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Bachelor thesis

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Valuation of intangible assets:
An analysis of practical limitations with a primary focus on monetary valuation methods for intangible assets.

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Abstract

Within the study of intangible assets various terms and definitions have emerged without reaching a consensus. Nevertheless, such assets are composed of components that can be categorised into human capital, relational capital and structural capital. They have become the strategic key to the future success of any business due to of structural changes and their importance continues to grow as a result of increasing competition.

Valuation of intangible assets is essential for their adequate strategic alignment, communication and successful business transactions. To demonstrate the breadth of available valuation approaches to intangible assets, this paper presents twenty-one methods from three categories that are aimed at determining their monetary value. Because valuation in the context of intangible assets continues to pose a great difficulty, these methods are analysed in terms of their practical limitations.

Although the methods are diverse and pursue different approaches, limitations with regard to their application can be condensed. It was found that the applicability of methods is situational. Therein the degree of detail required based on the underlying valuation motive plays an essential role. Unawareness as to which method corresponds to the purpose can lead to unsatisfactory results, as well as to misguided decisions. In addition various methods are of limited use for practical application for one of three reasons. These reasons are the requirement for unavailable or exhaustive amount of data as well as high implementation costs due to complexity and limited significance of determined results.

Keywords

Intangible assets, monetary valuation methods, market capitalisation methods, return on assets methods, direct intellectual capital methods, limitations, practical limitations

JEL classification

E22, G12, O14, O34

I Outline

II List of figures and tables

III List of abbreviations

AFTF	Accounting for the future
CE	Capital employed
CIV	Calculated Intangible Value
DCF	Discounted cash flow
DIC	Direct Intellectual capital method
HR	Human resources
IAMV	Investor Assigned Market Value
IAV	Intellectual Asset Valuation
IC	Intellectual capital
KCE	Knowledge Capital Earnings
M&A	Mergers & Acquisitions
MBV	Market-to-book value
MCM	Market capitalisation method
NOPAT	Net operating profit after tax
R&D	Research and development
ROA	Return on asset method
WACC	Weighted average cost of capital

1 Introduction

1.1 Research problem

Intangible assets are one of the most unique sources of value to companies across all industries. In more recent years, attention from multiple disciplines has moved toward the analysis and management of intangible assets, intellectual capital, as well as knowledge assets. Yet no unified understandings of these concepts, nor agreeable definitions, exist. A discussion of these terms is thus deemed essential in order to grasp further understanding of the concept. The focus lies upon its various components. This aids the process of categorisation and contextualisation. As the Industrial Age moved into a Knowledge Age, intangible assets are seemingly crucial and ever present. However, despite their ability to generate economic value and their relevance in a competitive environment, intangible assets seldom receive sufficient recognition and are often not adequately operationalised.

Valuation of intangible assets is deemed crucial for their adequate strategic alignment and strategic decision making. They otherwise remain unseen within conventional bottom-line thinking. Versatile frameworks and methodologies have been developed for the valuation of intangible, offering the potential to determine their value. Depending on the motive for investigating them, different approaches are available. Hence, many valuation methods focus on assessing the monetary value of intangible assets at the organisation level, while others aim to determine their individual monetary value.

Inadequate application of aforementioned methods can cause wrongful decision making, leading to high business costs, as well as loss of market position. Although valuation methods have evolved considerably in recent decades, monetary valuation methods are subject to limitations. Depending on the intangible asset, its characteristics and the underlying valuation motive, the scope and information value of the valuation result have to be taken into account.

The aim of this bachelor thesis is to analyse how methodological limitations in the valuation of intangible assets affect their practical applicability. The focus thereof will be on monetary valuation methods.

1.2 Course of investigation

This thesis investigates and analyses practical limitations of monetary valuation methods when applied to intangible assets. Due to the variety of existing concepts for both intangible assets and valuation approaches an analysis of terminologies and methodologies used in existing academic literature is chosen.

