al. (2002), pp. 92 f.

405 See Döring/Bortz (2016), pp. 312-314; Früh (2017), pp. 100 f. / pp. 142 f.

strata of the examination sample and serves as a basis for the quality evaluation in terms of (test-related) reliability and validity.[406]

After determining the sample types, it is necessary to clarify which selection or stratification characteristics are to be used, how these are operationalized, how the target population is finally defined, and how extensively the respective samples are to be formed. The **sampling characteristics** to be selected are those which have a confirmed significance for the characteristic examined (reporting quality) and are easy to collect.[407] Against the background of this requirement profile and the state of research on influencing factors and consequences of reporting quality, the size, the industry and the intensity of intangible assets of firms are selected as sampling characteristics.[408] In order to limit the distortion of characteristics due to one-off effects such as extraordinary depreciations, disposals, etc., mean values of the inputs are used for the reporting years 2012, 2013 and 2014.

The **operationalization** of firm size is based on 'total revenue (sales)', 'total assets' and the 'number of employees' at the end of each financial year.[409] These three parameters are combined into a size index on the basis of the mean value of their ranks,[410] using the temporal mean values of each parameter as the basis for ranking. The market value of equity (and other market parameters such as share turnover) partly included in the literature is not used because this would limit the population to listed firms.[411] The operationalization of industries is carried out via the 'industry classification' according to NACE-Code Rev. 2 (2008), whereby the individual industries are aggregated into four macro-industries as follows to ensure an appropriate distribution in view of the limited sample size:[412]

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406 See Früh (2017), p. 149 / pp. 179 ff., in particular pp. 182 f. Due to the small number of cases, however, the examination sample is used to ensure the statistical validity of the analyses in connection with the empirical evaluation of construct validity (see Chapter 1.5.3.2).

407 See Döring/Bortz (2016), pp. 303 f. / p. 313; Früh (2017), pp. 142 f.

408 On firm size and industry see, e.g., Hodgdon/Hughes (2016), Botosan (1997), in particular pp. 326 f. and the overview in Grüning (2011), pp. 178-184 / pp. 195-201 / pp. 274-278. On the intensity of intangible assets, see Glaum et al. (2013a) and Bepari et al. (2014).

409 Similarly, see, e.g., Grüning (2011), p. 184; Glaum et al. (2013a), p. 172.

410 See Glaum et al. (2013a), p. 172 / p. 177.

411 On the use, see, e.g., Glaum et al. (2013a), p. 172.

412 On the NACE classification see, on a fundamental level, eurostat (2016). As for the aggregation, however, on the basis of the old NACE code, see Grüning (2011), p. 201 / p. 275.

(1) A to F: Productive activities
(2) G: Retail & trade
(3) K: Financial and insurance activities
(4) H to J and L to U: Services

The intensity of intangible assets is calculated on the basis of the ratio of intangible assets to total assets (as reported in the statement of financial position)[413] aggregated over time by calculating the mean of the three respective intensities of each reporting year. Due to the focus of this work on intangible assets, non-capitalized research and development expenses are not reflected in this intensity indicator.

In order to be able to make at least limited statements about a **target population**, this should not be composed of all IFRS preparers worldwide. Rather, the target population in the context of this work is limited to firms applying IFRS that are domiciled in Germany. With regard to the research question under consideration, a limitation is also made to firms for which the average intensity of intangible assets, in relation to the reporting years 2012 to 2014, is at least 1 %. This is based on the assumption that an evaluation of the quality of the notes reporting on intangible assets is only meaningful for firms that feature recognized intangible assets.[414] In addition, firms with subgroup consolidated financial reports are excluded from the population in order to avoid double counting.[415]

The **required data** are taken from the Amadeus database[416] which, in comparison to other databases such as Compustat and Datastream, also contains data on non-listed firms and, thus, represents the population much more comprehensively. In contrast, it must be accepted that no data are available on banks and insurance firms. In Amadeus, only other firms in the macro industry (3) (financial service providers without banking and insurance activities) are listed, i.e., this industry is incompletely represented. In order to be able to precisely define the target population, the macro industry (3) (financial and insurance activities) is therefore completely

413 On the example of goodwill intensity, see Glaum et al. (2013a), in particular p. 171 and Bepari et al. (2014), in particular p. 123.

414 This procedure is also referred to as "relevance sampling" – see Krippendorff (2013), pp. 120 f.

415 For example, Audi AG, Fresenius Medical Care AG & Co. KGaA and Beiersdorf AG prepare subgroup consolidated financial reports, which in turn are included in the consolidated financial reports of the parent firms Volkswagen AG, Fresenius Management SE and Maxingvest AG. Only the consolidated financial reports of the latter firms are part of the target population.

416 The download took place on May 19, 2016, release number 260, with the last data update on May 13, 2016.

excluded from the analysis in this work. The data were comprehensively checked manually on the basis of the information published in the Federal Gazette (Bundesanzeiger) without the discovery of any objections, and supplemented in the event of data gaps.

Thus, the target population of this study is finally defined. As can be seen from Table 3 and Table 4, of the original 688 IFRS preparers domiciled in Germany (excluding banks and insurance firms) that prepared consolidated financial statements in the reporting year 2014 (population (*1*)), there remain 403 preparers for whom a uniform IFRS database for the reporting years 2012-2014 is available and for whom the above-mentioned limitations apply (population (*6*)). The reconciliation from population (*1*) to population (*6*) (the 'target population') is carried out in detail according to the following cumulative exclusion criteria:

- Firms for which no information from IFRS consolidated financial reports for the reporting years 2012-2014 was available in the Amadeus database as on May 19, 2016 (population (*2*))
- Belonging to industry (3) (financial and insurance activities) (population (*3*))
- Preparation of a subgroup consolidated financial report if the parent firm is also part of the target population (population (*4*))
- The annual period ends on a date outside the period December 31, 2014-March 31, 2015 (population (*5*))
- The average intensity of intangible assets is less than 1 % (population (*6*))

The 'development', 'examination' and 'test' samples (populations (*7*)-(*9*)) are selected from population (*6*).

For the **sample size** of the **development sample**, one to three cases (firms) are recommended for each manifestation of each characteristic, with approximately three characteristics taken into consideration.[417] The number of characteristics and the manifestations of the industry characteristic are already set at three. In order to achieve the widest possible range of reporting quality manifestations, the largest and smallest firms in each industry are selected first. In a second step, the firms with the highest and lowest intensity of intangible assets in each industry are

[417] See Döring/Bortz (2016), pp. 303 f.

selected from the remaining firms. The result is a sample size of 12 different firms or annual reports,[418] which corresponds to the above-mentioned recommendations.

For the **examination sample**, the sample size chosen is about five times as large (about 60 firms) as the development sample. This sample size restricts the external validity of the analysis, but can be justified as a result of weighing up the considerable effort involved in content analysis. For the stratification, the firms are divided into two groups (small or large and low or high, respectively) on the basis of their characteristics of size and intensity of intangible assets by comparison with the respective size or intensity median. In conjunction with the industry classification, this results in 12 strata to which the target population is distributed, as shown in Table 5. Selecting a fixed percentage of firms per stratum results in a proportionally stratified random sample that reflects the distribution of the objects (firms) that have (manifestations of) characteristics in the population.[419] In this work, 15 % are selected per stratum. This percentage ensures that each stratum is represented in the sample and that the above-mentioned target sample size is achieved (62 firms, see Table 5). In this regard, special attention was paid to ensure that no firms in the development sample were included in the examination sample.

The proposed size of the **test sample** is between 10 % and 20 % of the examination sample, with proportional stratification also desirable.[420] In view of the distribution of the population to the strata, a quota of 20 % is set. As firms of industry (2) (retail & trade) are scarcely present in either the target population or the examination sample, they are not included in the 'test sample' (*9*) (see Table 4; Table 5).

Looking at the location and distribution parameters of the firm characteristics in Table 3, it can be seen that the 'target population' (*6*) tends to comprise larger firms with a higher intensity of intangible assets than the 'initial population' (*2*). Table A 1 (Appendix I) shows that this difference is due in particular to the exclusion of low-intensity firms between populations (*5*) and (*6*). The industry distribution shifts slightly in favor of sector (4) (services) (see Table 4; Table A 2 (Appendix I)).

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418 The number is calculated according to the combination possibilities of the manifestations of the characteristics: 3*2*2*1 = 12. Consequently, 12 different annual reports are selected.

419 See Döring/Bortz (2016), p. 314.

420 See Döring/Bortz (2016), p. 558; Früh (2017), p. 149 / pp. 179 ff., in particular pp. 180 f.

Decisive for the external validity of the analysis is the question of whether there are also considerable differences between the 'examination sample' (*8*) and the 'target population' (*6*). With regard to the results in Table 6 and the distribution to strata in Table 5, there is no indication of this. Rather, the results in Table 6 corroborate that there are significant differences between the 'initial population' (*2*) and the 'target population' (*6*), but not between the 'target population' (*6*) and the 'examination sample' (*8*).[421] All in all, this indicates that the results of the analysis to be carried out can be appropriately generalized to the 'target population' (*6*), but not to the 'initial population' (*2*). A description of the firms included in each sample is provided in Appendix I (Table A 3; Table A 4; Table A 5).

[421] Since the 'examination sample' (*8*) is a subset of the 'target population' (*6*) and this, in turn, is a subset of the 'initial population' (*2*), the respective complements of populations (*2*) and (*6*) are used for comparison. Complements are the respective difference of sets such that, for example, set (*2*) \ (*6*) contains all firms from population (*2*) that are not contained in population (*6*) ('(*2*) without (*6*)').

Table 3: Description of the populations by size and intensity

Population	(2)	(6)	(7)	(8)	(9)
n	628	403	12	62	12
					Average revenue in reporting years 2012-2014 (thousand EUR)
Mean	3,329,042	4,125,745	24,803,518	2,204,786	5,058,694
Stand. dev.	13,220,717	15,611,534	57,130,743	5,527,011	10,761,615
Minimum	0	363	433	4,626	15,960
Maximum	197,380,336	197,380,336	197,380,336	33,524,300	33,524,300
P_1	752	3,566	433	4,626	15,960
P_{25}	80,688	100,137	18,076	95,773	73,713
P_{50}	265,214	326,646	903,606	379,753	338,773
P_{75}	1,341,559	1,681,700	18,025,191	1,329,088	1,911,015
P_{99}	60,319,668	73,476,000	197,380,336	33,524,300	33,524,300
					Average total assets in reporting years 2012-2014 (thousand EUR)
Mean	4,467,302	5,081,636	38,855,823	2,573,740	5,683,464
Stand. dev.	20,773,992	23,073,002	97,166,493	7,017,449	12,088,749
Minimum	182	1,392	1,392	5,633	52,049
Maximum	328,353,664	328,353,664	328,353,664	34,571,000	34,571,000
P_1	5,999	6,519	1,392	5,633	52,049
P_{25}	90,400	85,402	46,095	119,180	151,115
P_{50}	325,703	322,516	767,246	299,423	380,435
P_{75}	1,616,949	1,584,059	7,236,467	1,406,497	1,644,920
P_{99}	105,022,000	118,483,336	328,353,664	34,571,000	34,571,000
					Average number of employees in reporting years 2012-2014
Mean	11,920	14,273	69,276	12,219	33,623
Stand. dev.	44,093	49,606	163,469	33,646	68,616
Minimum	0	9	9	18	20
Maximum	543,918	543,918	543,918	183,037	183,037
P_1	4	18	9	18	20
P_{25}	346	396	58	442	565
P_{50}	1,218	1,530	925	1,488	1,757
P_{75}	5,229	6,441	22,987	6,458	13,818
P_{99}	232,797	276,615	543,918	183,037	183,037
					Average intensity of intangible assets in reporting years 2012-2014 (%)
Mean	17.08	19.77	28.28	19.92	19.96
Stand. dev.	18.03	17.21	26.04	15.96	18.57
Minimum	0.00	1.09	1.09	1.53	2.13
Maximum	88.10	88.10	88.10	69.24	52.52
P_1	0.00	1.30	1.09	1.53	2.13
P_{25}	2.89	6.62	4.62	6.89	5.32
P_{50}	10.41	13.94	24.94	13.97	14.30
P_{75}	26.92	30.49	43.68	30.90	33.13
P_{99}	71.98	71.98	88.10	69.24	52.52

(The table is continued on the next page.)

Table 3 (Continued)

This table describes the different populations with regard to the location and distribution parameters of their characteristics 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). Population (*2*) comprises groups domiciled in Germany (excluding banks and insurance firms) for which information from IFRS consolidated financial reports for the reporting years 2012-2014 were available in the Amadeus database as on May 19, 2016. Partly existing data gaps were closed with information published in the Federal Gazette (Bundesanzeiger). Population (*6*) represents the 'target population' and corresponds to population (*2*) less firms that meet the following exclusion criteria: Belonging to industry (3) ('financial and insurance activities'); preparation of a subgroup consolidated financial report if the parent firm is also part of the target population; the annual period ends on a date outside the period December 31, 2014-March 31, 2015; the average intensity of intangible assets is less than 1 %. From population (*6*), the populations (*7*), (*8*) and (*9*) are selected in the form of the 'development', 'examination' and 'test' samples. All calculations are performed with Stata 13.1 IC software.

Table 4: Description of the populations by industry

Population	(1)	(2)	(6)	(7)	(8)	(9)
n	688	628	403	12	62	12
n* = n - n(3)	619	572				
						Industry (1): Productive activities
Quantity	171	164	111	4	17	4
Share (%)	24.85	26.11	27.54	33.33	27.42	33.33
Share* (%)	27.63	28.67				
						Industry (2): Retail & trade
Quantity	44	42	28	4	5	0
Share (%)	6.40	6.69	6.95	33.33	8.06	0.00
Share* (%)	7.11	7.34				
						Industry (3): Financial and insurance activities
Quantity	69	56	0	0	0	0
Share (%)	10.03	8.92	0.00	0.00	0.00	0.00
						Industry (4): Services
Quantity	404	366	264	4	40	8
Share (%)	58.72	58.28	65.51	33.33	64.52	66.67
Share* (%)	65.27	63.99				

This table describes the distribution of the different populations among the industries (1)-(4). Population (*1*) comprises groups domiciled in Germany (excluding banks and insurance firms), for which a preparation of the consolidated financial report in accordance with IFRS for the reporting year 2014 was recorded in the Amadeus database as on May 19, 2016. Population (*2*) was reduced by dropping firms for which no information from IFRS consolidated financial reports for the reporting years 2012-2014 was available in the Amadeus database as on May 19, 2016. Partly existing data gaps were closed with information published in the Federal Gazette (Bundesanzeiger). Population (*6*) represents the 'target population' and corresponds to population (*2*) less firms that meet the following exclusion criteria: Belonging to industry (3) ('financial and insurance activities'); preparation of a subgroup consolidated financial report if the parent firm is also part of the target population; the annual period ends on a date outside the period December 31, 2014-March 31, 2015; the average intensity of intangible assets is less than 1 %. From population (*6*), the populations (*7*), (*8*) and (*9*) are selected in the form of the 'development', 'examination' and 'test' samples. For better comparability, the quantity n* or share* adjusted for firms in sector (3) is also reported for populations (*1*) and (*2*). The firms are allocated to industries according to their NACE code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); K ('financial and insurance activities'); other ('services'). All calculations are performed with Stata 13.1 IC software.

Table 5: Description of the target population and the examination sample by strata

	Population	(6)		(8)	
	n	403		62	
	Stratum	Quantity	Share (%)	Quantity	Share (%)
	Productive activities, large, high intensity	17	4.22	3	4.84
	Productive activities, large, low intensity	39	9.68	6	9.68
	Productive activities, small, high intensity	21	5.21	3	4.84
	Productive activities, small, low intensity	34	8.44	5	8.06
	Retail & trade, large, high intensity	7	1.74	1	1.61
	Retail & trade, large, low intensity	5	1.24	1	1.61
	Retail & trade, small, high intensity	6	1.49	1	1.61
	Retail & trade, small, low intensity	10	2.48	2	3.23
	Services, large, high intensity	71	17.62	11	17.74
	Services, large, low intensity	61	15.14	9	14.52
	Services, small, high intensity	79	19.60	12	19.35
	Services, small, low intensity	53	13.15	8	12.90

This table describes the distribution of the 'target population' (*6*) over twelve strata, which are defined by combinations of the characteristics productive activities, retail & trade and services ('industry'), large and small ('size') as well as high and low ('intensity'). The firms are allocated to industries according to their NACE code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); H to J and L to U ('services'). By comparison with the respective size or intensity median, the firms are also divided into two groups (large or small and high or low) on the basis of their characteristics 'size' and 'intensity of intangible assets'. The 'examination sample' (*8*) is a proportionally stratified random sample in which 15 % of the firms per stratum are randomly selected from the 'target population' (*6*). All calculations are performed with Stata 13.1 IC software.

Table 6: Comparison of the initial population and the target population with the examination sample

Population	A: (2) \ (6)	B: (6) \ (8)	C: (8)		Population comparison
n	225	341	62	A, B, C	A, B
					B, C
				Average revenue in reporting years 2012-2014 (thousand EUR)	
Mean	1,902,059	4,475,010	2,204,786	ANOVA	t
Stand. dev.	6,976,452	16,789,495	5,527,011	uneq. var.	-2.5194** (0.0121)
Minimum	0	363	4,626		1.0534 (0.2928)
Maximum	74,834,664	197,380,336	33,524,300		
P_1	0	3,214	4,626	Kruskal-Wallis	Wilcoxon
P_{25}	58,265	102,233	95,773	8.9521** (0.0114)	-2.8939*** (0.0038)
P_{50}	199,066	316,861	379,753		0.1588 (0.8738)
P_{75}	836,545	1,711,565	1,329,088		
P_{99}	40,435,668	77,769,336	33,524,300		
				Average total assets in reporting years 2012-2014 (thousand EUR)	
Mean	3,366,963	5,537,617	2,573,740	ANOVA	t
Stand. dev.	15,832,934	24,884,753	7,017,449	1.0259 (0.3591)	-1.1622 (0.2456)
Minimum	182	1,392	5,633		0.9303 (0.3528)
Maximum	200,001,600	328,353,664	34,571,000		
P_1	4,696	7,541	5,633	Kruskal-Wallis	Wilcoxon
P_{25}	93,458	79,286	119,180	0.0691 (0.9660)	-0.2437 (0.8075)
P_{50}	332,738	322,523	299,423		-0.0403 (0.9679)
P_{75}	1,624,698	1,662,228	1,406,497		
P_{99}	45,442,000	132,815,336	34,571,000		
				Average number of employees in reporting years 2012-2014	
Mean	7,706	14,647	12,219	ANOVA	t
Stand. dev.	31,591	52,014	33,646	1.6847 (0.1863)	-1.9735** (0.0489)
Minimum	0	9	18		0.3542 (0.7234)
Maximum	380,800	543,918	183,037		
P_1	0	16	18	Kruskal-Wallis	Wilcoxon
P_{25}	162	394	442	17.0995*** (0.0002)	-4.0302*** (0.0001)
P_{50}	764	1,539	1,488		0.1120 (0.9108)
P_{75}	3,248	6,242	6,458		*Average size 2012-2014*
P_{99}	159,004	279,638	183,037		*0.0800 (0.9362)*
				Average intensity of intangible assets in reporting years 2012-2014 (%)	
Mean	12.28	19.74	19.92	ANOVA	t
Stand. dev.	18.50	17.45	15.96	12.9418*** (0.0000)	-4.8627*** (0.0000)
Minimum	0.00	1.09	1.53		-0.0732 (0.9417)
Maximum	76.57	88.10	69.24		
P_1	0.00	1.29	1.53	Kruskal-Wallis	Wilcoxon
P_{25}	0.27	6.48	6.89	82.3792*** (0.0001)	-8.7521*** (0.0000)
P_{50}	2.54	13.94	13.97		-0.4172 (0.6765)
P_{75}	14.98	30.21	30.90		
P_{99}	69.23	72.86	69.24		

(The table is continued on the next page.)

Table 6 (Continued)

The purpose of this table is to assess the extent to which the 'examination sample' (*8*) differs from the 'target population' (*6*) and the 'initial population' (*2*) regarding their characteristics 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). Since the 'examination sample' (*8*) is a subset of the 'target population' (*6*) and this, in turn, is a subset of the 'initial population' (*2*), the respective complements of the populations (*2*) and (*6*) are used for comparison (populations A and B, respectively). In addition to a description of the different populations with regard to the location and distribution parameters of their characteristics, the results of statistical tests for differences in these parameters between the populations are reported (H_0: No differences are present). Populations A, B and C are compared using the single-factor between-subjects analysis of variance (ANOVA) and the Kruskal-Wallis one-way analysis of variance by ranks (Kruskal-Wallis). Populations A and B as well as B and C are compared using the *t*-test for two independent samples (t) and the Wilcoxon rank-sum test (Wilcoxon). The respective test statistics are reported with the corresponding (nondirectional/two-tailed) *p*-values in brackets. * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. In the event that at least two out of three tests for equality of variance (homogeneity of variance) (according to Levene as well as Brown and Forsythe) have a *p*-value < 0.1 (results not presented), the ANOVA values are not presented (uneq. var.) due to non-compliance with the underlying premises and the t values are calculated using the *t*-test for unequal variances. Results of further tests for normality (Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality) of the characteristics in the individual subpopulations and population (2) reject a normal distribution with $p < 0.01$, which is why the classical tests for equality of variance (homogeneity of variance) (*F*-test and Bartlett's test, respectively) are not considered due to their susceptibility to violations of the normality assumption. For this reason, limitations of the statistical validity of the ANOVA and *t*-test must also be presumed, which is why the focus in the interpretation must be on the non-parametric alternatives (Kruskal-Wallis and Wilcoxon). All calculations are performed with Stata 13.1 IC software.

1.4. Determination of the indicators and the measuring instrument

1.4.1. Procedure for the integrative content analysis

For the operationalization of the construct within the framework of the integrative content analysis, a standardized category system is to be developed in the first step, with which the manifestations of characteristics (that are research-relevant, i.e., relevant in relation to the research question to be answered) of the objects of investigation are translated (coded) into measured values/indicators (Chapter 1.4.3-1.4.4).[422] This is followed in a second step by considerations on scaling and combining/aggregating these indicator manifestations to form a measuring instrument (Chapter 1.4.5).

Particularly when developing the category system, it must be taken into account that the categories and their manifestations must meet the following **four criteria** so that the research design can fulfill the requirements of (test-related) reliability and validity:[423]

(1) **Completeness/exhaustivity**: The categories/manifestations must exhaustively represent the characteristic or meaning of interest of the respective object of investigation – i.e., the indicators must represent all aspects of the construct of interest.
(2) **Unambiguity/accuracy**: The categories/manifestations must be exactly defined so that they represent only the characteristic or meaning of interest (and not any other) of the respective object of investigation and this in exactly one single way – i.e., such that the indicators only represent the construct of interest (and no other construct(s)).
(3) **Mutual exclusivity/precision**: The categories/manifestations must be mutually exclusive so that only exactly one category/manifestation represents the characteristic or meaning of interest of the respective object of investigation – i.e., that the indicators do not overlap within the limitations of the construct of interest.
(4) **Systematization of the procedure/invariance of the coding rules**: The time of coding must not have any influence on the analysis, so that the categories/manifestations remain unchanged in their representation of the characteristic or meaning of interest of the respective object of investigation over the course of the investigation.

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422 See also the statements in Chapter 1.2.

423 See Döring/Bortz (2016), p. 238 / p. 557; Früh (2017), pp. 80-85 / pp. 90 f.; Krippendorff (2013), pp. 132 f. / pp. 150-152 / pp. 155 f.

The definition of the **categories/manifestations** can be either formal-syntactic or contentual-semantic, depending on the question to be answered. A formal-syntactic definition refers to formal characteristics of the object of investigation (document, sentence, etc.), such as the number of characters or key terms, regardless of their meaning.[424] Such definitions are easy to standardize and easy to apply, which is conducive to the (test-related) reliability of the content analysis.[425] The meaningfulness, however, is inevitably limited to constructs for which formal characteristics are of interest.[426] In the context of this work, this applies to the information presentation/preparation. A contentual-semantic definition, on the other hand, refers to semantic characteristics of the object of investigation, such as the precision of the disclosed useful life – regardless of its presentation.[427] In contrast to formal definitions, semantic definitions are often difficult to formulate without a degree of ambiguity or in a standardized manner and, thus, often place higher demands on the interpretation of the coders, which is detrimental to the (test-related) reliability of the content analysis.[428] However, the meaningfulness of the categories/manifestations for constructs in which meanings are of interest is only given if these categories/manifestations are defined semantically.[429] In the context of this work, the information content is therefore to be captured by semantically defined categories/manifestations, even if restrictions inevitably arise thereby with respect to (test-related) reliability.

In line with the already established preference for validity, these restrictions are, in principle, acceptable. A complete renunciation of (test-related) reliability, however, is out of the question, because in this case the analysis cannot provide meaningful results.[430] Rather, (test-related) reliability and validity have to be appropriately weighed in the course of the development and application of the category system.[431] The appropriate ratio cannot be determined in general

424 See Früh (2017), pp. 84-89; Döring/Bortz (2016), p. 553.

425 See Früh (2017), pp. 84-89 / pp. 114-117; Döring/Bortz (2016), p. 563.

426 See Früh (2017), pp. 84-89.

427 See Früh (2017), pp. 84-89; Döring/Bortz (2016), p. 553.

428 See Früh (2017), pp. 84-89 / pp. 114-117; Döring/Bortz (2016), p. 563.

429 See Früh (2017), pp. 84-89 / pp. 114-117; Döring/Bortz (2016), p. 554.

430 See Früh (2017), pp. 120 f.

431 See Früh (2017), pp. 120 f.

terms, but must be decided by the researcher on a discretionary basis, which is why strict documentation and disclosure of this decision (process) and the resulting measuring instrument is mandatory.[432]

These considerations apply analogously to the definition of the **investigation objects**.[433] A formal definition determines a word, sentence, section, table, etc. as a reference entity.[434] A semantic definition, on the other hand, focuses on the "unit of meaning", i.e., the entire section in which statements can be found in association with the definition of the respective category/manifestation.[435] Since the reporting on intangible assets in the notes – with the exception of the reporting instrument 'notes' – can hardly be restricted to formalized investigation objects according to the pattern 'Heading: intangible assets as indicated in the outline', semantic definitions of the investigation objects are predominantly used in this work, e.g., 'all firm-specific statements in the notes in connection with the useful life of intangible assets'.

In order to better differentiate the objects of investigation, a distinction is often made between the **sampling unit** or **unit of analysis** to which the entire content analysis refers ('notes reporting on intangible assets') and the **coding unit** or **unit of coding** to which the respective coding refers (e.g., 'all firm-specific statements in the notes in connection with the useful life of intangible assets').[436] The coding unit is therefore always a subset of the unit of analysis.[437]

1.4.2. Preliminary thoughts on and procedure for the determination

On the basis of the conceptualization of reporting quality, suitable indicators must be developed for both the (material) information content and the (formal) information presentation/preparation.

There is also the problem that the construct dimensions of the information content are particularly interdependent at the conceptual level. At this point, the existence of this interdependence is assumed for the moment and is discussed in more detail in Chapter 1.5.2.2. On the basis of the considerations in Part 3, however, it can already be stated at this point that users who, for

[432] See Früh (2017), pp. 120-122.

[433] See Früh (2017), pp. 84-89; Krippendorff (2013), pp. 109-111.

[434] See Früh (2017), pp. 84-89; Krippendorff (2013), p. 105.

[435] See Früh (2017), pp. 84-89; Krippendorff (2013), pp. 106-109.

[436] See Krippendorff (2013), pp. 99-101; Boyatzis (1998), pp. 62 f.; Früh (2017), pp. 86-90.

[437] See Krippendorff (2013), p. 100.

example, require different information depending on the underlying function will have different information content requirements for one and the same unit of information. This interaction of functions can also be reflected, for example, in the principles of relevance and reliability. This conceptual interdependence causes problems at the measurement level, because conceptual interdependence results in the fact that the individual construct dimensions cannot be identified separately at the measurement level, i.e., in separate indicators of relevance and reliability, for example. An allocation of individual indicators to individual construct dimensions would be a measurement of the construct that is unrealistic and, therefore, invalid.

The decomposition of the measurement problem into individual and separate indicators is, however, exactly what is necessary for the conduction of an integrative content analysis, since this method is significantly influenced by the bounded rationality of the human coder. The issue may be formulated using an example: At the conceptual level, the information content can be considered logically in terms of its principles of relevance and reliability. At the measurement level, however (i.e., when screening (examining) the notes reporting), these considerations are too abstract. For example, lists with required information (useful life, discount rate, etc.) are required in which the coding has been broken down into processable parts.

Therefore, two separate solutions are required – a concept solution and a measurement solution. Both are connected, because the measurement cannot be developed properly without the concept. Furthermore, both must be documented, as otherwise no evaluation of the depiction/representation quality of the construct can be made. This includes documenting the conceptual level as such and in relation to the construct reporting quality. This also includes documenting the measurement level itself and in relation to the conceptual level. However, it does not make sense to establish a reference to the broadly defined conceptual level (and the construct) at any narrowly defined point on the measurement level if this is not to result in redundancies and incompleteness in the argumentation.

These problems are exacerbated by inductive development, which is part of the integrative content analysis. The indicators are the result of a deductive and inductive cognitive/recognition process of the author. The documentation of the individual steps of this circular process is important in order to understand why measurements were made in one way and not another, and how the relation to the construct is considered. However, these steps cannot be allocated to the presentation of the individual indicators without repetitions.

To solve these problems, the documentation of the measurement is largely separated from the documentation of the relation of the measurement to the construct. The **documentation of the measurement** is provided in Chapter 1.4 and focuses only on parts of the whole. The aim is to understand *how* the respective indicator depicts/represents *which* phenomena of reality. In particular, the focus is on detailed problems of measurement, whereby a fundamental reference to the conceptual level is briefly established.

The **documentation of the relation of the measurement to the construct** is carried out together with the **evaluation of the measurement** in Chapter 1.5.2 and focuses on the whole. The aim is to understand *how* and *how well* the relation between the construct and the phenomena of reality is captured. The focus is on overarching questions of the quality of measurement – a critical reflection on the process of development as well as a critical appraisal of construct validity.

1.4.3. Indicators of information content

1.4.3.1. Information item, questions of manifestation, determination and reason

The decisive factor for information content is which information users need, i.e., which fundamental questions they wish to answer with the help of the information in the notes. Starting from the conceptualization, there is a need for the provision of relevant and reliable information through accounting in order to fulfill the prediction and determination function. From this, the following fundamental questions can be derived:

(1) Which intangible assets does the firm have and in what quantity or at what value do they exist?
(2) How are intangible resources depicted through the firm's accounting?
(3) Why and how have intangible assets and their depiction changed over time at the firm?

On the basis of these questions, the given accounting structure as well as the considerations of problem areas in the depiction of intangible resources (Part 2), a general framework of required information (**information items**) can be derived, which on the one hand systematizes the reality to be depicted on the basis of business transactions and, on the other hand, the decisions to be made by the management upon the depiction in the context of the accounting system. Business transactions that essentially occur in reality and must be recognized in the financial statements include, for example, purchase price allocations and the capitalization of development expenses. Among the accounting decisions to be made by management in the course of depiction

are the exercise of accounting options, the selection/determination of measures of value, valuation inputs, valuation models, the specification of indefinite/general terms and much more.

The relationships that exist between the information items and the accounting functions are exemplified in the following. By the disclosure of the remaining useful life, for example, the time of expiration of the patent protection and, thus, the risk of a loss of competitiveness or the urgency of replacement investments can be estimated (**prediction function**). If a firm valuation is carried out on the basis of earnings (rather than cash flow) information, it is equally important to be able to estimate/predict the total and remaining useful life as well as scheduled depreciation in the best possible way. For this purpose, extensive disclosures are helpful – whether made directly via disclosures of the respective useful lives or indirectly via comprehensive disclosures in the statement of changes in non-current assets that allow conclusions to be drawn about the useful lives. Extensive disclosures about the justification of the value of goodwill – which, for example, reveal how the uncovering of hidden reserves and burdens as part of the purchase price allocation was carried out/operationalized and how the management justifies the remaining residual value – can, in conjunction with disclosures about the impairment loss and the impairment test, be a relevant and reliable indicator of the firm's future potential for success.

Extensive disclosures about the impairment test of goodwill in conjunction with the disclosure of the impairment loss can also be a relevant and reliable indicator of the quality of past firm acquisitions. This in turn is important for assessing the management performance (**determination function**). Comprehensive disclosures about the purchase price allocation – e.g., the extent to which hidden reserves and burdens were uncovered, how these were determined and to what extent they will be recognized in the income statement in the future, for example, through scheduled depreciation – enable users to differentiate the effects on earnings in order to assess management performance more precisely. This also applies in the context of checking covenant violations. A list of the identified information items can be found in Table 8 in Chapter 1.4.3.7.

The further differentiation and concretization of this general framework of required information is carried out on the basis of two observations, which result from examining the development sample. According to the first observation, disclosures can be differentiated depending on whether they are useful for answering questions of manifestation, determination or reason/cause. According to the second observation, disclosures include either statements that set conditions/parameters or reflect observations (premises) or measurement, estimation and/or expectation statements (conclusions).

Disclosures that serve the purpose of answering **questions of manifestation** ('What is something?') make it possible to answer the question of which manifestation the respective reference object/information item has at the respective firm, e.g., how long the useful life is, what the indicators of the research and development phase are, how large the discount rate is, etc. **Questions of determination** ('How was something determined?') represent the need of the users to know how, i.e., using which theories, methods, models, processes, inputs etc., the firm used to determine these manifestations. In order to gain insights into the viewpoint and motives of the report-preparing management, it is also important for the users to know the reasons/causes of the manifestation and determination. Such questions shall be called **questions of reason/cause** ('Why is something as it is, or why has something been determined that way?'). Reasons relating solely to the determination are not of interest, since these are already covered by the questions of determination.

At the same time, each item tends to be either more of a premise/assumption or more of a conclusion. **Premises** are set and not determined: These are statements that set conditions/parameters, such as statements on the exercise of (non-discretionary) accounting options ('application of the cost model instead of the revaluation model') and the concretization of discretionary accounting options ('risk representation within the framework of DCF models in the numerator instead of in the denominator'), or unambiguous or no determination requiring statements of observation, such as statements on actions taken ('a depreciation was recognized').

Conclusions, on the other hand, are the results of determinations, which in turn draw on theories, methods, models, inputs, etc. These are often ambiguous, uncertain statements of measurement, estimation and/or expectation, such as statements on cost of goodwill, qualitative indicators of an impairment loss, quantification of an impairment loss, useful life of other intangible assets, etc. The determination is often carried out in several stages, since, in the case of quantification of an impairment loss, for example, the fair value must be quantified, among other things. The quantification in turn uses various valuation procedures (e.g., income approach). These procedures in turn are based on the aggregation of various valuation inputs (e.g., risk-return profile/discount rate), which in turn have to be determined using sub-determinations (e.g., expected cost of equity), etc. The path from conclusion to premise therefore consists of a cascade of stages of determination which can be extended by any number of aspects and, at the

end of which, a premise is again posited (e.g., estimation of the cost of equity using the capital asset pricing model).[438]

The fundamental need to capture, contentually, the (virtually) infinitely conceivable complexity of possible premises and conclusions as completely as possible is countered by restrictions arising from transaction costs and standardization requirements of the research design. The items listed in Table 8 in Chapter 1.4.3.7 represent a proposal for resolving this conflict. In accordance with the concept specification, a catalogue of the information required by the users (information items) thus exists, which is differentiated with regard to the three questions (manifestation (*M*), determination (*D*), reason/cause (*R*)).

The selection of items is based fundamentally on the already identified problem areas of the depiction of intangible resources, thereby taking the **economic significance** into account. The depth with which the content of a topic is captured is determined, in particular, by the respective **degree of standardization** of the respective topic in literature, regulation and practice. For example, the determination of fair value or recoverable amount is captured in a more complex way – i.e., differentiated into various sub-items – than the operationalization of materiality, whereby only disclosures relating to a materiality guideline are captured.

In the reference framework thus defined, further indicators are identified and determined in the following chapters. A summary of all indicators is provided in Figure 11, Table 7 and Table 8 in Chapter 1.4.3.7.

1.4.3.2. Completeness of the reference to the distribution level

The previously developed items, combined with questions of manifestation, determination and reason, are not yet sufficient on their own to adequately capture the information content. For example, if a firm discloses the useful life, this disclosure is useful only when it is clear to what that useful life is attributable – i.e., for all intangible assets with finite useful lives or for only a portion thereof. The **completeness of the reference** must also, therefore, be questioned.

The existing accounting structure enables the division of business transactions that need to be captured into further natural subsets, which can then be used to capture completeness. For example, the disclosure of useful lives is only possible for intangible assets with a finite useful

[438] On this subject, see also the 'Münchhausen trilemma' after Hans Albert, described in Döring/Bortz (2016), p. 39.

life; disclosures about the impairment test of intangible assets are only possible for intangible assets that have been tested accordingly, and so on. For this purpose, fixed reference levels are defined that enable this completeness to be captured and are referred to as **distribution levels**. Depending on how many assets in these subsets the firm provides disclosures for, a statement about the completeness of the disclosures can be generated. For information items from the range of 'subsequent accounting – scheduled depreciations', for example, intangible assets with a finite useful life are defined as the distribution level, since this is the maximum conceivable superset for disclosures in this range. In this example, the completeness of the reference is used to capture the proportion of intangible assets with a finite useful life for which the firm discloses, for example, the manifestation of the useful life. The structure of the distribution levels follows this idea.

There are two **particularities** to be mentioned in this context. In order to be able to differentiate between disclosures about different valuation approaches (e.g., 'tested for impairment with the income approach (IA)' vs. 'tested for impairment with the cost approach (CA)') and disclosures about goodwill and other intangible assets in the analysis, the distribution levels are differentiated accordingly (e.g., 'acquisition in the course of a business combination (BC) (without goodwill)' vs. 'additions to goodwill'). However, this procedure is subject to the aforementioned transaction-cost restrictions. For this reason, disclosures on individual valuation approaches, for example, are not additionally differentiated by asset category (e.g., 'tested for impairment with the IA (intangible assets with indefinite useful lives without goodwill)', 'tested for impairment with the IA (intangible assets with finite useful lives)', etc.).

Since the review of the notes of firms from the development sample shows that some of the firms only refer to new transactions, i.e., those that have occurred in the current financial year (e.g., in the range of 'initial measurement in the course of a purchase price allocation (PPA)'), a distinction is also made between a stock set and an addition set (e.g., 'addition in the course of a PPA with IA' vs. 'PPA with IA'). For example, all purchase price allocations (including those performed in previous financial years) are relevant for the stock set, whereas only the purchase price allocations of the past financial year are relevant for the addition set. The allocation of the distribution levels to the individual information items is shown in Table 8 in Chapter 1.4.3.7. The column marked with '*A*' indicates whether a differentiation is made between a stock set and an addition set.

1.4.3.3. Precision

In addition to the completeness of the reference to the distribution level, it is also important at which level information is provided, as this usually has an effect on the **precision/dispersion**[439] of the disclosures. Expressed in the coordinates of the introduced level system, disclosures are provided either at the individual asset level, above the individual asset level but below the distribution level, at the distribution level or above the distribution level. The latter is possible if the distribution level was set comparatively low (e.g., 'tested for impairment with the IA'), but the firms provide their disclosures in a more aggregated way (e.g., related to the impairment test in general). At the individual asset level, a precise disclosure is inevitably provided because disclosure and manifestation of the individual asset are directly **related at 1:1** (e.g., 'the useful life of the individual asset xy is 5 years'). However, a disaggregation of the disclosures to this lowest level of the individual assets is rarely observed in the development sample, and may not be reasonable with respect to materiality considerations. Above the individual asset level, some disclosures are also provided that permit a 1:1 relationship between the disclosure and the manifestations of the individual assets. This is the case when general/**one-dimensional** disclosures are provided that apply to each individual asset and also, thus, to its aggregate (e.g., 'intangible assets with a finite useful life are amortized on a straight-line basis' – for all corresponding individual assets and their aggregate, therefore, the manifestation 'straight-line amortization method' applies).

Often, however, aggregated **multidimensional** disclosures are provided in which the direct 1:1 relationship between the manifestation of the individual asset and the disclosure is no longer given. Instead, it is necessary to use statistical metrics representing the different manifestations (i.e., the distribution of manifestations, in particular their **dispersion/variability**) of a group of assets as a point value (e.g., 'the useful life of the group of assets xyz is on average five years'), closed interval (e.g., '(…) three to five years') and/or open interval (e.g., '(…) at least five

[439] On the general definition of precision (in the context of uncertainty) as a reciprocal of variance see, e.g., Verrecchia (1990), p. 366. See also the distinction between precision/dispersion and accuracy in Abdel-Rahim/Stevens (2018), p. 32.

years').[440] In the literature, the **level of measurement** (scale of measurement) pair of quantitative vs. qualitative is often subsumed under precision.[441] Qualitative descriptions ('the useful life is long') often have to be interpreted first and, therefore, usually represent a statement with a larger dispersion, i.e., with less precision than quantitative (point) values.[442] Without knowledge of the individual firm context, qualitative disclosures may also often be less specific.