Based on the research question presented in Chapter 1.1, the second chapter will be devoted to providing a common understanding of the concept of intangible assets. To comply with this, the first section will commence with a discussion of related terminologies and will include a definition. In the following section, additional comprehensibility will be achieved through a categorisation approach that distinguishes intangible assets according to their very components. Chapter two will conclude with a presentation of the relevance of intangible assets, in an effort to emphasise their strategic importance within a corporate context.

A clear understanding of the necessity and available approaches for valuation of intangible assets will be given in chapter three. This chapter is broken down into three sections. Firstly, various motives for the analysis of intangible assets will be addressed. Secondly, an overview of the valuation framework for intangible asset valuation methods will be presented, and basic approaches will be introduced. Details on available methodologies will be elucidated throughout the sections 3.3.1 to 3.3.3. Emphasis is placed upon MCM, ROA and DIC valuation methods that serve to determine the monetary value of intangible assets.

The fourth chapter will focus on practical limitations in applying monetary valuation methods to intangible assets. This section is divided into four subchapters. The first section will provide generic restrictions that apply to the valuation of intangible assets. Next, specific limitations to MCM methods that determine the value of intangible assets at the organisation level will be examined. Thereafter practical limitations that apply to ROA methods will be discussed. Finally, this chapter will attempt to provide deeper insight into the limitations of the practical application of DIC methods that determine monetary values of individual intangible assets.

Concluding with chapter five, the findings of chapter two to four will be summarised and an answer to the research question, presented in chapter 1.1, will be given. In addition, a critical acclaim regarding potential restrictions of these finding will be stated. Finally, an outlook will be given for the study of intangible assets and their valuation.

2 Intangible assets

2.1 Definition

Over the past few decades, numerous related concepts referring to non-physical sources of value have developed without reaching accordance in terms definitions or components (Boos, 2003, p. 16; Lönnqvist, 2004, pp. 33). The concepts predominantly applied are “Intangibles”, “Intangible assets” as well as “Knowledge assets” and “Intellectual capital” (in the following “IC”) (Kristandl & Bontis, 2007, p. 1511; also Möller & Gamerschlag, 2009, p. 5). Pastor, Glova, Lipták & Kovác (2016, p. 390), identified the term “Intangibles” as being most interchanged with “Intangible assets”. Analogous to this, the terms “IC” and “Knowledge assets” are often considered as equal (Green & Ryan, 2005, p. 45). However, in the extant literature “Intangible assets” and “IC” are frequently considered as synonyms, too (exemplary Brooking, 1996; Hand & Lev, 2003, Lönnqvist, 2004). The synonymic treatment of these terms is motivated with the argument that they refer to the same set of factors (Meritum, 2001, p. 9; also Boos 2003, p. 23). In accordance to this, Lev (2000, p. 5) states that all of these concepts represent “…a claim to future benefit that does not have physical or financial (a stock or a bond) embodiment”. Conversely, many economists and institutions distinguish between them, but acknowledge them as related (Kristandl & Bontis, 2007, p. 1516). For example, the OECD (cited in Lönnqvist, 2004, p. 35) states that IC represents the economic value of selected intangible asset categories. Others follow a similar approach, but inversely, i.e. intangible assets represent a subset of IC (Brooking, 1996, p. 12). For the Meritum project (2002, p. 9) IC corresponds to intangibles, which are “non-physical sources of future economic benefits …”, wherein intangible assets represent the elements of them that can be recognised in the balance sheet. For knowledge assets and IC, however, numerous economists argue that IC and equally intangible assets consist of more than just knowledge, whereas knowledge assets comprise nothing but knowledge (Edvinsson & Malone, 1997, p. 11; Pastor et al., 2016, p. 392; also Green & Ryan, 2005, p. 45). Nevertheless, throughout the literature there is seldom any statement as to whether these terms are used hierarchically, equivalently or distinctively (Kristandl & Bontis, 2007, p. 1511).

Albeit to the attention they have received in more recent times, no unified definition of these concepts exists (Lönnqvist, 2004, pp. 33). Mard, Hitchner, Hyden & Zyla (2002, p. 16) comment in this context “It seems everyone believes he knows what an

intangible asset is until it comes time to actually write a precise definition". Yet, depending on the discipline, definitions show similarities (Lev, 2000, p. 5). In that, IC originated from research on human resources (in the following "HR"), whereas economists tend to refer more to the concept of knowledge assets and accounting applies the terms intangibles or intangible assets (Housel & Nelson, 2005, p. 545; Möller & Gamerschlag, 2009, p. 5). The second observed communality is that the inclusion of "asset" implies compliance with accounting recognition criteria, such as demanded by International Accounting Standard 38 (Meritum, 2001, p. 9; also Kristandl & Bontis, 2007, pp. 1516). Their criteria demand an intangible asset to be controlled, to be with probable of future economic benefits and identifiable, that is, separable, or arising from contractual or other legal rights (IASB, 2018). Although this thesis does not attempt to test the usefulness or applicability of accounting standards on intangible assets, it is worth stressing that several non-physical value-adding sources that bring significant economic benefits do not comply with these criteria (Bontis, Chua Chong Keow and Richardson, 2000, p. 3; Archer, 2013, p. 10). This concerns, among others, knowledge, customer loyalty or the prestige of a company, because they are inherently uncontrollable or unidentifiable (Meritum, 2001, p. 10; Mard et al., 2002, p. 17). Nevertheless, since accounting asset recognition criteria are of no relevance for an intangible asset's economic distinction (Cohen, 2005, p. 9), they are not further considered throughout this paper.

When instead looking for definitions on intangibles, Kristandl & Bontis (2007, pp. 1516) provide a definition, which is based on a comprehensive review of literature for aforementioned concepts. The following description refers to their proposed definition, which is based on the findings of their conceptual paper. Therein intangibles are strategic firm resources of a non-physical and non-financial form, which enable the firm to create sustainable value. They fulfil the criteria: rarity; immobility, due to corporate control; not imitable or substitutable and with potential to bring future benefits. Furthermore intangibles have a finite life. It should be noted, that with their very definition, "immobility, due to corporate control" refers to an impediment to transferability on a factor market. The research of the Meritum project (2002, p. 9) has produced similar results. They add, however, that intangibles are "controlled (or at least influenced)" and may or may not be sold separately from other corporate assets. In the context of this thesis, the criteria for intangibles provided by Kristandl & Bontis (2007) are applied, and supplemented by the two characteristics

provided by Meritum (2002). However, throughout this paper, intangibles and intangible assets are regarded as interchangeable, as accounting regulations are not considered. Thereafter intangible assets can be defined as non-physical, non-financial strategic corporate resources with probable future economic benefits. They can be influenced and may or may not be tradable, independent of other company assets or in combination. Their availability is limited and they are neither substitutable nor imitable by competitors. Lastly, they have a finite life (Kristandl & Bontis, 2007, pp. 1516; Meritum, 2002, p. 9). The following subchapter will provide an ovweview of intangible asset categories as well as their components.