Therefore, **precision in terms of dispersion** (point value, interval value) is captured separately from **precision in terms of level of measurement** (quantitative, qualitative). Both dimensions can be combined in any way, since qualitative disclosures can also be provided as a point value (e.g., 'depreciations are calculated using the straight-line method'), as a closed interval (e.g., 'depreciations are calculated using either the straight-line or the declining-balance method') or as an open interval (e.g., 'depreciations are calculated using the straight-line method, among other methods').

This type of precision refers to aggregation/group formation. However, **precision** may also refer to **uncertain conditions**, as is the case with predictions (e.g., 'the expected value of the useful life of one/more asset(s) is twelve years with a standard deviation of +/- two years').[443]

In view of the conceptual considerations in Part 3, it is, in general, reasonable to demand a representation of these uncertain conditions in such a way that it represents the uncertainty perceived/assessed by management accordingly by the disclosure of confidence intervals, standard deviations and the like.[444] However, the practice of reporting in the development sample shows that this is only done in the case of sensitivity disclosures in connection with business combinations and as part of the impairment test. In view of the above-mentioned restrictions, it therefore seems appropriate to refrain from capturing the uncertainty-related precision of the disclosures for all information items. Instead, this aspect is captured by corresponding information items related to sensitivity disclosures and the questions of determination in general (e.g., 'how was the useful life determined?'). In the case of disclosures about the determination

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440 On the differentiation of dispersion (in the context of uncertainty) see, e.g., Krause et al. (2017), p. 252, Hope et al. (2013), p. 54 and Francis et al. (2008), p. 92.

441 See (in general) Botosan (1997), p. 334; see (in the context of uncertainty), e.g., Krause et al. (2017), p. 252, Hope et al. (2013), p. 54 and Francis et al. (2008), p. 92.

442 See (in general) Lundholm et al. (2014), p. 1455 and Botosan (1997), p. 334; see (in the context of uncertainty) Barth (2009), pp. 21 f.

443 See Verrecchia (1990); Ryan (2012), pp. 296 f.; Abdel-Rahim/Stevens (2018), p. 32.

444 See Verrecchia (1990), p. 365, footnote 3; Du et al. (2014); Ryan (2012), pp. 296 f.

of sensitivity, in particular, the degree of differentiation is also captured (**degree of differentiation (sensitivity)**). Relevant factors are coded, namely to what extent disclosures are available about whether the input parameters of the valuation models were varied symmetrically (only one-sided input variation vs. two-sided input variation), whether multiple scenarios were taken into account, and whether combined scenarios were taken into account.

This consideration of completeness and precision has so far been based on the assumption that disclosures are only made at one level. However, the reporting practice in the development sample shows that, comparatively often, information **on the same item** is disclosed by **the same firm** at **different levels** with different degrees of completeness and precision (e.g., 'the useful life of intangible assets with finite useful lives is three to five years. Software has a useful life of three years'). In order to be able to capture such coexisting or plural disclosures, the coding is carried out in two normal ranges. **Range 1** comprises the level(s) at which there is a **complete reference** between information item and distribution level, or at which this reference is unknown. **Range 2** comprises the level(s) at which there is an **incomplete reference** between the information item and the distribution level.

If the reference is incomplete, the **level of measurement** or **intensity** ('For what quantitative share of assets (usually carrying amounts) at the distribution level is a disclosure provided or is the incompleteness of a purely qualitative nature?'), the **reasons** ('Why was a limitation made?') and the **excluded components** ('Is a description of the excluded components provided?') are questioned analogously to the previous considerations. Possible reasons would be, for example, considerations of materiality.

1.4.3.4. Classification of the disaggregation

It has already been stated that in the developed level system, there is a range above the distribution level, there is the distribution level itself and there is a range below the distribution level. Disclosures can be provided in any of these ranges and levels. Each level at which disclosures of interest (according to the information item in question) are provided is referred to as the **reception level**. The object (e.g., software) to which the disclosure applies (e.g., 'the useful life of software is five years') is referred to as the **reception object**.

In order to gain further insights into the detailing, classification and comparability of the disclosures, further analysis of the mode of disaggregation is required. Since in principle an infinite

number of possibilities for disaggregation can be conceived of,[445] the typified scheme for capturing disclosures must be further concretized analogous to the considerations on the distribution levels, so that a standardized collection becomes possible. To do this, the reception object is differentiated on two levels into different **reception classes** according to standardized characteristics. This differentiation is based on the consideration that each information item creates certain relational information needs, according to which each item is often processed in the context of certain class types.

At the **first level**, a distinction is made between 'segment/CGU' and 'asset' (**reception class 1**). At the **second level**, on the one hand, the **reception classes 2** 'segment' and 'CGU' are differentiated within the reception class 1 'segment/CGU'. On the other hand, according to the categorization considerations in Part 2, Chapter 3 and in Chapter 4, the following reception classes 2 are differentiated in reception class 1 'asset': 'Major class' (e.g., data processing-related, engineering-related), 'class' (e.g., patent, software), 'sub-class' (e.g., software for controlling production facilities, software for payroll accounting) and 'accounting-related class', which relates in particular to the type of addition (e.g., internally generated intangible assets) and/or other asset characteristics that give rise to a particular accounting treatment (e.g., intangible assets with a finite useful life). Reception objects that are assigned to a residual class (residual items labeled 'other', 'miscellaneous', etc.) have no information content and are therefore treated as if they were not assigned to any class.[446] Even if further relevant differentiations are conceivable, e.g., the differentiation of a separate reception class 1 'business combination' for disclosures about business combinations, such differentiations are refrained from in view of the already mentioned transaction costs of data capturing.

For disclosures that do not serve to allocate monetary values to reception objects as part of the disclosures about stock and the temporal development of intangible assets that are discussed below (Chapter 1.4.3.6), such as disclosures of depreciations in the statement of changes in non-current assets, but rather serve to allocate other non-monetary information, e.g., the depreciation method, the **one-dimensional** aggregated disclosures described above are used to some extent by firms in the development sample. If the respective disclosure relates to all conceivable

445 See also, for example, Gröjer (2001).

446 See, for example, Gröjer (2001), p. 706, who also regards residuals such as goodwill as not belonging to any class. This strict understanding is not followed in this work. Instead, goodwill is regarded as belonging to the reception class 2 'class'.

reception objects, e.g., to ‘intangible assets with a finite useful life’, the reception class 2 indicator is considered to be completely fulfilled – even if the individual reception objects are not listed. Thus, no penalty is imposed when a firm chooses the highest possible level of aggregation for such aggregated one-dimensional disclosures, as this is consistent with the requirement of material reporting. If, even when looking at the entire notes, no information is provided on which different reception classes are included in the reception objects, this is captured using the indicators on stock and temporal development in Chapter 1.4.3.6. If there is a single one-dimensional disclosure that refers to less than all conceivable reception objects or if there are several different one-dimensional disclosures or a multi-dimensional disclosure, the reception class 2 indicator is specifically checked for fulfillment.

When analyzing disaggregation, it is also important whether the classes describe the objects with regard to the same characteristic. The use of a class ‘trademarks and software’ is more advantageous, for example, than a class ‘trademarks and internally generated intangible assets’, since the former classification indicates homogeneous characteristics (belonging to the reception class 2 ‘class’), while the latter indicates heterogeneous characteristics (belonging to the reception classes 2 ‘class’ and ‘accounting-related class’). This consideration is represented by the indicator **class homogeneity**.

In addition, disclosures can often only be interpreted reasonably when it is clear to ‘what quantity’ the respective disclosure relates, as this enables an assessment of quantitative materiality. For this reason, the indicator **quantitative context** captures whether there is information available concerning monetary values (gross carrying amount, carrying amount, etc.) of the reception objects.

1.4.3.5. Time reference

To capture the temporal context, the indicator **time reference** is used to capture whether the disclosures refer only to the current reporting year (‘t_0’), also to the previous reporting year (‘t_0 and t_{-1}’) or also to several previous reporting years (‘t_0, t_{-1} and t_{-n}’). In view of the practice in the development sample, disclosures of a generic nature, i.e., without a concrete reference to a date/period (‘generic’), often do not allow a precise conclusion to be drawn as to whether the disclosure refers to the current reporting year or also to previous reporting years, which is why these disclosures are allocated to the current reporting year (‘t_0’) for lack of a better allocation rule.

1.4.3.6. Stock and temporal development of intangible assets

For the most part, information on the stock (gross carrying amount, carrying amount) and temporal development (additions, disposals, depreciations, etc.) of intangible assets is allocated by the firms in the development sample in matrices to the respective classes of the first and second stage, which is why these are referred to as **'matrix disclosures'**. In general, the allocation is made separately for the classes 'business combination' ('BC matrix'), 'segment/CGU' ('CGU matrix') and 'asset' ('non-current assets matrix'). These disclosures are in part supplemented by explanations outside the matrices, in which the matrix disclosures are repeated 1:1, reasons for their realization are stated and/or in which the matrix disclosures are further disaggregated. Such explanations are referred to as **'additional disclosures'**. Matrix disclosures allocate disclosures to reception objects 1:1 and can be easily coded in a standardized manner. Additional disclosures, by contrast, are usually incomplete, often do not contain non-relevance/non-applicability statements, and vary widely between firms, thus proving less suitable for coding in a standardized way.

In view of the transaction costs of data capturing and the reporting practice in the development sample, a modified approach – in comparison to before – is therefore chosen for the question of the stock and temporal development of intangible assets. The modification refers to the fact that matrix disclosures are captured in more detail than the corresponding additional disclosures, and separately from them. **Matrix disclosures** are provided **within** the **matrices**, are of a quantitative nature and include the carrying amount, gross carrying amount, etc. Therefore, no questions of determination and reason are considered, but only corresponding questions of manifestation. The completeness of the reference is captured by means of the distribution levels as described in Chapter 1.4.3.2. The allocation is shown in Table 8. The precision of the disclosures is not captured, because within the matrices, quantitative point values are always provided. Because of the quantitative nature of the matrix disclosures, the classification of the disaggregation is carried out without capturing the quantitative context. For the same reason, only the level of measurement or the intensity of the incompleteness of the reference is captured with regard to details of incompleteness. The time reference is coded as described in Chapter 1.4.3.5. In addition, the degree of differentiation is captured for selected disclosures in the non-current assets matrix (**degree of differentiation (non-current assets matrix)**). It is interesting to know whether a differentiation is made or whether only the balance or the total is disclosed instead. For the items 'consolidated group changes', 'currency translation changes' and 'held for sale/discontinued operations changes', a differentiation between additions and

disposals is captured. A differentiation between scheduled (amortization) and non-scheduled (impairment losses) depreciations is captured for the item 'additions scheduled/non-scheduled'. For the item 'impairment reversals', a differentiation between depreciations and impairment reversals is captured. This allows disclosures by firms that offset scheduled and non-scheduled depreciations and/or depreciations and impairment reversals differently to be captured in a differentiated manner. For the remaining disclosures in the non-current assets matrix as well as in the BC or CGU matrix (e.g., 'reclassifications'), however, only the existence of a disclosure is coded, regardless of its differentiation (**degree of differentiation (matrix)**).

Additional disclosures are provided **outside** the **matrices** and are coded in less detail. A capturing of the completeness is ruled out due to the impossibility of defining ex-ante corresponding distribution levels in relation to the disaggregation variant selected by the firm in the matrices. Instead, what is captured is which function(s) the explanations actually serve (**explanation function**). Regarding the practice in the development sample, three typified sub-functions are distinguished: a 1:1 repetition of the matrix content; disclosure of reasons/origins not apparent from the matrix with regard to the stock/temporal development of items; and a further or different disaggregation of the matrix content and/or disaggregation of content not appearing in the matrix. Furthermore, the precision of the additional disclosures is captured. In view of the practice in the development sample, only the **level of measurement** (qualitative vs. quantitative) is coded to capture precision. The **time reference** is coded according to Chapter 1.4.3.5. Indicators of the classification of the disaggregation and capturing of the degree of differentiation are omitted with regard to transaction costs.

1.4.3.7. Overview of the indicators of the information content

Figure 11 below illustrates how all of the indicators of the information content are linked. A definition of the individual indicators can be found in Table 7. Table 8 shows the detailed allocation of reception class 1, distribution level and question type to the information items.

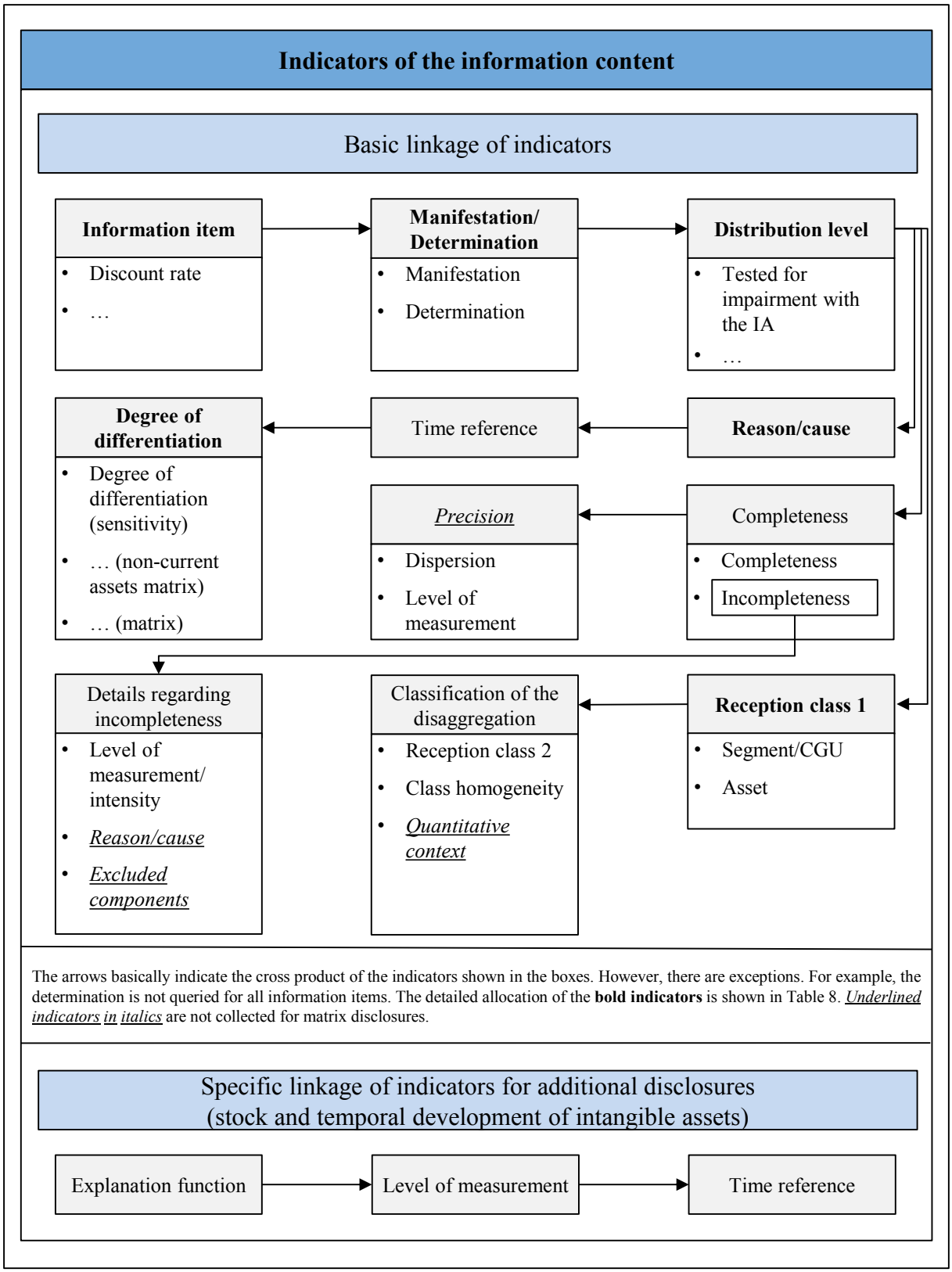

Figure 11: Linkage of the indicators of the information content

Table 7: Definition of the indicators of the information content

Indicators	Definitions/underlying questions[1)]
Information item	Fundamentally interesting information.
Manifestation	How is the item manifested?
Determination	How was the item determined?
Reason/cause	Why is the item manifested as it is, or why was the item determined in this way?
Distribution level	Reference level in relation to which completeness is captured.
Completeness	Is there a range with a complete disclosure, or is there a range for which completeness is unknown?
Incompleteness	Is there a range with an incomplete disclosure?
Dispersion	Is the disclosure provided as a point value, closed or open interval?
Level of measurement	Is the disclosure of a quantitative or qualitative nature?
Level of measurement/intensity (incompleteness)	For what quantitative share of assets (usually carrying amounts) at the distribution level is a disclosure provided or is the incompleteness of a purely qualitative nature?
Reason/cause (incompleteness)	Why is the disclosure incomplete?
Excluded components	Is a description of the excluded components provided?
Degree of differentiation (sensitivity)	Do disclosures about the determination of sensitivity reveal whether the input parameters of the valuation models were varied symmetrically, whether multiple scenarios were taken into account and whether combined scenarios were taken into account?
Reception object	The object to which the disclosure applies.
Reception class 1	Which of the following classes does the reception object refer to: segment/CGU, asset?
Reception class 2	Which of the following classes does the reception object refer to: segment, CGU; major class (e.g., data processing-related, engineering-related), class (e.g., patent, software), sub-class (e.g., software for controlling production facilities, software for payroll accounting), or accounting-related class (e.g., internally generated intangible assets)?
Class homogeneity	Are reception objects allocated to reception classes that describe the objects with regard to the same characteristic?
Quantitative context	Is there any information available concerning monetary values (gross carrying amount, carrying amount, etc.) of the reception objects that enable an assessment of quantitative materiality?
Time reference	What date/period does the disclosure refer to?
Degree of differentiation (non-current assets matrix)	Are selected disclosures differentiated in the non-current assets matrix, e.g., into scheduled (amortization) and non-scheduled (impairment losses) depreciations, or is only the balance disclosed instead?
Degree of differentiation (matrix)	Are selected disclosures provided in the BC, CGU, and non-current assets matrix, e.g., are reclassifications presented?
Additional disclosures	Explanations on the stock and temporal development of intangible assets outside the BC, CGU and non-current assets matrix.

(The table is continued on the next page.)

Table 7 (Continued)

Indicators	Definitions/underlying questions[1)]
Explanation function	Which of the following functions characterize the additional disclosures: a 1:1 repetition of the matrix content; disclosure of reasons/origins not apparent from the matrix with regard to the stock/temporal development of items; a further or different disaggregation of the matrix content and/or disaggregation of content not appearing in the matrix?

[1)] Disclosures can be provided at different levels in parallel, i.e., they can exist in a plural or coexistent form (e.g., 'total useful life five years, including three years for software'). Accordingly, multiple reception objects (e.g., 'total' and 'software') are possible. For reasons of clarity, the definitions do not differentiate precisely between singular and plural disclosures. How this is handled in the course of coding is described in Chapter 1.4.5.

Table 8: Overview of the information items, question types, distribution levels and reception classes

Information items			Question types				Distribution levels	Reception classes 1	
			M	D	R	A	Name	CG	AT
1	Minimum level[1)]		x				All		x
1	APC	Consolidated group changes[2)]	x				All		x
1	APC	Currency translation changes[2)]	x				All		x
1	APC	Held for sale/disc. operations changes[2)]	x				All		x
1	APC	Reclassifications	x				All		x
1	Cumulative depreciations	Additions scheduled/non-scheduled[2)]	x				All		x
1	Cumulative depreciations	Consolidated group changes[2)]	x				All		x
1	Cumulative depreciations	Currency translation changes[2)]	x				All		x
1	Cumulative depreciations	Held for sale/disc. operations changes[2)]	x				All		x
1	Cumulative depreciations	Reclassifications	x				All		x
1	Cumulative depreciations	Impairment reversals[2)]	x				All		x
2	Carrying amounts or APC		x				Goodwill	x	
2	Carrying amounts or APC		x				Tested for impairment (CGU)	x	x
2	Carrying amounts or APC		x				Equity	x	
2	Carrying amounts or APC	Additions	x				Goodwill	x	
2	Carrying amounts or APC	Additions	x				Tested for impairment (CGU)	x	x
2	Carrying amounts or APC	Additions	x				Equity	x	
2	Carrying amounts or APC	Disposals	x				Goodwill	x	
2	Carrying amounts or APC	Disposals	x				Tested for impairment (CGU)	x	x
2	Carrying amounts or APC	Disposals	x				Equity	x	
2	Carrying amounts or APC	Currency translation changes	x				Goodwill	x	
2	Carrying amounts or APC	Currency translation changes	x				Tested for impairment (CGU)	x	x
2	Carrying amounts or APC	Currency translation changes	x				Equity	x	
2	Carrying amounts or APC	Reclassifications	x				Goodwill	x	
2	Carrying amounts or APC	Reclassifications	x				Tested for impairment (CGU)	x	x
2	Carrying amounts or APC	Reclassifications	x				Equity	x	
2	Impairment losses		x				Goodwill	x	
2	Impairment losses		x				Tested for impairment (CGU)	x	x
2	Impairment losses		x				Equity	x	

(The table is continued on the next page.)

Table 8 (Continued)

Information items			Question types			Distribution levels		Reception classes 1	
			M	D	R	A	Name	CG	AT
3	Carrying amounts or APC		x			x	Acquisition BC (without goodwill)		x
3	Carrying amounts or APC		x			x	Goodwill		
3	Carrying amounts or APC		x				Additional bargain purchase		
4	Materiality guideline		x	x	x		All		x
4	Cost vs. revaluation model		x	x	x		All		x
4	Valuation model non-controlling interests		x		x		All		x
5	Capitalized borrowing costs		x	x	x	x	Qualified (borrowing costs)		x
5	Indicators qualified int. assets (borrowing costs)		x	x	x	x	Qualified (borrowing costs)		x
5	Indicators research and development phase		x	x	x		R&D expenses (not capitalized)		x
5	Indicators research and development phase		x	x	x	x	Internally generated		x
5	Cost components (internally generated int. assets)		x	x	x	x	Internally generated		x
5	Identification/recognition criteria int. assets (PPA)		x	x	x	x	Acquisition BC (without goodwill)		x
5	Reasons for/components of the difference		x			x	Goodwill		
5	Reasons for/components of the difference		x				Additional bargain purchase		
5	Extrapolation share of the difference (FGM)		x		x	x	Extrapolated difference (all)		
5	Extrapolation share of the difference (FGM)		x		x	x	Extrapolated goodwill		
5	Extrapolation share of the difference (FGM)		x		x		Additional extrapolated bargain purchase		
5	Fair value non-controlling interests			x	x	x	Extrapolated difference (all)		
5	Fair value non-controlling interests			x	x	x	Extrapolated goodwill		
5	Fair value non-controlling interests			x	x		Additional extrapolated bargain purchase		
5	Criteria for allocation to CGU (impairment test)		x	x	x	x	Goodwill	x	
5	Criteria for allocation to CGU (impairment test)		x	x	x		Tested for impairment (CGU)	x	x
5	Criteria for CGU identification/delimitation		x	x	x		CGU	x	
6	Valuation approach		x		x	x	Acquisition BC (without goodwill)		x
6	Valuation hierarchy		x		x	x	Acquisition BC (without goodwill)		x
6	DCF approach (income approach)	Market/market participants	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Risk representation numerator/denominator	x		x	x	PPA using the IA		x
6	DCF approach (income approach)	Valuation period	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Valuation method CF	x		x	x	PPA using the IA		x

(The table is continued on the next page.)

Table 8 (Continued)

Information items			Question types				Distribution levels	Reception classes 1	
			M	D	R	A	Name	CG	AT
6	DCF approach (income approach)	Individual parameters CF	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Detailed planning period	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Growth rate	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Discount rate	x	x	x	x	PPA using the IA		x
6	DCF approach (income approach)	Individual parameters discount rate	x	x	x	x	PPA using the IA		x
6	Market/analogy approach (market approach)	Valuation method	x		x	x	PPA using the MA		x
6	Market/analogy approach (market approach)	Market/analogous valuation object	x	x	x	x	PPA using the MA		x
6	Market/analogy approach (market approach)	Input parameter	x	x	x	x	PPA using the MA		x
6	Market/analogy approach (market approach)	Object-specific modifications	x	x	x	x	PPA using the MA		x
6	Cost approach	Valuation method	x		x	x	PPA using the CA		x
6	Cost approach	Market/market participants	x	x	x	x	PPA using the CA		x
6	Cost approach	Included costs	x	x	x	x	PPA using the CA		x
6	Sensitivity acquisition cost[3)]		x	x	x	x	Acquisition BC (without goodwill)		x
7	Total useful life		x	x	x		Finite useful life		x
7	Remaining useful life		x	x	x		Finite useful life		x
7	Depreciation method		x	x	x		Finite useful life		x
7	Commencement date of depreciations		x	x	x		Finite useful life		x
8	Indicators qualitative impairment test		x	x	x		All		x
8	Indicators qualitative impairment test		x	x	x		Tested for impairment (unqualified)		x
8	Valuation perspective		x		x		Tested for impairment (separately)		x
8	Valuation perspective		x		x		Tested for impairment (CGU)	x	x
8	Valuation perspective		x		x		Goodwill	x	
8	Valuation approach		x		x		Tested for impairment (separately)		x
8	Valuation approach		x		x		Tested for impairment (CGU)	x	x
8	Valuation approach		x		x		Goodwill	x	
8	Valuation hierarchy		x		x		Tested for impairment (separately)		x
8	Valuation hierarchy		x		x		Tested for impairment (CGU)	x	x
8	Valuation hierarchy		x		x		Goodwill	x	

(The table is continued on the next page.)

Table 8 (Continued)

Information items			Question types			Distribution levels		Reception classes 1	
			M	D	R	A	Name	CG	AT
8	Recoverable amount		x		x		Tested for impairment (separately)		x
8	Recoverable amount		x		x		Tested for impairment (CGU)	x	x
8	Recoverable amount		x		x		Goodwill	x	
8	DCF approach (income approach)	Market/market participants	x	x	x		Tested for impairment using the IA (FV)	x	x
8	DCF approach (income approach)	Risk representation numerator/denominator	x		x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Valuation period	x	x	x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Valuation method CF	x		x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Individual parameters CF	x	x	x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Detailed planning period	x	x	x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Growth rate	x	x	x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Discount rate	x	x	x		Tested for impairment using the IA	x	x
8	DCF approach (income approach)	Individual parameters discount rate	x	x	x		Tested for impairment using the IA	x	x
8	Market/analogy approach (market approach)	Valuation method	x		x		Tested for impairment using the MA	x	x
8	Market/analogy approach (market approach)	Market/analogous valuation object	x	x	x		Tested for impairment using the MA	x	x
8	Market/analogy approach (market approach)	Input parameter	x	x	x		Tested for impairment using the MA	x	x
8	Market/analogy approach (market approach)	Object-specific modifications	x	x	x		Tested for impairment using the MA	x	x
8	Sensitivity recoverable amount[3)]		x	x	x		Tested for impairment (separately)		x
8	Sensitivity recoverable amount[3)]		x	x	x		Tested for impairment (CGU)	x	x
8	Sensitivity recoverable amount[3)]		x	x	x		Goodwill	x	

(The table is continued on the next page.)

Table 8 (Continued)

This table describes which **information items** (1 – stock/temporal development: non-current assets matrix; 2 – stock/temporal development: CGU matrix; 3 – stock/temporal development: BC matrix; 4 – basic accounting policies; 5 – initial accounting miscellaneous; 6 – initial measurement PPA; 7 – subsequent accounting scheduled depreciations; 8 – subsequent measurement impairment test) with regard to which **question type** (M – manifestation; D – determination; R – reason/cause), with reference to which **distribution level** (A – distribution level is differentiated into an addition set and a stock set) and **reception class 1** (CG – segment/CGU; AT – asset) are captured in the course of the content analysis.

[1)] Per acquisition/production costs (APC) and cumulative depreciations (amortization and impairment) balance values annual period end date values as of January 1 and December 31 as well as differentiation of additions and disposals; also disclosure of the carrying amounts as of January 1 and December 31.

[2)] In addition, information is captured on whether a differentiation is made or only the balance is disclosed instead. For the items 'consolidated group changes', 'currency translation changes' and 'held for sale/discontinued operations changes', a differentiation between additions and disposals is captured. For the item 'additions scheduled/non-scheduled', a differentiation between scheduled (amortization) and non-scheduled (impairment losses) depreciations is captured. For the item 'impairment reversals', a differentiation between depreciations and impairment reversals is captured.

[3)] In the case of disclosures about the determination of sensitivity, another factor that is captured is to what extent disclosures are available about whether the input parameters of the valuation models were varied symmetrically (only one-sided input variation vs. two-sided input variation), whether multiple scenarios were taken into account and whether combined scenarios were taken into account.

1.4.4. Indicators of information presentation/preparation

1.4.4.1. Materiality

The question of how the firm operationalizes materiality and where the concept applies, i.e., how materiality is generally reported on, has already been addressed in the context of indicators of the information content. However, materiality in the sense of the information presentation/preparation is concerned with the question of how material the disclosures provided by firms are, i.e., to what extent the maximum criterion is adhered to in view of the information amount/overload problem. Due to the problems of operationalization of materiality described in Part 3, the boilerplate aspect of materiality is focused on in this work. Accordingly, disclosures can be divided into boilerplate and non-boilerplate disclosures, whereby the former must be minimized and the latter maximized, respectively, in order to increase materiality.

For the purpose of this work, specifically, **boilerplate disclosures** are to be understood as all disclosures that may generally be of significance due to their topic relation, but are usually not significant due to their lack of firm specificity. The topic relation derives from the respective information items (e.g., in connection with ‘subsequent accounting scheduled depreciations’). With regard to the practice in the development sample, a lack of firm specificity concerns general and trivial descriptions of depiction rules (e.g., ‘internally generated intangible assets are capitalized if they meet the recognition requirements’) or their application (e.g., ‘for the estimation of cash flows, the key influencing parameters are taken into account’) or corresponding statements with regard to classification/consequences (e.g., ‘estimates are uncertain and, therefore, do not have to be realized in the future’). **Non-boilerplate disclosures** are topic-related, firm-specific disclosures.

The ratio of the corresponding text characters (without spaces) or words of non-boilerplate disclosures to the sum of non-boilerplate and boilerplate disclosures is used as the indicator (**non-boilerplate intensity**). The text characters/words contained in headings and references are excluded, whereas those in tables are included due to their importance for the notes. The point of reference is thus formed by the text characters/words of topic-related statements as a whole – regardless of whether they are firm-specific or not and regardless of whether they are presented in the form of text or tables. The capturing takes place at the sentence level, i.e., for example, all text characters/words of sentences containing non-boilerplate disclosures are captured in the

numerator.[447] Text characters/words are counted using MS Word 2013 software. In order to limit any distorting influence of the choice of counting objects (text characters vs. words), the indicator is determined by the mean value of the manifestations of the respective non-boilerplate intensity, which in turn is determined on the basis of text characters or words.

1.4.4.2. Format

Indicators of the format capture the use of visual means as part of the notes reporting. With regard to the practice in the development sample, various characteristics of the notes reporting can be observed. Although, on the one hand, no **graphics** are used, some **tables** are, whereby their use differs depending on the topic. For example, while all firms provide a tabular non-current-asset matrix, the useful life disclosures, however, are only presented in tabular form (in some cases). On the other hand, all firms use an individual uniform layout in their annual reports with regard to the highlighting of terms (**bold/italic type**) and the use of structuring paragraphs (**paragraph design**), i.e., these aspects do not differ depending on the disclosure topic.

In order to capture the use of **tables/graphics** (insofar as they occur in the examination sample), differentiations are made between the disclosures in the different matrix types, disclosures about the useful life, the accounting methods and disclosures about the impairment test. The capturing of **bold/italic type** and **paragraph design** is therefore performed **without differentiation** for all examined notes disclosures.

Bullet (point) lists or the like are considered equivalent to tables/graphics and are captured with this indicator because they are likely to have a similar effect on clarity and their use also differs according to the topic. A **paragraph** is defined as a separation of two text bodies by a blank line, which means that a simple line break (without spacing) is not included.

1.4.4.3. Diction

Diction, the linguistic component of clarity, is often captured in accounting literature using **indices** such as the Fog, Flesch or Flesch-Kincaid index, which represent a linear combination of sentence length and proportion of complex words (words with more than two or three syllables) or number of syllables.[448] In addition, other text characteristics such as the use of the passive voice or abstract words are occasionally captured.[449] Due to considerable transaction

[447] See also the similar measurement parameters in Hope et al. (2016) and Lang/Stice-Lawrence (2015).

[448] See, e.g., Li (2008); Loughran/McDonald (2014), in particular p. 1644; Guay et al. (2016).

[449] See, e.g., Miller (2010) and Hwang/Kim (2017).

costs, these text characteristics can only be captured using **computer-aided** methods. Furthermore, the content analysis is carried out on the basis of annual reports in the **German language** in order to be able to preclude or limit the probability of language-induced coding errors and the coding effort in view of the fact that the coder is a native German. Therefore, a readability analysis of German-language texts is necessary.[450]

Considering these requirements, **TextLab software** was used in this work to capture the text characteristics, which enables the automated, computer-aided capturing of the manifestations of diction-relevant characteristics of German texts.[451] As an indicator of diction, the **Hohenheimer Verständlichkeitsindex (HIX)** [Hohenheimer understandability index] is used – a readability measurement parameter with possible manifestations in intervals from 0 (‘very difficult to understand’) to 20 (‘very easy to understand’). The HIX is calculated from a linear combination of the scaled manifestations of different text characteristics, such as the proportion of multi-syllable words and the average sentence length, as described in Table 9.[452]

The non-boilerplate disclosures defined in Chapter 1.4.4.1, i.e., the topic-related and firm-specific disclosures, without tables, are used as **text bodies**. Tables are excluded because their content does not allow linguistic analysis due to the absence of sentences.

[450] An exception is the firm Swyx Solutions, which only publishes its annual reports in English – for this firm, the Flesch reading ease index is used.

[451] The texts were analyzed in the period from October 5, 2017 to October 25, 2017 with TextLab software version 7.5.0 from H&H Communication Lab GmbH.

[452] Source of information: H&H Communication Lab GmbH.

Table 9: Definition of the indicators of the diction

Indicators		Captured text characteristics
1	Amstad formula	Average sentence length and average number of syllables
2	Vierte Wiener Sachtextformel [Fourth Viennese factual text formula]	Proportion of three-syllable and multi-syllabic words
3	SMOG Index (G-SMOG)	Proportion of three-syllable and multi-syllabic words
4	LIX readability index	Average sentence length in words and proportion of long words (more than six characters)
5	Subindex A	Mean value of the manifestations of the indicators 1-4
6		Average sentence length in words
7		Average sentence-part length in words
8		Average word length in letters
9		Proportion of words with more than 16 letters
10		Proportion of sentence parts with more than twelve words
11		Proportion of sentences with more than 20 words
12	Subindex B	Mean value of the manifestations of the indicators 6-11
	Hohenheimer-Verständlichkeitsindex (HIX) [Hohenheimer understandability index]	Sum of the manifestations of subindex A and subindex B

Each of the indicators 1-4 and 6-11 is scaled to a value between 0 ('very difficult to understand') and 10 ('very easy to understand') points on the basis of empirically substantiated scaling rules not presented here. Source of information: H&H Communication Lab GmbH.

1.4.4.4. Coherence

Coherence indicators must capture the logic and connection of the information or information presentation/preparation. The considerations on coherence are essentially based on the assumed divide-and-conquer strategy (see Part 3, Chapter 3.3), from which a positive effect of indicated, isolated and, at the same time, referenced partial information packages can be derived for clarity. Coherence therefore depends on the extent to which information is available **in isolation**, the extent to which items of information are related or **referenced** to each other, and the extent to which information is **indicated** using meaningful headings or categorizations.

The following operationalization is based on the assumption that, on the one hand, an external structure is likely to be important for indicating and referencing, which is why the existence of a table of contents, the depth of the outline in the table of contents and references from the financial statements to the notes are captured as factors that enhance coherence. On the other hand, the internal structure is also likely to be important. For this purpose, typified partial information packages are assumed, which are based on the considerations regarding the information content in Chapter 1.4.3 (e.g., all disclosures with information content about the topic

'subsequent measurement impairment test'). The more referencing takes place between different locations of the disclosures per partial information package – or if all disclosures are provided at one location (isolated disclosure) – the more coherent the presentation. In addition, the indication specificity of the respective headings is captured, as this is likely to be decisive for the search costs of the users and, thus, for the coherence.

In principle, firms structure their disclosures in the notes using headings (e.g., 'intangible assets'). This includes all character strings (word, number, letter) used outside illustrations to name sections, paragraphs, etc. in the notes. On the one hand, the extent to which this structure is **referenced outside the notes** is important for the coherence. To capture this, the extent to which these headings are referenced in a table of contents is coded (**TOC referencing**). On the other hand, the extent to which the financial statements (statement of financial position, income statement) contain a reference to notes information via headings or page numbers is captured (**financial statement referencing**).

In order to capture the isolation/dispersion of information and its referencing to each other **within the notes**, it is necessary to delineate individual/separate problem areas for which users process information in isolation into partial solutions as part of their divide-and-conquer strategy before combining it to form an overall solution. On the basis of the information items identified as part of the information content, the topics listed in Table 10 are examined as problem areas for **isolation/referencing** of the disclosures ('Is the disclosure provided in one or several locations, and (in the latter case) are the locations linked to each other by references?'). The reference points of the isolation/referencing are the respective disclosure locations, and are defined as disclosures below a heading of the lowest outline level (**isolation/referencing (fine)**) and below the first outline level within the notes (**isolation/referencing (coarse)**), respectively. If disclosures related to a topic are provided at several locations, the indicator is considered to be fully met if each location refers to all other locations and these, in turn, refer back. If, for example, disclosures on a certain topic are provided at three different locations, six references are required.

In order to gain insights into the indication/referencing as a function of the respective topics, information is captured on whether the headings are formulated in their entirety from the top to the bottom outline level in a topic-specific or general way (**indication specificity**). Topic specificity is defined as the reference of the heading text both to a reception class (e.g., 'goodwill') and to a topic (e.g., 'impairment test').

Table 10: Definition of the topics for the indicators isolation/referencing and indication specificity

Topics		Information items according to Chapter 1.4.3.7, Table 8
1	Materiality guideline	4 – Basic accounting policies\materiality guideline
2	Cost vs. revaluation model	4 – Basic accounting policies\cost vs. revaluation model
3	Business combination or purchase price allocation	3 – Stock/temporal development: BC matrix 5 – Initial accounting miscellaneous\identification/recognition criteria int. assets (PPA) 5 – Initial accounting miscellaneous\reasons for/components of the difference 6 – Initial measurement PPA
4	Subsequent accounting scheduled depreciations	7 – Subsequent accounting scheduled depreciations
5	Internal generation	5 – Initial accounting miscellaneous\indicators research and development phase 5 – Initial accounting miscellaneous\cost components (internally generated int. assets)
6	Stock/temporal development non-current assets matrix	1 – Stock/temporal development: non-current assets matrix
7	Impairment test	2 – Stock/temporal development: CGU matrix 5 – Initial accounting miscellaneous\criteria for allocation to CGU (impairment test) 5 – Initial accounting miscellaneous\criteria for CGU identification/delimitation 8 – Subsequent measurement impairment test

This table shows the allocation of information items to topics, which are each examined with regard to isolation/referencing and indication specificity.

1.4.4.5. Overview of the indicators of the information presentation/preparation

A definition of the individual indicators can be found in Table 11.

Table 11: Definition of the indicators of the information presentation/preparation

Indicators	Definitions/underlying questions
Non-boilerplate intensity	Ratio of the text characters (without spaces) or words of non-boilerplate disclosures to the sum of non-boilerplate and boilerplate disclosures. Boilerplate disclosures are all disclosures that generally may be of significance due to their topic relation, but are usually not significant due to their lack of firm specificity. Non-boilerplate disclosures are topic-related, firm-specific disclosures. The text body also contains text characters/words from tables, while text characters/words from headings and references are not included. The indicator is determined by the mean value of the manifestations of the respective non-boilerplate intensity, which in turn is determined on the basis of text characters and words.
Tables/graphics	Are tables/graphics or bullet-point lists used to highlight content on selected topics (e.g., non-current assets matrix, disclosures about the useful life)?
Bold/italic type	Are terms (excluding headings) highlighted, e.g., by bold or italic type?
Paragraph design	Are paragraphs used to structure the disclosures? A paragraph is defined as a separation of two text bodies by a blank line, i.e., a simple line break (without spacing) is not included.
Diction	Hohenheimer-Index (HIX) of the non-boilerplate disclosures without tables. The HIX is a readability measurement parameter that is calculated from a linear combination of the scaled manifestations of different text characteristics, such as the average sentence length. An overview of the text characteristics considered is provided in Chapter 1.4.4.3, Table 9.
Heading	All character strings (word, number, letter) used outside illustrations to name sections, paragraphs, etc. in the notes.
TOC referencing	To what extent is notes information referenced via headings in a table of contents?
Financial statement referencing	To what extent is notes information referenced via headings or page numbers in the financial statements (statement of financial position, income statement)?
Isolation/referencing (fine)[1)]	Is the disclosure provided in one or several locations and (in the latter case) are the locations linked to each other by references? A disclosure location (fine) is defined as disclosures below a heading of the lowest outline level within the notes.
Isolation/referencing (coarse)[1)]	Is the disclosure provided in one or several locations and (in the latter case) are the locations linked to each other by references? A disclosure location (coarse) is defined as disclosures below a heading of the first outline level within the notes.
Indication specificity[1)]	Are the headings from the top to the bottom outline level formulated in a topic-specific or general way? Topic specificity is defined as the reference of the heading text both to a reception class (e.g., ‘goodwill’) and to a topic (e.g., ‘impairment test’).