2.2 Categorisation

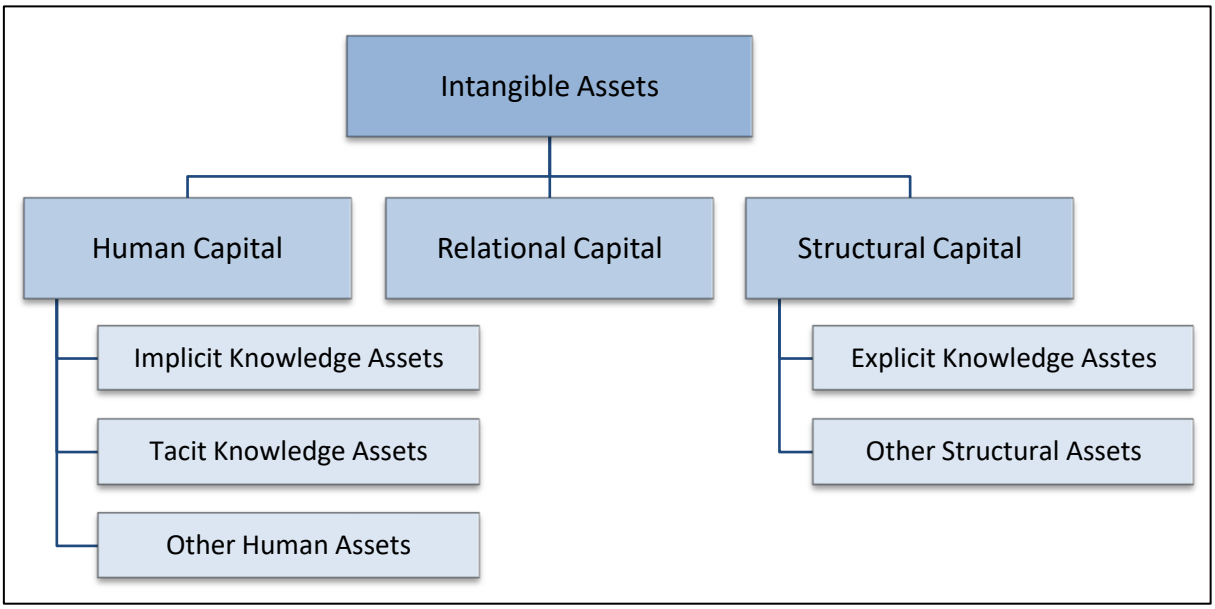
An intangible asset refers to a label used to encompass various types of non-physical sources of value (Ghezzi & Manzini, 2012, p. 2). For this cause they are regularly described not by a definition, but by categories which indicate the origin of the asset's value (Kristandl & Bontis, 2007, p. 1511). The need for such a categorisation is reasoned with divergence in their characteristics, which lead to different requirements for their management and determination of their value (Ghezzi & Manzini, 2012, p. 2). Similar to the concepts illustrated in chapter 2.1, different classifications and categorisations have emerged (Lönnqvist, 2004, pp. 37). Examples are proposed by Edvinsson & Malone (1997), whose Skandia Navigator model represents the most popular categorisation for IC (Pastor et al., 2016, p. 392) as well as by the economist Sveiby (1997) and his study "The Intangible Assets Monitor". Academic literature regularly refers to both concepts (exemplary Lönnqvist, 2004, p. 35; Kok, 2007, p. 188; Andriessen, 2004, p. 21).

Even though these and other approaches are of different depth level, they follow a similar mind-set, wherein a general convergence is observable (Villanueva, 2011, p. 3). This becomes evident, when comparing the two approaches proposed by Sveiby (1997 pp. 10) and Edvinsson & Malone (1997, pp. 11). Sveiby (1997, p. 11) states that intangible assets arise from three areas, namely employee competencies, internal and external structure. Internal structure serves as a collective term for by example patents, administrative systems and processes, whereas the external structure is composed of, amongst others, relationships maintained with suppliers, the firm's image and trademarks (Ghezzi & Manzini, 2012, p. 2). Expertise and skills of the workforce are summarised by employee competencies (Pastor et al., 2016, p. 392). Edvinsson & Malone's Skandia Navigator model (1997, p. 52) provides two

main components of intangible assets (the authors use IC), namely human and structural capital. Human capital comprises any intangible asset that belongs to firm's workforce, in other words skills and their innovativeness (Biel, 2007, p. 102). This poses much similarity to Sveiby's employee competencies. Structural capital is further divided into customer and organisational capital (Edvinsson & Malone, 1997, p. 36). Therein organisational capital refers to process and innovation capital inside the company, such as processes, which improve efficiency and intellectual properties (Lönnqvist, 2004, p. 35). Their customer capital includes relationships to customers, along with the firm's relational capital, including distribution channels and affiliations with strategic partners (Bontis et al., 2000, p. 5).

In the context of this thesis, intangible assets are categorised in a combined manner of the models of Edvinsson & Malone (1997) and Sveiby (1997). At the third level, more specific components are incorporated into the categories, for it allows to integrate the concepts presented in chapter 2.1 (Pastor et al., 2016, p. 392). Figure 1 illustrates these categories and components of which intangible assets are composed.

Figure 1 Categories and components of intangible assets



Source: own source based on Pastor et al., 2016, Intangibles and methods for their valuation in financial terms, p. 394

Human capital comprises two types of knowledge assets, i.e. implicit and tacit knowledge, along with other human assets (Collins, 2010, p. 1; also Kok, 2007, p. 184). Implicit knowledge assets refer to knowledge, which has not been set out in concrete form, but could on request (Anumnu, 2013, p. 45). This includes for

example efficient workflows not defined as standards and undocumented responsibilities (McInerney & Koenig 2011, p. 45). Tacit knowledge assets, in contrast, refer to knowledge which can hardly be taught and which transformation into somewhat tangible is associated with great operational difficulty (Contractor, 2001, p. 9). They include routines that are followed unconsciously and employee's talents and skills resulting from experience, such as artistic flair (Collins, 2010, p. 11). Other human capital results, for example, from teamwork ability, employee satisfaction and loyalty of the workforce (Karchegani, Sofian and Amin, 2013, p. 566). For the second main category, relational capital corresponds to the customer capital proposed by Edvinsson & Malone (1997, p. 36), wherein all resources linked to the firm's external network are summarised (Becker, 2011, p.384). Furthermore, it is comprised of the company's reputation and brands (Meritum, 2001, p. 11). Structural capital contains the remaining knowledge assets, i.e. explicit knowledge assets and other structural capital (Pastor et al., 2016, p. 392). McInerney & Koenig (2011, p. 45) describe explicit knowledge as knowledge transferred into concrete forms. Thereby it remains with the firm when employees leave the office, and applies to e.g. databases, processes or software codes (Mard et al., 2002, p. 17; Bontis et al., 2000, p. 4). For the last component, other structural assets include the internal organisation of the company including software systems, its culture and in addition intellectual properties (Edvinsson & Malone, 1997, pp. 11; Malkmus, 2002, p. 566). Within this framework, intangible assets can be identifiable or non-identifiable, depending on whether or not they meet the asset recognition criteria (Villanueva, 2011, pp. 3).

2.3 Relevance

Intangible assets have always been forms of capital contributing to future profits (Hand & Lev, 2003, p. 4). However, since the mid 1980s, their relevance for firms of all kinds and sizes is increasing (Biel, 2007, p. 13; Villanueva, 2011, p. 2). This is frequently emphasised through structural changes during the transition from the Industrial Age to the Knowledge Age (Wulf, Pfeifer & Kivikas, 2009, p. 146; also Savickaitė, 2014, p. 146). Because the new economy is based on information and services, rather than on material assets, expenditures on research and development (in the following "R&D") have a higher significance to a company's productivity and its output compared to other expenditures (Biel, 2007, p. 16; Witt, 2004, p. 617). In this context, increasing competition brought by globalisation as well as by far-reaching deregulations have had an impact on their new centralised standing (Lev, 2000, p. 9).

International transactions of these assets were not only made possible, but also necessary, resulting in their frequent trade between members of strategic alliances or multinational enterprises (Boos, 2003, p. 15; Hand & Lev, 2003, pp. 1).

Furthermore, intangible assets are a primary source for competitive advantage (Green & Ryan, 2005, p. 45; also Scholich, Mackenstedt & Greinert, 2004, pp. 502). A competitive advantage is considered the result of the strategic employment of resources, i.e. assets and capabilities, derived from a company's unique portfolio of tangible and intangible assets (Kristandl & Bontis, 2007, p. 1516; Wulf et al., 2009, p. 146). Leliuc Cosmulese, Grosu & Hlaciuc (2017, p.1) add that for strategic decision making in the Knowledge Age, intangible assets even have a higher significance than corporate assets. Guenther (2004, p. 552) states in this context that in most Western economies the importance of, inter alia, brands, capabilities and customer relationships are increasing. This corresponds to the results of Biel (2007, p. 20), who found that since 2000, investment in intangible assets in OECD countries has tended to outweigh those on plant and equipment. Moreover, intangible assets surpass physical assets not only in value, but also in growth contribution (Lev, 2000, p. 7; Daum, 2003, p. 98). This does not only apply to new economy firms or high-tech companies, but also to old economy companies (Hand & Lev, 2003, p. 2). Thereby intangible assets have a substantive and significant relationship with business performance, almost irrespective of their sector (Bontis et al., 2000, p. 9; Van der Walt, 2000, p. 10). Reasons for that are, among other things, the role of information on a company's ability to compete and their nature of being the driver for a firm's innovation capability (Villanueva, 2011, p. 2; Möller & Gamerschlag, pp. 9). Another reason for their relevance in competition arises from their non-substitutable nature and rare availability (Kristandl & Bontis, 2007, pp. 1512; also Andriessen, 2004, pp. 5). These characteristics make them a unique source of value and a key factor to growth (Savickaitė, 2014, pp. 147; Biel, 2007, p. 96). Thus, intangible assets are the strategic key to future success and represent the most important asset for wealth and growth in the Knowledge Age within any business (Andriessen, 2004, p. 4; Van der Walt, 2000, p. 10; Green & Ryan, 2005, p. 43). Performance and future success depend on the strategic alignment of these intangible assets and ignoring them usually results in negative outcomes for a company (Lönnqvist, 2004, p. 2; Savickaitė, 2014, p. 134). Consequently, they do not only affect corporate strategy, but also have to be aligned with it (Villanueva, 2011, p. 1).