(The table is continued on the next page.)

Table 11 (Continued)

[1)] The data capturing is differentiated according to the following topics: 1 – materiality guideline; 2 – cost vs. revaluation model; 3 – business combination or purchase price allocation; 4 – subsequent accounting scheduled depreciations; 5 – internal generation; 6 – stock/temporal development: non-current assets matrix; 7 – impairment test. An overview of the allocated information items is provided in Chapter 1.4.4.4, Table 10.

1.4.5. Coding units, measuring units and index

1.4.5.1. Coding and measuring units

The final steps in determining the measuring instrument are the allocation of the empirical data to the indicators (**determination of the coding units**) as well as the final definition of the indicator manifestations and the allocation of numerical values to the indicator manifestations (**determination of the measuring units**) – both of which are addressed in this chapter – as well as their aggregation to an overall measured value of the construct reporting quality (**determination of the index**), which is addressed in the following chapter. In order to avoid repetitions, the determination of the coding and measuring units – e.g., for the indicators of materiality and coherence – has already been partially carried out in the preceding chapters. The following statements are supplementary in this respect.

Analogously to the considerations on materiality, all topic-related firm-specific disclosures in the notes determine the **coding units**, which is a semantic definition.

In order to determine the **measuring units**, the possible manifestations of the individual indicators and their level of measurement must be defined. Measurement means the structure-preserving mapping of an empirical relative (e.g., 'completeness of reporting by firm xy') in accordance with a mapping function/scale into a numerical relative (e.g., 'yes – 1' or 'no – 0').[453] The measured values resulting from the measurement permit different interpretations (of the empirical relative), which are classified in the form of the so-called levels of measurement. In this circumstance, the following principle applies: the higher the level of measurement, the more extensive the possibilities for analysis.[454]

At the **nominal** level of measurement, the manifestations can be classified unambiguously and precisely; at the **ordinal** level of measurement, the manifestations can additionally be ordered meaningfully in the sense of, for example, better/worse; at the **cardinal** level of measurement,

[453] See Döring/Bortz (2016), pp. 235-237; Brosius et al. (2016), pp. 34 f.; Früh (2017), pp. 31 f.

[454] See Döring/Bortz (2016), pp. 232 f.; Rossiter (2002), p. 323; Krippendorff (2013), pp. 168 f.

the distances between manifestations (interval level of measurement) or even ratios of manifestations (ratio level of measurement) can be interpreted.[455] In order to be able to analyze the disclosure quality achieved by firms on the basis of an index, it is therefore necessary to have at least an ordinal level of measurement of the indicator manifestations, whereby higher levels of measurement are preferable, as these offer better possibilities for analysis.[456]

Although a maximization of the level of measurement of the indicator manifestations is desirable in principle, two essential constraints have to be taken into account in the determination. On the one hand, the level of measurement depends on the **construct/concept specification** formulated in the measurement model, since this determines whether at least an order of the manifestations is justifiable.[457] On the other hand, the determination of the level of measurement depends on the **nature of the empirical relative**, i.e., on how the characteristics are manifested in reporting practice, since not every empirical relative can be measured properly with regard to (test-related) reliability and validity at high levels of measurement.[458] With these aspects in mind, the reciprocal definition of indicator manifestations and their assignment to levels of measurement is discussed below. The result is summarized in Table 12 in Chapter 1.4.5.2.

On the basis of the **construct/concept specification** of reporting quality, all indicator manifestations per indicator can at least be ranked ('complete disclosures are better than incomplete disclosures, disclosures with reasons are better than disclosures without reasons, etc.'). For the indicators of the format dimension, in particular, their direction of effect is indicated with +/- in the overall concept, since, for example, no general preference can be justified for the use of graphics instead of tables or bold type instead of italics.[459] However, a preference can be justified for the use of graphics or tables and for bold or italic type instead of unformatted text.[460] Nevertheless, the broad definitions of indicators – which do not differentiate between the use of tables or graphs and the use of bold or italic type – make it possible to establish a ranking order. Thus, all indicator manifestations feature at least the **ordinal** level of measurement.

455 See Döring/Bortz (2016), pp. 232 ff.; Brosius et al. (2016), pp. 36 ff.; Krippendorff (2013), pp. 168 f.

456 See Döring/Bortz (2016), pp. 232 f. / p. 279.

457 See Früh (2017), pp. 33 f. / pp. 38-40; Boyatzis (1998), pp. 130 f.

458 See Döring/Bortz (2016), p. 237; Brosius et al. (2016), pp. 42 f.

459 See, e.g., Kelton et al. (2010), pp. 83 ff.

460 See, e.g., Tan et al. (2014); Wu/Yuan (2003).

Whether they feature the **interval** level of measurement depends on whether equally large differences in characteristics (empirical relative) are represented by equally large differences in measured values (numerical relative) or, conversely, whether equally large differences in measured values can be interpreted as equally large differences in characteristics.[461] In the literature, the boundary between the interval and the ordinal level of measurement is discussed to some extent as a function of the number of possible manifestations of so-called **rating scales**.[462] Rating scales are used to rate the frequency, intensity, etc. of a particular characteristic by the coder along a continuum between two extreme manifestations using a multi-point scale (e.g., statement applies/does not apply to different degrees), with the level of measurement being regarded as tending to become higher with an increasing number of possible indicator manifestations.[463] In view of the limited differentiation capabilities of the coders, however, there are limits to the differentiation of possible manifestations, whereby the empirically supported optimum number of possible manifestations lies between five and nine.[464] In order to determine the level of measurement within these limits, research practice sometimes assumes – and not without criticism – that an interval scale exists for rating scales that comprise at least five possible manifestations, whereas an ordinal scale exists in the case of fewer manifestations.[465]

In view of the **nature of the empirical relative** of this work, the use of rating scales is particularly suitable for indicators that are intended to measure mixed or graded characteristics. This applies, for example, to the indicator ‘level of measurement’, since disclosures are rarely only qualitative or only quantitative, but instead are usually mixed. In such cases, a five-point/five-category intensity (degree) rating scale (partly unipolar, partly bipolar) with verbal marks/labels and equidistant formulations is used.[466] A different approach applies, for example, to the indicator ‘completeness’. For this indicator, it is assumed that a disclosure can only be complete or that its completeness cannot be assessed or is unknown, which is why a dichotomous scale is used. With regard to the indicators ‘tables/graphics’, ‘bold/italic type’ and ‘paragraph design’, a dichotomous scale should also properly represent the characteristic to be captured by the respective indicator, since the reporting practice features dichotomous manifestations of these

461 See Döring/Bortz (2016), p. 244.

462 See Döring/Bortz (2016), pp. 244 ff.; Rossiter (2002), p. 323; Brosius et al. (2016), pp. 40 f.

463 See Döring/Bortz (2016), p. 245 / p. 249; Rossiter (2002), pp. 323 f.; Brosius et al. (2016), pp. 40 f.

464 See Döring/Bortz (2016), p. 249 with further references; Rossiter (2002), p. 323 with further references.

465 See Döring/Bortz (2016), p. 241 / pp. 249-251 / pp. 561-563; Rossiter (2002), p. 323; Krippendorff (2013), pp. 136 f. / pp. 165-168.

466 See Boyatzis (1998), pp. 132-134; Döring/Bortz (2016), pp. 245 ff.; Rossiter (2002), pp. 322-324.

characteristics. The indicator 'time reference', on the other hand, is defined with several manifestations (polytomous) which, however, do not correspond to a rating scale, since the reporting practice in the development sample indicates that a frequency or intensity differentiation of the individual manifestations is not necessary. The same applies to the indicators 'degree of differentiation (non-current assets matrix)', 'TOC referencing' and 'financial statement referencing'. The indicator 'explanation function' is also defined by polytomous manifestations. In this case, a differentiation of the manifestations in the form of a rating scale is refrained from for reasons of (test-related) reliability.

Finally, it must be determined whether the **ordinal or the interval level of measurement** can be assumed for the indicators and the index to be formed. There are tendencies in favor of the interval level of measurement, e.g., indicators that use rating scales and, thus, measure equidistant manifestations to a certain extent. Another example is the indicator 'non-boilerplate intensity', for which, due to its quantitative nature, the interval level of measurement at least should be applicable. However, there are also tendencies against the interval level of measurement. For the polytomous indicators 'time reference' and 'explanation function', equidistant manifestations are likely to be difficult to justify.[467] Also, the above-mentioned pragmatic classification in the sense of 'at least five different rating points/categories indicate the interval level of measurement' is criticized to some extent.[468] An ultimate resolution of this question cannot be achieved. In research practice, therefore, a pragmatic view is partly taken in favor of interval-scaled data, especially since this does not favor one's own hypotheses and the risk of erroneous interpretations can be reduced by parallel application of non-parametric tests.[469]

For many indicators in this work, it is not possible to assume an interval level of measurement without restriction. For some indicators, only the ordinal level of measurement is likely to be present. In the overall view, however, the level of measurement is more likely to correspond to an interval scale. For the majority of the indicators and the resulting overall index, the **interval level of measurement** is thus assumed in the following. This is an assumption based on the subjective assessment by the researcher, which must be taken into account when interpreting

[467] On this issue, see also Marston/Shrives (1991), p. 199 / p. 204 and Coy/Dixon (2004), pp. 82 f. in the general context of the disclosure literature.

[468] See Döring/Bortz (2016), p. 250; Krippendorff (2013), pp. 136 f. / pp. 165-168.

[469] See Döring/Bortz (2016), p. 251.

the results. For reasons of caution, not only parametric tests but also non-parametric tests are therefore applied.

1.4.5.2. Index

As part of the index formation, i.e., the aggregation of indicator manifestations into a total index value, various problems need to be resolved. On the one hand, there is the question of **weighting**, i.e., to what extent individual manifestations are reflected in the overall index value. On the other hand, the extent to which different indicator values are **standardized** and, in particular, how adjustments are made depending on the reporting contents relevant to the firm, needs to be clarified. Finally, the question of whether the indicators are linked additively or multiplicatively (**index formation**) needs to be resolved.

In principle, the **weighting** reflects the extent to which individual indicator values influence the overall index value. This means that there are no unweighted indices in the narrower sense, but at most equally weighted indices.[470] The paired term 'weighted/unweighted', which is frequently used in the literature, is therefore to be understood as a distinction between the unequally and equally weighted considerations of manifestations in the total index value. In principle, it is undisputed that an index is an instrument for measuring a construct and that the weighting factors are to be determined in accordance with the objective.[471] With regard to the objective pursued by this work, the measurement of reporting quality, and similar objectives of the 'disclosure literature', the weighting of the indicators has therefore to be guided by the interests of the users.[472] Since these interests (or rather their weighting factors) are usually unknown, there is some controversy in the literature with regard to the criteria of (test-related) reliability and validity as to how the corresponding weighting factors are to be determined.[473]

One possibility is to use **exogenous empirical weighting factors** such as the statement of financial position values, the level of non-compliance, or survey results, which are interpreted as indicators of materiality from the point of view of the users.[474] Another possibility is the use of **endogenous measuring-instrument-related weighting factors**, which result from either the

[470] See Coy/Dixon (2004), p. 84; Singleton/Globerman (2002), p. 99; Devalle et al. (2016), p. 14.

[471] See, e.g., Döring/Bortz (2016), pp. 281 f.

[472] See Dhaliwal (1980); Marston/Shrives (1991); Coy/Dixon (2004), pp. 82-84.

[473] See, e.g., Marston/Shrives (1991); Dhaliwal (1980); Coy/Dixon (2004), pp. 83 f.

[474] See, e.g., Möller/Lenz (2006), in particular pp. 902 f.; Hodgdon et al. (2008), in particular p. 6; Firth (1980), in particular pp. 102 f.; Chow/Wong-Boren (1987), in particular pp. 535 f.; Armeloh (1998).

structure/systematics of the coding scheme or are determined by its construction. If, for example, different categories contain a different number of subcategories, this leads to unequal weighting of all subcategories if the *subcategories within a category* are equally weighted and the categories as a whole are equally weighted or, conversely, if *all subcategories* are equally weighted, this leads to unequal weighting of all categories.[475] One example in the context of this work is as follows: The category 'materiality' contains one subcategory (non-boilerplate intensity), while the category 'format' contains three subcategories (tables/graphics, bold/italic type and paragraph design). If the subcategories within the categories and the categories themselves are weighted equally, this means that non-boilerplate intensity is weighted by a factor of 1, while tables/graphics, etc. are weighted by a factor of 1/3. If, on the other hand, all subcategories are weighted equally, but not the categories, materiality would be weighted by a factor of 1 and format by a factor of 3. The use of empirical weighting factors is associated with the problems already highlighted in Chapter 1.2, among other things in the context of survey studies, which is why only measuring instrument-related weighting factors are applied in this work, which will be further concretized in the following.[476]

It still needs to be clarified to what extent the individual manifestations are to be weighted equally or unequally, whereby different levels of consideration must be distinguished. At the level of **individual manifestations per indicator**, indicator-specific rankings of individual manifestations were defined on the basis of the conceptualization. The closer the coded manifestation is to the best possible manifestation (e.g., 'completeness: yes'), the more it is included in (and the more it affects) the total index value. This means that manifestations per indicator are unequally weighted, i.e., there is a within-indicator weighting.[477] Since the index aggregates different indicators, it must also be clarified at the **level of the individual indicators** whether the indicators are to be weighted differently from each other, i.e., to what extent a between-indicator weighting is applied. Based on the conceptualization, an unequal weighting of the indicators cannot be justified, which is why the assumption is made that these are of equal

[475] See, e.g., Botosan (1997), p. 334 in conjunction with Singleton/Globerman (2002), p. 99, footnote 9; Baboukardos/Rimmel (2014), in particular p. 7 in conjunction with Tsalavoutas et al. (2010).

[476] On this, see, for example, the problematization in Chow/Wong-Boren (1987), p. 536, Cooke (1989), p. 182 and Ali et al. (2004), p. 187, footnote 7.

[477] On this issue, see the following statement in Marston/Shrives (1991), p. 204: "Essentially giving different or partial scores is an extension of the weighting system." See also Botosan (1997), in particular p. 334 and Krause et al. (2017), in particular p. 252.

importance in principle and, therefore, are included in the index with equal weightings.[478] It follows from this that the indicators must be **standardized/scaled**, as otherwise the unequal within-indicator weights of the manifestations across all indicators would lead to a different weighting of the indicators.[479] The standardization/scaling of the indicator manifestations is carried out on the basis of their respective maximum values.[480]

Due to the disparate differentiation of main indicators into sub-indicators in this coding scheme (e.g., there are different numbers of distribution levels for each information item), it further needs to be clarified how or in what respect the **indicators are to be weighted equally across multiple aggregation levels**. The first possibility is that each indicator manifestation is included in the overall index according to its share in the sum of all coded expressions at the lowest level (weighting symmetry at the lowest aggregation level – formal equal weighting).[481] The second possibility is to aggregate all sub-indicators with equal weights at each aggregation level to the respective main indicator (weighting symmetry at each aggregation level – semantic equal weighting).[482] With a formal equal weighting, for example, the information content would have a greater influence on the total index value than the information processing/preparation due to a larger number of possible indicator manifestations. With a semantic equal weighting, on the other hand, both dimensions would have the same influence on the total index value – however, manifestations at the lowest aggregation level would have different effects on the total index value. In the context of this work, a semantic equal weighting approach is applied, as this corresponds best to the assumption made above of an equal inclusion of the indicators.

The aggregation of the indicator manifestations to a total index value is predominantly additive, since it is usually not justifiable (conceptually) to have minimum manifestations for all indicators; multiplicative links are only used in order to **scale** the index to information items/topics

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478 See also the discussions in Coy/Dixon (2004), pp. 83 f., Devalle et al. (2016), p. 14, Chow/Wong-Boren (1987), p. 536 and Cooke (1989), p. 182.

479 See Rossiter (2002), p. 325.

480 See, e.g., Döring/Bortz (2016), p. 279; Baboukardos/Rimmel (2014), p. 7; Botosan (1997), p. 334.

481 See, e.g., Botosan (1997), p. 334 in conjunction with Singleton/Globerman (2002), p. 99, footnote. 9; Baboukardos/Rimmel (2014), in particular p. 7 in conjunction with Tsalavoutas et al. (2010).

482 See, e.g., Botosan (1997), p. 334 in conjunction with Singleton/Globerman (2002), p. 99, footnote 9; Baboukardos/Rimmel (2014), in particular p. 7 in conjunction with Tsalavoutas et al. (2010).

for which disclosures can be expected from the respective firm.[483] For this purpose, the indicator 'relevant topics (distribution level)' is used to determine whether there are indications in the firm's annual report that an information item/topic is relevant to the firm. If there is a no-relevance/non-applicable statement or if there is no evidence of relevance in the firm's annual report (in dubio pro reo), the respective information item/topic is not included in the calculation of the maximum value.[484] This scaling is naturally problematic, since the relevance of business transactions and, thus, the necessity of disclosures in the annual report is determined recursively through (other) disclosures in the annual report, which is not always unequivocally possible.[485] However, it is necessary to limit the opposite extreme of non-comparability of the total index values.[486] For the indicators of the information presentation/preparation in particular, the scaling is not only based on whether disclosures about information items/topics are expected from the respective firm, but even more so on whether these disclosures have actually been provided, i.e., that indicators of information presentation/preparation are only included in the total index to the extent that corresponding information content disclosures are available. This reflects the fact that disclosures can only be presented/prepared if they are provided in the first place.

Due to the structure of the coding scheme, two further scalings are necessary according to the above considerations. On the one hand, for information items related to 'subsequent measurement impairment test' with the distribution level 'tested for impairment using the (...)', both reception classes 1 'segment/CGU' and 'asset' are only considered in the total index value if the indicator 'relevant topics (distribution level)' is coded with the manifestation 'relevance existent' for both distribution levels 'goodwill' and 'tested for impairment (separately)', or at least for the distribution level 'tested for impairment (CGU)'. In the other cases, if there are only indications for the relevance of the distribution level 'goodwill' or 'tested for impairment (separately)', only the reception class 1 'segment/CGU' or 'asset', respectively, is considered in the total index value.

On the other hand, if the distribution level 'acquisition BC (without goodwill)' or 'addition set acquisition BC (without goodwill)' is classified as relevant, but none of the distribution levels 'PPA using (...)' or 'addition set PPA using (...)' are so classified, there is the problem that

483 On the formation of both additive and multiplicative indexes, see Döring/Bortz (2016), pp. 280 f.

484 See, e.g., Ali et al. (2004), pp. 187 f.; Street/Gray (2002), p. 60; Cooke (1989), p. 183 / p. 189, footnote 3; Armeloh (1998), pp. 93-95; Möller/Lenz (2006), p. 902.

485 See, e.g., Ali et al. (2004), pp. 187 f.; Cooke (1989), p. 189, footnote 3.

486 See, e.g., Ali et al. (2004), pp. 187 f.; Cooke (1989), p. 189, footnote 3; Armeloh (1998), pp. 93-95.

missing disclosures about the valuation approach for the purchase price allocation result in a large part of the information items relating to this not being included in the total index value, although one of the three approaches available (income/market/cost approach) necessarily has to be applied. In order to limit this problem, the distribution level ‘PPA using the IA’ and/or ‘addition set PPA using the IA’ is automatically classified as relevant for the above-mentioned case constellations. The choice is made for the distribution level with reference to the income approach, as this approach should usually be applied in consideration of the observations in Part 2.

Table 12: Overview of the index formation

Indicators	Measuring units	Index	
	Indicator manifestations	Weighting[1)]	Aggr. levels[2)]
Topic-related standardization[3)]			
Relevant topics (distribution level)	Relevance unknown/ambiguous; no relevance; relevance existent	0; 0; 1	-
Information content		1	0
Information item	No topic-related firm-specific disclosure is provided; A ... disclosure is provided	0; 1	1
Manifestation		1	2
Determination		1	2
Distribution level		1	3
Reason/cause	A reason/cause for the information item is not disclosed at all; … is disclosed to a small extent; … is partly disclosed and partly not disclosed; … is mainly disclosed; ... is disclosed without exception	0; 1; 2; 3; 4	4
Range 1 (completeness)	No; unknown; yes	0; 1; 1	4^{x}
Range 2 (incompleteness)	No; yes	0; 1	4^{xx}
Completeness (aggregated)		1	4*
Completeness	The completeness of the reference to the distribution level is unknown; the reference to the distribution level is complete	0; 1	5^{x} / 5*
Incompleteness (aggregated)		1	5^{xx} / 5* / 5**
Incompleteness	The incompleteness of the reference to the distribution level is of a qualitative nature; the incompleteness of the reference to the distribution level is of a quantitative nature and has the intensity value ‘x’	1; 1 < x < 2	6**
Level of measurement/intensity (incompleteness)	See ‘incompleteness’		6**
Reason/cause (incompleteness)	A reason/cause for the incompleteness of the reference to the distribution level is not disclosed at all; … is disclosed to a small extent; … is partly disclosed and partly not disclosed; … is mainly disclosed; ... is disclosed without exception	0; 1; 2; 3; 4	6**
Excluded components	Excluded components are not described at all; … are described to a small extent; … are partly described and partly not described; … are mainly described; … are described without exception	0; 1; 2; 3; 4	6**
Dispersion	Open interval without exception; mainly open interval, but in isolated cases also closed interval and/or point value; closed interval and/or mixture of disclosures with open interval and point value; mainly point value, but in isolated cases also closed interval and/or open interval; point value without exception	1; 2; 3; 4; 5	4^{x} / 4^{xx}

(The table is continued on the next page.)

Table 12 (Continued)

Indicators	Measuring units	Index	
	Indicator manifestations	Weighting[1)]	Aggr. levels[2)]
Level of measurement	Qualitative disclosures without exception; qualitative disclosures supplemented in a few cases by quantitative disclosures; qualitative disclosures supplemented in a large number of cases by quantitative disclosures; qualitative disclosures supplemented in a majority of cases by quantitative disclosures; qualitative disclosures supplemented in all cases by quantitative disclosures	1; 2; 3; 4; 5	4^x / 4^{xx}
Degree of differentiation (sensitivity)	'x' is not disclosed at all; 'x' is disclosed to a small extent; 'x' is partly disclosed, partly not disclosed; 'x' is mainly disclosed; 'x' is disclosed without exception 'x' stands for [(a-)symmetry of the input variation; number of scenarios; scenario combination]	0; 1; 2; 3; 4	4
Reception class 2[4)]	Disclosures are not related to class 'x' at all; … to a small extent …; … partly …, partly but not …; … mainly …; … without exception 'x' stands for [segment; CGU] or [accounting-related class; major class; class; sub-class]	0; 1; 2; 3; 4	4
Class homogeneity[4)]	Heterogeneous classes without exception; mainly heterogeneous …; partly heterogeneous, partly homogeneous …; mainly homogeneous …; homogeneous classes without exception	0; 1; 2; 3; 4	4
Quantitative context[4)]	Quantitative context is not disclosed at all; … is disclosed to a small extent; … is partly disclosed but partly not …; … is mainly disclosed; … is disclosed without exception	0; 1; 2; 3; 4	4
Time reference	Disclosures do not refer concretely to a date/period ('generic') or refer only to the current reporting year ('t_0'); disclosures refer also to the previous reporting year ('t_0 and t_{-1}'); … also to several previous reporting years ('t_0, t_{-1} und t_{-n}')	1; 2; 3	4
Degree of differentiation (non-current assets matrix)	No disclosures are provided; disclosures are provided as a balance (in an undifferentiated manner); disclosures are provided in a differentiated manner	0; 1; 2	4
Degree of differentiation (matrix)	No disclosures are provided; disclosures are provided	0; 1	4
Explanation function	The additional disclosures serve the function of a 1:1 repetition of the matrix content; … a disclosure of reasons/origins not apparent from the matrix with regard to the stock/temporal development of items; … a further or different disaggregation of the matrix content and/or disaggregation of content not appearing in the matrix	0; 1; 1	4

(The table is continued on the next page.)

Table 12 (Continued)

Indicators	Measuring units	Index	
	Indicator manifestations	Weighting[1)]	Aggr. levels[2)]
Information presentation/preparation		1	0
Non-boilerplate intensity	Intensity values $0 \leq x \leq 1$	1	1
Format		1	1*
Tables/graphics[4)]	Disclosures are not provided in the form of a table/graphic; disclosures are provided in the form of a table/graphic	0; 1	2*
Bold/italic type	Terms excluding headings are not highlighted by, e.g., bold or italic type; terms excluding headings are highlighted by, e.g., bold or italic type	0; 1	2*
Paragraph design	The disclosures are not structured by paragraphs; the disclosures are structured by paragraphs	0; 1	2*
Diction	Hohenheimer-Index (HIX) / 20, i.e., intensity values $0 \leq x \leq 1$	1	1
Coherence		1	1**
TOC referencing	There is no table of contents which refers to the notes; the table of contents refers only to the financial statements and the notes; the table of contents refers to the first outline level of the notes; the table of contents refers to all outline levels of the notes	0; 1; 2; 3	2**
Financial statement referencing	The financial statements do not refer to the notes; the financial statements refer in an item-unspecific manner to the notes in general; the financial statements refer item-by-item (in an item-specific way) to the notes in general; the financial statements refer item-by-item (in an item-specific way) to specific headings in the notes	0; 1; 2; 3	2**
Isolation/referencing		1	2** / 2***
Isolation/referencing (fine)[4)]	Several locations that do not refer to each other without exception; mainly several locations that do not refer to each other; locations that partly do not refer to each other, partly do refer to each other; mainly several locations that refer to each other; several locations that refer to each other without exception or one location	0; 1; 2; 3; 4	3***
Isolation/referencing (coarse)[4)]	see 'isolation/referencing (fine)'	0; 1; 2; 3; 4	3***
Indication specificity[4)]	General indication without exception; mainly general indication; partly general, partly topic-specific indication; mainly topic-specific indication; topic-specific indication without exception	0; 1; 2; 3; 4	2**

(The table is continued on the next page.)

Table 12 (Continued)

[1)] Indicator manifestations are weighted for each indicator according to the presented values (within-indicator weights) and scaled to 100 % on the basis of the maximum possible score. For example, weighting '0; 1; 2' means that the respective manifestations are transformed into an indicator value of 0, 0.5 and 1.0, respectively. The indicator values are equally weighted across the various aggregation levels and included in the total index value, i.e., between-indicator weights are always 1.0.

[2)] At the respective levels, an equally weighted aggregation of the manifestations to the level with the next lower number is carried out. * / ** / *** indicate subaggregation ranges of indicators. The indicator manifestations of level '3***' are aggregated, e.g., to the subaggregation range '2***'. ^{x} indicates the multiplicative linkage of 'range 1 (Completeness)' with the indicators 'completeness', 'dispersion' and 'level of measurement' (analogous indication for 'range 2 (incompleteness)' using ^{xx}). In this way, the respective indicator manifestations are only included in the total index value if the range exists.

[3)] For the indicators of the information content, the index formation is scaled to topics of relevance to the firm. The indicators of the information presentation/preparation are scaled to topics for which the information content was actually provided (i.e., indicators of information presentation/preparation are only included in the total index to the extent that corresponding information content disclosures are available).

[4)] The indicator manifestations are captured in an equally weighted state for the different reception classes 1 (information content) or topics (information presentation/preparation) in the total index value.

1.5. Evaluation of the quality of the measuring instrument/research design

1.5.1. (Test-related) Reliability

In the formative measurement model used in this work, some of the commonly used forms of reliability testing are ruled out due to non-compliance with the underlying premises. Thus, testing internal consistence reliability (Cronbach's alpha) and evaluating reliability within the framework of a causal analysis is not permissible, since there is no redundant measurement of the construct via several indicators – i.e., each indicator measures a different dimension of the construct, which is why the relation between these indicators as required by measurement/test theory does not exist.[487] Testing by means of parallel test reliability (alternative forms reliability) is ruled out due to the lack of a second equivalent measuring instrument, which is why only testing by means of test-retest reliability is suitable in the context of this work.[488]

Essentially, the **test-retest reliability** approach aims at quantifying the reproducibility of the relation of measured values to characteristic manifestations for the same objects that exhibit these (manifestations of) characteristics with the same measuring instrument on the basis of the similarities of the measurement series by repeating the measurement.[489] In principle, two different variants are discussed in literature, addressing either the intersubjective or the intrasubjective agreement.

In the first variant, the **intersubjective agreement** of the executions is evaluated, which enables conclusions to be drawn about the objectivity and reliability of the executions. Objectivity is basically the independence of the measurement results from human agents with regard to execution, analysis/evaluation and interpretation.[490] Transferred to the content analysis, the intersubjective agreement of the executions can be measured by capturing intercoder deviations.[491] In the second variant, the **intrasubjective agreement** of the execution is evaluated. This is

[487] See Himme (2009), pp. 488-490.

[488] See Himme (2009), pp. 487-490.

[489] See the explanations in Chapter 1.1 and the explanations in Himme (2009), pp. 487 f. and Döring/Bortz (2016), pp. 442-444.

[490] See Döring/Bortz (2016), pp. 442 f.

[491] See Krippendorff (2013), pp. 270 f.; Döring/Bortz (2016), p. 566.

measured in the context of content analysis by the (degree of) agreement of at least two measurement series collected by the same coder (intracoder deviations).[492] The intrasubjective agreement only allows conclusions to be drawn about reliability in the narrower sense, i.e., not about the objectivity of the data collection.

Due to economic restrictions on research, the second variant is applied in this work. In view of the comprehensive and thorough documentation of the execution, analysis/evaluation and interpretation of the measurement results, the assessment by the author is that there are no indications of a significant lack of objectivity.[493] In addition, the time interval between the original and the repetition measurement series is deliberately chosen to be quite large at six months in order to reduce the influence of personal knowledge advantages that might result from the development and first application of the measuring instrument. Reliability is thus considered independently of intersubjective coder influences.

In addition to selecting a test sample as discussed in Chapter 1.3, it is also necessary **to narrow down the indicators to be tested**. Despite the thorough documentation, the assessment by the author is that the greatest potential reliability deficiencies lie in the area of information content due to the greater discretion of the coder, which is why indicators from this area are tested. In order to be able to evaluate a high number of codings within the test sample, the information items are also limited to 'stock/temporal development: non-current assets matrix' and 'total useful life (manifestation)'. A high number of codings offers sampling advantages and is, therefore, important for the statistical validity of the results. Despite the limitation to selected indicators and items, therefore, a sound evaluation of the reliability of the research results should be ensured.

With regard to the question of how to **quantify the coder agreement** and at what value level substantial reliability deficiencies can be assumed, the literature shows a heterogeneous picture – however, the following statements can be extracted.[494] Depending on the fulfillment of different premises such as the level of measurement of the measuring instrument to be evaluated,

[492] See Krippendorff (2013), pp. 270 f.; Döring/Bortz (2016), p. 566.

[493] See Döring/Bortz (2016), p. 442.

[494] See, in the following, the statements in Neuendorf (2017), pp. 165 ff., Döring/Bortz (2016), pp. 344-347 / pp. 566-570, Gwet (2014), Himme (2009), pp. 487 f., Krippendorff (2013), pp. 277 ff. and Früh (2017), pp. 179 ff.

absolute measurement parameters of agreement (e.g., Holsti's formula), chance-adjusted measurement parameters of agreement (e.g., Cohen's Kappa and Scott's Pi) and/or measurement parameters of association/correlation (e.g., the Pearson correlation coefficient) are proposed. For quality classification, typified reference values are often used, which roughly define three evaluation classes. Accordingly, values > 80 % indicate no substantial reliability deficiencies, values < 60 % indicate substantial reliability deficiencies and values between 60 % and 80 % represent a selective range. In principle, such reference values are helpful for an initial classification, though they have little or no basis in the nature of the matter. There is thus the risk of a blanket evaluation that does not do justice to the complexity of the task. Rather, the results are to be placed in the overall context (nature of the empirical relative, etc., see Chapter 1.4.5.1). Moreover, due to the problems mentioned above, transparent disclosure of various measurement parameters is not only recommended in aggregated form (e.g., with regard to the total index), but also at the level of individual variables/indicators, since otherwise considerable individual reliability deficiencies can be concealed by minor overall reliability deficiencies.

In the following, various reliability measurement parameters are therefore reported on a total (Table 13) and an individual basis (Table 14). For the measurement parameters of agreement, three different variants are reported for each measurement parameter, which are to be used depending on the assumed level of measurement of the measured values.[495] Variant (1) represents unweighted measurement parameters and is to be used at nominal levels of measurement; Variant (2) represents measurement parameters using ordinal weights and is to be used at ordinal levels of measurement; Variant (3) represents measurement parameters using linear weights and is to be used at interval levels of measurement. The different weighting reflects the consideration that not every deviation represents the same loss of reliability. According to variant (1), each deviation is captured in the same way – no matter how close the two codings are to each other. As per variants (2) and (3), respectively, it is captured whether the rank order or the distances between the two codings differ. Due to the interval level of measurement assumed here (with, to some extent, debatable overlaps to the ordinal level of measurement), the following interpretations are based on variants (2) and (3). For supplementary documentation of which manifestations the reliability measurement parameters have when checking for identical codings, the unweighted values (variant (1)) are also reported.

[495] On this subject and in the following, see, e.g., Gwet (2014), pp. 91-100.

Of the 392 second codings, a total of eleven codings are not identical to the initial coding, which corresponds to a deviation rate of 2.81 %. These deviations relate to five out of twelve firms, and are distributed among the indicators as follows: 'completeness' (*CP*) (four deviations), 'reception class 2' (*RC*) (three deviations), 'degree of differentiation (non-current assets matrix)' (*DDMT*) (two deviations), 'dispersion' (*DP*) (one deviation), and 'level of measurement' (*LM*) (one deviation). With regard to the information items, the deviations are distributed at a ratio of 5:6 among disclosures about the non-current assets matrix and the useful life, respectively. This deviation rate alone does not indicate reliability deficiencies.

With regard to the values of the reliability measurement parameters per indicator in Table 13, it is noticeable that with the exception of the indicators 'completeness' (*CP*) and 'level of measurement' (*LM*), the majority of the indicators in each measurement parameter category – agreement and association – have values of at least 80 %. For the indicators 'completeness' (*CP*) and 'level of measurement' (*LM*), the values are predominantly in the range of 70-80 % and, in some cases, even above 90 %. According to the above-mentioned blanket values, these results also do not point to substantial reliability deficiencies.

The problem with this evaluation at the indicator level is that it is based on cumulative values where deviations can be offset. This can be observed well in the fact that, for example, there are three absolute deviations for the indicator 'reception class 2' (*RC*), but Holsti's formula shows only one deviation for the corresponding sum value (the value 91.67 % corresponds to an 11/12 agreement). Therefore, a deeper look at the reliability measurement parameters at the level of the individual indicators is advisable.

Only the individual indicators for which absolute deviations were found (in the sense of 'the individual codings are not identical') are considered further. The results in Table 14 show the lowest values for the individual codings within the indicators 'completeness' (*CP*) and 'level of measurement' (*LM*) (*CP_1*-*CP_3* and *LM_1*). While the values for *CP_1*-*CP_3* are predominantly greater than 70 %, the values for *LM_1* are more in the 60-70 % value range, which indicates greater limitations of reliability. The results for 'dispersion' (*DP_1*) and 'reception class 2' (*RC_1*) with values in the range of 70-80 % – at least for the measurement parameters of agreement – indicate slight limitations of reliability.

Despite these isolated limitations and in view of the documentation of the measuring instrument and the reliability values reported here, it can be concluded overall that there are no consistent

indications of substantial reliability deficiencies. In particular, a favorable aspect to be mentioned is that the measurement parameter Gwet's AC, which is considered to be more robust with regard to various distortions than the other measurement parameters of agreement,[496] consistently shows values well above 80 % for all indicators and individual indicators. For the sake of prudence, however, higher measurement errors should be taken into account for the indicators 'completeness' (*CP*) and 'level of measurement' (*LM*).

[496] For example, with regard to the distortion whereby despite high agreement, a low coefficient value can result. See, for example, the classification in Neuendorf (2017), pp. 177 f.

Table 13: Reliability measurement parameters per indicator

	Aggregate	DDMT	CP	DP	LM	RS	RC	CHG	QC	TR
n (firms)	12	12	12	11	11	11	12	12	11	12
Measurement parameters of agreement										
Holsti's formula (1)	0.6667	0.9167	0.7500	0.9091	0.9091	1,0000	0.9167	1.0000	1.0000	1.0000
Brennan and Prediger (1)	0.6444	0.9129	0.7475	0.8990	0.8990	all zero	0.9141	1.0000	1.0000	1.0000
(2)	0.9129	0.9948	0.9350	0.9082	0.8623		0.9991	1.0000	1.0000	1.0000
(3)	0.8434	0.9782	0.8738	0.8898	0.8623		0.9924	1.0000	1.0000	1.0000
Cohen's Kappa (1)	0.6471	0.8983	0.5955	0.8608	0.8406	all zero	0.9000	1.0000	1.0000	1.0000
(2)	0.9059	0.9608	0.7606	0.8011	0.7715		0.9944	1.0000	1.0000	1.0000
(3)	0.8485	0.9341	0.7211	0.8053	0.7843		0.9762	1.0000	1.0000	1.0000
Scott's Pi (1)	0.6418	0.8979	0.5862	0.8599	0.8394	all zero	0.8996	1.0000	1.0000	1.0000
(2)	0.9058	0.9607	0.7603	0.7993	0.7691		0.9944	1.0000	1.0000	1.0000
(3)	0.8479	0.9339	0.7176	0.8036	0.7822		0.9762	1.0000	1.0000	1.0000
Gwet's AC (1)	0.6446	0.9135	0.7485	0.9020	0.9030	all zero	0.9144	1.0000	1.0000	1.0000
(2)	0.9154	0.9968	0.9774	0.9538	0.9405		0.9995	1.0000	1.0000	1.0000
(3)	0.8472	0.9829	0.9286	0.9257	0.9161		0.9941	1.0000	1.0000	1.0000
Krippendorff's Alpha (1)	0.6567	0.9021	0.6034	0.8662	0.8467	all zero	0.9038	1.0000	1.0000	1.0000
(2)	0.9097	0.9624	0.7702	0.8084	0.7796		0.9946	1.0000	1.0000	1.0000
(3)	0.8542	0.9366	0.7294	0.8125	0.7921		0.9772	1.0000	1.0000	1.0000
Measurement parameters of association										
Correlation coefficient (Pearson)	0.9445	0.9756	0.7861	0.8357	0.7927	all zero	0.9972	1.0000	1.0000	1.0000
Correlation coefficient (Spearman)	0.9441	0.9982	0.8168	0.9701	0.6585	all zero	0.9892	1.0000	1.0000	1.0000
Correlation coefficient (Lin's CCC)	0.9407	0.9674	0.7619	0.8000	0.7687	all zero	0.9968	1.0000	1.0000	1.0000
Correlation coefficient (ICC)	0.9454	0.9700	0.7773	0.8148	0.7852	all zero	0.9971	1.0000	1.0000	1.0000

(The table is continued on the next page.)

Table 13 (Continued)

This table provides various measurement parameters for evaluating the reliability of the indicators 'degree of differentiation ((non-current assets) matrix)' (*DDMT*), 'completeness' (*CP*), 'dispersion' (*DP*), 'level of measurement' (*LM*), 'reason/cause' (*RS*), 'reception class 2' (*RC*), 'class homogeneity' (*CHG*), 'quantitative context' (*QC*) and 'time reference' (*TR*) for the information items 'stock/temporal development: non-current assets matrix' and 'total useful life (manifestation)' for the firms in the test sample. These calculations are based on a second coding conducted by the same coder after a time period of six months. The 'aggregate' column contains the corresponding (values of the) measurement parameters for the sum of the indicator values. For the indicator *RS*, no values are reported for the most part ('all zero'), as the corresponding codings have all resulted in the value zero and, therefore, the measurement parameters cannot be calculated. The lines (1)-(3) in the measurement parameters of agreement contain the values of the unweighted (nominal level of measurement – (1)), ordinally weighted (ordinal level of measurement – (2)) and linearly weighted (interval level of measurement – (3)) measurement parameters, respectively; on this matter, see the documentation in Stata ('help kappaetc_choosing') in conjunction with Gwet (2014), p. 24. In the case of the measurement parameters of agreement, *AC* stands for 'agreement coefficient'. In the case of the measurement parameters of association, *CCC* and *ICC* stand for 'concordance correlation coefficient' and 'intraclass correlation coefficient', respectively. The *ICC* values are calculated in the form of two-way mixed-effects models, absolute agreements and individual ratings. All calculations are performed with Stata 13.1 IC software.