3 Valuation

3.1 Motives

Valuation of intangible assets has become of interest in various disciplines (Piwinger, 2006 cited in Biel, 2007, p. 95). These include, inter alia, business management, economic policy and accounting (Ghezzi & Manzini, 2012, p. 1). Irrespective of the field of study, to determine an intangible asset's value an effort has to be undertaken and it must serve a purpose, which justifies costs associated with the act of valuation (Hunter, Webster and Wyatt, 2005, p. 12). The range of motives can be grouped into external factors, internal management, transactional reasons, as well as into statutory reasons and reliability of national accounts (Andriessen, 2004, p. 3; Marr & Gray, 2002 cited in Lönnqvist, 2004, p. 1), where the latter two are beyond the scope of this research.

External factors are mainly reporting related, in other words disclosure to investors, lenders and shareholders, which has become of greater importance in more recent years (Savickaitė, 2014, p. 134; Kristandl & Bontis, 2007, p. 1510). The motivation derives from the "relevance lost" of financial reports (Kaplan & Johnson, 1987). Due to accounting regulations, intangible assets are seldom capitalised to the extent that financial statements offer little information on them (Lev, 2003, p. 17; Green & Ryan, 2005, p. 43). Leliuc Cosmulese et al. (2017, p. 5), state "What is found in the balance sheet does not manage to fairly present companies to the public." This holds true especially for new economy firms, which are knowledge-intensive and the balance sheet only comprises a fraction of their total assets (Lönnqvist, 2004, p. 23; Witt, 2004, p. 615). Furthermore, though other reports may provide partial information on R&D spending, they seldom state relevant information on other intangible asset related aspects, such as expenditures on software technology or employee training (Hand & Lev, 2003, p. 13). This results in deficient reporting about the performance of firms and its value (Biel, 2007, p. 13). A growing gap between market values and book values since the 1990's demonstrates the information asymmetry between assets reported by accounting and a company's "real value" (Sandner, 2010, p. 19; Möller & Gamerschlag, 2009, p. 5). This difference is associated with intangible assets not included on the balance sheet (Luthy, 1998, n. pag.; also Lönnqvist, 2004, p. 34). Supportive to this, Biel (2007, p. 24) found that the ratio of these two values can reach up to 20:1 for knowledge-based industries, such as software vendors, whereas traditional industries tend to have a ratio of 1:1. However, this information

asymmetry is problematic for stakeholders (Daum, 2003, p. 99). For intangible intensive firms a lack of transparency and incomplete information are likely to result in an undervaluation that is high cost of capital, which makes it more challenging for them to finance future projects (Lev, 2003, p. 20). Encompassing valuation is a necessity for communicating innovation and potential and is deemed to enable the perception of the real value of a company, while insufficient valuation of intangible assets can weaken the market position (Villanueva, 2011, p. 4; Hunter et al., 2005, p. 12). For external motives, it can be concluded that valuation serves as incentives to investors, enhances corporate reputation and improves loan conditions for lenders (Scholich et al., 2004, pp. 493; also Andriessen, 2004, p. 8).