Table 14: Reliability measurement parameters per individual indicator with different codings

	DDMT_1	DDMT_2	RC_1	RC_2	CP_1	CP_2	CP_3	DP_1	LM_1
n (firms)	12	12	12	12	11	11	11	11	11
Measurement parameters of agreement									
Holsti's formula (1)	0.9167	0.9167	0.8333	0.9167	0.9091	0.8182	0.9091	0.9091	0.9091
Brennan and Prediger (1)	0.8750	0.8750	0.7917	0.8958	0.8182	0.8017	0.8864	0.8909	0.8909
(2)	0.9250	0.9250	0.8810	0.9107	0.8182	0.9869	0.6753	0.7662	0.6494
(3)	0.9062	0.9062	0.8438	0.8958	0.8182	0.8130	0.7727	0.8130	0.7662
Cohen's Kappa (1)	0.8621	0.8462	0.7670	0.8776	0.7442	0.5417	0.7442	0.7556	0.7609
(2)	0.8974	0.8667	0.7983	0.8560	0.7442	0.9394	0.7442	0.8173	0.6224
(3)	0.8824	0.8571	0.7805	0.8519	0.7442	0.7738	0.7442	0.7885	0.6541
Scott's Pi (1)	0.8613	0.8452	0.7659	0.8769	0.7412	0.5319	0.7412	0.7528	0.7582
(2)	0.8970	0.8659	0.7957	0.8551	0.7412	0.9391	0.7412	0.8157	0.6158
(3)	0.8818	0.8563	0.7785	0.8509	0.7412	0.7715	0.7412	0.7864	0.6486
Gwet's AC (1)	0.8809	0.8860	0.7973	0.8997	0.8599	0.8115	0.9003	0.9019	0.9017
(2)	0.9358	0.9435	0.9072	0.9360	0.8599	0.9959	0.8671	0.9100	0.8634
(3)	0.9166	0.9244	0.8659	0.9153	0.8599	0.9275	0.8766	0.9004	0.8745
Krippendorff's Alpha (1)	0.8671	0.8516	0.7756	0.8821	0.7529	0.5532	0.7529	0.7640	0.7692
(2)	0.9013	0.8715	0.8043	0.8612	0.7529	0.9419	0.7529	0.8241	0.6333
(3)	0.8867	0.8623	0.7877	0.8571	0.7529	0.7819	0.7529	0.7961	0.6645
Measurement parameters of association									
Correlation coefficient (Pearson)	0.9206	0.9113	0.8321	0.8705	0.7698	0.8503	0.7698	0.8395	0.6633
Correlation coefficient (Spearman)	0.9238	0.9670	0.8019	0.7460	0.7698	0.8575	0.7698	0.8563	0.7230
Correlation coefficient (Lin's CCC)	0.9091	0.8750	0.8077	0.8580	0.7442	0.8298	0.7442	0.8233	0.6154
Correlation coefficient (ICC)	0.9160	0.8842	0.8208	0.8683	0.7619	0.8428	0.7619	0.8367	0.6377

(The table is continued on the next page.)

Table 14 (Continued)

This table provides various measurement parameters for evaluating the reliability of various individual indicators, for which there are deviations between the initial and the second coding for the information items 'stock/temporal development: non-current assets matrix' and 'total useful life (manifestation)' for the firms in the test sample. The second coding was conducted by the same coder after a time period of six months. The individual indicators are 'stock/temporal development: non-current assets matrix/APC or cumulative depreciations/consolidated group changes/degree of differentiation (non-current assets matrix)' (*DDMT_1* or *DDMT_2*), 'stock/temporal development: non-current assets matrix/reception class 2/accounting-related class or class' (*RC_1* or *RC_2*), 'total useful life/completeness or incompleteness or excluded components' (*CP_1* or *CP_2* or *CP_3*), 'total useful life/dispersion' (*DP_1*) and 'total useful life/level of measurement' (*LM_1*). The lines (1)-(3) in the measurement parameters of agreement contain the values of the unweighted (nominal level of measurement – (1)), ordinally weighted (ordinal level of measurement – (2)) and linearly weighted (interval level of measurement – (3)) measurement parameters, respectively; on this matter, see the documentation in Stata ('help kappaetc_choosing') in conjunction with Gwet (2014), p. 24. In the case of the measurement parameters of agreement, *AC* stands for 'agreement coefficient'. In the case of the measurement parameters of association, *CCC* and *ICC* stand for 'concordance correlation coefficient' and 'intraclass correlation coefficient', respectively. The *ICC* values are calculated in the form of two-way mixed-effects models, absolute agreements and individual ratings. All calculations are performed with Stata 13.1 IC software.

1.5.2. Theoretical evaluation of the construct validity

1.5.2.1. Preliminary thoughts on and procedure for the theoretical evaluation

In the course of the evaluation of construct validity, it must be discussed to what extent the developed measuring instrument is able to represent the underlying theoretical construct, i.e., to what extent the underlying construct is expressed in the analyzed data. These considerations apply in addition to the (test-related) reliability considerations made in the previous chapter. The determinants of construct validity are, on the one hand, the construct or concept specification and, on the other, the steps of operationalization.

To prove the existence (or rather the manifested degree) of construct validity conclusively is impossible.[497] Measurement parameters assessed as valid are characterized by a comprehensive and direct relation to theory, whereby these theories, according to epistemology, are themselves exposed to possible falsification/rejection – every measurement parameter developed in such a manner is, thus, contingently invalid. Research deals in two fundamentally different ways with this logical circular reference of evaluation – theoretically on the one hand, empirically on the other.

Within the framework of the **theoretical evaluation**, it is acknowledged that construct validity cannot be tested formally. A rigorous, theory-driven and transparent construction of measurement parameters is conducted, which at the same time facilitates construct validity per se as well as its evaluation. The evaluation is carried out through an argumentative comparison of the construct and measurement level as well as a critical reflection of the construction/development process.

Within the framework of the **empirical evaluation**, validity statements are derived from empirical relations. It is assumed that empirical relations to previous measurement parameters of the same/different construct (convergent/discriminant validity) or to measurement parameters of determinants/consequences related to the construct (criterion validity) provide clues for the evaluation of construct validity. This procedure is not very convincing in the form of **convergent/divergent validity**, since, for example, the lack of/the existence of an empirical relation

[497] On this matter and the following considerations on the testability of validity, see the discussion in Rossiter (2002), in particular pp. 326-328. For classification and definition of the terms, see also Himme (2009), pp. 491-496, Neuendorf (2017), pp. 126-128 and Döring/Bortz (2016), pp. 445-448.

to previous measurement parameters only indicates that something was measured differently/equally (and/or that another/the same thing was measured) – the actual question of the validity of the interpretation of the measured values, i.e., the question of what was actually measured, is not answered with this procedure. A decisive argument of this work is that previous measurement parameters have a lower (or unknown) validity, so that an orientation toward these measurement parameters would be all the more problematic. Such an evaluation cannot lead to meaningful results in this work, and is therefore not applied.

In the form of **criterion validity**, evaluation problems inevitably arise if the underlying theories do not permit precise and accurate predictions of the relations. These problems are exacerbated when there are doubts regarding the degree to which the other constructs formulated in the theories (i.e., not corresponding to the construct to be evaluated) can be validly measured. A measurement is valid if the constructs described in the underlying theories are adequately represented in the analyzed data. In other words, the quality and meaningfulness of empirical evaluation via criterion validity will be all the greater the more distinctly stable relations exist to the construct questioned regarding its validity, the more distinctly these relations have been processed in and into theories and the more distinctly these relations can also be 'detected' as such in the data. The question of whether it makes sense in the context of this work to pursue the path of evaluation by means of criterion validity cannot be answered conclusively. Many of the above-mentioned problems are characteristic of the social sciences, and the presentation of the state of research in Part 1 shows that this also applies – and perhaps even in particular – to the concrete thematic framework of this work.

Even if, in principle, both perspectives/approaches – theoretical and empirical – are equally important components of the cognitive process and, thus, are also equally important perspectives on/approaches to the evaluation, the theoretical perspective/approach is better suited for evaluation due to the described problems of empirical detection, especially in the context of this work. In the following, the theoretical evaluation is therefore carried out first. Since a comprehensive documentation and evaluation also includes an empirical approach, an empirical evaluation is also carried out afterwards.

Construct validity is theoretically determined by two factors: the construct or concept specification and the steps of operationalization. A complete and precise **construct or concept specification** is difficult to demonstrate argumentatively, since it is essentially determined by the selection, analysis and interpretation of the underlying theoretical and empirical findings. Apart

from the reference that this was done to the best of the author's knowledge and belief/conscience, nothing can be contributed argumentatively to answering this question.

For reasons of better readability, the **steps of operationalization** – which describe the path from the construct to the measuring instrument – have essentially already been discussed at the points where a decision or consideration had to be made, e.g., with regard to the selection of the research design, the measurement model, the measurement method, the coding and measuring units, etc.

One step that has not yet been explicitly acknowledged, but which, in the author's assessment, is likely to have the greatest influence on the quality of the knowledge gained, is the link between the identified construct dimensions (information principles) and indicators or, more precisely, the degree of correspondence between these levels. On the one hand, a fundamental influence results from the nature of the matter, in that the finding of appropriate indicators is a necessary condition of an appropriate measuring instrument. On the other hand, the indicators developed in this work are to be classified predominantly as innovative (in the sense of novel, a deviation from what has been done so far; not in the sense of a better-worse judgement), which entails both increased risks and opportunities for the validity of the further results. Consequently, the focus of the following explanations is on linking these two levels (construct level and indicator or measurement level). At the same time, the author will do his best to reflect, in the context of the construct or concept specification, on his own considerations that led to the construction of the indicators in order to clarify the implications and limitations of the measurement.

1.5.2.2. Information content

1.5.2.2.1. Construct level

When considering the construct dimension information content, it is noticeable that, in contrast to the construct dimension information presentation/preparation, the principles formulated therein are not directly allocated to the individual indicators. The principle of materiality is measured, for example, by the indicator 'non-boilerplate intensity', whereas no individual indicators were constructed for the principles of relevance and reliability due to the greater complexity of the relevance/reliability considerations. The reason for the greater complexity, however, is the pronounced context dependence, which is already formulated in the nominal definition of reporting quality and has the greatest impact in the area of information content. This results in manifold interdependencies between the individual information (sub)principles, which make an isolated measurement – as is postulated here and discussed later – impossible. This postulate is based on an extensive and intensive review of previous practices in the literature in conjunction with numerous attempts by the author to divide this problem area precisely in terms of measurement theory. Under this premise, the lack of direct allocation between information (sub)principles on the one hand and indicators on the other does not indicate any deficiency in operationalization. On the contrary, in this case this is a necessary condition for a realistic and, thus, construct-valid representation of complex reality.

Even if there is no direct allocation, it is crucial for construct validity that the indicators described in their sum properly represent the information principles described. In order to understand how the individual indicators contribute to this, examples are provided below to illustrate the complex relationship between principles and indicators, first illustrating the interaction at the principle/construct level and then the transition to indicators (measurement level).

At the **construct level**, information is relevant if it contributes to the achievement of the recipient's objective and reliable if it is as truthful as possible and can be assessed accordingly by the recipient – both of which are beneficial to reporting quality. Although this meaning can be logically allocated to two principles, this is difficult at the indicator/measurement level. For example, take the disclosure of detailed information (cost of capital, allocation to CGU, etc.) about an impairment test and classify it first with regard to the objective and then with regard to the information principles relevance and reliability. While one user makes an estimate of the future firm risk or the like on the basis of the disclosures in accordance with the prediction

function, another user will use the same information in accordance with the determination function to assess the performance of the manager or similar (objective). While on the one hand it can be argued that this information is suitable for a better assessment of the fundamental firm risk, the opportunity/risk situation in various firm areas, the performance of management, etc. (relevance), on the other hand it can also be argued that this information is suitable for checking an impairment loss for its truthfulness, limiting earnings management, etc. (reliability). In the real world, all these aspects usually occur in parallel, but the underlying phenomena in the real world cannot be directly represented in different indicators at the measurement level.

In order to assist in the search for and construction of indicators, further subprinciples regarding information topics and information design were identified within the relevance principle. These subprinciples are by no means always mutually exclusive, but they complement each other and are intended to ensure that no significant considerations implicit in the nominal definition are overlooked in the development of the indicators. Here it becomes clear how multifaceted the considerations on relevance are. In the above example, the need to know the cost of capital, the allocation to CGUs, etc. can already be derived from the functions and the definition of relevance. In the next step, the subprinciples serve a deeper rationale/substantiation and, in particular, a concretization in order to be able to derive finer/more detailed information needs. Thus, on the basis of the information topics, the need can already be deduced that it makes sense to provide disclosures about the manifestation of the values (to assess reality, e.g., to estimate the success potential of the firm) and about the determination of these values (to assess the depiction of reality). Building on this, refinements of this need can be derived with the aid of the subprinciples. In relation to the above example of the cost of capital, e.g., the following considerations can be derived:

- A need for disaggregation of the cost of capital into the cost of capital of individual CGUs and assets (disaggregation).
- A need for the content-describing classification of the commonalities/differences of the reference objects (classification – not only ‘other assets’).
- A need for disclosure of values from the previous year(s) (specificity or temporal context).
- A need for disclosure of the assumptions made by management for the determination/calculation (specificity or firm context).

- A need for disclosure of uncertainty in estimating the cost of capital (specificity or uncertainty context).
- The insight that complete disclosures must be provided: otherwise, the relevance of the information decreases (completeness).
- The insight that the comparability of disclosures is inevitably influenced by the degree to which these requirements are met (intertemporal and/or firm-specific).

Analogously, these considerations – due to the inherent linkage of relevance and reliability shown above – can be transferred to the principle of reliability. The more specific, complete, etc. disclosures are, the more reliability deficiencies are identified or reduced. These reliability deficiencies arise from a complex system of effects, which is largely determined by uncertainty and external verification frictions as well as competence or incentive frictions, with their foundations in the manager or in the contract design. These factors and the considerations on relevance are crucial to capture reliability – however, like the subprinciples of relevance, they cannot be isolated into individual/separate indicators.

It can therefore be concluded that interdependent links already exist at the construct level – complete disclosures generally lead to more comparability (of information), classifications are only meaningful if they also represent specific disclosures from the point of view of (the better-informed) management, which in turn help in identifying or reducing reliability deficiencies, etc.

The construct described in this way elucidates the information content in annual reports in general. As the focus of this work is on the notes reporting on intangible assets, two additional specifications have been made. The first specification is based on the delimitation of the notes, which essentially results – not theoretically, but empirically – from the classic division of annual reports into three parts: management report, financial statements and notes in conjunction with the usually assigned functions explanation, supplementation and disburden. Accordingly, the explanation and supplementation of intangible assets are important for the information content in the notes. The second specification results from the special characteristics of intangible assets such as increased uncertainty, classification variants (types) as well as characteristics that result explicitly from their depiction by accounting. As a result, the numerous interdependencies mentioned above continue to exist. In its specified form, however, the construct information content describes more concretely – and, thus, better for the purpose of finding indicators – how the information content can be measured (in a valid way).

1.5.2.2.2. From the construct level to the measurement level

After clarifying the complexity of the information content construct, the focus shifts to the transition to the **measurement level**, i.e., to the indicators. In light of the previous remarks, it should be emphasized once again that isolated and all-encompassing indicators for separate construct dimensions such as relevance, comparability, disaggregation, etc. are not possible. In addition, an average view is implicitly assumed, i.e., the resulting indicators are to represent the information requirements of an average user, detached from individual peculiarities. The operationalization of the information content was carried out through six steps, which are reflected in the following in the context of the construct or concept specification (principle/construct level).

In the **first step**, four basic epistemic goals of the users were derived: information on intangible assets with regard to type ('what?'), quantity/value ('how many or at what value?'), reason/cause ('why, where from?') and depiction ('according to which (firm-)specified rules is the depiction carried out?').

In the **second step**, a general framework was built based on these questions and the existing accounting structure, which on the one hand systematizes the reality to be depicted on the basis of business transactions and, on the other hand, the decisions to be made by management on the depiction in the context of the accounting system. Business transactions that occur in the real world and must be recognized in the financial statements include, for example, purchase-price allocations and the capitalization of development expenses. Among the accounting decisions to be made by management in the course of depiction are the exercise of accounting options, the selection/determination of measures of value, valuation inputs, valuation models, the specification of indefinite/general terms and much more.

In a **third step**, this general framework was further differentiated and concretized on the basis of two observations that only became clearly apparent when the development sample was examined. On the one hand, it was noted that there are often three fundamentally different types of disclosures that can be separated meaningfully: descriptions of conditions themselves (manifestations – e.g., 'what is (the value of) the discount rate?'), (descriptions of) determinations of conditions, describing the process by which the manifestation is created (determinations – e.g., 'how was the discount rate determined?') and statements of reason/cause that identify causal factors that led to the determination process or to the manifestation (e.g., 'due to the change in the ECB's money market policy, the risk-free interest rate has increased, leading to an increase in the cost of capital'). On the other hand, it became apparent that disclosures can

be divided into statements that set something or statements of condition/observation (premises) and statements of measurement, estimation and/or expectation (conclusions). An infinite number of refinements can be conceived of, i.e., each premise can in turn be seen as a conclusion and can in turn be traced back to one or more premise(s) of a more fundamental nature.[498]

It is reasonable to differentiate in depth on the basis of the subdivision into manifestation, determination and reason/cause, as this is covered by the construct on the one hand and is shown in reporting practice as a suitable dividing criterion on the other, which should result in measurement being less prone to error. However, the fact that this subdivision is possible in infinite complexity is problematic for measurement. A transparent, but ultimately arbitrary – in the sense of not being directly derivable from the construct – limitation therefore has to be made. Within the scope of this work, this limitation was derived from the intensive examination of the development sample. The idea behind this is that if, for example, no firm goes into detail on how the market portfolio was selected when applying the CAPM, this will probably not be the case in the examination sample either. Retrospectively – after analyzing the examination sample – this proved to be correct.

This approach has critical consequences for the interpretation of the measured values. If report contents that are in principle covered by the construct are not captured because they are not the subject of reporting practice, a relative measurement is carried out – statements about the absolute level of information content are thus not possible and, therefore, inadmissible. However, comparative and, thus, relative statements between firms are still permissible. In other words, it can be seen here that completeness with regard to the measurement of the construct can only be achieved relatively under consideration of the frictions of research practice, i.e., the resulting indicators do not capture all theoretically conceivable phenomena of reality and, thus, the construct in every conceivable differentiation, since in principle many further subdivisions conforming to the construct could be conceived of. However, this does not prevent a meaningful comparison of the firms on the basis of the information content thus represented.

The observation formulated at the beginning of the chapter that it is not possible to allocate individual indicators to individual subprinciples and principles in the construct of information content can now be further illustrated. The more disclosures a firm provides according to the

[498] On this subject, see also the ‘Münchhausen trilemma’ after Hans Albert, described in Döring/Bortz (2016), p. 39.

phenomena that can be captured by the indicators identified so far (more topics, more manifestations, more determinations, more reasons/causes, etc.), the more detailed, specific, reliable, contextualized, etc. are the disclosures, and the higher the information content. Which part of the disclosures now influences relevance and which influences reliability or their respective subprinciples cannot be resolved at the measurement level. Therefore, it is not possible to draw unambiguous conclusions about (the accordance with or the fulfillment of) subprinciples and principles from the identified indicators in isolation. If, on the other hand, all indicators are considered (in combination), conclusions can inevitably be drawn about the construct, since the previous development steps were derived from the construct.

These provisional indicators were further differentiated in a **fourth step** in order to be able to capture further aspects of the construct in reality in a more detailed manner. The existing accounting structure offers the possibility to divide the business transactions to be depicted into further natural subsets that can be used to capture completeness. For example, the disclosure of useful lives is only possible for intangible assets with a finite useful life, disclosures about the impairment test of intangible assets are only possible for intangible assets that have been tested accordingly, and so on. Depending on the number of assets for which disclosures are provided by the firm in these subsets referred to as ‘distribution levels’, a statement about the completeness of the disclosures can be generated. Here, too, it is not only one subprinciple that is represented exclusively. Since the query of complete disclosures is carried out within the previously illustrated reference system, it also has implications for other subprinciples, such as disaggregation. In precise terms, this measurement parameter (of completeness) captures the share of the distribution level for which the firm provides disclosures, for example, in the form of the manifestation(s) of the cost of capital. Likewise, the previous argument regarding the impossibility of a complete indicator development also applies here. If a firm’s disclosures on all identified topics along the dimensions manifestation and determination establish a complete reference to all distribution levels, the firm reports more completely than another firm whose disclosures do not establish a reference to any particular distribution level – the emphasis here is on the comparative statement ‘more completely’ in the sense of relative completeness. An inference as to the absolute completeness of the disclosure(s) and reporting, however, would be incorrect and misleading.

Within this structure, further indicators were developed iteratively in a **fifth step** on the basis of a further detailed examination of the considerations contained in the construct and the reporting practice in the development sample in order to be able to represent the considerations contained in the construct as comprehensively as possible in the index. The considerations on the subprinciples disaggregation, classification and context point out that disclosures will differ in their information content if they contain differently concretized reference objects (e.g., 'intangible assets' vs. 'patents'). Of importance are the distinction according to a classification scheme ('patent' = 'class', etc.), the allocation of a financial scale ('one million EUR', etc.) and the homogeneity of the classification ('patents and software' vs. 'patents and intangible assets with a finite useful life', etc.). Likewise, the level of measurement ('the useful life is long' vs. 'the useful life is five years', etc.), the dispersion ('the useful life is three to five years' vs. 'the useful life is three years') and the time reference of the disclosures ('the carrying amount is five million EUR' vs. 'the carrying amount is five million EUR as in the previous year') influence (their accordance with or their fulfillment of) subprinciples such as specificity, comparability, context and disaggregation and, thus, their information content.

In the **sixth step**, it became clear relatively quickly during the software-based implementation and initial coding test runs that this measurement system would not be applicable to all the identified disclosures without, among other things, having to accept considerable errors and, thus, losses in (test-related) reliability, which in turn would inevitably lead to losses in validity. After a comprehensive examination of the reporting practice in the development sample, it became apparent that most of the stock and temporal development disclosures (development in the sense of change) can be found in the non-current assets matrix, CGU matrix and BC matrix and that, in addition, there are often incomplete, inconsistently structured disclosures pertaining to reasons/causes outside the matrices. As the capturing of the latter disclosures has a major impact on the complexity of the coding system and its application, a simplified coding system has been introduced for these disclosures. Accordingly, matrix disclosures are coded in a very comprehensive and detailed way while the additional disclosures (to be found outside the matrices) are coded more coarsely with regard to their additional explanatory contribution (e.g., a further disaggregation of the matrix disclosures). A disadvantage of this approach is the resulting breach of the indicator system in comparison with the indicators of the other disclosures. In addition, the phenomena of reality are unlikely to be reflected in the measured values for these stock and temporal development disclosures in as many layers as they are for the other disclosures, which must be taken into account when interpreting the results. However, these

disadvantages should be more than offset by the benefits of a substantially lower error rate and more efficient data collection. Moreover, the indicator system still conforms to the construct.

Overall, it has to be noted for the indicators of the information content that, due to the complexity/interdependencies of the construct to be measured, they cannot provide an isolated measurement of individual information (sub)principles. Furthermore, these indicators measure information content in a relative manner. This is due to the impossibility of representing all information requirements that can be thought of/conceived of within the construct by means of indicators. The above explanations are intended to illustrate where incompleteness may arise (or where it may exist) and, thus, are also intended to help identify any existing construct validity deficiencies.

1.5.2.3. Information presentation/preparation

1.5.2.3.1. Construct level

The considerations on the information content implicitly assume a pure benefit consideration from the point of view of the users. The higher the content of the information, the more benefits users can derive from it in the context of their own considerations. However, this alone allows only incomplete statements about the quality of the reported information, since costs must also be considered when assessing quality. In view of the usual understanding of the concept of reporting quality, only the users' direct transaction costs of acquiring and processing information (information costs), which are influenced by the information presentation/preparation, were regarded as a component of reporting quality and further specified in this work.

For this purpose, the information principles of materiality and clarity were identified at the **construct level** with special consideration of the insights offered by behavioral economics. The first principle of materiality refers to a limitation of the information content. If the information content is limited to particularly important/relevant information, the information costs of the users are reduced as a result, since a smaller amount of information, c.p., reduces costs for the information acquisition and processing of the users. As a result, the overall costs are likely to fall more than proportionately to the benefits, with the result that the cost-benefit ratio is likely to be more favorable overall. The second principle of clarity refers to the presentation of reported information. The more a report presents information in accordance with the subprinciples of format (visualization), diction (formulation) and coherence (logic and connection), the

easier it will be for the users to acquire and process information, resulting in, c.p., lower information costs and, thus, a more favorable cost-benefit ratio.

Both information principles establish a relative relation to information costs by identifying factors that influence those costs. The more material and clear the reporting by firms is, the more favorable, c.p., the cost-benefit ratio or the lower the information costs from the users' point of view. An absolute statement about the cost-benefit ratio is therefore not possible. In order to prevent misinterpretations and to express/indicate the common effect character of these principles, they are subsumed under the term information presentation/preparation. Information presentation/preparation represents the extension of the considerations on the information content by information costs.

1.5.2.3.2. From the construct level to the measurement level

After clarifying the information presentation/preparation construct, the transition to the **measurement level** – i.e., to the indicators of the individual principles – is considered. Starting with the principle of materiality, it should be noted that the aspects formulated in the construct can only be measured by knowing the (user-dependent) weighting of information and the associated costs. These aspects can only be captured – if at all – with the help of other measurement methods, such as a user survey. Since this type of data collection is itself subject to further problems (see the discussion on the selection of the measurement method in Chapter 1.2), corresponding consideration of weighting factors and information costs was refrained from in this work. Instead, the non-boilerplate intensity indicator was assigned to the construct of materiality, representing a quantity-related intensity measurement parameter of firm-specific and, at the same time, topic-related disclosures in relation to all topic-related disclosures. On the basis of the assumptions that only firm-specific disclosures embody a benefit or a considerably greater benefit in comparison with other already generally known disclosures, that all topic-related disclosures cause costs and, in particular, that the costs of the firm-specific disclosures are no more than proportionately related to the benefit, it can be deduced that a higher intensity value represents a more favorable cost-benefit relation and, thus, the construct of materiality.

As a result, it should be noted that a relative measurement of materiality is carried out and that other aspects of the construct that can only be taken into account by knowing the individual cost-benefit relations are not represented in isolation. In addition, it should be noted that the assumption that only firm-specific disclosures embody a benefit is also implicitly assumed in

the capturing of the information content due to the formulation of the coding units and indicators, which by the author's assessment should adequately represent the corresponding constructs.

The other aspects of the information presentation/preparation are captured in isolation within the principle of clarity using the subprinciples diction, format and coherence. Diction is represented by the capturing of various text characteristics identified in linguistics, which generally should have a valid connection with the diction/readability of texts and are therefore not discussed further here. The indicators of the format subprinciple, in turn, capture visual characteristics that are usually described in the literature as being clarity-facilitating (e.g., the use of tables or graphics) and also occur in the reporting practice of the development sample. Due to the fact that no substantial considerations in the construct were ignored here, the indicators should, in principle, represent the construct appropriately.

The considerations on coherence are essentially based on the divide-and-conquer strategy assumed, from which a positive effect of indicated, isolated and, at the same time, referenced partial information packages can be derived for clarity. The operationalization is based on the assumption that, on the one hand, an external structure is likely to be important for indicating and referencing, which is why the existence of a table of contents, the depth of the outline in the table of contents and references from the financial statements to the notes are captured as factors that enhance coherence. On the other hand, the internal structure is likely to be important. For this purpose, typified partial information packages were assumed, which are based on the considerations regarding the information content (e.g., all disclosures with information content about the topic 'subsequent measurement impairment test'). The more referencing takes place between different locations of the disclosures per partial information package or if all disclosures are provided at one location (isolated disclosure), the more coherent the presentation. In addition, the indication specificity of the respective headings is captured, as this is likely to be decisive for the search costs of the users and, thus, for coherence. Due to the considerable complexity of the variants of coherent vs. less coherent reporting to be conceived of in the information subprinciple 'coherence', this operationalization can be understood as a rough approximation. Further ideas, e.g., with regard to the capturing of distances (measured, e.g., by pages) between the individual locations of disclosures, have been rejected for reasons of economic restrictions on research. In addition, it should be noted restrictively that, depending on the assumed typified information search and processing strategy, other indicators may also be

justifiable. This applies in particular if the information referencing in the context of opportunities of automated text search may be of less importance.

1.5.2.4. Overall view

Overall, various indicators are thus available that represent a large part of the dimensions described in the construct of reporting quality. When it comes to interpretation, the following points are decisive. On the one hand, the index carries out a **relative measurement**, e.g., with regard to the infinitely possible differentiation of disclosures of interest, which cannot be completely depicted/captured with (or allocated to) indicators. On the other hand, the index carries out an **average measurement** because, e.g., not every user needs disclosures about cost of capital as part of the impairment test for his individual decision making/context, whereas the average user does. It is also an average measurement because not every user – e.g., due to different skills in analyzing annual reports – draws substantial cost-benefit advantages from better information presentation/preparation in the form of increased readability, etc.

1.5.3. Empirical evaluation of the construct validity

1.5.3.1. Theory framework

For an empirical evaluation of construct validity, a theoretical framework of reference that is considered valid must first be selected that the vast majority of empirical studies does not contradict. In addition, it is important to ensure that the theoretical reference entities/constructs are measured as directly as possible, i.e., without the need for extensive further assumptions, in order to be able to limit distortions or measurement errors.

A **theoretical framework of reference** that best meets these requirements according to the literature is the signal precision approach in the context of cost of capital.[499] Accordingly, external users, such as equity providers, are interested in estimating/assessing the uncertain future manifestations of the economic situation of the firm as well as possible in order to determine the firm value. In making these estimates/assessments, they rely on information that is itself subject to uncertainty. Depending on the precision of this information (signal precision or information uncertainty), it is possible to deduce behavioral predictions (consequences) from the theories, which can be substantiated by observable manifestations of capital market characteristics.

Before these theoretical relations can be empirically detected, this chapter first clarifies two fundamental aspects on a theoretical level. The first step is to describe the theoretical model from which the predictions are derived (see Figure 12, to which reference is made in the following with regard to the individual paths of effects). To this end, the consequences of signal precision (path (1)) and the influencing factors of signal precision (paths (4)-(6)) are specified separately and, initially, by ignoring endogeneity (path (3)). Afterwards, the discussion deals with the thus-modeled construct ‘signal precision’ and which theoretical relation it has to the construct ‘notes reporting quality’ that is to be validated. Furthermore, another point of discussion is that of which consequences result from this for further evaluation. In the following chapter, these considerations are transferred to the measurement level (determination of the research design and operationalization).

[499] On this and the following statements, see (representatively) the theoretical modeling in Lambert/Verrecchia (2015) and Lambert et al. (2012). On this and the following statements, see (representatively) the findings of the empirical testing in Armstrong et al. (2011), Bhattacharya et al. (2012), Balakrishnan et al. (2014), Lu et al. (2010), Amihud (2002) and Amihud/Mendelson (1986).

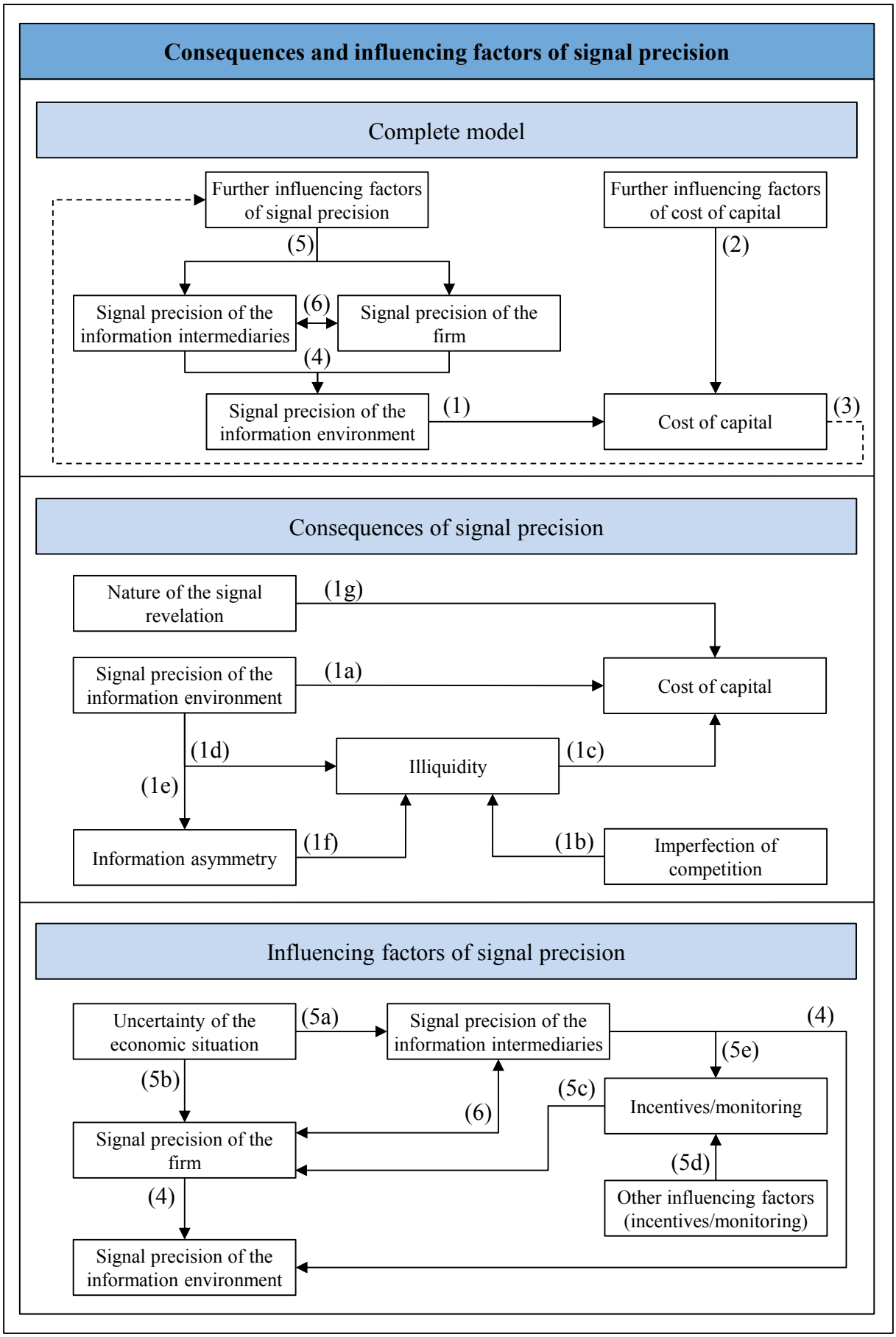

Figure 12: Modeling of the consequences and influencing factors of signal precision

The **consequences** of a change in signal precision are modeled, in theory, as follows.[500] With perfect competition on the capital market, whether knowledge is unequally distributed among investors – i.e. whether there are information asymmetries between investors – is irrelevant to the effect of a change in precision on the cost of capital, since less well-informed (less informed) investors can learn from the trading behavior of more well-informed (better informed) investors. In this case (perfect competition), an increase in precision directly reduces the cost of capital, but the initial distribution of knowledge is irrelevant (path (1a)). With imperfect competition, investors face a (stock) price curve that rises with increasing demand, resulting in transaction costs and (stock) illiquidity (path (1b)). In this framework of premises, a distinction is made between two cases. If no information asymmetries exist, i.e., if knowledge is distributed equally among investors, the cost of capital is reduced by higher precision (path (1a)) and lower illiquidity (path (1c)), whereby precision in turn has a reducing effect on illiquidity (path (1d)). If, on the other hand, information asymmetries exist, a further effect channel exists in addition to path (1a) and path (1d), which goes beyond a change in the average precision of the knowledge of all users/investors: even with constant average precision of all (better and less informed) users/investors, a reduction in knowledge differences (path (1e)) leads to a reduction in illiquidity (path (1f)) and, thus, to a reduction in the cost of capital (path (1c)). It follows that knowledge differences only have an isolated influence on illiquidity (path (1f)) and cost of capital (path (1c)) if the learning mechanism is inhibited by market imperfection.

In addition, there are other factors influencing the cost of capital, such as the nature (i.e., positive or negative) of the signal revelation (path (1g)), individual risk preferences of the users/investors, etc. (path (2)).[501] Due to the later decision to focus on the investigation of the relationship between signal precision and information asymmetry (path (1e)) and between signal precision and illiquidity (path (1d)), respectively, these influencing factors are not discussed further. With this, the modeling of the effects/consequences (‘What does signal precision result in?’) is described. It remains to be clarified which influencing or actuating factors determine signal precision (‘What leads to/what causes signal precision?’).

The primary **influencing factor** of signal precision is the underlying uncertainty of the economic situation of the firm, which is attributable to the firm’s business activities (business

[500] On this and the following statements, see (representatively) Lambert/Verrecchia (2015) and Lambert et al. (2012).

[501] See, e.g., Wagenhofer/Ewert (2015), pp. 131 ff.

model, operating environment, etc.).[502] This uncertainty is transformed into a signal and reported to the users/investors by the reporting of the management (annual reports, etc.) and the information intermediaries (analysts, etc.) (path (5a), (5b) and (4)). The firm signal in focus here is modeled as the result of a transformation process influenced by incentives and monitoring/scrutiny.[503] Theoretically, it is to be expected that, c.p., the signal becomes more precise the more pronounced the (corresponding) incentives and monitoring are (path (5c)). For example, it is assumed that management anticipates the consequences of its reporting described above (information asymmetries, illiquidity, cost of capital) and aligns its reporting with these consequences in accordance with/as a consequence of a cost-benefit analysis (path (5d)). For this reason, the (presumed) consequences are also to be understood as influencing factors of reporting, i.e., there is a circular relationship between consequences and influencing factors (path (3)).[504] Therefore, all investigations of these underlying relationships are always exposed to an endogeneity problem of the variables analyzed.

This circular reference problem exists similarly with regard to the interaction of intermediary and firm signals, whereby analysts in particular are regarded as information intermediaries in this setting.[505] The firm signal serves as an input for analyst forecasts (signal precision of the firm as a cause) and analysts bring about greater precision of the firm signal by means of incentive setting and monitoring (signal precision of the firm as a consequence). According to this explanatory approach, both signals are in a complementary relationship to each other. Alternatively, however, there is also a substitutive explanatory approach: according to this, both signals compete on the 'information market', which, for example, in the case of an increase in the firm's signal precision, can lead to a reduction in the number of analysts and thus, c.p., to the lower precision of the analysts' signals. These different relations are represented by the paths (6) and (5e). Irrespective of their concrete effect on each other, it can be stated that the

[502] On this and the following statements, see (representatively) the modeling and the empirical findings in Bhattacharya et al. (2012), Bhattacharya et al. (2013), Francis et al. (2004), Lang et al. (2012), Lang/Maffett (2011), Ng (2011) and Lu et al. (2010).

[503] See, e.g., the partitioning in Daske et al. (2013), in particular pp. 504 f.

[504] See, e.g., Balakrishnan et al. (2014).

[505] On this and the following statements, see (representatively) Balakrishnan et al. (2014), Lang/Lundholm (1996), in particular pp. 470 f. and Hope (2003b), in particular pp. 239-241.

signal precision of both information sources – firms and intermediaries – influences the precision of all information available to the users/investors (information environment) in a generally positive manner (path (4)).

The **relation** of this theoretical framework to the construct **notes reporting quality** to be validated is the prediction function, as elaborated in Part 3, in the context of generating information for a firm valuation. The problem is that the constructs of reporting quality and signal precision are not identical.[506] At the theoretical level, there is the problem that the construct of reporting quality contains more aspects, especially with regard to the determination function. An increase in reporting quality does not necessarily have to be accompanied by higher signal precision and vice versa. In addition, the theories on signal precision in the context of cost of capital assume the complete modeling of the signals reaching the users/investors. These signals go far beyond firms' reporting on intangible assets in the notes to annual reports. If the consequences of a change in notes reporting quality are to be isolated, the effects of other signals contained in the theories must be isolated. However, in research practice this is usually only possible in an incomplete way, e.g., because data are missing or the number of variables has to be limited, otherwise the statistical validity of the analysis/evaluation would decrease drastically. Thus, at the empirical level there is the problem that the empirically detectable relations are likely to be systematically distorted/biased in comparison to the theoretically expected relations. The extent of this distortion – inherent in the nature of the matter – cannot be further evaluated at this point.

[506] On this, see also, e.g., the discussion in Bhattacharya et al. (2013), in particular p. 485 and Bhattacharya et al. (2012), pp. 454 f.

1.5.3.2. Research design and operationalization

1.5.3.2.1. Research design

The aim of the empirical evaluation is to empirically test the predictions derived from the theories with regard to the influencing factors of reporting quality and the consequences of reporting quality. For this purpose, a research design has to be determined first. In addition, the theoretical framework with the constructs formulated therein must be operationalized in the form of measurement models and measurement parameters.

For the **research design,** the following aspects apply. The theoretical framework is characterized by numerous interdependent relationships of the contained constructs and requires a method of analysis that allows the isolation of the marginal effects of different constructs. A suitable method of analysis for this purpose is the multiple linear regression analysis, which is therefore selected here. The number of cases in the test sample (twelve firms) is too small to ensure the the statistical validity of the analyses, which is why the examination sample (62 firms) is used. Since the required data for all analyzed variables are available for only part of the examination sample (39 firms), it will be attempted in the following to keep the number of variables as low as possible. However, this reduction of variables has its limits, since theoretically important constructs must be part of the analysis. In the following analyses, the problem will therefore regularly arise that the models contain too many variables in view of the relatively small number of cases, which leads to limitations in terms of the statistical validity. The reasons for the small number of cases lie in the fundamental orientation of the research design of this work, according to which the focus is on the construct validity of the capturing of reporting quality. This requirement inevitably collides with the requirement of statistical validity because, on the contrary, a high number of cases is conducive to statistical validity. In order to limit this problem and to be better able to detect distortions that are likely to arise from the small number of cases, all models are analyzed step by step in the following, i.e., the analysis starts with a (reduced) model that only comprises a few variables before it is extended step by step with further variables.

Similarly, no time-series data is available for reporting quality, which is why various validity-enhancing design aspects cannot be selected, e.g., an analysis of the relationships over a longer period of time (e.g., panel-data analysis) or a specific examination of time- or event-induced changes in the variables (e.g., difference-in-differences and event study designs). Due to the small number of cases, a multi-stage regression analysis to solve the endogeneity problem of

the theoretical relationships already clarified in the previous chapter (e.g., instrumental-variables regression analysis) is ruled out as well. Therefore, in the course of the analysis, influencing factors and consequences of reporting quality are examined separately, i.e., their interdependence – which is a potential source of distortions – is ignored.

It follows from this design determination that the results of the following regression analysis should not be regarded as causal relationships or, if so, only with great caution. The theories allow the assumption to be made that the results can be attributed to an underlying causality, but the design chosen in this work does not allow this causality to be detected beyond doubt. Under consideration of the aforementioned potential distortions, it is possible to detect at most general tendencies that can be expected on the basis of the theories (e.g., that firms which generally have a higher level of reporting quality generally have shares with lower degrees of illiquidity). Consequently, the results are to be understood as a rough complement to the theoretical considerations on construct validity, and do not represent an all-encompassing touchstone.

1.5.3.2.2. Operationalization

1.5.3.2.2.1. Influencing factors of reporting quality

For the regression analysis, models and input measurement parameters are operationalized in the following. Where reasonable and possible, established operationalizations of empirical literature will be used to facilitate the classification of the insights gained here. A summarizing overview of the individual variables can be found in Table 15 at the end of the following chapter.

According to the theoretical framework, the **influencing factors** of the signal precision of the firm and reporting quality are the constructs ‘uncertainty of the economic situation of the firm’, ‘incentives for or monitoring of reporting quality’ and ‘signal precision of the information intermediaries’. The allocation of measurement parameters to constructs is shown in Figure 13 and is elaborated below.

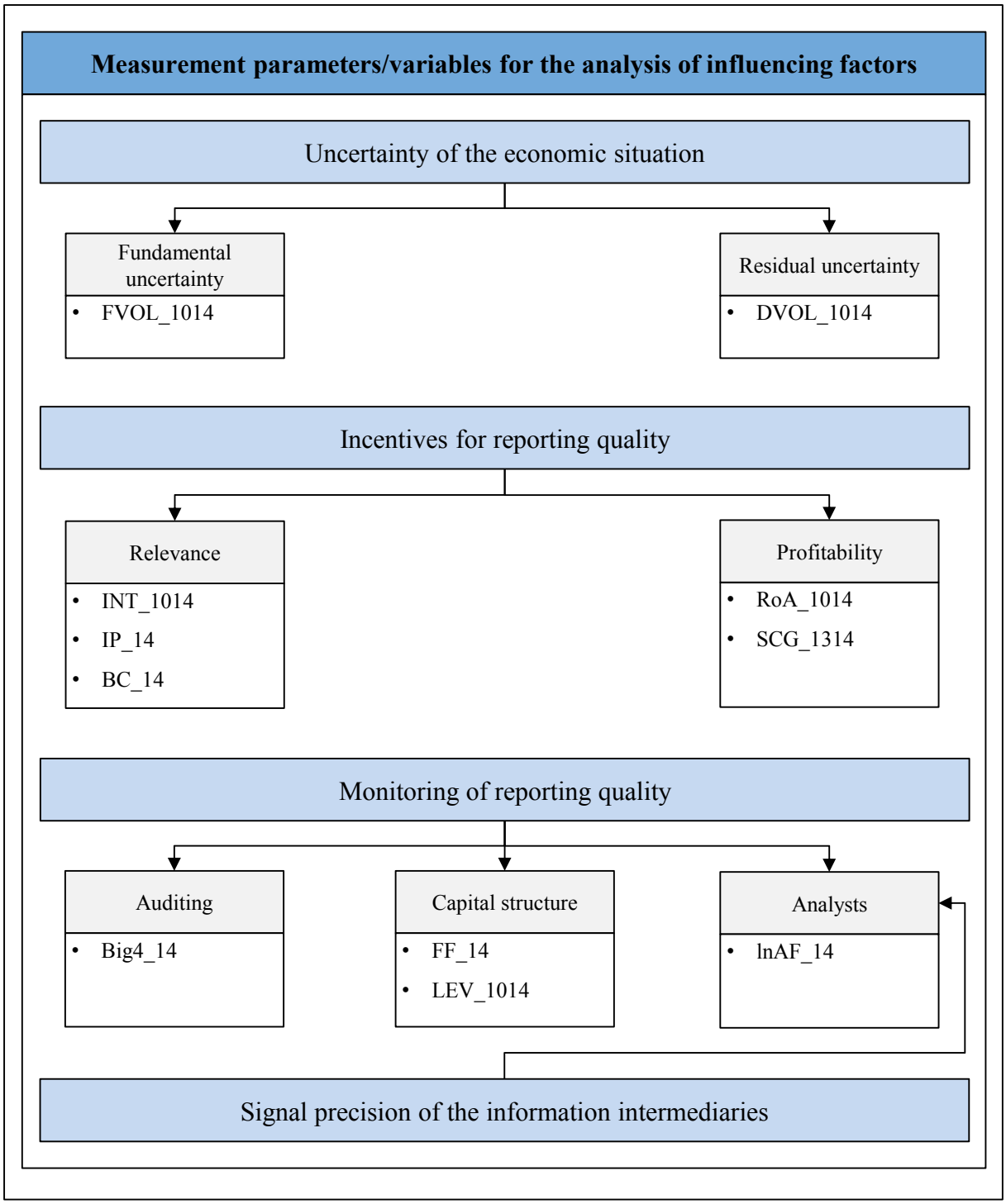

Figure 13: Measurement parameters/variables for the analysis of influencing factors of reporting quality

Uncertainty is influenced by various factors such as the business model and the operating environment, while uncertainty in turn – depending on the signal transformation by management and the underlying accounting rules – influences the signal precision of the firm. In order to be able to separate these theoretical constructs at the measurement level, the approach frequently used in the literature of partitioning signal precision into a fundamental and a discretionary

component is used here.[507] The signal precision is captured by the ratio of the standard deviation of the income before extraordinary items to the standard deviation of the operating cash flow of the last five financial/reporting years (financial years 2010 to 2014), whereby both the income and the cash flow are scaled by (i.e., divided by) total assets. This indicator, referred to in the literature as 'earnings smoothness', is to be interpreted as an inverse measurement parameter of the precision of the firm signal, since larger values represent more volatility and thus, c.p., lower signal precision.

The partitioning results from a separate regression. Based on various fundamental variables that influence uncertainty, such as the duration of the operating cycle, the precision or volatility of the firm signal attributable to these variables is estimated (for information on the detailed procedure, see the explanations in Appendix II). This portion of the signal precision or volatility, which can be explained by fundamental variables, is called the innate or fundamental portion (*FVOL_1014*) and serves as a measurement parameter of the uncertainty of the economic situation of the firm, which is more or less independent of reporting decisions by management. A negative relation to the signal precision is to be expected, i.e., the less volatile the business model or operating environment of the firm is, the more precisely the economic situation of the firm is expected to be estimable. The inexplicable (i.e., residual) portion is referred to as discretionary precision/volatility and is interpreted as an indicator for management's reporting decisions (*DVOL_1014*). This includes various conflicting aspects such as earnings management or lack of transparency, reporting quality and errors. Due to this mixed interpretation, the relation to signal precision cannot be predicted exactly.[508] This also applies to the relation to reporting quality examined in this work.

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[507] On this and the following statements on the measurement and partitioning of signal precision in the context of uncertainty, see (representatively) Francis et al. (2004), Bhattacharya et al. (2012), Lang/Maffett (2011), Lang et al. (2012) and Ng (2011). In addition to the earnings smoothness measurement parameter used in this work, these studies also use other measurement parameters such as accruals quality, which are not considered further here. An exclusive partitioning of other measurement parameters is carried out, e.g., in Bhattacharya et al. (2013) and Francis et al. (2005b).

[508] On this, see also the following statement in Bhattacharya et al. (2012), p. 471: "(…) management's reporting decisions, which determine discretionary earnings quality, are a mixture of performance-revealing information (which would increase reporting quality), manipulations, and noise (both of which are expected to reduce reporting quality), with the result that discretionary earnings quality is not as pure a measure of information risk as is innate earnings quality, which is determined by business models and operating environments." The discretionary portion is sometimes interpreted more coarsely as an indicator of earnings management and opacity: see Lang et al. (2012), in particular pp. 736 f. In this work, the former (finer) interpretation is assumed.

A precise prediction is also not possible regarding the relation between the fundamental portion and reporting quality.[509] On the one hand, the more volatile the firm's operating activities are and the lower, c.p., the fundamental signal precision, the more likely it is that the requirements of the users for reporting quality will increase. On the other hand, it is to be expected that, in a very uncertain context, management may be more inclined to report as little information as possible in order to conceal this uncertainty and, thus, positively influence its own share-based compensation, for example. This illustrates that the constructs of uncertainty and incentives/monitoring can hardly be separated at the measurement level.

The **incentives** construct is additionally modeled by two further groups of measures, which suggest a connection: relevance of reporting items and profitability. In each case, both structural long-term and event-driven short-term influencing factors are taken into account. Empirical results indicate that disclosure policy decisions are largely made on a long-term basis by firms.[510] Theoretically, this can be explained, for example, by the fact that the underlying regulatory framework is only partially changed over very long periods of time and that an extensive short-term adjustment of reporting may be associated with high costs. Short-term adjustments, on the other hand, are to be expected in a financial year in which the firm's management, for example, had to recognize a goodwill impairment loss resulting in a greater need for explanation on the part of the users in addition to extended regulatory reporting obligations.

Concerning relevance/importance,[511] the structural indicator used is the average 'intensity of intangible assets' over the last five years (*INT_1014* – the mean value of the carrying amount of intangible assets, scaled by total assets, for the financial years 2010 to 2014). The event-driven indicators for the 2014 financial year under examination are the 'intensity of a goodwill impairment loss' (*IP_14* – the amount of impairment loss scaled by total assets) and a 0/1 indicator that indicates if a firm acquired intangible assets in a business combination in the financial year 2014 (*BC_14*). Analogous to the previous consideration, a higher intensity of intangible assets is likely to be accompanied by a greater need for information on the part of the users,

[509] In particular, regarding the following statements on the ambiguity of the relationship between uncertainty and reporting quality, see (representatively) the statements and empirical results in Chen et al. (2015a), Lang/Lundholm (1993), Li (2008) and Guay et al. (2016).

[510] On this and the following statements, see (representatively) the empirical results in Chen et al. (2015a), p. 1034 / p. 1045 and Lang/Stice-Lawrence (2015), p. 126 / p. 128. See also the considerations in Lang/Lundholm (1996), p. 484 and Lang/Lundholm (1993), p. 267.

[511] On the following statements on the relevance indicators in the context of intangible assets, goodwill impairment and business combinations, see (representatively) Chen et al. (2015a), Glaum et al. (2013a), Bepari et al. (2014), Li (2008), Lundholm et al. (2014) und Bushee et al. (2018).

since in principle intangible assets (and their depiction) embody more uncertainty and information asymmetries (on this point and in the following, see also the statements in Part 2, Chapters 3 and 4). However, the particular characteristics of intangible assets may also provide a reverse incentive. It is precisely because such property rights cannot be fully enforced and the depiction (of intangible resources) is regularly subject to considerable discretion that management may have little interest in extensive reporting to protect corporate interests or to conceal their own earnings management. Consequently, a precise prediction cannot be derived.

In principle, this also is likely to apply to the short-term indicators. For the impairment intensity indicator, however, it should be noted that the underlying regulation of disclosures in the notes in the event of an impairment loss (IAS 36.126 ff.) is much more specific and comprehensive than is generally the case for intangible assets (IAS 38.118 ff.) or a business combination (IFRS 3.B64 ff.). For example, disclosures on the sensitivity of estimates are only explicitly required for impairment tests. In principle, however, it is possible for management to evade this obligation by interpreting the materiality clause or the general clause of decision usefulness in a way that makes the non-disclosure seem appropriate. However, such behavior is likely to involve considerable costs in the long term, especially in the case of larger impairment losses (loss of trust on the part of the users with corresponding negative consequences such as higher cost of capital, extensive discussions with the auditor, etc.), so it is likely to be of low desirability and, therefore, to occur only in isolated cases. Therefore, the indicator impairment intensity is expected to be positively related to reporting quality.

Regarding profitability, the average 'return on assets' of the last five years (*RoA_1014* – the mean value of the income before extraordinary items, scaled by total assets, for the financial years 2010 to 2014) and a 0/1 indicator for a 'change in the sign of the income before extraordinary items from the financial year 2013 to the financial year 2014' (*SCG_1314*) are used as long- and short-term indicators, respectively. The long-term level of profitability does not allow for a precise prediction.[512] A positive relation to reporting quality, for example, is supported by the fact that management might be more willing to provide information about the causes of higher returns (i.e., the way in which these returns were generated), especially if, e.g., a deeper disaggregation allows this positive result to be better attributed to management's own performance. For a negative relation, it is argued, for example, that higher profitability leads to

[512] On the following statements on the profitability indicators, see (representatively) Lang/Lundholm (1993), Merkley (2014), Grüning (2011), in particular pp. 203 ff., Daske et al. (2013), Li (2008), Guay et al. (2016) and Lang/Stice-Lawrence (2015).

less reporting (quality), as the management wants to provide little information to potential competitors. In addition, it is argued that lower profitability results in a greater need for explanation on the part of the users, which is expected to lead to more comprehensive reporting.

In principle, these relations are also likely to apply to the short-term change in the sign of the income. Since both directions of the sign change are captured here, both success messages by management (sign change from minus to plus) as well as explanations of a deteriorated income (sign change from plus to minus) are captured with a larger indicator value. Therefore, a positive relation of the sign change to reporting quality is generally to be expected, although a negative relation cannot be excluded altogether.

The **monitoring** construct is represented by the 0/1 indicator *Big4_14* (the auditing firm in the financial year 2014 belongs to the 'Big 4' in Germany), the percentage of all shares of a firm that were classified as 'free float' on the annual period end date of the financial year 2014 (December 31, 2014 or March 31, 2015) (*FF_14* – free float), the average 'financial leverage' of the last five years (*LEV_1014* – the mean value of the carrying amount of long-term debt, scaled by total assets, of the financial years 2010 to 2014) as well as the natural logarithm of the 'number of analysts following a firm' in the financial year 2014 (*lnAF_14* – the natural logarithm of the median calculated over 12 months of the number of analysts following a firm)[513].

These indicators are subject to similar problems regarding the predictability of precise relations to reporting quality. In the literature, the size of the auditing firm is usually associated with characteristics such as the professionalism of the auditor, greater reputational and legal risks, greater client independence and economies of scale. These characteristics are perceived as being conducive to audit quality, which in turn is perceived as being conducive to reporting quality.[514] However, this argumentation is one-sided and imprecise. For example, it can also be argued that as the size of the auditor increases, greater standardization of audit procedures can be expected, which may reduce the specificity of the audit and, in turn, adversely affect the quality of reporting. In addition, many studies on audit quality extend the interpretation of their

[513] Missing values are replaced with zero. On this procedure, see, e.g., Daske et al. (2013), p. 505.

[514] On the positive influence of the size of the auditing firm, see (representatively) Glaum et al. (2013a), Möller/Lenz (2006), Bepari et al. (2014), Hodgdon et al. (2009), Bushman et al. (2004), Lang/Stice-Lawrence (2015), Lang et al. (2012) and Lang/Maffett (2011). Doubts about this positive relationship are at best hinted at in footnotes: see, e.g., Lang et al. (2012), p. 737, footnote 13.

results onto reporting quality, which is somewhat imprecise. According to a common definition, audit quality is understood as the probability that the auditor will detect and report a rule violation/breach (committed by the client).[515] Many aspects of the reporting quality construct are not covered by this, e.g., a disaggregation of impairment information beyond legal requirements. In view of these considerations, no prediction is made for the indicator *Big4_14*.

The free float is interpreted as an inverse indicator of owner concentration and, thus, as an indicator of the degree of shareholders' monitoring. The direction of effect also cannot be precisely predicted on the basis of theoretical considerations (on this, see also the statements on the state of research in Part 1, Chapter 2.2.3).[516] Given a low concentration of owners, an increase in concentration should, for example, provide shareholders with more incentives and opportunities to effect more comprehensive reporting (positive relation). In the case of a high concentration of owners, there should be more opportunities – though fewer incentives – to effect more comprehensive reporting (negative relation). In the empirical literature, attempts are sometimes made to resolve this level dependency of the prediction by adding variables, partitioning the sample as a function of ownership concentration, etc. In this work, these variants are not taken into account due to the design aspects already discussed, which is why no prediction is made for the indicator *FF_14*.

The (financial) leverage is used analogously to take into account the monitoring interests and activities of debt-capital providers.[517] The more debt capital the firm raises/borrows, the greater the capital structure risk and the greater – from the perspective of the debt-capital providers – the concerns about the enrichment of the owners at their expense. This should, in principle, lead to a greater intensity of monitoring and thus, c.p., a higher quality of reporting. On the other hand, it can also be argued that, in view of a greater capital structure risk, management could refrain from comprehensive reporting in order to maximize individual benefits (see the above statements on *FVOL_1014*). It is true that the capital structure risk is already reflected in the

[515] See DeAngelo (1981), p. 186.

[516] On this and the following statements, see (representatively) Glaum et al. (2013a), Grüning (2011), pp. 162 ff., Lang et al. (2012) and Guay et al. (2016).

[517] On this and the following statements, see (representatively) Francis et al. (2005a), Daske et al. (2013) and Grüning (2011), pp. 170 ff. See also the statements on the state of research in Part 1, Chapter 2.2.3.

indicator *FVOL_1014* (model 3, see Appendix II). However, it is unlikely that the different opposing effects can be captured separately at the measurement level, which is why the resulting effect direction cannot be predicted.

The number of analysts following (the firm) serves on the one hand to capture the monitoring of the firm, and on the other hand as a positive indicator for the **signal precision of the information intermediaries** (i.e., resulting from their use of distributed knowledge). The signal precision of other intermediaries (e.g., rating agencies) cannot be taken into account due to a lack of data. The explanation in the previous chapter showed that a positive relation (i.e., a complementary relationship) can be established via the demand effect, whereas a negative relation (i.e., a substitutive relationship) between the signal precision of the firm and the signal precision of the analysts can be established via the supply effect. Even if a positive relation between the precision of the firm signal and the quality of reporting is assumed, it is not yet clear whether the complementary or substitutive effect path dominates. A precise prediction of the relationship between the number of analysts following the firm and the quality of reporting is therefore not possible. The use of further indicators for the isolated measurement of analysts' signal precision, e.g., on the basis of typical forecast quality measurement parameters used in the literature,[518] is refrained from, as this would drastically reduce the sample size.

In order to consider and control for different (diffuse) influences, the firm size is often analyzed as an influencing factor in the literature.[519] The argumentation for a relation is similar to the argumentation regarding the quality of the audit. For a positive relation (to reporting quality), for example, economies of scale (in terms of cost structure) and professionalism are cited, along with increased reporting incentives with regard to reputational and legal risks, intensity of monitoring and firm complexity. In most cases, the influence of firm complexity, in particular, is likely to be attributable to inadequate conceptual and measurement-related considerations, since the mere fact that there is more to report fundamentally (e.g., because the group consists of more business units) and that (perhaps) more is reported accordingly does not yet constitute an increase in reporting quality. For this reason, reporting quality is measured in this work using a standardized/scaled index – e.g., firms that acquired another firm in a transaction that qualifies as a business combination have to report more than firms where this is not the case in order to

[518] See, e.g., Lang/Lundholm (1996), Hope (2003b) and Glaum et al. (2013b).

[519] On the following statements, see (representatively) Lang/Lundholm (1993), Francis et al. (2005a), Glaum et al. (2013a), Chen et al. (2015a), Li (2008) and Lang/Stice-Lawrence (2015).

achieve the same level of reporting quality. Due to this scaling, this consideration is reflected in the index. A negative relation can be attributed, e.g., to a more intensive drive for reporting efficiency. This can occur, e.g., because reporting processes are becoming more and more standardized, which is likely to make firm-specific reporting more difficult and, thus, reduce reporting quality. Moreover, it is plausible – particularly in the case of a large number of business transactions to be reported – that missing information will be less noticeable, which may ultimately weaken the effect of the incentive and monitoring mechanism of external users and, thus, tend to have a negative influence on reporting quality. It is therefore not possible to predict any effect direction for the relationship between firm size and reporting quality. As a measurement parameter of firm size, the natural logarithm of the mean value of 'total assets' for the financial years 2010 to 2014 is used (*lnTA_1014*).

Given the relatively large number of variables, the following analysis does not include industry controls. Firm industry is a very heterogeneous influencing factor (see Part 1, Chapter 2.2.3), and in the overall view, including industry controls would worsen statistical validity (and, thus, the evaluation of construct validity) more than its inclusion would improve the evaluation of construct validity.

The considerations on the influencing factors of reporting quality that are explained here do not differentiate between information content and information presentation/preparation, since the underlying theories permit equivalent predictions in this respect. In principle, it is irrelevant whether management does not report information (i.e., the information content decreases) or hides this information in the annual report by using complex formulations (i.e., the level of information presentation/preparation decreases) if, in the end, the user does not process this information (i.e., the reporting quality decreases).[520] In the first case, however, the information cannot be found by the (or to be precise, by any) user in the annual report, while in the second case the probability that this information will be found decreases with increasing complexity, due to the transaction costs caused by the complexity. The underlying influencing factors, therefore, should not differ. In order to test this argument empirically, it would also be necessary to analyze whether there is a difference in the effects of the influencing factors if, instead of the aggregated reporting quality construct, the information content and information presentation/preparation construct dimensions are considered separately.

[520] See the considerations in Part 3, Chapter 3.1.

At the measurement level, the information content would have to be controlled for in the models with information presentation/preparation as the dependent variable. Various empirical studies investigating influencing factors of parts of the construct information presentation/preparation (for the most part readability/diction and materiality) arrive at different predictions regarding the influencing factors, since usually an interdependence of information content and information presentation/preparation is assumed – which, however, is hardly or only insufficiently disentangled in terms of measurement.[521] For example, low readability does not necessarily mean low reporting quality, as low readability may be due to high information content. In contrast to many studies, a potential influence of the information content on the information presentation/preparation could be controlled for directly on the basis of the more comprehensive measurement parameter of reporting quality developed in this work. Due to the known restrictions (sample size), however, the evaluation is not based on a separate analysis of information content and information presentation/preparation.

1.5.3.2.2.2. Consequences of reporting quality

For the second analysis of the **consequences** of reporting quality, effects on information asymmetry and illiquidity are examined. In contrast to an analysis of cost-of-capital effects, this focus offers two major advantages. On the one hand, no variables are needed to control for further influencing factors of the cost of capital and, on the other hand, the measurement parameters of the constructs information asymmetry and illiquidity have greater validity, which is critical for the evaluation of the construct validity of the reporting quality measurement parameter to be carried out in the following.[522] The allocation of measurement parameters to constructs is shown in Figure 14 and is elaborated below.

[521] On this and the following statement see, e.g., Bushee et al. (2018), Guay et al. (2016) and Lundholm et al. (2014).

[522] See, e.g., the studies on the cost of capital by Armstrong et al. (2011) and Bhattacharya et al. (2012).

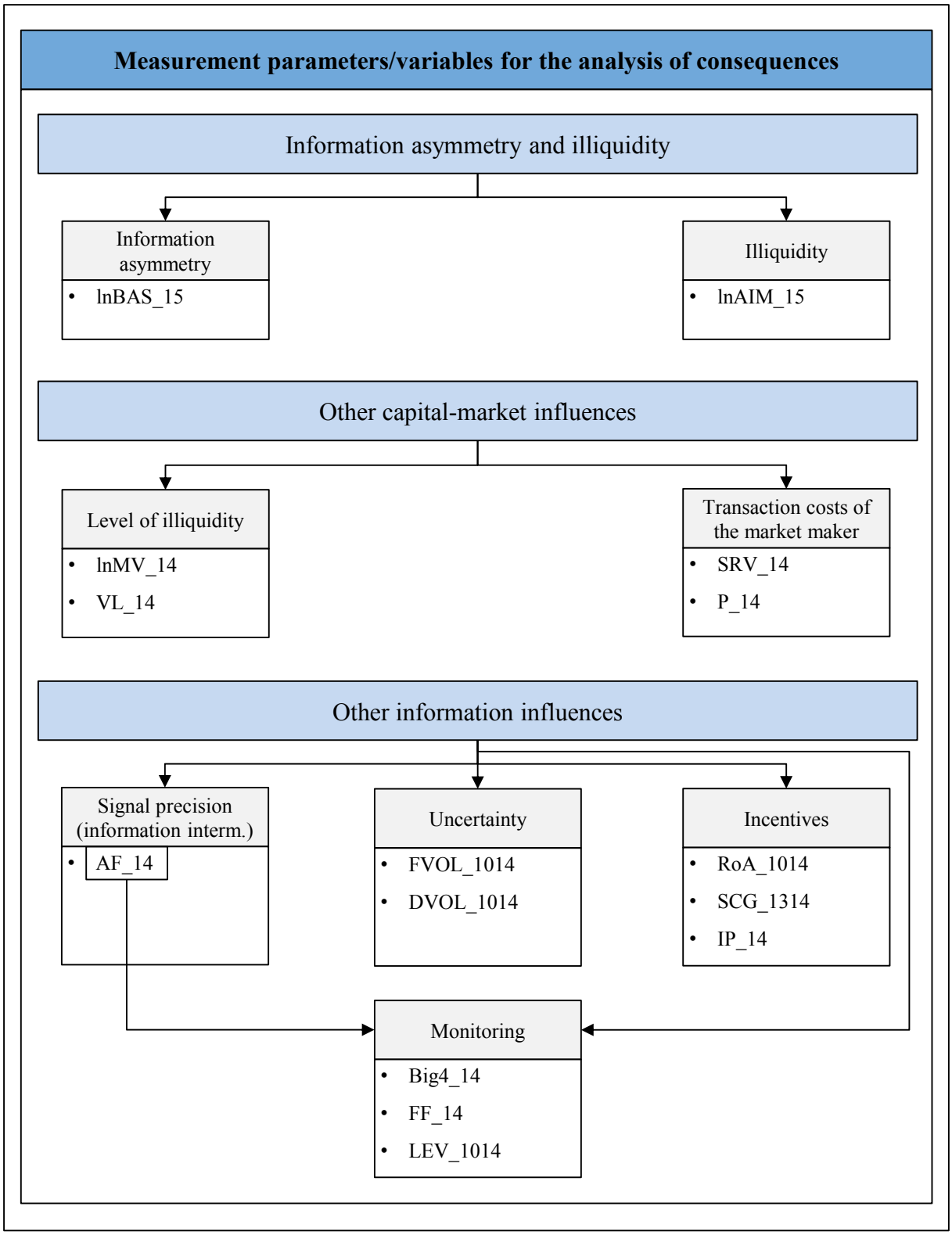


Figure 14: Measurement parameters/variables for the analysis of consequences of reporting quality

Information asymmetry is measured by the natural logarithm of the mean value of daily 'bid-ask spreads' in the (following) financial year 2015 (*lnBAS_15* – the daily bid-ask spreads are calculated as the difference between the ask and bid prices in relation to the mean value of ask

and bid prices).[523] Theoretically, this price spread is determined by the market maker depending on the manifestations of transaction costs of order processing and stock/inventory holding as well as the extent of adverse selection (which is attributable to information asymmetries). If the first two influencing factors are controlled for, the extent of information asymmetries can be inferred from the price spread. In addition, the larger the price spread, the greater the degree of illiquidity. As an indicator for (stock) **illiquidity**, the so-called 'AIM' measurement parameter is used (*lnAIM_15* – the natural logarithm of the mean value of daily AIM values in the financial year 2015; daily AIM values are calculated as the absolute value of the daily percentage of the price change (absolute stock return) in relation to the respective (euro) trading volume). The underlying rationale is that in markets with higher levels of information asymmetry and illiquidity, trading activity (transaction/trading volume) has a greater impact on price. Both measurement parameters are based on data from the (following) financial year of 2015, as this (time lag) takes into account the theoretical relationship between the firm signal based on the financial year 2014 and the subsequent processing on the capital market in the financial year 2015.

What is crucial for the evaluation is that reporting quality and the firm's signal precision are likely to be positively related, whereby signal precision in turn is likely to have a negative effect on the extent of information asymmetry and illiquidity. Consequently, a negative relation between reporting quality and the above-mentioned capital-market characteristics is to be expected.

In order to isolate the effect of reporting quality on information asymmetry and illiquidity, other capital market influences and reporting quality must be isolated. The following typical control variables from the literature are used to isolate **other capital market influences**:[524] indicators of the general (firm-specific) illiquidity level are the 'equity market value' (*lnMV_14* – the equity market value on the annual period end date of the financial year 2014) and the average daily 'trading volume' (*VL_14* – the mean value of the daily number of shares traded in the financial year 2014), while indicators of the transaction costs of order processing and stock/inventory holding of the market maker are the 'volatility of daily stock returns' (*SRV_14* – the standard deviation of daily stock returns in the financial year 2014) and the average daily 'stock price' (*P_14* – the mean value of daily stock prices in the financial year 2014). All price data

[523] On the following statements on information asymmetry and illiquidity, see (fundamentally), e.g., Amihud/Mendelson (1986), Amihud (2002) and the overview in Grüning (2011), pp. 228 ff.

[524] On the following statements see, e.g., Amihud (2002), Amihud/Mendelson (1986), Chen et al. (2015a), Balakrishnan et al. (2014), Bhattacharya et al. (2012) and Grüning (2011), pp. 228 ff.

refer to the respective daily closing price. Other theoretically reasonable influencing factors such as the number of market makers or the level of order fees cannot be taken into account due to a lack of data availability.

In order to isolate the influencing factor reporting quality or to isolate **other information influences**, it is also important to consider the precision of the intermediary signal and the precision of the firm signal separately. The precision of the intermediary signal is captured analogously to the above statements using the variable *AF_14* – due to the resulting better model characteristics, the natural logarithm is not used here.[525] Since (the measurement parameter of) notes reporting quality can theoretically represent only a part of the whole firm signal precision, the variables *FVOL_1014* and *DVOL_1014* are also included. In the event that these indicators together still do not fully reflect the precision of the firm signal, the constructs of incentives and monitoring are also controlled for. The incentives construct is controlled for using the profitability indicators described above (*RoA_1014* and *SCG_1314*). In addition, regarding relevance/importance, the 'intensity of a goodwill impairment loss' (*IP_14*) is included. A goodwill impairment loss, due to its direct effect on income, is likely to have a substantial influence on the signal precision perceived in the short-term and, thus, on the capital market assessment. For the evaluation of the construct validity of (the measurement parameter of) reporting quality, it is crucial to show that there is a negative relationship between reporting quality and both information asymmetry and illiquidity that extends beyond this event.

The other indicators *INT_1014* and *BC_14* are not taken into account due to the large number of variables, as these variables relate primarily to the notes reporting on intangible assets examined in this work and, thus, are likely to tend to be less substantial for a general influence on signal precision and capital market characteristics. The construct of monitoring is controlled for using the variable *AF_14* and the variables *Big4_14*, *FF_14* and *LEV_1014* described above.

[525] Better model characteristics according to tests for misspecification of the models (RESET-Test (Stata command 'ovtest') and specification link test (Stata command 'linktest')).

Table 15: Overview of the variables of the empirical evaluation of the construct validity

Variables	Determination/definitions[1)]
FVOL_1014	The portion of earnings smoothness that can be explained by fundamental variables (see Appendix II for the procedure). Earnings smoothness is captured by the ratio of the standard deviation of the income before extraordinary items to the standard deviation of the operating cash flow of the last five financial years (financial years 2010 to 2014), whereby both the income and the cash flow are scaled by (i.e., divided by) total assets.
DVOL_1014	The inexplicable (i.e., residual) portion of earnings smoothness (analogous to FVOL_1014).
INT_1014	Mean value of the carrying amount of intangible assets, scaled by total assets, for the financial years 2010 to 2014.
IP_14	Amount of goodwill impairment loss, scaled by total assets, for the financial year 2014.
BC_14	0/1 indicator that indicates if a firm acquired intangible assets in a business combination in the financial year 2014.
RoA_1014	Mean value of the income before extraordinary items, scaled by total assets, for the financial years 2010 to 2014.
SCG_1314	0/1 indicator for a change in the sign of the income before extraordinary items from financial year 2013 to financial year 2014.
Big4_14	0/1 indicator that indicates if the annual report was audited by a 'Big4' auditing firm in the financial year 2014. Based on the market shares in Germany (DAX, MDAX, SDAX, TecDAX) in 2014, the following auditing firms are classified as 'Big4': KPMG, PricewaterhouseCoopers, Ernst & Young (EY) and Deloitte. [Source: https://de.statista.com/statistik/daten/studie/449991/umfrage/marktanteile-der-groessten-deutschen-wirtschaftspruefer/, retrieved on: August 5, 2018]
FF_14	Percentage of all shares of a firm that were classified as 'free float' on the annual period end date of the financial year 2014 (December 31, 2014 or March 31, 2015) (%).
LEV_1014	Mean value of the carrying amount of long-term debt, scaled by total assets, of the financial years 2010 to 2014.
lnAF_14 AF_14	Median value, calculated over 12 months, of the number of analysts following a firm in the financial year 2014. Missing values are replaced with zero. The values of the variable lnAF_14 are logarithmized using the natural logarithm (ln(1+AF_14)).
lnTA_1014	Natural logarithm of the mean value of total assets for the financial years 2010 to 2014 (million EUR).
lnBAS_15	Natural logarithm (ln(1+x)) of the mean value of daily bid-ask spreads in the financial year 2015. Daily bid-ask spreads are calculated as the difference between ask and bid prices in relation to the mean value of ask and bid prices.
lnAIM_15	Natural logarithm ('ln(1+x)') of the mean value of daily AIM values in the financial year 2015. Daily AIM values are calculated as the absolute value of the daily percentage price change (absolute stock return) in relation to the respective (euro) trading volume, multiplied by 10^7.
lnMV_14	Equity market value at the annual period end date of the financial year 2014 (in thousands of EUR).
VL_14	Mean value of the daily number of shares traded in the financial year 2014 (in thousands).
SRV_14	Standard deviation of daily stock returns in the financial year 2014.
P_14	Mean value of daily stock prices in the financial year 2014 (EUR).

[1)] Data source: Datastream (capital market data, retrieval date: February 12, 2018); I/B/E/S (analyst following, retrieval date: September 8, 2017); Compustat (all fundamental data not collected manually, retrieval date: November 14, 2017); annual reports – manual data collection (impairment losses (goodwill), BC_14, Big4_14). All price data refer to the respective daily closing price.

1.5.3.3. Sample description

Descriptions of the variables included in the regression analysis are provided in Table 16 and Table 17. In comparison to the complete examination sample, 23 of the original 62 firms are excluded due to the lack of available data (on this and the following statements, see also Table 3 in Part 4, Chapter 1.3). Looking at the variables 'intensity of intangible assets' (*INT_1014*) and 'total assets' (*lnTA_1014*) which are available in both samples, there is no drastic shift in the characteristics to be observed. For example, the 'intensity of intangible assets' (*INT_1014*) in the larger examination sample is approx. 14 % (median or $P_{0.50}$) and 20 % (mean), respectively, which is almost identical to the values of the sample to be analyzed here. Regarding 'total assets' (*lnTA_1014*), a substantial decrease (according to the mean, total assets decrease from approx. 2.6 to approx. 0.5 billion EUR) or a slight increase (according to the median, total assets increase from approx. 0.3 to approx. 0.4 billion EUR) can be observed depending on the location parameter. This is surprising insofar as firm size would have been expected to increase more substantially as a result of the restriction of the sample to firms that are listed by large database providers.

It is also noticeable that some variables tend toward rare but extreme deviations (especially *VL_14*, *SRV_14* and *IP_14*). The 'intensity of a goodwill impairment loss' (*IP_14*) is noteworthy insofar as it indicates that the majority of firms did not recognize any impairment at all. This observation corresponds to empirical insights from recent years, according to which firms rarely recognize goodwill impairment losses.[526] The variable 'sign change of the income before extraordinary items' (*SCG_1314*) follows a similar distribution. Assuming that a change of sign usually indicates a substantial improvement or deterioration in profitability, it is plausible that this only affects a small number of firms at any given point in time.

Overall, when looking at the sample, there are no irregularities to be observed that indicate a systematic distortion of the data or data errors. Another positive aspect is that the manifestations of the characteristics are to a large extent unequally distributed between the firms (i.e., they show substantial cross-sectional heterogeneity). This allows firm characteristics such as the 'size of the auditing firm' (*Big4_14*) to be considered in a meaningful way as controls or influencing variables in the following regression analysis.

[526] See (representatively) Rogler et al. (2012).

Table 16: Description of the variables of the empirical evaluation of the construct validity (influencing factors)

	RQ_14	lnTA_1014	INT_1014	BC_14	IP_14	RoA_1014	SCG_1314	FVOL_1014	DVOL_1014	Big4_14	lnAF_14	FF_14	LEV_1014
n	39	39	39	39	39	39	39	39	39	39	39	39	39
Mean	0.4483	6.1287	0.1988	0.5385	0.0041	0.0401	0.1282	1.1544	-0.1440	0.6667	1.6695	65.3590	0.1300
Stand. dev.	0.0338	2.0285	0.1554	0.5050	0.0166	0.0471	0.3387	0.6499	0.8131	0.4776	1.1073	24.2384	0.1284
Skewness	0.4731	0.3077	0.5171	-0.1543	4.2303	0.2613	2.2242	1.9210	0.3615	-0.7071	-0.0253	-0.2759	0.9508
Kurtosis	2.1415	2.8948	1.8483	1.0238	19.7039	3.3280	5.9471	6.6255	4.2831	1.5000	1.8536	2.3364	2.9638
Minimum	0.3997	1.5960	0.0146	0.0000	0.0000	-0.0659	0.0000	0.3487	-2.0585	0.0000	0.0000	14.0000	0.0000
Maximum	0.5213	10.3511	0.5208	1.0000	0.0867	0.1619	1.0000	3.4368	1.9717	1.0000	3.5835	100.0000	0.4482
P_{75}-P_{25}	0.0599	2.4498	0.2807	1.0000	0.0000	0.0543	0.0000	0.4953	0.8621	1.0000	1.7918	31.0000	0.1931
P_1	0.3997	1.5960	0.0146	0.0000	0.0000	-0.0659	0.0000	0.3487	-2.0585	0.0000	0.0000	14.0000	0.0000
P_5	0.4015	3.0142	0.0147	0.0000	0.0000	-0.0420	0.0000	0.4030	-1.9486	0.0000	0.0000	18.0000	0.0000
P_{10}	0.4074	3.8142	0.0257	0.0000	0.0000	-0.0243	0.0000	0.6490	-0.8125	0.0000	0.0000	27.0000	0.0001
P_{25}	0.4204	4.7081	0.0637	0.0000	0.0000	0.0100	0.0000	0.7921	-0.6149	0.0000	0.6931	50.0000	0.0169
P_{50}	0.4429	6.0008	0.1446	1.0000	0.0000	0.0375	0.0000	0.8924	-0.1677	1.0000	1.7918	68.0000	0.0789
P_{75}	0.4803	7.1580	0.3444	1.0000	0.0000	0.0643	0.0000	1.2874	0.2472	1.0000	2.4849	81.0000	0.2100
P_{90}	0.4953	9.1393	0.4198	1.0000	0.0018	0.1101	1.0000	2.2481	0.7824	1.0000	3.2581	100.0000	0.3172
P_{95}	0.5140	10.3308	0.4770	1.0000	0.0595	0.1318	1.0000	2.9952	1.7904	1.0000	3.3673	100.0000	0.4480
P_{99}	0.5213	10.3511	0.5208	1.0000	0.0867	0.1619	1.0000	3.4368	1.9717	1.0000	3.5835	100.0000	0.4482

This table presents various location and distribution parameters of the variables used for examining the influencing factors of 'reporting quality' (*RQ_14*). Included are all firms of the examination sample for which data are available. The definition of the variables is provided in Table 15 in Chapter 1.5.3.2.2.2. All calculations are performed with Stata 13.1 IC software.

Table 17: Description of the variables of the empirical evaluation of the construct validity (consequences)

	lnBAS_15	lnAIM_15	lnMV_14	VL_14	SRV_14	P_14	AF_14
n	39	39	39	39	39	39	39
Mean	0.0194	7.1667	12.7129	4.2323	2.3032	36.9379	8.0897
Stand. dev.	0.0162	1.6830	2.0645	8.6721	1.3107	51.4895	9.2109
Skewness	0.7852	-0.1278	0.3212	4.7435	2.8829	2.2277	1.3059
Kurtosis	2.1909	2.7645	2.8379	26.5306	12.6730	7.4796	3.7502
Minimum	0.0024	3.8350	8.7796	0.1594	1.0065	0.3514	0.0000
Maximum	0.0555	10.6663	17.3762	52.6980	8.2821	229.6245	35.0000
P_{75}-P_{25}	0.0280	1.9594	2.9779	2.7222	0.8550	30.9660	10.0000
P_{1}	0.0024	3.8350	8.7796	0.1594	1.0065	0.3514	0.0000
P_{5}	0.0025	3.8545	9.2544	0.2213	1.1594	0.5868	0.0000
P_{10}	0.0038	4.2210	9.9655	0.3674	1.1940	2.7476	0.0000
P_{25}	0.0069	6.3131	11.2960	1.2186	1.7088	6.9375	1.0000
P_{50}	0.0120	7.1527	12.5403	1.9203	1.9464	16.1675	5.0000
P_{75}	0.0349	8.2726	14.2739	3.9409	2.5637	37.9035	11.0000
P_{90}	0.0440	9.3836	15.3101	10.1092	4.0441	140.8365	25.0000
P_{95}	0.0538	10.1104	17.1698	17.6214	5.0426	164.6456	28.0000
P_{99}	0.0555	10.6663	17.3762	52.6980	8.2821	229.6245	35.0000

In addition to Table 16, this table provides various location and distribution parameters of the variables used for examining the consequences of 'reporting quality' (*RQ_14*). Included are all firms of the examination sample for which data are available. The definition of the variables is provided in Table 15 in Chapter 1.5.3.2.2.2. All calculations are performed with Stata 13.1 IC software.

1.5.3.4. Presentation and discussion of the results

The results of the regression analysis are reported in Table 18, Table 19 and Table 20. Regarding **influencing factors** of reporting quality, the results in all models show, as predicted, a significant (predominantly with p-values < 0.01) positive association between the 'goodwill impairment intensity' (*IP_14*) and 'reporting quality' *(RQ_14*), as well as between the 'sign change of the income before extraordinary items' (*SCG_1314*) and 'reporting quality' (*RQ_14*).

However, it should be noted that the hypothesis of normality of the residuals tends to be rejected, which is why the reported p-values should be interpreted with caution. A distortion of the independent variables by multicollinearity should not pose a substantial problem, since the coefficient signs do not change between the models (i.e., depending on the number of control

variables included) and the variance inflation factors (VIF) show moderate values.[527] It is also noteworthy that the explanation of variance in the dependent variable by the independent variables (as indicated by the adjusted R^2) is highest in model (2) and tends to decrease with the addition of further (independent) variables. This may indicate that models (3)-(6) contain too many variables given the small sample size. On the other hand, the decreasing degree of empirical explanation could also be related to the fact that the added variables do not adequately represent the theoretical constructs or that the underlying theoretical considerations do not permit precise and accurate predictions. In this work, an attempt is made to minimize this fundamental problem of the empirical evaluation of construct validity – i.e. the evaluation of the quality of a measurement parameter by using other measurement parameters that are contingently invalid – by using 'established' (other) measurement parameters. Despite these limitations, it is to be noted that the results on influencing factors of reporting quality presented here essentially corroborate the expected relations.

With regard to the analysis of **consequences** of reporting quality, the results are also in good agreement with the theoretical predictions. In all models, the results indicate the expected negative relation between *RQ_14* and the indicators of information asymmetry (*lnBAS_15*) and illiquidity (*lnAIM_15*). Except in model (5) (dependent variable: *lnAIM_15*), these relations are statistically significant, although in some cases only at the 10 % level. Considering the small portion of the information environment covered by *RQ_14* and the fact that other information influences can only be controlled for roughly, this result is not surprising.

Some remarkable phenomena include the relatively high variance inflation factors (VIF) in models (4) and (7), which suggest that the variable *AF_14* correlates strongly with other independent variables. A distortion due to multicollinearity of the independent variables, however, should not pose a substantial problem overall, since the signs of the coefficients do not change between the models as a function of the number of control variables included and the variance

[527] However, the results of an additional correlation analysis (correlation coefficients according to Pearson and Spearman) not presented here indicate substantial correlations of several independent variables (criteria: absolute value of correlation coefficient ≥ 0.25 and p-value < 0.05). For the evaluation, the variables *IP_14* and *SCG_1314* are particularly important. There are substantial correlations between *IP_14* and *lnAF_14* (-), between *SCG_1314* and *RoA_1014* (-) and between *SCG_1314* and *DVOL_1014* (+). Since the results do not change in principle even if these variables are included, there should not, in this respect, be any substantial problems for the validity of the results.

inflation factors (VIF) show predominantly moderate values.[528] Regarding the explanation of variance in the different models (adjusted R^2), the considerations on the influencing factors apply analogously (with regard to *lnBAS_15*, the values for models (3), (4), (6) and (7) decrease; with regard to *lnAIM_15*, the values for model (4) and model (7) decrease). In view of the constant results of the individual models in comparison, however, this is not considered to be problematic for the quality of the results.

Overall, it can thus be concluded that the empirical results presented here corroborate the preceding theoretical considerations on the construct validity in question. The measurement parameter of reporting quality developed in this work can thus be considered to be valid both from a theoretical and an empirical perspective. With the development of this measurement parameter and the positive evaluation of its validity, the necessary basis is thus provided for analyzing empirical manifestations of reporting quality in practice in the following.

[528] However, the results of an additional correlation analysis (correlation coefficients according to Pearson and Spearman) not presented here indicate a substantial positive correlation (criteria: absolute value of correlation coefficient ≥ 0.25 and *p*-value < 0.05) between the variables *RQ_14* and *IP_14*. If the variable *IP_14* is removed from the models (results not reported), the results of the coefficient estimation for *RQ_14* become to some extent even more significant, as the signs do not change. In this respect, the results reported can be classified as comparatively conservative. Based on theoretical considerations (i.e., controlling for other information influences), all models are calculated by including the variable *IP_14*.

Table 18: Results of the empirical evaluation of the construct validity (influencing factors)

		Dependent variable: RQ_14					
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Intercept	?	0.4438*** (0.0000)	0.4389*** (0.0000)	0.4337*** (0.0000)	0.4622*** (0.0000)	0.4581*** (0.0000)	0.4504*** (0.0000)
lnTA_1014	+/-	-0.0020 (0.4834)	-0.0024 (0.4139)	-0.0021 (0.5191)	-0.0020 (0.4683)	-0.0002 (0.9467)	0.0017 (0.6976)
INT_1014	+/-	0.0320 (0.3314)	0.0340 (0.2987)	0.0350 (0.3010)	0.0424 (0.2456)	0.0498 (0.1883)	0.0507 (0.1949)
BC_14	+/-	0.0132 (0.3093)	0.0143 (0.2602)	0.0134 (0.3058)	0.0180 (0.2121)	0.0173 (0.2396)	0.0177 (0.2414)
IP_14	+	**0.7790*** (0.0002)**	**0.8459*** (0.0004)**	**0.8848*** (0.0008)**	**0.7652*** (0.0026)**	**0.6927*** (0.0077)**	**0.6227** (0.0205)**
RoA_1014	+/-		0.0757 (0.5272)	0.1046 (0.4493)	0.1708 (0.1875)	0.2009 (0.1498)	0.2226 (0.1151)
SCG_1314	+		**0.0245** (0.0122)**	**0.0318** (0.0173)**	**0.0462*** (0.0005)**	**0.0464*** (0.0003)**	**0.0476*** (0.0003)**
FVOL_1014	+/-			0.0005 (0.9556)	-0.0017 (0.8592)	0.0009 (0.9295)	0.0009 (0.9306)
DVOL_1014	+/-			-0.0057 (0.4217)	-0.0082 (0.2369)	-0.0065 (0.3268)	-0.0073 (0.2793)
Big4_14	+/-				-0.0072 (0.6309)	-0.0096 (0.5162)	-0.0068 (0.6742)
lnAF_14	+/-						-0.0059 (0.4376)
FF_14	+/-				-0.0005** (0.0301)	-0.0005** (0.0257)	-0.0005** (0.0300)
LEV_1014	+/-					-0.0455 (0.2349)	-0.0377 (0.3358)

(The table is continued on the next page.)

Table 18 (Continued)

		Dependent variable: RQ_14					
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
n		39	39	39	39	39	39
Adj . R^2		0.0846	0.0929	0.0503	0.0823	0.0737	0.0515
F-test		4.8632*** (0.0033)	3.8029*** (0.0057)	2.6446** (0.0253)	4.0405*** (0.0017)	4.3383*** (0.0009)	4.0703*** (0.0013)
Max. VIF		1.44	1.45	1.85	1.89	2.30	4.03
Correct model specification		Yes	Yes	Yes	Yes	Yes	Yes
Homoskedasticity of residuals		No**	Yes	Yes	Yes	Yes	Yes
Normality of residuals		No**	No**	No***	No*	No**	No**
Huber-White sandwich estimator		Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of the multiple linear regression analysis of the influencing factors of 'reporting quality' (*RQ_14*). The definition of the individual variables can be found in Table 15 in Chapter 1.5.3.2.2.2. The respective coefficient estimates are reported with the corresponding (nondirectional/two-tailed) *p*-values in brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. The results of tests for violations of the assumptions of multiple linear regression analysis are presented at the end of the table. The asterisks indicate the level of significance at which a violation of the respective assumption is detected. The fulfillment of the respective assumption is classified as 'No' if one of the various tests indicates rejection at the 10 % significance level at least. The following tests are applied: RESET test (Stata command 'ovtest') and specification link test (Stata command 'linktest') [tests regarding the correct model specification]; Breusch-Pagan / Cook-Weisberg test for heteroskedasticity (Stata command 'hettest') and Cameron & Trivedi's information matrix test (Stata command 'imtest') [tests regarding the homoskedasticity of residuals]; Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality [tests regarding the normality of residuals]. For the assessment of the degree of multicollinearity of the independent variables, the largest variance inflation factor (VIF) is also reported for each model. Since heteroskedasticity (of residuals) cannot be ruled out after examination of the residual plots, the calculations in all models are based on the Huber-White sandwich estimator. All calculations are performed using Stata 13.1 IC software.

Table 19: Results of the empirical evaluation of the construct validity (consequences, lnBAS_15)

		Dependent variable: lnBAS_15						
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Intercept	?	0.1001*** (0.0002)	0.1355*** (0.0000)	0.1324*** (0.0001)	0.1172*** (0.0002)	0.1297*** (0.0002)	0.1481*** (0.0005)	0.1394*** (0.0005)
RQ_14	**-**	**-0.0810* (0.0888)**	**-0.1115** (0.0108)**	**-0.1108** (0.0121)**	**-0.1083** (0.0138)**	**-0.0915* (0.0744)**	**-0.1083** (0.0422)**	**-0.1083** (0.0462)**
lnMV_14	-	-0.0041*** (0.0000)	-0.0063*** (0.0000)	-0.0062*** (0.0000)	-0.0050*** (0.0009)	-0.0063*** (0.0000)	-0.0069*** (0.0006)	-0.0062*** (0.0019)
VL_14	-	-0.0004** (0.0163)	-0.0002** (0.0317)	-0.0002* (0.0711)	-0.0003** (0.0428)	-0.0003*** (0.0062)	-0.0002 (0.1570)	-0.0002 (0.1574)
SRV_14	+	0.0039*** (0.0003)	0.0038*** (0.0008)	0.0034** (0.0212)	0.0035** (0.0223)	0.0037*** (0.0068)	0.0033* (0.0508)	0.0034* (0.0526)
P_14	-		0.0001** (0.0361)	0.0001** (0.0409)	0.0001** (0.0382)	0.0001** (0.0332)	0.0002** (0.0397)	0.0002** (0.0365)
IP_14	+	0.2461*** (0.0000)	0.2481*** (0.0000)	0.2496*** (0.0000)	0.2298*** (0.0001)	0.1974*** (0.0016)	0.1913*** (0.0038)	0.1885*** (0.0073)
FVOL_1014	+/-			0.0021 (0.4523)	0.0026 (0.3448)	0.0006 (0.7714)	0.0000 (0.9856)	0.0002 (0.9545)
DVOL_1014	+/-			-0.0005 (0.8238)	-0.0003 (0.9098)	0.0010 (0.6547)	-0.0001 (0.9793)	-0.0003 (0.9275)
AF_14	+/-				-0.0003 (0.2415)			-0.0002 (0.5741)
RoA_1014	+/-					-0.0661** (0.0328)	-0.0551 (0.1058)	-0.0561* (0.0975)
SCG_1314	+/-					-0.0084* (0.0836)	-0.0057 (0.3049)	-0.0049 (0.3980)

(The table is continued on the next page.)

Table 19 (Continued)

		Dependent variable: lnBAS_15						
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Big4_14	+/-						0.0014 (0.7715)	0.0018 (0.7365)
FF_14	+/-						-0.0001 (0.3572)	-0.0001 (0.4552)
LEV_1014	+/-						0.0040 (0.7529)	0.0057 (0.6398)
n		39	39	39	39	39	39	39
Adj . R^2		0.5909	0.7141	0.7050	0.7032	0.7280	0.7067	0.6974
F-test		48.1218*** (0.0000)	46.2440*** (0.0000)	47.5727*** (0.0000)	55.6713*** (0.0000)	64.4879*** (0.0000)	45.7842*** (0.0000)	40.5667*** (0.0000)
Max. VIF		1.42	2.07	2.09	6.18	2.53	3.84	8.09
Correct model specification		Yes	Yes	Yes	Yes	Yes	No*	No**
Homoskedasticity of residuals		No**	Yes	Yes	Yes	Yes	Yes	Yes
Normality of residuals		No***	Yes	Yes	Yes	Yes	Yes	Yes
Huber-White sandwich estimator		Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of the multiple linear regression analysis of the consequences of 'reporting quality' (*RQ_14*). The definition of the individual variables can be found in Table 15 in Chapter 1.5.3.2.2.2. The respective coefficient estimates are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. The results of tests for violations of the assumptions of multiple linear regression analysis are presented at the end of the table. The asterisks indicate the level of significance at which a violation of the respective assumption is detected. The fulfillment of the respective assumption is classified as 'No' if one of the various tests indicates rejection at the 10 % significance level at least. The following tests are applied: RESET-Test (Stata command 'ovtest') and specification link test (Stata command 'linktest') [tests regarding the correct model specification]; Breusch-Pagan / Cook-Weisberg test for heteroskedasticity (Stata command 'hettest') and Cameron & Trivedi's information matrix test (Stata command 'imtest') [tests regarding the homoskedasticity of residuals]; Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality [tests regarding the normality of residuals]. For the assessment of the degree of multicollinearity of the independent variables, the largest variance inflation factor (VIF) is also reported for each model. Since heteroskedasticity (of residuals) cannot be ruled out after examination of the residual plots, the calculations in all models are based on the Huber-White sandwich estimator. All calculations are performed using Stata 13.1 IC software.

Table 20: Results of the empirical evaluation of the construct validity (consequences, lnAIM_15)

		Dependent variable: lnAIM_15						
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Intercept	?	18.5856*** (0.0000)	17.4774*** (0.0000)	16.7963*** (0.0000)	16.2363*** (0.0000)	17.0314*** (0.0000)	20.0833*** (0.0000)	19.8980*** (0.0000)
RQ_14	**-**	**-7.6944** (0.0364)**	**-6.7395** (0.0855)*	**-6.5178** (0.0782)*	**-6.4245** (0.0914)*	-5.8527 (0.1262)	**-8.8367** (0.0401)**	**-8.8369** (0.0447)**
lnMV_14	-	-0.6430*** (0.0000)	-0.5760*** (0.0000)	-0.5600*** (0.0000)	-0.5134*** (0.0016)	-0.5684*** (0.0000)	-0.6456*** (0.0000)	-0.6307*** (0.0002)
VL_14	-	-0.0565*** (0.0004)	-0.0615*** (0.0006)	-0.0579*** (0.0003)	-0.0589*** (0.0002)	-0.0599*** (0.0000)	-0.0424*** (0.0004)	-0.0427*** (0.0006)
SRV_14	+	0.1818* (0.0792)	0.1856* (0.0840)	0.1355 (0.3593)	0.1391 (0.3617)	0.1567 (0.2265)	0.0922 (0.4312)	0.0935 (0.4409)
P_14	-		-0.0043* (0.0848)	-0.0037 (0.1829)	-0.0040 (0.1555)	-0.0034 (0.1818)	-0.0000 (0.9911)	-0.0001 (0.9659)
IP_14	+	6.1347** (0.0175)	6.0719** (0.0148)	6.6922** (0.0114)	5.9623* (0.0662)	4.2267 (0.1935)	2.3957 (0.6134)	2.3354 (0.6469)
FVOL_1014	+/-			0.3711 (0.1828)	0.3903 (0.1725)	0.1896 (0.4090)	0.0854 (0.7425)	0.0878 (0.7408)
DVOL_1014	+/-			-0.1740 (0.3642)	-0.1652 (0.4200)	-0.1518 (0.3539)	-0.3462* (0.0536)	-0.3502* (0.0618)
AF_14	+/-				-0.0104 (0.6478)			-0.0038 (0.8607)
RoA_1014	+/-					-5.4279* (0.0529)	-3.2518 (0.2070)	-3.2739 (0.2098)
SCG_1314	+/-					-0.2736 (0.2641)	0.3296 (0.4190)	0.3480 (0.4086)

(The table is continued on the next page.)

Table 20 (Continued)

		Dependent variable: lnAIM_15						
Independent variables / parameters	Predictions	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Big4_14	+/-						0.0389 (0.8842)	0.0465 (0.8688)
FF_14	+/-						-0.0141** (0.0311)	-0.0139** (0.0382)
LEV_1014	+/-						0.3526 (0.7001)	0.3891 (0.6791)
n		39	39	39	39	39	39	39
Adj . R^2		0.8186	0.8252	0.8556	0.8516	0.8667	0.8834	0.8786
F-test		44.6281*** (0.0000)	46.4929*** (0.0000)	39.1899*** (0.0000)	37.7806*** (0.0000)	46.5146*** (0.0000)	62.5490*** (0.0000)	57.4662*** (0.0000)
Max. VIF		1.42	2.07	2.09	6.18	2.53	3.84	8.09
Correct model specification		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Homoskedasticity of residuals		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normality of residuals		Yes	Yes	Yes	No*	Yes	Yes	Yes
Huber-White sandwich estimator		Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the results of the multiple linear regression analysis of the consequences of 'reporting quality' (*RQ_14*). The definition of the individual variables can be found in Table 15 in Chapter 1.5.3.2.2.2. The respective coefficient estimates are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. The results of tests for violations of the assumptions of multiple linear regression analysis are presented at the end of the table. The asterisks indicate the level of significance at which a violation of the respective assumption is detected. The fulfillment of the respective assumption is classified as 'No' if one of the various tests indicates rejection at the 10 % significance level at least. The following tests are applied: RESET-Test (Stata command 'ovtest') and specification link test (Stata command 'linktest') [tests regarding the correct model specification]; Breusch-Pagan / Cook-Weisberg test for heteroskedasticity (Stata command 'hettest') and Cameron & Trivedi's information matrix test (Stata command 'imtest') [tests regarding the homoskedasticity of residuals]; Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality [tests regarding the normality of residuals]. For the assessment of the degree of multicollinearity of the independent variables, the largest variance inflation factor (VIF) is also reported for each model. Since heteroskedasticity (of residuals) cannot be ruled out after examination of the residual plots, the calculations in all models are based on the Huber-White sandwich estimator. All calculations are performed using Stata 13.1 IC software.

2. Presentation and discussion of the results

2.1. Analysis by construct dimensions and indicators

2.1.1. Reporting quality, information content and information presentation/preparation

The results in Table 21 and Figure 15 show that the empirical distribution of '**reporting quality**' (*RQ*) is clearly distant from the possible extreme values 0 and 1, with the central tendency of the distribution – measured by the arithmetic mean (in the following: mean) and the median ($P_{0.50}$) – being approximately 0.44 and, thus, below the exact scaling centre of 0.5. Compared to a normal distribution, the empirical distribution is slightly skewed to the right (skewness > 0 – for comparison, a normal distribution has a skewness value of 0) and indicates a slight tendency to frequent, modestly sized deviations from the mean (kurtosis < 3 – for comparison, a normal distribution has a kurtosis value of 3). Infrequent extreme deviations (outliers) are therefore not a distinctive characteristic of reporting quality. Relatively low values of range (i.e., the difference between the minimum and maximum values), interquartile range (P_{75}-P_{25}) and standard deviation indicate moderate limitations with respect to the cross-sectional comparability of the notes reporting quality.

Different characteristics can be observed with regard to the dimensions of reporting quality ('**information content**' (*IC*) and '**information presentation/preparation**' (*IP*)). On the one hand, comparability within the dimensions is less pronounced, as the range and standard deviation are substantially larger. On the other hand, the distributions of both dimensions are more distinctly skewed to the right and tend more toward infrequent extreme deviations. Thus, the aggregation of the quality dimensions to an overall quality index leads to a leveling of the manifestations. With respect to central tendency, the distribution of 'information content' (*IC*) exhibits lower values, whereas the distribution of 'information presentation/preparation' (*IP*) exhibits higher values. This also applies to the individual percentiles. Except for the 1st percentile, the 'information presentation/preparation' (*IP*) has higher values. On the basis of the scaling of the measurement parameters that is assumed here, the firms examined therefore perform (in their entirety) better with respect to the 'information presentation/preparation' (*IP*).

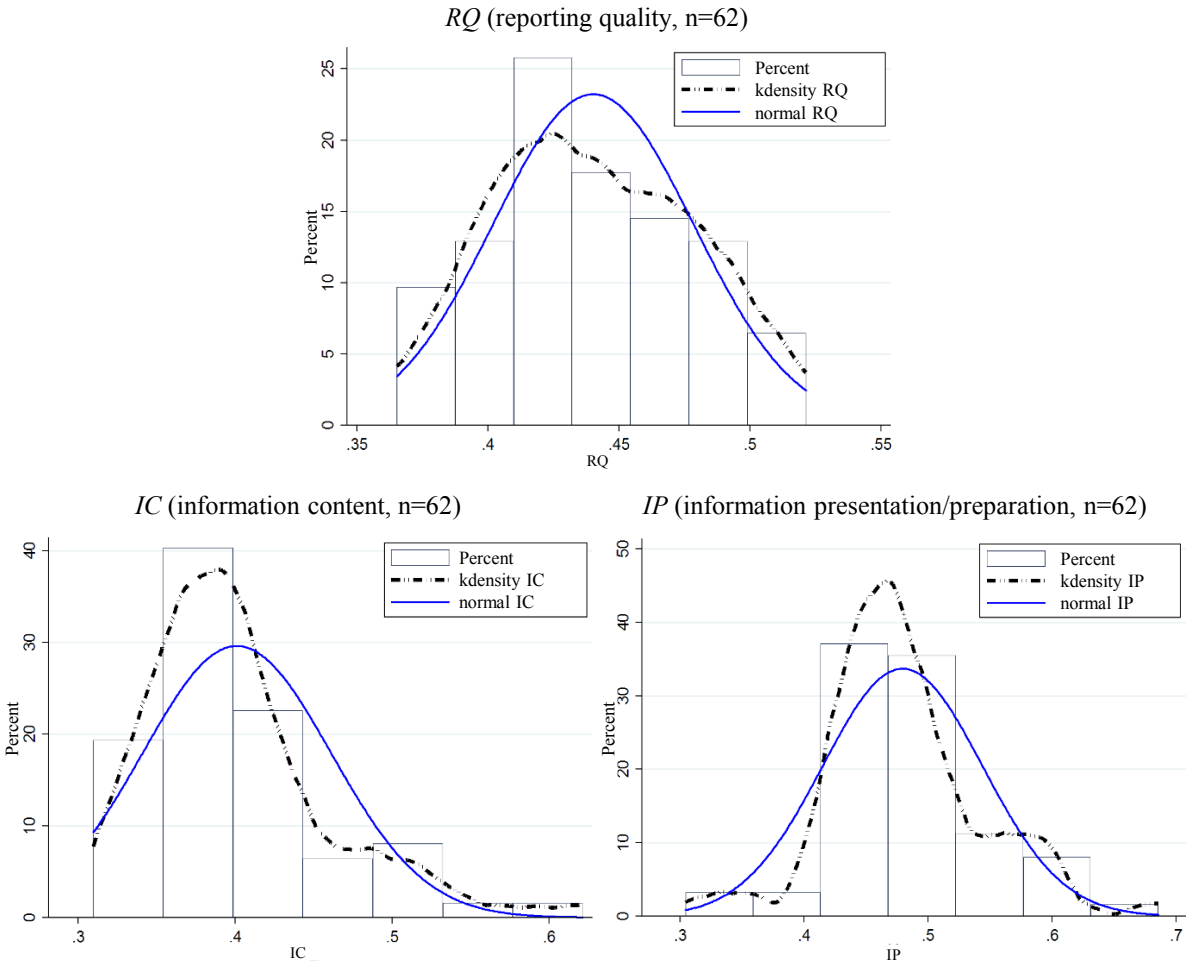
The results of the correlation analysis in Table 22 do not indicate that there is a statistically substantial correlation (criteria: absolute value of the correlation coefficient ≥ 0.25 and *p*-value < 0.05) between the 'information content' (*IC*) and the 'information presentation/preparation'

(*IP*). Thus, there are no convincing results for the rejection of their independence, so that it is cautiously concluded that firms choose the content of their notes reporting independently of its presentation/preparation.

Table 21: Description of the indicators RQ, IC and IP

	RQ	IC	IP
n	62	62	62
Mean	0.4402	0.4010	0.4794
Stand. dev.	0.0383	0.0600	0.0645
Skewness	0.1377	1.3378	0.4227
Kurtosis	2.2082	5.2091	4.3425
Minimum	0.3653	0.3097	0.3044
Maximum	0.5213	0.6214	0.6857
P_{75}-P_{25}	0.0567	0.0599	0.0581
P_{1}	0.3653	0.3097	0.3044
P_{5}	0.3801	0.3358	0.4112
P_{10}	0.3942	0.3409	0.4195
P_{25}	0.4123	0.3620	0.4443
P_{50}	0.4368	0.3905	0.4697
P_{75}	0.4690	0.4218	0.5024
P_{90}	0.4906	0.4907	0.5754
P_{95}	0.5060	0.5160	0.5850
P_{99}	0.5213	0.6214	0.6857

This table presents various location and distribution parameters of the indicators 'reporting quality' (*RQ*), 'information content' (*IC*) and 'information presentation/preparation' (*IP*) for the firms in the examination sample. All calculations are performed using Stata 13.1 IC software.



These graphics show percent-normalized histograms (i.e., the sum of the bars' height equals 100) with corresponding density plots of the indicators 'reporting quality' (*RQ*), 'information content' (*IC*) and 'information presentation/preparation' (*IP*) for the firms in the examination sample. The two density plots are a scaled normal density plot that has the same mean and standard deviation as the data (*normal*) and a scaled kernel density estimate of the density (Epanechnikov kernel, "optimal half-width") (*kdensity*); see on this matter also the documentation in Stata ('help histogram'). All calculations are performed with the software Stata 13.1 IC.

Figure 15: Distributions of the indicators RQ, IC and IP

Table 22: Correlation coefficients of the indicators RQ, IC and IP

	RQ	IC	IP
RQ	1.0000	0.5830***	0.6234***
		(0.0000)	(0.0000)
IC	0.5771***	1.0000	-0.1330
	(0.0000)		(0.3028)
IP	0.6506***	-0.2446*	1.0000
	(0.0000)	(0.0553)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicators 'reporting quality' (*RQ*), 'information content' (*IC*) and 'information presentation/preparation' (*IP*) for the firms in the examination sample. The respective (nondirectional/two-tailed) *p*-values are provided in the brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

2.1.2. Subindicators of the information content

The results in Table 23 show the distributions of the individual **subindicators of the information content**, which differ substantially from the distribution of the aggregated 'information content' indicator (*IC*). The distributions of most subindicators are also skewed to the right, some more strongly ('completeness' (*CP*), 'reason/cause' (*RS*), 'class homogeneity' (*CHG*), 'time reference' (*TR*)) and some more weakly ('dispersion' (*DP*), 'quantitative context' (*QC*), 'degree of differentiation (sensitivity)' (*DDSS*)). A few subindicators show a left-skewed distribution ('level of measurement' (*LM*), 'reception class 2' (*RC*), 'degree of differentiation ((non-current assets) matrix)' (*DDMT*), 'explanation function' (*EF*)). The tendency toward infrequent extreme deviations (kurtosis) is more pronounced for most subindicators ('completeness' (*CP*), 'reason/cause' (*RS*), 'reception class 2' (*RC*), 'class homogeneity' (*CHG*), 'time reference' (*TR*), 'degree of differentiation ((non-current assets) matrix)' (*DDMT*), 'explanation function' (*EF*)) than for the 'information content' indicator (*IC*). Frequent modestly sized deviations are characteristic of the subindicators 'dispersion' (*DP*), 'level of measurement' (*LM*), 'quantitative context' (*QC*) and 'degree of differentiation (sensitivity)' (*DDSS*). The measurement parameters range, interquartile range and standard deviation tend to have larger values for the majority of the subindicators (exceptions: 'reason/cause' (*RS*) and 'explanation function' (*EF*)), which suggests limitations regarding the comparability of notes disclosures.

With respect to their central tendency (mean and median), it should be noted that the subindicators 'completeness' (*CP*), 'class homogeneity' (*CHG*), 'degree of differentiation ((non-current assets) matrix)' (*DDMT*) and 'explanation function' (*EF*) have larger/better values than the overall indicator 'information content' (*IC*). The central tendency of the subindicator 'level of measurement' (*LM*) is similar to the tendency of the 'information content' (*IC*). The subindicator 'degree of differentiation (sensitivity)' (*DDSS*)) follows an unusual distribution, since the mean is smaller and the median larger than the comparative value of the 'information content' (*IC*). The remaining subindicators ('reason/cause' (*RS*), 'dispersion' (*DP*), 'reception class 2' (*RC*), 'quantitative context' (*QC*), 'time reference' (*TR*)) show values below the level of the overall indicator (*IC*). These relations also apply almost entirely to the individual percentiles (exceptions: 'level of measurement' (*LM*), 'degree of differentiation (sensitivity)' (*DDSS*)), 'degree of differentiation ((non-current assets) matrix)' (*DDMT*)).

Consequently, it can be stated that the empirical information content of the notes reporting is heterogeneous, i.e., that firms choose different manifestations for different qualitative content

characteristics of their disclosures. From a between-indicator perspective, for instance, the notes reporting is much better with respect to the disaggregation of disclosures into homogeneous classes (*CHG*), whereas with respect to disclosures of reasons/causes (*RS*) for manifestations/determinations of information items, it is much worse. This assessment of heterogeneity also applies when looking at distributions of manifestations per indicator (within-indicator perspective), e.g., their kurtosis. These findings illustrate the empirical complexity/multidimensionality of the information content of the notes reporting and underline the necessity of a correspondingly differentiated capturing/measurement and discussion in research and practice, which (unfortunately) does not happen often enough. For example, the dichotomous capturing/measurement of disclosures (e.g., 'discount rate is disclosed/is not disclosed'), which is predominantly found in literature, depicts this complex reality too coarsely and, therefore, inadequately. Accordingly, discussions about a target level of disclosure to be achieved (statements of what 'ought-to-be') and about any existing deficiencies in notes reporting often lack the necessary sound/valid reference basis.

Furthermore, (and ignoring reporting costs,) the results of this work on the information content indicate that there are deficiencies in many aspects of the notes reporting. For example, firms disclose few reasons, disclosures are not very precise, there is often no disaggregation into different reception classes, the quantitative context is often not visible, previous year's/years' disclosures (i.e., the provision of a temporal context) are rare, etc. These indicator values take account of the fact that the firms in some cases do not provide any topic-related firm-specific disclosures at all.[529] A multitude of the elaborated information requirements of the users is thus only inadequately met.

The results of the correlation analysis in Table 24 indicate that, predominantly, the subindicators are statistically interdependent to a substantial degree (criteria: absolute value of the correlation coefficient ≥ 0.25 and p-value < 0.05) and form the information content in a predominantly complementary manner (exceptions: 'degree of differentiation ((non-current assets) matrix)' (*DDMT*) and 'explanation function' (*EF*)), i.e., with positive correlations to each other. Thus, there are convincing results for a rejection of the independence of (most of) the subindicators. This result is consistent with the previous theoretical considerations on interdependencies in the construct information content and related subindicators (see Chapter 1.5.2).

[529] The extent of non-disclosure is about 1/3 (mean: 0.6868; median: 0.6542 – values not presented in the table) and is already taken into account with zero in the indicator values.

Table 23: Description of the subindicators of the information content

	IC	CP	RS	DP	LM	RC	CHG	QC	TR	DDSS	DDMT	EF
n	62	62	62	62	62	62	62	62	62	57	62	62
Mean	0.4010	0.4685	0.0076	0.2920	0.4084	0.2501	0.5155	0.2765	0.3118	0.3330	0.5284	0.9773
Stand. dev.	0.0600	0.1104	0.0169	0.0801	0.1016	0.0556	0.0997	0.0884	0.0725	0.3036	0.1503	0.0574
Skewness	1.3378	2.2067	3.2005	0.7884	-0.1789	-0.8745	1.4210	0.9038	1.5006	0.5483	-1.6318	-3.1902
Kurtosis	5.2091	7.6078	14.0227	3.1913	3.2010	6.3495	5.6436	3.2196	6.4164	2.6852	6.2400	12.0911
Minimum	0.3097	0.3385	0.0000	0.1400	0.1528	0.0217	0.3542	0.1359	0.2051	0.0000	0.0185	0.7407
Maximum	0.6214	0.8913	0.0833	0.5083	0.6294	0.3868	0.8913	0.5156	0.5870	1.0000	0.7778	1.0000
P_{75}-P_{25}	0.0599	0.0841	0.0096	0.0850	0.1086	0.0653	0.1201	0.0804	0.0833	0.5000	0.1296	0.0370
P_1	0.3097	0.3385	0.0000	0.1400	0.1528	0.0217	0.3542	0.1359	0.2051	0.0000	0.0185	0.7407
P_5	0.3358	0.3769	0.0000	0.1872	0.2262	0.1755	0.4015	0.1646	0.2255	0.0000	0.1481	0.7778
P_{10}	0.3409	0.3859	0.0000	0.2090	0.2662	0.1937	0.4269	0.1944	0.2359	0.0000	0.3889	0.9630
P_{25}	0.3620	0.4034	0.0000	0.2450	0.3656	0.2197	0.4527	0.2222	0.2576	0.0000	0.4815	0.9630
P_{50}	0.3905	0.4397	0.0000	0.2750	0.4075	0.2470	0.4866	0.2548	0.3015	0.4792	0.5463	1.0000
P_{75}	0.4218	0.4875	0.0096	0.3300	0.4742	0.2850	0.5727	0.3026	0.3409	0.5000	0.6111	1.0000
P_{90}	0.4907	0.5642	0.0208	0.4270	0.5435	0.3101	0.6274	0.4231	0.3808	0.5000	0.6667	1.0000
P_{95}	0.5160	0.7536	0.0321	0.4538	0.5783	0.3231	0.6604	0.4583	0.4104	1.0000	0.7037	1.0000
P_{99}	0.6214	0.8913	0.0833	0.5083	0.6294	0.3868	0.8913	0.5156	0.5870	1.0000	0.7778	1.0000

This table presents various location and distribution parameters of the indicators ‘information content’ (*IC*), ‘completeness’ (*CP*), ‘reason/cause’ (*RS*), ‘dispersion’ (*DP*), ‘level of measurement’ (*LM*), ‘reception class 2’ (*RC*), ‘class homogeneity’ (*CHG*), ‘quantitative context’ (*QC*), ‘time reference’ (*TR*), ‘degree of differentiation (sensitivity)’ (*DDSS*), ‘degree of differentiation ((non-current assets) matrix)’ (*DDMT*) and ‘explanation function (*EF*)’ for the firms in the examination sample. All calculations are performed with Stata 13.1 IC software.

Table 24: Correlation coefficients of the subindicators of the information content

	IC	CP	RS	DP	LM	RC	CHG	QC	TR	DDSS	DDMT	EF
IC	1.0000	0.8237***	0.2833**	0.5562***	0.6399***	0.5407***	0.7184***	0.4323***	0.7697***	0.3113**	0.0926	-0.0516
		(0.0000)	(0.0257)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0004)	(0.0000)	(0.0184)	(0.4741)	(0.6907)
CP	0.8276***	1.0000	0.0168	0.3969***	0.3750***	0.3686***	0.6900***	0.2657**	0.5566***	0.1376	0.0690	-0.1415
	(0.0000)		(0.8966)	(0.0014)	(0.0027)	(0.0032)	(0.0000)	(0.0369)	(0.0000)	(0.3075)	(0.5942)	(0.2725)
RS	0.3738***	0.1794	1.0000	0.2203*	0.4121***	0.1712	-0.1018	0.2454*	0.3267***	0.0996	-0.0783	0.1125
	(0.0028)	(0.1630)		(0.0854)	(0.0009)	(0.1834)	(0.4309)	(0.0545)	(0.0096)	(0.4612)	(0.5454)	(0.3838)
DP	0.4194***	0.0710	0.3724***	1.0000	0.3975***	0.7586***	0.4304***	0.8220***	0.2670**	0.2777**	-0.0835	-0.1431
	(0.0007)	(0.5835)	(0.0029)		(0.0014)	(0.0000)	(0.0005)	(0.0000)	(0.0359)	(0.0365)	(0.5189)	(0.2673)
LM	0.6188***	0.2479*	0.4524***	0.4597***	1.0000	0.2742**	0.3067**	0.2598**	0.4524***	0.3094**	0.0084	0.0199
	(0.0000)	(0.0520)	(0.0002)	(0.0002)		(0.0311)	(0.0153)	(0.0415)	(0.0002)	(0.0192)	(0.9483)	(0.8781)
RC	0.1127	-0.1955	0.1909	0.7343***	0.1577	1.0000	0.4899***	0.7464***	0.3312***	0.3706***	-0.1796	-0.1587
	(0.3832)	(0.1279)	(0.1372)	(0.0000)	(0.2210)		(0.0001)	(0.0000)	(0.0086)	(0.0045)	(0.1624)	(0.2180)
CHG	0.7803***	0.7466***	0.0496	0.2869**	0.2170*	0.0907	1.0000	0.3041**	0.4562***	0.1197	-0.0750	-0.1441
	(0.0000)	(0.0000)	(0.7020)	(0.0238)	(0.0902)	(0.4833)		(0.0163)	(0.0002)	(0.3752)	(0.5624)	(0.2640)
QC	0.3522***	0.0142	0.3498***	0.9180***	0.3864***	0.7318***	0.2268*	1.0000	0.2267*	0.2753**	-0.2396*	-0.2862**
	(0.0050)	(0.9126)	(0.0053)	(0.0000)	(0.0019)	(0.0000)	(0.0762)		(0.0765)	(0.0382)	(0.0607)	(0.0241)
TR	0.8437***	0.6476***	0.3711***	0.1985	0.4518***	-0.0158	0.5907***	0.1786	1.0000	0.2196	0.0416	-0.0816
	(0.0000)	(0.0000)	(0.0030)	(0.1220)	(0.0002)	(0.9029)	(0.0000)	(0.1649)		(0.1007)	(0.7480)	(0.5286)
DDSS	0.3611***	0.2673**	0.1407	0.3515***	0.3735***	0.4419***	0.1546	0.3600***	0.1569	1.0000	-0.0022	0.0608
	(0.0058)	(0.0444)	(0.2967)	(0.0073)	(0.0042)	(0.0006)	(0.2509)	(0.0060)	(0.2437)		(0.9873)	(0.6533)
DDMT	0.0479	-0.0401	-0.0855	-0.1815	0.0797	-0.1771	-0.1748	-0.2741**	0.0153	-0.1665	1.0000	0.0188
	(0.7118)	(0.7568)	(0.5087)	(0.1581)	(0.5381)	(0.1686)	(0.1743)	(0.0311)	(0.9058)	(0.2157)		(0.8847)
EF	0.0650	0.0087	0.0985	-0.1441	0.1662	-0.1082	-0.0585	-0.1944	0.0851	0.2343*	-0.0999	1.0000
	(0.6156)	(0.9463)	(0.4461)	(0.2637)	(0.1968)	(0.4027)	(0.6515)	(0.1300)	(0.5106)	(0.0793)	(0.4396)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicators 'information content' (*IC*), 'completeness' (*CP*), 'reason/cause' (*RS*), 'dispersion' (*DP*), 'level of measurement' (*LM*), 'reception class 2' (*RC*), 'class homogeneity' (*CHG*), 'quantitative context' (*QC*), 'time reference' (*TR*), 'degree of differentiation (sensitivity)' (*DDSS*), 'degree of differentiation ((non-current assets) matrix)' (*DDMT*) and 'explanation function' (*EF*) for the firms in the examination sample. The respective (nondirectional/two-tailed) *p*-values are provided in the brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

2.1.3. Subindicators of the information presentation/preparation

The results in Table 25 show the distributions of the individual **subindicators of the information presentation/preparation**. The distributions of the indicators 'non-boilerplate intensity' (*NB*) and 'coherence' (*CH*) are skewed to the left. The distribution of the indicator 'format' (*FT*) is skewed comparatively more weakly to the right and the distribution of the indicator 'diction' (*DT*) is skewed comparatively more strongly to the right. The distribution of the 'non-boilerplate intensity' (*NB*) tends more strongly – while the distributions of the other three subindicators tend more weakly – toward infrequent extreme deviations (kurtosis) than the overall 'information presentation/preparation' (*IP*). Range, interquartile range and standard deviation for the individual subindicators show larger values than for the aggregated indicator 'information presentation/preparation' (*IP*) (exception: range of 'diction' (*DT*)). This suggests limitations regarding the comparability of notes disclosures. To some extent, the central tendency shows substantially larger ('non-boilerplate intensity' (*NB*) and 'coherence' (*CH*)), to some extent slightly larger ('format' (*FT*)) and, to some extent, substantially smaller ('diction' (*DT*)) values than the overall 'information presentation/preparation' (*IP*). Regarding the individual percentiles of the distributions, similar relations are to be noted. The 'diction' (*DT*) exhibits lower values in all percentiles, the 'non-boilerplate intensity' (*NB*) and 'coherence' (*CH*) exhibit larger values from the 5th percentile and the 'format' (*FT*) exhibits larger values from the median/50th percentile on.

The subindicators 'format' (*FT*) and 'coherence' (*CH*) are themselves aggregates of various subindicators. The respective subindicators also have different distribution characteristics, which are shown in Table 25 and are not described in more detail here. Among the most remarkable features are the extreme values of mean and median of the subindicators 'bold/italic type' (*BI*) (relatively small), 'paragraph design' (*PD*), 'financial statement referencing' (*FSR*) and 'indication specificity' (*IS*) (relatively large), which are accompanied by distinctive distribution characteristics with respect to skewness, kurtosis and percentile values.

Consequently, it can be concluded that the presentation/preparation of the notes reporting in practice is strongly characterized by heterogeneity, as is the information content. In addition, the results indicate that the information presentation/preparation has deficiencies in many aspects. On average, about 1/3 of the disclosures are to be classified as boilerplate due to their lack of (firm) specificity and thus, in essence, as useless for the users. The criticism of an 'information overload' in the notes reporting, as stated by prior research (see Part 1, Chapter 1),

is corroborated in the light of these results (with the restriction that there may also be firms whose disclosure amount/volume is relatively low overall despite a low non-boilerplate intensity). In addition, the sometimes markedly negative findings on the design of the notes reporting with regard to language ('diction' (*DT*)), layout ('bold/italic type' (*BI*)) and structure ('TOC referencing' (*TCR*), and 'isolation/referencing' (*IR*)) make it clear in what respect the notes reporting currently practiced by firms cannot be attested to as an appropriate presentation/preparation of their information (content) supply.

The results of the correlation analysis in Table 26 do not indicate that statistically substantial correlations exist (criteria: absolute value of the correlation coefficient ≥ 0.25 and p-value < 0.05) between the subindicators 'non-boilerplate intensity' (*NB*), 'format' (*FT*), 'diction' (*DT*) and 'coherence' (*KH*). Thus, there are no convincing results regarding the rejection of their independence. This result is consistent with the previous theoretical considerations on the mutual exclusiveness/independence of the subindicators within the individual dimensions of the construct information presentation/preparation.

Table 25: Description of the subindicators of the information presentation/preparation

	IP	NB	FT	TG	BI	PD	DT	CH	TCR	FSR	IR	IS
n	62	62	62	62	62	62	62	62	62	62	62	62
Mean	0.4794	0.6552	0.4988	0.4804	0.1452	0.8710	0.1425	0.6209	0.3656	0.9839	0.3521	0.7821
Stand. dev.	0.0645	0.1191	0.1821	0.1951	0.3551	0.3380	0.0939	0.1013	0.2812	0.1270	0.1633	0.1174
Skewness	0.4227	-0.8391	0.1545	0.1221	2.0146	-2.2132	0.8167	-0.8275	-0.1833	-7.6822	0.0007	-1.0157
Kurtosis	4.3425	5.1838	3.5255	2.1391	5.0587	5.8981	3.1595	3.9542	1.4514	60.0164	2.2962	4.8473
Minimum	0.3044	0.2149	0.0556	0.1667	0.0000	0.0000	0.0000	0.2656	0.0000	0.0000	0.0000	0.3750
Maximum	0.6857	0.9015	0.9444	0.8333	1.0000	1.0000	0.3770	0.7917	0.6667	1.0000	0.6667	0.9500
P_{75}-P_{25}	0.0581	0.1292	0.1389	0.3333	0.0000	0.0000	0.1190	0.1396	0.6667	0.0000	0.2500	0.1000
P_1	0.3044	0.2149	0.0556	0.1667	0.0000	0.0000	0.0000	0.2656	0.0000	0.0000	0.0000	0.3750
P_5	0.4112	0.4978	0.1667	0.1667	0.0000	0.0000	0.0170	0.4625	0.0000	1.0000	0.1000	0.6000
P_{10}	0.4195	0.5330	0.2667	0.2000	0.0000	0.0000	0.0415	0.5000	0.0000	1.0000	0.1000	0.6250
P_{25}	0.4443	0.5966	0.4167	0.3333	0.0000	1.0000	0.0700	0.5521	0.0000	1.0000	0.2500	0.7500
P_{50}	0.4697	0.6564	0.5000	0.5000	0.0000	1.0000	0.1295	0.6432	0.3333	1.0000	0.3542	0.8000
P_{75}	0.5024	0.7258	0.5556	0.6667	0.0000	1.0000	0.1890	0.6917	0.6667	1.0000	0.5000	0.8500
P_{90}	0.5754	0.7953	0.7778	0.8000	1.0000	1.0000	0.3105	0.7214	0.6667	1.0000	0.5938	0.9500
P_{95}	0.5850	0.8215	0.8333	0.8333	1.0000	1.0000	0.3225	0.7542	0.6667	1.0000	0.6000	0.9500
P_{99}	0.6857	0.9015	0.9444	0.8333	1.0000	1.0000	0.3770	0.7917	0.6667	1.0000	0.6667	0.9500

This table presents various location and distribution parameters of the indicators 'information presentation/preparation' (*IP*), 'non-boilerplate intensity' (*NB*), 'format' (*FT*), 'tables/graphics' (*TG*), 'bold/italic type' (*BI*), 'paragraph design' (*PD*), 'diction' (*DT*), 'coherence' (*CH*), 'TOC referencing' (*TCR*), 'financial statement referencing' (*FSR*), 'isolation/referencing' (*IR*) and 'indication specificity' (*IS*) for the firms in the examination sample. All calculations are performed with Stata 13.1 IC software.

Table 26: Correlation coefficients of the subindicators of the information presentation/preparation

	IP	NB	FT	TG	BI	PD	DT	CH	TCR	FSR	IR	IS
IP	1.0000	0.4156***	0.6935***	0.3046**	0.5744***	0.3172**	0.3237**	0.3388***	0.2739**	0.2111*	0.2268*	0.0056
		(0.0008)	(0.0000)	(0.0161)	(0.0000)	(0.0120)	(0.0103)	(0.0071)	(0.0312)	(0.0996)	(0.0763)	(0.9657)
NB	0.5826***	1.0000	0.0699	0.2236*	0.1343	-0.2151*	-0.0980	0.1519	0.2395*	0.1896	-0.1283	-0.0433
	(0.0000)		(0.5892)	(0.0806)	(0.2979)	(0.0932)	(0.4487)	(0.2386)	(0.0608)	(0.1400)	(0.3202)	(0.7381)
FT	0.6653***	0.0752	1.0000	0.4863***	0.6132***	0.5836***	0.0336	-0.1395	-0.1339	0.1114	0.0304	-0.2778**
	(0.0000)	(0.5611)		(0.0001)	(0.0000)	(0.0000)	(0.7952)	(0.2795)	(0.2996)	(0.3885)	(0.8148)	(0.0288)
TG	0.2731**	0.2283*	0.2729**	1.0000	-0.0117	-0.1253	-0.1162	0.0377	0.0817	0.1559	-0.0612	-0.1009
	(0.0317)	(0.0743)	(0.0319)		(0.9283)	(0.3317)	(0.3685)	(0.7713)	(0.5278)	(0.2263)	(0.6368)	(0.4350)
BI	0.6534***	0.1663	0.7461***	-0.0055	1.0000	0.1586	0.2674**	-0.0845	-0.0491	0.0528	0.0500	-0.3177**
	(0.0000)	(0.1965)	(0.0000)	(0.9660)		(0.2182)	(0.0357)	(0.5140)	(0.7050)	(0.6838)	(0.6994)	(0.0119)
PD	0.2313*	-0.1849	0.6752***	-0.1302	0.1586	1.0000	-0.1344	-0.2461*	-0.3007**	-0.0493	-0.0189	0.0014
	(0.0705)	(0.1503)	(0.0000)	(0.3131)	(0.2182)		(0.2976)	(0.0539)	(0.0176)	(0.7037)	(0.8843)	(0.9917)
DT	0.3390***	-0.0374	-0.0044	-0.1505	0.2497*	-0.1826	1.0000	-0.0265	-0.1327	-0.0894	0.1284	0.1258
	(0.0070)	(0.7727)	(0.9731)	(0.2430)	(0.0503)	(0.1555)		(0.8379)	(0.3038)	(0.4894)	(0.3198)	(0.3301)
CH	0.3524***	0.2080	-0.1871	0.0764	-0.1035	-0.2378*	-0.0112	1.0000	0.8232***	0.2183*	0.5663***	0.3006**
	(0.0050)	(0.1048)	(0.1453)	(0.5553)	(0.4235)	(0.0627)	(0.9309)		(0.0000)	(0.0883)	(0.0000)	(0.0176)
TCR	0.2774**	0.2776**	-0.1800	0.1030	-0.0477	-0.3004**	-0.1051	0.8013***	1.0000	0.1638	0.1501	-0.0267
	(0.0290)	(0.0289)	(0.1615)	(0.4255)	(0.7130)	(0.0177)	(0.4161)	(0.0000)		(0.2032)	(0.2443)	(0.8369)
FSR	0.2788**	0.1594	0.0582	0.1524	0.0528	-0.0493	-0.0371	0.4526***	0.1678	1.0000	0.0968	-0.0540
	(0.0282)	(0.2158)	(0.6530)	(0.2369)	(0.6838)	(0.7037)	(0.7746)	(0.0002)	(0.1923)		(0.4540)	(0.6771)
IR	0.2042	-0.1208	0.0040	-0.0692	0.0565	-0.0130	0.1347	0.5302***	0.1279	0.0807	1.0000	0.0697
	(0.1114)	(0.3495)	(0.9753)	(0.5933)	(0.6626)	(0.9202)	(0.2967)	(0.0000)	(0.3219)	(0.5330)		(0.5903)
IS	-0.0334	0.0487	-0.2832**	-0.0518	-0.3787***	-0.0300	0.0658	0.3058**	0.0116	-0.0335	0.0458	1.0000
	(0.7966)	(0.7071)	(0.0257)	(0.6890)	(0.0024)	(0.8168)	(0.6113)	(0.0157)	(0.9286)	(0.7963)	(0.7239)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicators 'information presentation/preparation' (*IP*), 'non-boilerplate intensity' (*NB*), 'format' (*FT*), 'tables/graphics' (*TG*), 'bold/italic type' (*BI*), 'paragraph design' (*PD*), 'diction' (*DT*), 'coherence' (*CH*), 'TOC referencing' (*TCR*), 'financial statement referencing' (*FSR*), 'isolation/referencing' (*IR*) and 'indication specificity' (*IS*) for the firms in the examination sample. The respective (non-directional/two-tailed) *p*-values are provided in brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

In contrast to the other subindicators, '**diction**' (*DT*) offers the possibility of using comparative values that allow a better interpretation of the value level. The values of the subindicator 'diction' (*DT*) are substantially lower than those of the other subindicators of the information presentation/preparation. Accounting language is to some extent complex by nature, so lower values of diction may be unavoidable systematically. For a better classification of the diction values of notes reporting, a comparison is made with selected reference texts which can be assumed to represent the average language-comprehension levels of non-professional users and, thus, an appropriate level of comparison.

For this purpose, on the one hand, two widely used German textbooks were applied that cover the topics focused on in this work (i.e., depiction of intangible assets/resources under IFRS, including special aspects related to the preparation of consolidated financial reports). In particular, these text samples serve to capture text characteristics in connection with technical vocabulary and detailed descriptions of accounting rules/standards. On the other hand, topic-related newspaper articles were selected from the business press (*Handelsblatt*) – ten articles from the series "Dax-Konzerne ungeschminkt" (where financial analyses are conducted of firms listed in the German DAX stock index) and four articles addressing current topics of international financial reporting (such as firms' goodwill impairment practices). These text samples serve, in particular, to capture text characteristics in connection with the financial analysis of firms in the context of accounting rules/standards. In order to limit confounding events, e.g., changes in the accounting environment (changes in accounting rules/standards, etc.), textbook editions from the year of the examination sample (2014) were used. Similarly, the financial analyses of the "Dax-Konzerne ungeschminkt" series refer to annual reports for 2014. The detailed origin of the text samples can be found in Table 27.

Table 27: Overview of the comparative text passages used

Sources		Text passages
1	Coenenberg et al. (2014)	"B. Bilanzbewertung" (pp. 123-132) "E. Bilanzierung von immateriellem Vermögen nach IFRS" (pp. 184-192) "A. Kapitalkonsolidierung" (pp. 688-707)
1	Pellens et al. (2014)	"Kapitel 8: Wertminderung im Anlagevermögen" (pp. 300-316) "Kapitel 9: Immaterielles Anlagevermögen" (pp. 322-346) "Kapitel 21: Unternehmenszusammenschlüsse und Konsolidierung" (pp. 765-772; pp. 774-781)
2	Handelsblatt	*From the series "Dax-Konzerne ungeschminkt":* 2015, no. 90, pp. 32 f. 2015, no. 91, pp. 20 f. 2015, no. 93, pp. 24 f. 2015, no. 93, pp. 26 f. 2015, no. 94, pp. 22 f. 2015, no. 96, pp. 24 f. 2015, no. 96, pp. 30 f. 2015, no. 98, pp. 18-21 2015, no. 99, pp. 6-9 2015, no. 117, pp. 18 f. *Current topics of international financial reporting:* "Die Schein-Heiligen" (2016, no. 55, pp. 42-45) "10 legale Bilanztricks" (2016, no. 55, pp. 46-51) "Vorsicht, Bilanzdoping!" (2017, no. 119, pp. 49-56) "Es fehlt der gute Wille" (2017, no. 119, pp. 56 f.)

Coenenberg et al. (2014): Coenenberg, Adolf G./Haller, Axel/Schultze, Wolfgang, Jahresabschluss und Jahresabschlussanalyse. Betriebswirtschaftliche, handelsrechtliche, steuerrechtliche und internationale Grundlagen – HGB, IAS/IFRS, US-GAAP, DRS, 23rd edition, Stuttgart 2014.

Pellens et al. (2014): Pellens, Bernhard/Fülbier, Rolf Uwe/Gassen, Joachim/Sellhorn, Thorsten, Internationale Rechnungslegung. IFRS 1 bis 13, IAS 1 bis 41, IFRIC-Interpretationen, Standardentwürfe, 9th edition, Stuttgart 2014.

1 – textbook; 2 – newspaper article

As it is not possible to narrow down firm-specific statements in a meaningful way for the comparative texts, all topic-related firm disclosures – i.e., general and firm-specific disclosures – are used as the text basis for calculating the 'diction' (*DT*) of firms' notes reporting. As Table 28 shows, the mean, median and all percentiles of the 'diction's' (*DT*) distribution – except the 1st percentile – have smaller values for 'all disclosures' (*Disclosures_tt*) than for 'firm-specific disclosures' (*Disclosures_sp*), i.e., the general disclosures tend to reduce/worsen the diction/readability. In comparison with 'all disclosures' (*Disclosures_tt*), the diction/readability of the textbooks is slightly better, whereas the diction/readability of the newspaper articles is substantially better. Due to the small number of cases, however, it should be noted that the results on the diction/readability of the textbooks' texts should be interpreted with caution.

The test results shown in Table 29 also indicate that there is a statistically significant difference (criterion: p-value < 0.01 for parametric and non-parametric tests) between the distributions of the diction/readability of firms' disclosures and newspaper articles.

Thus, it can be cautiously concluded that the diction/readability of the notes reporting – at least for non-professional users – is likely to play a not-insignificant role with regard to the acquisition and processing of information by the users and with regard to resulting information costs. Thus, the results corroborate and underline the already identified deficiencies in the information presentation/preparation of the notes reporting.

Table 28: Description of the diction of the notes reporting in the context of comparative texts

	Disclosures_sp	Disclosures_tt	Technical text	Newspaper	Textbook
n	62	62	16	14	2
Mean	0.1425	0.0884	0.5234	0.5809	0.1205
Stand. dev.	0.0939	0.0646	0.2209	0.1658	0.0601
Skewness	0.8167	1.2483	-0.7415	-0.7943	0.0000
Kurtosis	3.1595	4.2747	2.2850	2.5768	1.0000
Minimum	0.0000	0.0025	0.0780	0.2555	0.0780
Maximum	0.3770	0.2969	0.7790	0.7790	0.1630
P_{75}-P_{25}	0.1190	0.0745	0.3485	0.1960	0.0850
P_1	0.0000	0.0025	0.0780	0.2555	0.0780
P_5	0.0170	0.0155	0.0780	0.2555	0.0780
P_{10}	0.0415	0.0275	0.1630	0.2795	0.0780
P_{25}	0.0700	0.0365	0.3518	0.5215	0.0780
P_{50}	0.1295	0.0783	0.5858	0.6028	0.1205
P_{75}	0.1890	0.1110	0.7003	0.7175	0.1630
P_{90}	0.3105	0.1780	0.7485	0.7485	0.1630
P_{95}	0.3225	0.2270	0.7790	0.7790	0.1630
P_{99}	0.3770	0.2969	0.7790	0.7790	0.1630

This table presents various location and distribution parameters of the Hohenheimer index (on the definition, see Chapter 1.4.4.3) for various text samples. *Disclosures_sp* and *Disclosures_tt* refer to the topic-related firm-specific ("*_sp*") and total topic-related disclosures ("*_tt*"), respectively, for the firms in the examination sample. *Newspaper* and *Textbook* refer to the text samples according to Table 27. *Technical text* is the union of *Newspaper* and *Textbook*. All calculations are performed with Stata 13.1 IC software.

Table 29: Tests for differences in diction between the notes reporting and comparative texts

Population comparison	Test	Test statistic (*p*-value)
Disclosures_tt, Newspaper	t	10.9264*** (0.0000)
(n=62, n=14)	Wilcoxon	5.7886*** (0.0000)

The purpose of this table is to assess the extent to which the notes reporting of the firms in the examination sample (*Disclosures_tt*) differs from newspaper articles (*Newspaper*) in terms of manifestations of the Hohenheimer index (for a definition of the variables, see Tables 27 and 28). The results of statistical tests for differences in these manifestations between the populations are provided (H_0: No differences are present). The comparison is made using the *t*-test for two independent samples (t) and the Wilcoxon rank-sum test (Wilcoxon). The respective test statistics are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets. * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. In the event that at least two out of three tests for equality of variance (homogeneity of variance) (according to Levene as well as Brown and Forsythe) have a *p*-value < 0.1 (results not presented), the t values are calculated on the basis of the *t*-test for unequal variances. Results of further tests for normality (Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality) of the characteristics in the subpopulation *Disclosures_tt* and the combined population (*Disclosures_tt* and *Newspaper*) reject a normal distribution with $p < 0.01$, which is why the classical tests for equality of variance (homogeneity of variance) (*F*-test and Bartlett's test) are not considered due to their susceptibility to violations of the normality assumption. For this reason, limitations must also be assumed with respect to the statistical validity of the *t*-test, which is why the focus in the interpretations must be on the non-parametric alternative (Wilcoxon). All calculations are performed with Stata 13.1 IC software.

2.2. Analysis by topic

2.2.1. Allocation of indicators to topics

In order to gain further insights into the empirical manifestation of the notes reporting (quality), the further analysis is differentiated into various reporting topics. Table 30 shows the **allocation of the indicators** to the individual topics. Here it should be noted that the indicators of the information presentation/preparation that are not differentiated by topic ('non-boilerplate intensity' (*NB*), 'diction' (*DT*), 'bold/italic type' (*BI*), 'paragraph design' (*PD*), 'TOC referencing' (*TCR*) and 'financial statement referencing' (*FSR*)) cannot be allocated. In the following, therefore, only a correspondingly narrower partial delimitation will be analyzed (excluding these undifferentiated indicators). The different sample size per indicator and topic is due to the fact that the same topics are not relevant for every firm, since, for example, not every firm has carried out a business combination. In addition, the information presentation/preparation is only coded if disclosures are provided on a specific topic, i.e., if coded information content exists.

Table 30: Allocation of indicators to topics

Topics		Information items according to Chapter 1.4.3.7, Table 8	Tables/graphics	Isolation/referencing and indication specificity according to Chapter 1.4 4.4, Table 10
A	Accounting methods	4 – Materiality guideline 4 – Cost vs. revaluation model 4 – Valuation model non-controlling interests 5 – Capitalized borrowing costs 5 – Indicators qualified int. asset (borrowing costs)	Accounting methods	1 – Materiality guideline 2 – Cost vs. revaluation model
B	Business combination or purchase price allocation	3 – Stock/temporal development: BC matrix 5 – Identification/recognition criteria int. assets (PPA) 5 – Reasons for/components of the difference 5 – Extrapolation share of the difference (FGM) 5 – Fair value non-controlling interests 6 – Initial measurement PPA	BC matrix	3 – Business combination or purchase price allocation
C	Subsequent accounting scheduled depreciations	7 – Subsequent accounting scheduled depreciations	Useful life matrix	4 – Subsequent accounting scheduled depreciations
D	Internal generation	5 – Indicators research and development phase 5 – Cost components (internally generated int. assets)	-	5 – Internal generation
E	Non-current assets matrix	1 – Stock/temporal development: non-current assets matrix	Non-current assets matrix	6 – Stock/temporal development: non-current assets matrix
F	Impairment test	2 – Stock/temporal development: CGU matrix 5 – Criteria for allocation to CGU (impairment test) 5 – Criteria for CGU identification/delimitation 8 – Subsequent measurement impairment test	CGU matrix Impairment test	7 – Impairment test

2.2.2. Reporting quality

The results in Table 31 show the manifestations of **reporting quality for the individual topics**. The mean, median and the majority of the percentiles (exception: the 10th and 25th percentiles of topics A (*RQ_A*) and C (*RQ_C*)) indicate that reporting on topics A ('accounting methods' (*RQ_A*)) and B ('business combination, purchase price allocation' (*RQ_B*)) is worse and, on topic E ('non-current assets matrix' (*RQ_E*)), substantially better than reporting on topics C ('subsequent accounting scheduled depreciations' (*RQ_C*)), D ('internal generation' (*RQ_D*)) and F ('impairment test' (*RQ_F*)) – which have approximately similar values. In this respect, the test results shown in Table 32 show consistent results (criterion: p-value < 0.01 for parametric and non-parametric tests), with the exception of comparisons with topic D ('internal generation' (*RQ_D*)). The tests for topic D ('internal generation' (*RQ_D*)) only point to substantial differences with regard to topic E ('non-current assets matrix' (*RQ_E*)), which may be due to the small number of cases (n=9) and must, therefore, be interpreted with caution. It can therefore be concluded that the reporting quality for the 'non-current assets matrix' (*RQ_E*) is comparatively the best, while the reporting quality in relation to disclosures about the application of 'accounting methods' (*RQ_A*) and 'business combinations' (*RQ_B*) is worst.

The results of the correlation analysis in Table 33 indicate that for the reporting quality, statistically substantial dependencies (criteria: absolute value of the correlation coefficient ≥ 0.25 and p-value < 0.05) do not exist between the individual topics. The large correlation coefficients in relation to topic D ('internal generation' (*RQ_D*)) are probably due to the small number of cases (n=9). Thus, there are no convincing results for a rejection of the independence, so that it may be cautiously stated that firms choose/determine the quality of their notes reporting on individual topics independently of other topics.

Table 31: Description of the reporting quality by topic

	RQ_A	RQ_B	RQ_C	RQ_D	RQ_E	RQ_F
n	61	42	61	9	62	57
Mean	0.3148	0.2915	0.3875	0.3827	0.7179	0.4145
Stand. dev.	0.0865	0.1296	0.1525	0.0914	0.0375	0.1214
Skewness	-0.0763	-0.1540	0.1778	0.8134	0.6163	0.0325
Kurtosis	2.4658	1.7536	1.6077	3.0747	5.2829	2.1520
Minimum	0.1201	0.0750	0.1598	0.2701	0.6250	0.1808
Maximum	0.5009	0.5115	0.6730	0.5685	0.8607	0.6715
P_{75}-P_{25}	0.1153	0.2035	0.2844	0.0273	0.0466	0.1891
P_{1}	0.1201	0.0750	0.1598	0.2701	0.6250	0.1808
P_{5}	0.1514	0.1029	0.1911	0.2701	0.6682	0.2225
P_{10}	0.2139	0.1035	0.2045	0.2701	0.6771	0.2476
P_{25}	0.2451	0.1963	0.2402	0.3599	0.6953	0.3172
P_{50}	0.3292	0.2979	0.3686	0.3682	0.7193	0.4113
P_{75}	0.3604	0.3998	0.5247	0.3872	0.7419	0.5063
P_{90}	0.4229	0.4542	0.5862	0.5685	0.7617	0.5823
P_{95}	0.4344	0.4745	0.6023	0.5685	0.7677	0.5935
P_{99}	0.5009	0.5115	0.6730	0.5685	0.8607	0.6715

This table presents various location and distribution parameters of the indicator 'reporting quality' (*RQ*) according to the topics defined in Table 30 for the firms in the examination sample. All calculations are performed with Stata 13.1 IC software.

Table 32: Tests for differences in the reporting quality between topics

RQ_A-RQ_F	(n=292)				
ANOVA		Kruskal-Wallis		SkilMack	
uneq. var.		161.6334*** (0.0001)		139.417*** (0.0001)	
t Wilcoxon Wilcoxon-mp	RQ_A (n=61)	RQ_B (n=42)	RQ_C (n=61)	RQ_D (n=9)	RQ_E (n=62)
RQ_B (n=42)	1.0185 (0.3122) 0.7520 (0.4520) 1.3023 (0.1928)				
RQ_C (n=61)	-3.2368*** (0.0017) -2.0719** (0.0383) -2.8121*** (0.0049)	-3.4329*** (0.0009) -2.8925*** (0.0038) -2.6195*** (0.0088)			
RQ_D (n=9)	-2.1818** (0.0326) -2.1529** (0.0313) -1.0070 (0.3139)	-2.5018** (0.0237) -1.6804* (0.0929) -1.2136 (0.2249)	0.1328 (0.8961) -0.1140 (0.9092) 0.4146 (0.6784)		
RQ_E (n=62)	-33.4215*** (0.0000) -9.5687*** (0.0000) -6.7913*** (0.0000)	-20.7373*** (0.0000) -8.6260*** (0.0000) -5.6454*** (0.0000)	-16.4376*** (0.0000) -9.5303*** (0.0000) -6.7913*** (0.0000)	-10.8738*** (0.0000) -4.8224*** (0.0000) -2.6656*** (0.0077)	
RQ_F (n=57)	-5.1093*** (0.0000) -4.3502*** (0.0000) -3.9317*** (0.0001)	-4.8434*** (0.0000) -4.1347*** (0.0000) -3.9574*** (0.0001)	-1.0703 (0.2868) -1.0636 (0.2875) -1.3149 (0.1885)	-0.9255 (0.3716) -0.9997 (0.3175) -0.8402 (0.4008)	18.0939*** (0.0000) 9.3678*** (0.0000) 6.5667*** (0.0000)

(The table is continued on the next page.)

Table 32 (Continued)

The purpose of this table is to assess the extent to which the 'reporting quality' (*RQ*) among the firms in the examination sample differs in terms of the individual topics (for the topic definitions, see Table 30). The results of statistical tests for differences in the manifestations of reporting quality between the populations/topics are provided (H_0: No differences are present). The comparison of all topics together is carried out using the single-factor between-subjects analysis of variance (ANOVA) and the Kruskal-Wallis one-way analysis of variance by ranks (Kruskal-Wallis), with the pairwise comparison carried out using the *t*-test for two independent samples (t) and the Wilcoxon rank-sum test (Wilcoxon). Since all populations are composed of the identical firms (albeit with different sample sizes), a dependency between the populations ('dependent populations') cannot be ruled out. A dependency may theoretically be justifiable on the basis of the expectation that firms that generally report 'better/worse' are likely to exhibit this reporting behavior systematically in each topic. In addition, therefore, the results of the Skillings-Mack Test (SkilMack – a generalization of the Friedman two-way analysis of variance by ranks for data sets with missing values) are reported for the comparison of all topics together, whereas the results of the Wilcoxon matched-pairs signed-ranks test (Wilcoxon-mp) are reported for the pairwise comparison. The respective test statistics are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets. * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. In the event that at least two out of three tests for equality of variance (homogeneity of variance) (according to Levene as well as Brown and Forsythe) have a *p*-value < 0.1 (results not presented), the ANOVA values are not presented (uneq. var.) due to non-compliance with the underlying premises and the t values are calculated using the *t*-test for unequal variances. Results of further tests for normality (Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality) of the characteristics in the population composed of all topics reject a normal distribution with $p < 0.01$. In the individual subpopulations, rejections occur in some cases. Overall, the (assumption of a) normal distribution thus tends to be rejected, which is why the classical tests for equality of variance (homogeneity of variance) (*F*-test and Bartlett's test) are not considered due to their susceptibility to violations of the normality assumption. For this reason, limitations must also be assumed with respect to the statistical validity of the ANOVA and *t*-test, which is why the focus in the interpretation must be on the non-parametric alternatives (Kruskal-Wallis, SkilMack, Wilcoxon and Wilcoxon-mp). All calculations are performed with Stata 13.1 IC software.

Table 33: Correlation coefficients of the reporting quality by topic

	RQ_A	RQ_B	RQ_C	RQ_D	RQ_E	RQ_F
RQ_A	1.0000	0.1551	0.1362	-0.4958	0.0008	-0.0204
		(0.3329)	(0.2993)	(0.1747)	(0.9949)	(0.8812)
RQ_B	0.1674	1.0000	0.0571	0.5000	0.1449	-0.0220
	(0.2954)		(0.7197)	(0.3910)	(0.3599)	(0.8898)
RQ_C	0.1614	0.0859	1.0000	0.1000	-0.0562	0.1417
	(0.2181)	(0.5887)		(0.7980)	(0.6672)	(0.2931)
RQ_D	-0.5955*	0.1283	0.0180	1.0000	0.3264	0.3095
	(0.0906)	(0.8371)	(0.9633)		(0.3914)	(0.4556)
RQ_E	0.1150	0.1400	-0.1313	0.4599	1.0000	0.1045
	(0.3774)	(0.3767)	(0.3130)	(0.2129)		(0.4390)
RQ_F	-0.0837	0.0111	0.1501	0.1192	0.0849	1.0000
	(0.5395)	(0.9442)	(0.2652)	(0.7785)	(0.5301)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicator 'reporting quality' (*RQ*) according to the topics defined in Table 30 for the firms in the examination sample. The respective (nondirectional/two-tailed) *p*-values are provided in the brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

2.2.3. Information content

Next, the results regarding the **information content** in Table 34 are considered. Topic D ('internal generation' (*IC_D*)) now has more observations, since the measurement of the information content is not dependent on whether the firm provides disclosures, in contrast to the information presentation/preparation. Median, mean and the different percentiles are smaller for topics B ('business combination, purchase price allocation' (*IC_B*)) and D ('internal generation' (*IC_D*)) and substantially larger for topic E ('non-current assets matrix' (*IC_E*)) than for the other topics. Topic B ('business combination, purchase price allocation' (*IC_B*)) exhibits predominantly slightly larger values (exceptions: 1st, 5th, 10th, 99th percentiles) than topic D ('internal generation' (*IC_D*)). Topic F ('impairment test' (*IC_F*)) exhibits predominantly larger values (exceptions: 1st, 5th, 95th percentiles) than topics A ('accounting methods' (*IC_A*)) and C ('subsequent accounting scheduled depreciations' (*IC_C*)). Topic A ('accounting methods' (*IC_A*)) has larger mean and median values than topic C ('subsequent accounting scheduled depreciations' (*IC_C*)), but the individual percentiles show different relations. The test results shown in Table 35 largely support these findings (criterion: p-value < 0.01 for parametric and non-parametric tests). The difference between topics A ('accounting methods' (*IC_A*)) and F ('impairment test' (*IC_F*)) is only significant at the 5 % level for one of the two non-parametric tests and, therefore, must be interpreted with caution.

Accordingly, it can be cautiously concluded that the notes reporting on 'internally generated' intangible assets (*IC_D*) and 'business combinations' (*IC_B*) has, by comparison, the lowest information content, while the 'non-current assets matrix' (*IC_E*) has the highest. Furthermore, the results indicate that the notes reporting on the 'impairment test' (*IC_F*) has a slightly higher information content than the notes reporting on 'scheduled depreciations' (*IC_C*) and 'accounting methods' (*IC_A*). With the exception of the 'non-current assets matrix' (IC_E), the information content of the individual topics can be classified as clearly insufficient/deficient on the basis of these results. It is particularly noteworthy that with this reporting behavior, firms tolerate or do not reduce information asymmetry, especially with regard to those topics which have already been identified in Part 2 as particularly problematic with respect to uncertainty, information asymmetry and discretion due to the characteristics and depiction of the associated business transactions. The indications presented at the beginning of this work (see Part 1) that the current disclosures do not meet the requirements of external users in practice and that there is a discrepancy between importance and practical implementation of notes reporting are therefore supported by the results of this work.

For the most part, the results of the correlation analysis in Table 36 do not indicate statistically substantial dependencies (criteria: absolute value of the correlation coefficient ≥ 0.25 and *p*-value < 0.05) of the information content between the individual topics. Only between topics E ('non-current assets matrix' (*IC_E*)) and F ('impairment test' (*IC_F*)) do the results indicate a complementary dependence. Taking this exception into account, there are hardly any convincing results overall for a rejection of the independence, so that it may be stated cautiously that firms choose/determine the information content of their notes reporting on individual topics independently of other topics.

Table 34: Description of the information content by topic

	IC_A	IC_B	IC_C	IC_D	IC_E	IC_F
n	62	55	61	53	62	62
Mean	0.2570	0.0544	0.2293	0.0321	0.7130	0.3116
Stand. dev.	0.1121	0.0628	0.1005	0.0770	0.0559	0.1160
Skewness	-0.0654	1.5306	1.3286	2.4188	-0.4462	-1.5657
Kurtosis	1.7947	4.6167	3.7681	8.3596	2.7111	4.9007
Minimum	0.0000	0.0000	0.1257	0.0000	0.5625	0.0000
Maximum	0.4625	0.2441	0.5335	0.3555	0.8115	0.4813
P_{75}-P_{25}	0.1729	0.0555	0.0997	0.0000	0.0865	0.0971
P_{1}	0.0000	0.0000	0.1257	0.0000	0.5625	0.0000
P_{5}	0.1153	0.0000	0.1323	0.0000	0.6094	0.0000
P_{10}	0.1153	0.0000	0.1387	0.0000	0.6422	0.1428
P_{25}	0.1729	0.0161	0.1637	0.0000	0.6708	0.2874
P_{50}	0.2822	0.0250	0.1865	0.0000	0.7198	0.3328
P_{75}	0.3458	0.0716	0.2634	0.0000	0.7573	0.3844
P_{90}	0.3458	0.1583	0.3986	0.1573	0.7854	0.4175
P_{95}	0.4198	0.2105	0.4309	0.1964	0.7917	0.4216
P_{99}	0.4625	0.2441	0.5335	0.3555	0.8115	0.4813

This table presents various location and distribution parameters of the indicator 'information content' (*IC*) according to the topics defined in Table 30 for the firms in the examination sample. All calculations are performed with Stata 13.1 IC software.

Table 35: Tests for differences in the information content between topics

IC_A-IC_F	(n=355)				
ANOVA		Kruskal-Wallis		SkilMack	
uneq. var.		268.0678*** (0.0001)		234.086*** (0.0001)	
t Wilcoxon Wilcoxon-mp	IC_A (n=62)	IC_B (n=55)	IC_C (n=61)	IC_D (n=53)	IC_E (n=62)
IC_B (n=55)	12.2326*** (0.0000) 8.3034*** (0.0000) 6.3273*** (0.0000)				
IC_C (n=61)	1.4422 (0.1519) 1.4596 (0.1444) 1.6269 (0.1038)	-11.3565*** (0.0000) -8.2684*** (0.0000) -6.4180*** (0.0000)			
IC_D (n=53)	12.6832*** (0.0000) 8.3560*** (0.0000) 6.0260*** (0.0000)	1.6505 (0.1018) 4.9058*** (0.0000) 3.0218*** (0.0025)	11.8421*** (0.0000) 8.2747*** (0.0000) 6.2901*** (0.0000)		
IC_E (n=62)	-28.6604*** (0.0000) -9.6552*** (0.0000) -6.8464*** (0.0000)	-60.0182*** (0.0000) -9.3167*** (0.0000) -6.4515 (0.0000)	-32.9048*** (0.0000) -9.5659*** (0.0000) -6.7913*** (0.0000)	-54.7906*** (0.0000) -9.4882*** (0.0000) -6.3344*** (0.0000)	
IC_F (n=62)	-2.6645*** (0.0088) -2.7304*** (0.0063) -2.4153** (0.0157)	-15.1384*** (0.0000) -7.8708*** (0.0000) -6.4515*** (0.0000)	-4.2006*** (0.0001) -4.6439*** (0.0000) -4.0475*** (0.0001)	-15.4148*** (0.0000) -8.4172*** (0.0000) -6.2238*** (0.0000)	24.5455*** (0.0000) 9.6055*** (0.0000) 6.8463*** (0.0000)

(The table is continued on the next page.)

Table 35 (Continued)

The purpose of this table is to assess the extent to which the 'information content' (*IC*) among the firms in the examination sample differs in terms of the individual topics (for the topic definitions, see Table 30). The results of statistical tests for differences in the manifestations of reporting quality between the populations/topics are provided (H_0: No differences are present). The comparison of all topics together is carried out using the single-factor between-subjects analysis of variance (ANOVA) and the Kruskal-Wallis one-way analysis of variance by ranks (Kruskal-Wallis), while the pairwise comparison is carried out using the *t*-test for two independent samples (t) and the Wilcoxon rank-sum test (Wilcoxon). Since all populations are composed of the identical firms (albeit with different sample sizes), a dependency between the populations ('dependent populations') cannot be ruled out. A dependency may theoretically be justifiable on the basis of the expectation that firms that generally report 'better/worse' are likely to exhibit this reporting behavior systematically in each topic. In addition, therefore, the results of the Skillings-Mack Test (SkilMack – a generalization of the Friedman two-way analysis of variance by ranks for data sets with missing values) are reported for the comparison of all topics together, whereas the results of the Wilcoxon matched-pairs signed-ranks test (Wilcoxon-mp) are reported for the pairwise comparison. The respective test statistics are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets. * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. In the event that at least two out of three tests for equality of variance (homogeneity of variance) (according to Levene as well as Brown and Forsythe) have a *p*-value < 0.1 (results not presented), the ANOVA values are not presented (uneq. var.) due to non-compliance with the underlying premises and the t values are calculated using the *t*-test for unequal variances. Results of further tests for normality (Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality) of the characteristics in the population composed of all topics reject a normal distribution with $p < 0.01$. In the individual subpopulations, it is predominantly rejections that occur. Overall, the (assumption of a) normal distribution thus tends to be rejected, which is why the classical tests for equality of variance (homogeneity of variance) (*F*-test and Bartlett's test) are not considered due to their susceptibility to violations of the normality assumption. For this reason, limitations must also be assumed with respect to the statistical validity of the ANOVA and *t*-test, which is why the focus in the interpretation must be on the non-parametric alternatives (Kruskal-Wallis, SkilMack, Wilcoxon and Wilcoxon-mp). All calculations are performed with Stata 13.1 IC software.

Table 36: Correlation coefficients of the information content by topic

	IC_A	IC_B	IC_C	IC_D	IC_E	IC_F
IC_A	1.0000	0.0678	0.0900	-0.0463	-0.0186	-0.1171
		(0.6229)	(0.4902)	(0.7418)	(0.8860)	(0.3647)
IC_B	0.1636	1.0000	0.0868	-0.0974	-0.0220	0.0102
	(0.2326)		(0.5288)	(0.5100)	(0.8735)	(0.9409)
IC_C	0.0134	0.1139	1.0000	0.2088	0.1438	-0.0083
	(0.9182)	(0.4076)		(0.1334)	(0.2690)	(0.9497)
IC_D	-0.0846	-0.1362	0.2380	1.0000	0.0941	0.1402
	(0.5471)	(0.3562)	(0.0861)		(0.5029)	(0.3166)
IC_E	-0.0013	-0.0828	0.1825	0.0783	1.0000	0.2498**
	(0.9921)	(0.5479)	(0.1593)	(0.5775)		(0.0502)
IC_F	0.0354	0.0381	0.0895	0.0403	0.3046**	1.0000
	(0.7844)	(0.7826)	(0.4928)	(0.7746)	(0.0161)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicator 'information content' (*IC*) according to the topics defined in Table 30 for the firms in the examination sample. The respective (nondirectional/two-tailed) *p*-values are provided in the brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

2.2.4. Information presentation/preparation

The **information presentation/preparation** in the individual topics is as follows (see Table 37). In terms of median, mean and percentiles, topic A ('accounting methods' (*IP_A*)) has predominantly the smallest values (exceptions: 1st, 10th, 25th percentiles) and topic E ('non-current assets matrix' (*IP_E*)) predominantly (exception: 75th percentile) the largest values. Among these, it can be seen that topic F ('impairment test' (*IP_F*)) tends to have larger values than topic A ('accounting methods' (*IP_A*)), topic B ('business combination, purchase price allocation' (*IP_B*)) in turn predominantly larger values than topic F ('impairment test' (*IP_F*)) (exception: all percentiles excluding the 50th percentile), topic C ('subsequent accounting scheduled depreciations' (*IP_C*)) again tends to have larger values than topic B ('business combination, purchase price allocation' (*IP_B*)) and topic D ('internal generation' (*IP_D*)) predominantly (exception: 75th percentile) larger values than topic C ('subsequent accounting scheduled depreciations' (*IP_C*)).

The test results in Table 38 support (criterion: p-value < 0.01 for parametric and non-parametric tests), with limitations, the statement that the information presentation/preparation of topic A ('accounting methods' (*IP_A*)) has the smallest and that of topic E ('non-current assets matrix' (*IP_E*)) the largest values. The limitations result from the fact that not all tests detect a significant difference at the 1 % level. In addition, the statistically insignificant pairwise differences between the topics B ('business combination, purchase price allocation' (*IP_B*)), F ('impairment test' (*IP_F*)), C ('subsequent accounting scheduled depreciations' (*IP_C*)) and D ('internal generation' (*IP_D*)) indicate an indifferent value range, i.e., the equality of the distributions cannot be rejected. To sum up, it can therefore be cautiously concluded that the notes reporting on 'accounting methods' (*IP_A*) is, by comparison, the worst and that on the 'non-current assets matrix' (*IP_E*) the best in terms of information presentation/preparation. The previous statements on the information content also apply here in principle (even if the indicators of the information presentation/preparation tend to show larger values), as the 'non-current assets matrix' (*IP_E*) performs better than the other topics, although the users are likely to impose the greatest requirements on the other topics, such as 'business combination' (*IP_B*) or 'impairment test' (*IP_F*).

The results of the correlation analysis in Table 39 do not indicate statistically substantial dependencies (criteria: absolute value of the correlation coefficient ≥ 0.25 and p-value < 0.05) of

the information presentation/preparation between the individual topics. Analogous to the considerations already made on reporting quality, the large correlation coefficients in relation to topic D ('internal generation' (*IP_D*)) are probably attributable to the low number of cases (n=9). Thus, there are no convincing results for a rejection of the independence, so that it may cautiously be stated that firms choose/determine the information presentation/preparation of their notes reporting on individual topics independently of other topics.

Table 37: Description of the information presentation/preparation by topic

	IP_A	IP_B	IP_C	IP_D	IP_E	IP_F
n	61	42	61	9	62	57
Mean	0.3683	0.5134	0.5456	0.5764	0.7228	0.4901
Stand. dev.	0.1386	0.2258	0.2943	0.2068	0.0550	0.2048
Skewness	0.3753	-0.3201	0.1859	0.8478	2.5120	0.2766
Kurtosis	3.1915	1.6655	1.5058	2.9306	12.3264	2.3729
Minimum	0.1250	0.1250	0.1875	0.3750	0.6250	0.1250
Maximum	0.7500	0.8750	1.0000	1.0000	1.0000	1.0000
P_{75}-P_{25}	0.1875	0.4375	0.5625	0.2500	0.0625	0.3125
P_1	0.1250	0.1250	0.1875	0.3750	0.6250	0.1250
P_5	0.1250	0.1875	0.1875	0.3750	0.6875	0.1875
P_{10}	0.1875	0.1875	0.1875	0.3750	0.6875	0.2188
P_{25}	0.3125	0.2500	0.2500	0.3750	0.6875	0.3750
P_{50}	0.3438	0.5000	0.5000	0.5625	0.7188	0.4688
P_{75}	0.5000	0.6875	0.8125	0.6250	0.7500	0.6875
P_{90}	0.5000	0.7500	1.0000	1.0000	0.7813	0.7500
P_{95}	0.5000	0.7500	1.0000	1.0000	0.8125	0.8125
P_{99}	0.7500	0.8750	1.0000	1.0000	1.0000	1.0000

This table presents various location and distribution parameters of the indicator 'information presentation/preparation' (*IP*) according to the topics defined in Table 30 for the firms in the examination sample. All calculations are performed with Stata 13.1 IC software.

Table 38: Tests for differences in the information presentation/preparation between topics

IP_A-IP_F	(n=292)				
ANOVA		Kruskal-Wallis		SkilMack	
uneq. var.		72.3128*** (0.0001)		57.476*** (0.0001)	
t Wilcoxon Wilcoxon-mp	IP_A (n=61)	IP_B (n=42)	IP_C (n=61)	IP_D (n=9)	IP_E (n=62)
IP_B (n=42)	-3.7099*** (0.0004) -3.2320*** (0.0012) -2.8642*** (0.0042)				
IP_C (n=61)	-4.2558*** (0.0001) -2.6008*** (0.0093) -3.4555*** (0.0005)	-0.6275 (0.5318) -0.8476 (0.3966) -0.4089 (0.6826)			
IP_D (n=9)	-3.9300*** (0.0002) -3.1399*** (0.0017) -2.0805** (0.0375)	-0.7698 (0.4451) -0.3741 (0.7083) -0.8127 (0.4164)	-0.3920 (0.7012) -0.4941 (0.6212) -0.3570 (0.7211)		
IP_E (n=62)	-18.5854*** (0.0000) -9.1648*** (0.0000) -6.7799*** (0.0000)	-5.8929*** (0.0000) -4.8116*** (0.0000) -4.3866*** (0.0000)	-4.6236*** (0.0000) -2.5639** (0.0104) -3.6661*** (0.0002)	-2.1132* (0.0668) -3.0171*** (0.0026) -1.7362* (0.0825)	
IP_F (n=57)	-3.7577*** (0.0003) -2.9991*** (0.0027) -3.0727*** (0.0021)	0.5348 (0.5940) 0.5588 (0.5763) 0.2008 (0.8408)	1.1946 (0.2349) 0.8734 (0.3824) 1.1379 (0.2552)	1.1730 (0.2451) 0.9855 (0.3244) 1.4924 (0.1356)	8.3070*** (0.0000) 5.8897*** (0.0000) 5.6265*** (0.0000)

(The table is continued on the next page.)

Table 38 (Continued)

The purpose of this table is to assess the extent to which the 'information presentation/preparation' (*IP*) among the firms in the examination sample differs in terms of the individual topics (for the topic definition, see Table 30). The results of statistical tests for differences in the manifestations of reporting quality between the populations/topics are provided (H_0: No differences are present). The comparison of all topics together is carried out using the single-factor between-subjects analysis of variance (ANOVA) and the Kruskal-Wallis one-way analysis of variance by ranks (Kruskal-Wallis), while the pairwise comparison is carried out using the *t*-test for two independent samples (t) and the Wilcoxon rank-sum test (Wilcoxon). Since all populations are composed of the identical firms (albeit with different sample sizes), a dependency of the populations ('dependent populations') cannot be ruled out. A dependency may theoretically be justifiable on the basis of the expectation that firms that generally report 'better/worse' are likely to show this reporting behavior systematically in each topic. In addition, therefore, the results of the Skillings-Mack Test (SkilMack – a generalization of the Friedman two-way analysis of variance by ranks for data sets with missing values) are reported for the comparison of all topics together, whereas the results of the Wilcoxon matched-pairs signed-ranks test (Wilcoxon-mp) are reported for the pairwise comparison. The respective test statistics are reported with the corresponding (non-directional/two-tailed) *p*-values in brackets. * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. In the event that at least two out of three tests for equality of variance (homogeneity of variance) (according to Levene as well as Brown and Forsythe) have a *p*-value < 0.1 (results not presented), the ANOVA values are not presented (uneq. var.) due to non-compliance with the underlying premises and the t values are calculated using the *t*-test for unequal variances. Results of further tests for normality (Shapiro-Wilk / Shapiro-Francia / skewness and kurtosis tests for normality) of the characteristics in the population composed of all topics reject a normal distribution with $p < 0.01$. In the individual subpopulations, rejections occur in some cases. Overall, the (assumption of a) normal distribution thus tends to be rejected, which is why the classical tests for equality of variance (homogeneity of variance) (*F*-test and Bartlett's test) are not considered due to their susceptibility to violations of the normality assumption. For this reason, limitations must also be assumed with respect to the statistical validity of the ANOVA and *t*-test, which is why the focus in the interpretation must be on the non-parametric alternatives (Kruskal-Wallis, SkilMack, Wilcoxon and Wilcoxon-mp). All calculations are performed with Stata 13.1 IC software.

Table 39: Correlation coefficients of the information presentation/preparation by topic

	IP_A	IP_B	IP_C	IP_D	IP_E	IP_F
IP_A	1.0000	0.0108	0.1050	-0.2692	0.0470	0.0008
		(0.9465)	(0.4246)	(0.4837)	(0.7190)	(0.9953)
IP_B	0.0023	1.0000	0.0627	0.4104	0.1954	0.0172
	(0.9886)		(0.6930)	(0.4925)	(0.2149)	(0.9138)
IP_C	0.1210	0.0774	1.0000	0.1522	0.0093	0.1724
	(0.3571)	(0.6260)		(0.6959)	(0.9435)	(0.1997)
IP_D	-0.3663	0.2791	-0.0495	1.0000	0.4639	0.4236
	(0.3323)	(0.6493)	(0.8994)		(0.2084)	(0.2956)
IP_E	0.0562	0.1834	-0.1442	0.2339	1.0000	0.1293
	(0.6670)	(0.2451)	(0.2674)	(0.5447)		(0.3376)
IP_F	-0.0656	0.0017	0.1278	0.1647	0.0305	1.0000
	(0.6311)	(0.9914)	(0.3434)	(0.6967)	(0.8219)	

This table presents the correlation coefficients according to Pearson (below the diagonal) and Spearman (above the diagonal) of the indicator 'information presentation/preparation' (*IP*) according to the topics defined in Table 30 for the firms in the examination sample. The respective (nondirectional/two-tailed) *p*-values are provided in brackets (H_0: Coefficient is zero). * / ** / *** indicate significance at the 10 % / 5 % / 1 % levels, respectively. All calculations are performed with Stata 13.1 IC software.

Part 5: Conclusion

The starting point of the conclusion is a summary of the insights gained in the course of this work. Subsequently, this consideration is extended in the form of a theses-based outlook describing implications for various interest groups in accounting research.

The motivation for this work was that in practice and academia, and from various angles, international financial reporting – and, in particular, the notes reporting – has for many years been accused of lacking information provision for its users, or that such provision is deficient (**Part 1**). This criticism points to deficiencies in terms of content and presentation and, thus, to overall deficiencies in the quality of the notes reporting. Even if this criticism is presented by different interest groups with different points of view, and is thus broadly diversified and manifold, it is predominantly anecdotal in nature – valid scientific evidence and, thus, valid knowledge/insights have so far been lacking. Due to the multifaceted nature of the discussion conducted over a longer period of time, the outlined lack of knowledge regarding the quality of the notes reporting was identified as the problem and the reduction of this lack of knowledge was made the objective of this work. Due to their special nature, intangible assets were selected as the object of consideration: As immateriality promotes a high degree of information uncertainty and asymmetry, reporting on intangibles is of great importance for the users.

A necessary condition of insightful empirical analysis is that the construct of interest (notes reporting quality) is measured validly. The review of the state of research revealed that to date, no valid measurement parameter has been identified that is suitable for achieving this objective. Before empirical insights could be gained, therefore, both conceptual (‘What is reporting quality, what does it consist of?’) and operational/measurement-related (‘How can reporting quality be recognized/detected in observable phenomena, how can it be operationalized?’) insights had to be gained first.

The conceptual analysis (**Part 2** and, in particular, **Part 3**) revealed that reporting quality is a relative measurement parameter of the fulfillment of users’ requirements and that reporting quality is determined/formed by a content and a formal dimension. Regarding its meaning, each dimension was differentiated, concretized and synthesized in the form of principles and subprinciples. Due to their relativity, the information requirements for the content dimension (information content) were derived from the functions of accounting (prediction and determination function), which represent a typification/generalization of users’ information requirements.

Among other things, the generally accepted but, in terms of specific details, widely debated subdivision into relevance and reliability was used as the starting point of the analysis, the result of which is a specification and delimitation of these (sub)principles. As a result, the information content is determined/formed by the information principles of relevance and reliability, along with numerous concretizing and forming subprinciples such as context, classification and verifiability. This specification of the information content clarifies which information and which information characteristics are required by users.

Information needs within the formal dimension (information presentation/preparation) were derived from the insights of behavioral economics (and, in particular, from the theory of bounded rationality). As a result, the information presentation/preparation is determined/formed by the information principles of materiality and clarity (with the subprinciples of format, diction and coherence). At the same time, information quantity (information overload) problems were addressed and specified within the materiality principle, whereas information presentation problems where addressed and specified within the clarity principle. The concept specification also revealed that numerous interdependencies exist between the functions and the principles and subprinciples of the content dimension – in contrast to the formal dimension – which prevent isolated measurement.

In view of the deficiencies identified in prior research, construct validity was initially defined as the target (research) quality criterion guiding the further operationalization of the latent construct reporting quality. As was elaborated, the desired achievement of high construct validity requires – in the context of this work's objective and research questions – a formative measuring instrument in conjunction with manual integrative content analysis as a measurement method (**Part 4, Chapter 1**). By means of the selected formative measuring instrument in conjunction with the manual integrative content analysis, the objects of consideration – the information content and the information presentation/preparation of the notes reporting – are measured directly (and not indirectly). This fundamental advantage of manual collection – i.e., systematically approaching the construct to be measured – is also countered by some disadvantages. For example, manual capturing/coding reduces the sample size that can be examined, which is, however, a necessary result of focusing on/prioritizing construct validity. Also, (test-related) reliability deficiencies may arise, which, however, after conducting corresponding reliability tests in this work, were classified as being moderate/not substantial.

For the evaluation of the achieved construct validity, the measuring instrument was evaluated both theoretically (argumentative reflection) and empirically (empirical test of predicted relations derived from the underlying theories). The results indicate the high construct validity of the measuring instrument. When interpreting the measured values generated with this measuring instrument, the following aspects are essential. These indicators measure notes reporting quality on a relative basis. This is due to the impossibility of representing all information requirements that can be conceived within the construct by means of indicators. For the information content indicators, it should be noted that due to the complexity/interdependencies of the construct to be measured, they cannot provide an isolated measurement of individual information (sub)principles. For the indicators of the information presentation/preparation, on the other hand, an isolated measurement of individual information (sub)principles is possible. In addition, the measurement is made on an average basis because, for example, not every user needs disclosures about the cost of capital as part of the impairment test for their individual decision making/context, whereas the average user does. It is also an average measurement because not every user – e.g., due to different skill levels in analyzing annual reports – draws substantial cost-benefit advantages from better information presentation/preparation in the form of increased readability, etc.

On the basis of these insights, the question raised at the beginning of this work as to the empirical manifestation of notes reporting quality was examined for a representative sample of German groups' IFRS notes (**Part 4, Chapter 2**). The results indicate that both the information content and the information presentation/preparation between firms (i.e., cross-sectionally) are heterogeneous and that the reporting has deficiencies in many aspects. It is noteworthy that with this reporting behavior, firms tolerate or do not reduce information asymmetry, especially with regard to those topics that were identified in this work as particularly problematic with respect to uncertainty, information asymmetry and discretion (e.g., disclosures about business combinations and impairment tests) due to the characteristics and depiction of the associated business transactions, and are thus likely to be particularly important for the users. Overall, the results of this analysis reveal that there are deficiencies in notes reporting quality, and they reveal the concrete nature of these deficiencies. The results thus support the points of criticism presented at the beginning of this work regarding the quality of the notes reporting.

The results of this work offer various opportunities for a theses-based outlook with respect to implications for different accounting research interest groups in the areas of research, practice

and regulation. In accounting **research**, it is primarily latent constructs that are analyzed and a large part of this research is quantitative-empirical – however, the respective analyses often suggest the presence of extensive and systematic deficiencies with regard to their construct validity. In order to carry out meaningful theory testing, the existence of construct validity is a necessary condition and, therefore, indispensable. The research approach that is currently common, namely to first limit the possibilities of gaining insights/knowledge to manifest (and, thus, widely available) data in order to then, in a second step, establish a (loose) relation (of the data) to the constructs to be investigated by means of argumentation based on innumerable – often unrevealed – assumptions, can only result in limited insights/knowledge (if at all). The increasing trend in recent years toward very complex and sophisticated statistical methods and techniques cannot (alone) solve these problems, since applying meaningful statistical analysis is a necessary, but by no means sufficient, condition for the validity of the insights/knowledge generated. If insufficient measurement parameters are used, it does not help the analysis if the manifestations of these measurement parameters can be captured for a multitude of firms, thus fulfilling the criterion of 'large sample evidence' – it is evidence, but not very insightful evidence. Therefore, it would be worthwhile if this work could serve to sensitize the research community to the importance of construct validity.

The findings of this work also reveal and illustrate the empirical variety and complexity of the information content of the notes reporting and underline the necessity of correspondingly differentiated capturing and discussion in research and practice, which does not take place often enough. For example, the dichotomous capturing/coding of disclosures (e.g., 'discount rate is disclosed/not disclosed'), which is widely found in the literature, only depicts/represents the complex reality inadequately, or too coarsely. Accordingly, any discussion about a target level of notes reporting (quality) and about any existing deficiencies often lacks a sound/valid reference basis, which is necessary. The conceptual considerations on measuring reporting quality presented in this work can be transferred unproblematically – though not effortlessly – to objects of investigation other than intangible assets and notes reporting. Future research could make this transfer and expand the sample sizes, thus gaining further insights into the quality of the measuring instrument and the empirical manifestations of (notes) reporting quality. Starting from this basis, insightful analyses of influencing factors and consequences of (notes) reporting quality can then be carried out.

There are also opportunities for orientation in **practice** and **regulation**. The results of this work, which indicate deficiencies especially with regard to those topics for which the greatest information needs of the users are likely to exist, may be explained using a variety of approaches and/or from different perspectives. In addition to alternative reasons (e.g., the management's motives in the context of earnings management and the protection of property rights), it is presumably also the following reasons that complicate high-quality notes reporting on intangible assets. With regard to the regulatory environment, it is important to point out the loose accumulation of individual rules, the patchy conceptual basis for the rules and regulation and, in some cases, the lack of concretization/operationalization of regulatory terms such as materiality. Further reasons might also include, in practice, intensifying effects in the form of efficiency efforts by firms' reporting departments and auditors.

The empirical evidence of this work reveals disclosure topics to practitioners and regulators where the need for improvement is potentially great (e.g., disclosures about goodwill impairment losses and business combinations). This work also offers conceptual and operational orientation, which provides the regulator with the opportunity to improve the conceptual basis of regulation and to further concretize regulatory concepts. In practice, the concept specification and operationalization undertaken in this work should also facilitate the understanding of regulatory terminology – and also of typical accounting research terminology – in the context of concrete examples of the notes reporting on intangible assets (e.g., with regard to the question of what is meant by 'relevant' and by 'reliable' information in the context of business combinations).

Against this background, the research results of this work – the conceptualization, the operationalization and the empirical evidence – together form a starting point for developing, in the context of the (notes) reporting and its quality, valid insights/knowledge in research, 'best practice' solutions in practice and conceptually sound and target-oriented solutions in regulation.

Appendices

Appendix I: Sample selection and description

Table A 1: Description of populations (1)-(6) by size and intensity

Population	(1)	(2)	(3)	(4)	(5)	(6)
n	688	628	572	537	485	403
				Average revenue in reporting years 2012-2014 (thousand EUR)		
Mean		3,329,042	3,545,624	3,514,051	3,491,136	4,125,745
Stand. dev.		13,220,717	13,819,884	14,073,296	14,300,462	15,611,534
Minimum		0	0	0	0	363
Maximum		197,380,336	197,380,336	197,380,336	197,380,336	197,380,336
P_1		752	826	826	433	3,566
P_{25}		80,688	85,793	79,736	79,736	100,137
P_{50}		265,214	273,247	258,071	258,071	326,646
P_{75}		1,341,559	1,373,564	1,248,635	1,217,536	1,681,700
P_{99}		60,319,668	73,476,000	73,476,000	73,476,000	73,476,000
				Average total assets in reporting years 2012-2014 (thousand EUR)		
Mean		4,467,302	4,423,451	4,391,218	4,436,630	5,081,636
Stand. dev.		20,773,992	20,137,085	20,627,440	21,131,428	23,073,002
Minimum		182	182	182	182	1,392
Maximum		328,353,664	328,353,664	328,353,664	328,353,664	328,353,664
P_1		5,999	5,999	6,519	5,999	6,519
P_{25}		90,400	90,400	85,373	85,402	85,402
P_{50}		325,703	323,972	319,009	325,984	322,516
P_{75}		1,616,949	1,635,714	1,509,600	1,506,633	1,584,059
P_{99}		105,022,000	105,022,000	105,022,000	118,483,336	118,483,336
				Average number of employees in reporting years 2012-2014		
Mean		11,920	12,867	12,521	12,069	14,273
Stand. dev.		44,093	46,085	46,700	45,486	49,606
Minimum		0	0	0	0	9
Maximum		543,918	543,918	543,918	543,918	543,918
P_1		4	4	4	3	18
P_{25}		346	349	348	342	396
P_{50}		1,218	1,224	1,187	1,193	1,530
P_{75}		5,229	5,487	5,081	5,038	6,441
P_{99}		232,797	276,615	276,615	276,615	276,615

(The table is continued on the next page.)

Table A 1 (Continued)

Population	(1)	(2)	(3)	(4)	(5)	(6)
n	688	628	572	537	485	403
						Average intensity of intangible assets in reporting years 2012-2014 (%)
Mean		17.08	16.74	16.66	16.48	19.77
Stand. dev.		18.03	17.49	17.43	17.31	17.21
Minimum		0.00	0.00	0.00	0.00	1.09
Maximum		88.10	88.10	88.10	88.10	88.10
P_1		0.00	0.00	0.00	0.00	1.30
P_{25}		2.89	3.10	3.08	2.78	6.62
P_{50}		10.41	10.41	10.48	10.35	13.94
P_{75}		26.92	25.78	25.89	25.35	30.49
P_{99}		71.98	71.98	71.98	71.98	71.98

This table describes the different populations with regard to the location and distribution parameters of their characteristics, namely 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). Population (*1*) comprises groups domiciled in Germany (excluding banks and insurance firms), for which a preparation of the consolidated financial report in accordance with IFRS for the reporting year 2014 was recorded in the Amadeus database on May 19, 2016. Population (*2*) was reduced by dropping firms for which no information from IFRS consolidated financial reports was available for the reporting years 2012-2014 in the Amadeus database on May 19, 2016. Partly existent data gaps were closed with information published in the Federal Gazette (Bundesanzeiger). Population (*6*) represents the 'target population' and corresponds to population (*2*) less firms that meet the following exclusion criteria: Belonging to industry (3) ('financial and insurance activities') (population (*3*)); preparation of a subgroup consolidated financial report if the parent firm is also part of the target population (population (*4*)); the annual period ends on a date outside the period December 31, 2014-March 31, 2015 (population (*5*)); the average intensity of intangible assets is less than 1 % (population (*6*)). All calculations are performed with Stata 13.1 IC software.

Table A 2: Description of populations (1)-(6) by industry

Population	(1)	(2)	(3)	(4)	(5)	(6)
n	688	628	572	537	485	403
n* = n - n(3)	619	572				
						Industry (1): Productive activities
Quantity	171	164	164	151	130	111
Share (%)	24.85	26.11	28.67	28.12	26.80	27.54
Share* (%)	27.63	28.67				
						Industry (2): Retail & trade
Quantity	44	42	42	40	37	28
Share (%)	6.40	6.69	7.34	7.45	7.63	6.95
Share* (%)	7.11	7.34				
						Industry (3): Financial and insurance activities
Quantity	69	56	0	0	0	0
Share (%)	10.03	8.92	0.00	0.00	0.00	0.00
						Industry (4): Services
Quantity	404	366	366	346	318	264
Share (%)	58.72	58.28	63.99	64.43	65.57	65.51
Share* (%)	65.27	63.99				

This table describes the distribution of the different populations among the industries (1)-(4). Population (*1*) comprises groups domiciled in Germany (excluding banks and insurance firms), for which a preparation of the consolidated financial report in accordance with IFRS for the reporting year 2014 was recorded in the Amadeus database on May 19, 2016. Population (*2*) was reduced by dropping firms for which no information from IFRS consolidated financial reports was available for the reporting years 2012-2014 in the Amadeus database on May 19, 2016. Partly existent data gaps were closed with information published in the Federal Gazette (Bundesanzeiger). Population (*6*) represents the 'target population' and corresponds to population (*2*) less firms that meet the following exclusion criteria: Belonging to industry (3) ('financial and insurance activities') (population (*3*)); preparation of a subgroup consolidated financial report if the parent firm is also part of the target population (population (*4*)); the annual period ends on a date outside the period December 31, 2014-March 31, 2015 (population (*5*)); the average intensity of intangible assets is less than 1 % (population (*6*)). For better comparability, the quantity n* or share* adjusted for firms in sector (3) is also reported for populations (*1*) and (*2*). The firms are allocated to industries according to their NACE-Code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); K ('financial and insurance activities'); other ('services'). All calculations are performed with Stata 13.1 IC software.

Table A 3: Firms in the development sample

Firm name	Average characteristics in reporting years 2012-2014				
	Stratum	Revenue (thousand EUR)	Total assets (thousand EUR)	Number of employees (thousand EUR)	Intensity of intangible assets (%)
DEUTSCHE TELEKOM AG	SLH	60,319,668	118,483,336	232,797	39.18
BIGPOINT TOPCO GMBH	SSH	95,647	306,966	628	88.10
CASH.MEDIEN AG	SSH	3,566	1,392	21	21.31
PRÜFTECHNIK DIETER BUSCH AKTIENGESELLSCHAFT	SSL	76,562	83,800	547	1.09
CELESIO AG	TLH	22,001,466	7,785,534	37,020	28.58
STADA-ARZNEIMITTEL AKTIENGESELLSCHAFT	TLH	1,967,901	3,243,820	8,955	48.17
ZALANDO SE	TLL	1,711,565	1,227,526	6,076	1.60
MATICA TECHNOLOGIES AG	TSL	31,889	30,460	68	7.64
VOLKSWAGEN AKTIENGESELLSCHAFT	PLH	197,380,336	328,353,664	543,918	18.14
GAZPROM GERMANIA GMBH	PLL	14,048,915	6,687,400	1,221	1.15
MEDIGENE AG	PSH	4,263	61,731	49	52.51
ROPAL EUROPE AG	PSH	433	4,244	9	31.88

This table describes the firms in the 'development sample' on the basis of their stratum and the mean values of their characteristics 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). The strata are formed from the characteristics 'industry' ('productive activities' (*P*); 'retail & trade' (*T*); 'services' (*S*)), 'size' ('large' (*L*); 'small' (*S*)) and 'intensity of intangible assets' ('high' (*H*); 'low' (*L*)) in the 'target population'. The firms are allocated to industries according to their NACE-Code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); H to J and L to U ('services'). By comparison with the respective size or intensity median, the firms are also divided into two groups (large or small and high or low) on the basis of their characteristics 'size' and 'intensity of intangible assets'. The 'development sample' is the result of a qualitative sampling plan in which the largest and smallest firms in each industry are selected from the 'target population'. In a second step, the firms with the highest and lowest intensity of intangible assets in each industry are selected from the remaining firms. All calculations are performed with Stata 13.1 IC software.

Table A 4: Firms in the examination sample

Firm name	Average characteristics in reporting years 2012-2014				
	Stratum	Revenue (thousand EUR)	Total assets (thousand EUR)	Number of employees (thousand EUR)	Intensity of intangible assets (%)
ALBA SE	SLH	1,732,917	507,667	1,819	14.93%
ALLGEIER SE	SLH	452,314	302,914	4,316	41.14%
CTS EVENTIM AG & CO. KGAA	SLH	612,994	929,686	1,799	38.97%
DEKRA SE	SLH	2,328,306	1,662,605	28,978	34.47%
EUROMICRON AKTIENGESELLSCHAFT COMMUNICATION & CONTROL TECHNOLOGY	SLH	334,017	295,931	1,651	44.99%
FRESENIUS MANAGEMENT SE	SLH	21,170,666	34,571,000	183,037	52.52%
GROHE HOLDING GMBH	SLH	1,133,531	2,065,170	7,137	69.24%
JOH. VAILLANT GMBH & CO. KG	SLH	2,348,733	2,215,867	11,783	36.81%
KION GROUP AG	SLH	4,633,055	6,122,714	21,922	39.47%
ROLLS-ROYCE POWER SYSTEMS AG	SLH	3,238,400	3,214,067	10,481	14.00%
TÜV RHEINLAND AKTIENGESELLSCHAFT	SLH	1,621,113	1,560,549	17,743	17.60%
DMG MORI AKTIENGESELLSCHAFT	SLL	2,106,865	1,951,717	6,458	10.21%
FRAPORT AG FRANKFURT AIRPORT SERVICES WORLDWIDE	SLL	2,404,100	9,156,867	20,613	4.80%
GESCO AKTIENGESELLSCHAFT	SLL	448,396	380,412	2,179	6.89%
H&R AKTIENGESELLSCHAFT	SLL	1,167,321	641,461	1,431	7.56%
HBPO BETEILIGUNGSGESELLSCHAFT MBH	SLL	1,329,088	270,833	1,450	9.11%
JENOPTIK AKTIENGESELLSCHAFT	SLL	591,846	711,265	3,225	12.47%
KLÖCKNER & CO SE	SLL	6,756,519	3,700,983	9,950	11.46%
OHB SE	SLL	674,750	588,259	2,351	8.47%
TÜV NORD AG	SLL	1,077,134	758,859	9,837	11.01%

(The table is continued on the next page.)

Table A 4 (Continued)

Firm name	Average characteristics in reporting years 2012-2014				
	Stratum	Revenue (thousand EUR)	Total assets (thousand EUR)	Number of employees (thousand EUR)	Intensity of intangible assets (%)
ARTNET AG	SSH	13,454	5,633	118	16.52%
DRILLISCH AKTIENGESELLSCHAFT	SSH	301,270	450,152	350	23.39%
ECKERT & ZIEGLER STRAHLEN- UND MEDIZINTECHNIK AG	SSH	121,464	176,727	620	29.03%
ECOTEL COMMUNICATION AG	SSH	95,676	43,888	192	30.90%
EVOTEC AG	SSH	87,566	225,802	650	38.47%
INFAS HOLDING AKTIENGESELLSCHAFT	SSH	24,204	20,288	133	26.25%
NEXUS AG	SSH	71,917	103,359	604	49.53%
PFERDEWETTEN.DE AG	SSH	4,626	5,999	18	33.98%
REVERSE LOGISTICS GMBH	SSH	112,382	191,881	251	24.14%
TELEGATE AG	SSH	73,726	104,129	1,145	20.40%
THOMAS HOLDING MANAGEMENT GMBH & CO. KG	SSH	95,773	64,693	433	29.41%
ZT MANAGEMENT HOLDING GMBH	SSH	229,151	216,381	1,335	43.88%
3U HOLDING AG	SSL	49,977	68,106	158	1.53%
FORIS AG	SSL	18,504	21,060	40	13.94%
HELIAD EQUITY PARTNERS GMBH & CO. KGAA	SSL	15,960	79,679	20	2.59%
INIT INNOVATION IN TRAFFIC SYSTEMS AKTIENGESELLSCHAFT	SSL	100,137	119,180	442	6.07%
MATERNUS-KLINIKEN AKTIENGESELLSCHAFT	SSL	116,516	137,966	2,452	10.73%
NORDIC YARDS HOLDING GMBH	SSL	195,739	161,370	1,079	4.66%
SHANGGONG (EUROPE) HOLDING CORP. GMBH	SSL	126,934	153,595	1,393	10.98%
TANQUID GMBH & CO. KG	SSL	75,510	380,458	319	3.74%

(The table is continued on the next page.)

Table A 4 (Continued)

Firm name	Average characteristics in reporting years 2012-2014				
	Stratum	Revenue (thousand EUR)	Total assets (thousand EUR)	Number of employees (thousand EUR)	Intensity of intangible assets (%)
KONTRON AG	TLH	456,314	442,288	1,525	34.78%
OTTO (GMBH & CO KG)	TLL	11,947,299	7,966,415	54,039	10.35%
ACENTIC GMBH	TSH	35,975	33,600	117	18.81%
NORDWEST HANDEL AKTIENGESELLSCHAFT	TSL	425,490	160,665	295	5.13%
POWERLAND AG	TSL	177,726	217,458	1,695	2.08%
BILFINGER SE	PLH	7,383,100	6,447,667	62,137	30.79%
CONTINENTAL AKTIENGESELLSCHAFT	PLH	33,524,300	28,170,666	177,015	22.38%
LINDE AKTIENGESELLSCHAFT	PLH	16,511,667	33,823,668	61,499	41.31%
ATLAS ELEKTRONIK GMBH	PLL	429,776	759,625	2,025	8.17%
ELRINGKLINGER AG	PLL	1,201,033	1,406,497	6,441	11.77%
KOENIG & BAUER AG	PLL	1,164,567	1,088,167	5,943	3.10%
SMA SOLAR TECHNOLOGY AG	PLL	1,067,105	1,256,295	6,219	6.65%
STO SE & CO. KGAA	PLL	1,172,142	713,065	4,649	6.01%
STRABAG AG	PLL	2,200,917	1,729,291	9,893	2.13%
DÜRR DENTAL AG	PSH	210,820	198,871	961	19.27%
IPSEN INTERNATIONAL HOLDING GMBH	PSH	154,058	199,964	734	52.26%
STRATEC BIOMEDICAL AG	PSH	131,826	121,329	511	24.11%
AMG MINING AG	PSL	119,901	91,114	559	5.17%
ISARIA WOHNBAU AG	PSL	92,392	230,022	38	2.39%
LPKF LASER & ELECTRONICS AKTIENGESELLSCHAFT	PSL	121,498	114,260	728	7.23%
MASTERFLEX SE	PSL	58,451	52,049	526	8.01%
SWYX SOLUTIONS AG	PSL	17,852	9,748	93	6.66%

(The table is continued on the next page.)

Table A 4 (Continued)

This table describes the firms in the 'examination sample' on the basis of their stratum and the mean values of their characteristics 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). The strata are formed from the characteristics 'industry' ('productive activities' (*P*); 'retail & trade' (*T*); 'services' (*S*)), 'size' ('large' (*L*); 'small' (*S*)) and 'intensity of intangible assets' ('high' (*H*); 'low' (*L*)) in the 'target population'. The firms are allocated to industries according to their NACE-Code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); H to J and L to U ('services'). By comparison with the respective size or intensity median, the firms are also divided into two groups (large or small and high or low) on the basis of their characteristics 'size' and 'intensity of intangible assets'. The 'examination sample' is a proportionally stratified random sample in which 15 % of the firms per stratum are randomly selected from the 'target population'. All calculations are performed with Stata 13.1 IC software.

Table A 5: Firms in the test sample

Firm name	Average characteristics in reporting years 2012-2014				
	Stratum	Revenue (thousand EUR)	Total assets (thousand EUR)	Number of employees (thousand EUR)	Intensity of intangible assets (%)
FRESENIUS MANAGEMENT SE	SLH	21,170,666	34,571,000	183,037	52.52
TÜV RHEINLAND AKTIENGESELLSCHAFT	SLH	1,621,113	1,560,549	17,743	17.60
GESCO AKTIENGESELLSCHAFT	SLL	448,396	380,412	2,179	6.89
TÜV NORD AG	SLL	1,077,134	758,859	9,837	11.01
NEXUS AG	SSH	71,917	103,359	604	49.53
ZT MANAGEMENT HOLDING GMBH	SSH	229,151	216,381	1,335	43.88
HELIAD EQUITY PARTNERS GMBH & CO. KGAA	SSL	15,960	79,679	20	2.59
TANQUID GMBH & CO. KG	SSL	75,510	380,458	319	3.74
CONTINENTAL AKTIENGESELLSCHAFT	PLH	33,524,300	28,170,666	177,015	22.38
STRABAG AG	PLL	2,200,917	1,729,291	9,893	2.13
DÜRR DENTAL AG	PSH	210,820	198,871	961	19.27
MASTERFLEX SE	PSL	58,451	52,049	526	8.01

This table describes the firms in the 'test sample' on the basis of their stratum and the mean values of their characteristics 'revenue', 'total assets', 'number of employees' and 'intensity of intangible assets' (intangible assets as reported in the statement of financial position divided by total assets). The strata are formed from the characteristics 'industry' ('productive activities' (*P*); 'retail & trade' (*T*); 'services' (*S*)), 'size' ('large' (*L*); 'small' (*S*)) and 'intensity of intangible assets' ('high' (*H*); 'low' (*L*)) in the 'target population'. The firms are allocated to industries according to their NACE-Code Rev. 2 (2008) as follows: A to F ('productive activities'); G ('retail & trade'); H to J and L to U ('services'). By comparison with the respective size or intensity median, the firms are also divided into two groups (large or small and high or low) on the basis of their characteristics 'size' and 'intensity of intangible assets'. The 'test sample' is a proportionally stratified random sample in which 20 % of the firms per stratum are randomly selected from the 'examination sample'. All calculations are performed with Stata 13.1 IC software.

Appendix II: Disaggregation of earnings smoothness

For partitioning the earnings smoothness or volatility, the ratio of the standard deviation of the income before extraordinary items to the standard deviation of the operating cash flow of the last five financial years (financial years 2010 to 2014) per firm is first calculated (*VOL_1014*), whereby both the income and the cash flow are scaled by total assets.

To estimate the 'fundamental portion of volatility' (*FVOL_1014*), a multiple linear regression is calculated with *VOL_1014* as the dependent variable and several independent variables that have as valid a relationship as possible to the uncertainty of the economic situation of the firm. The result is a model with estimated coefficients of the independent variables to explain the dependent variable. The predicted value from this model is *FVOL_1014*, the residual (the difference between the actual and the predicted value of the dependent variable *VOL_1014*) is *DVOL_1014*.[530]

In **the literature**, three theoretically equivalent models are predominantly proposed that differ in terms of which independent variables are included to explain the uncertainty. In the **first** model, the following variables are included: firm size (logarithmized total assets), cash flow volatility of recent years (standard deviation of operating cash flow scaled by total assets), sales volatility of recent years (standard deviation of sales scaled by total assets), duration of the operating cycle (logarithmized duration of accounts receivable and inventory) and the percentage of recent years with a negative income before extraordinary items.[531] The **second** model is an extension of the first model by the variables intensity of intangible assets (research and development expenses plus advertising expenses divided by sales or, in some cases, an additional 0/1 indicator indicating an intensity not equal to zero and equal to zero, respectively) and intensity of property, plant and equipment (carrying amount of property, plant and equipment divided by total assets).[532] The **third** model also takes into account the firm size, the sales volatility of recent years, the percentage of recent years with a negative income before extraordinary items, the duration of the operating cycle and the intensity of property, plant and equipment. In addition, the following variables are also taken into account: the debt ratio (ratio of total debt to total assets), the book-to-market ratio (ratio of book value (i.e., carrying amount)

[530] On the procedure, see the studies referenced below, which are distributed among the individual models.

[531] See Dechow/Dichev (2002), Francis et al. (2005b) and Bhattacharya et al. (2013).

[532] See Francis et al. (2004) and Bhattacharya et al. (2012).

to market value of equity), the average sales growth in recent years and the average operating cash flow in recent years (scaled by total assets) and a variable for each firm industry.[533]

In all models, the reference periods are selected congruently with the dependent variable. For variables that refer to several years, three to ten years are selected, depending on the study.

In this work, these models are calculated with the following adjustments. In model 2, only one variable is used for measuring the intensity of intangible assets. This is calculated on the basis of the carrying amount of intangible assets. In theory, the underlying characteristics, such as uncertainty and information asymmetry, are likely to be somewhat less pronounced for intangible assets recognized in the statement of financial position, but this is likely to be more than compensated for by the advantage of substantially better data availability. Since the 0/1 indicator of intensity is only used in one of the referenced studies and there are no apparent reasons for that indicator's relevance, it is not included in favor of a reduced number of variables. In model 3, the book-to-market ratio is not included. This ensures that there is no mixing of firm-based and market-based variables, which is also not the case for models 1 and 2. Furthermore, due to data gaps, the debt ratio is determined only on the basis of long-term debt, which theoretically should not lead to any distortions compared with the calculation on the basis of total debt.

The model parameters are estimated using data from the Compustat database (retrieval date: November 14, 2017) for IFRS preparers with complete data regarding the required variables for the five financial years 2010 to 2014 (362 to 366 firms, depending on the model). The period of five years is within the period used in the literature and should represent a good compromise between data availability and statistical validity. In addition, if longer time intervals are applied, there is the risk that macro-shocks such as the financial crisis or regulatory changes would (further) distort the results.

Tests for violations of the assumptions of multiple linear regression analysis indicate a misspecification in models 1 and 2,[534] which is why the variables *FVOL_1014* and *DVOL_1014* are calculated on the basis of model 3.

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[533] See Lang et al. (2012) and Lang/Maffett (2011).

[534] Both the RESET-Test (Stata command 'ovtest') and the specification link test (Stata command 'linktest') reject model 1 and model 2 (p-value < 0.05). For model 3, p-values substantially larger than 0.1 are calculated. All calculations are performed with Stata 13.1 IC software.

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