The group of internal management motives summarises several aspects (Ghezzi & Manzini, 2012, p. 1). Sveiby (2010, p. 1) found that the most common reason for valuation of intangible assets is management control, which is rooted on the idea “You cannot manage what you cannot measure”. Although proven false, since firms have always managed what they have not measured (Stewart, 2001, p. 291), one can argue that valuation is crucial for the adequate management of a firm’s resources (Villanueva, 2011, p. 4). As many businesses do not perform valuation on intangible assets, they fail to recognise opportunities, which maximise their return (Green, 2007, p. 1). Initially, management requires awareness and valuation of intangible assets increases the consciousness of their significance (Andriessen, 2004, p. 5; Savickaitė, 2014, p. 147). In addition, the strategic feature that derives from management is important with respect to making profound decisions (Beyer, 2009, p. 310; also Lönnqvist, 2004, p. 9). For example, it supports the decision on whether or not to invest further in innovative projects by putting a value on the potential future knowledge gained from it (Contractor, 2001, p. 4; Green & Riayn, 2005, p. 45). Thus, valuation enables the company to focus on the development and utilisation of their essential value drivers, which leads to more efficient management and minimises costs (Hunter et al., 2005, p. 12; also Savickaitė, 2014, p. 147).

In 2001, Contractor (2001, p. 3) argued, that for the last two decades, valuation has become of greater concern for managers because of a rapid increase in transactional and cooperation activities between companies. This includes licensing agreements, trade of brands, and alliances as well as Merger & Acquisition transactions (in the following M&A”) (ibid). Therefore the last group of motives, is placing a value on intangible assets for business transaction purposes (Sveiby, 2010, n. pag.).

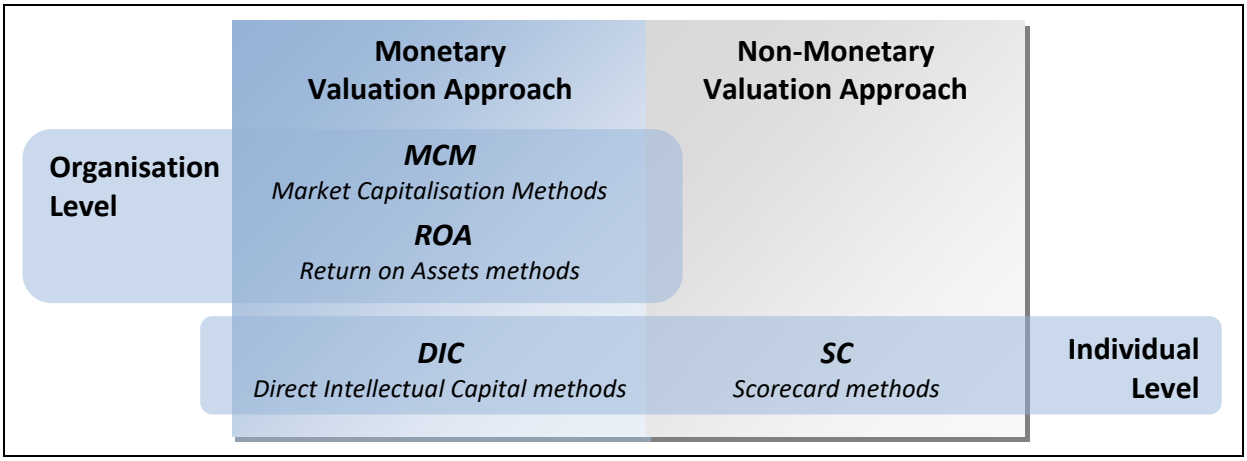
Identifiable intangible assets, such as brands, patents, copyrights as well as technologies and explicit knowledge, can be detached from other assets and an organisation (Ghezzi & Manzini, 2012, p. 1). Hence, they usually can be sold or licensed to others (Boos, 2003, p. 36). For such transactions, it is crucial for the receiver to assess how much he is willing to pay and for the supplier to assess what he must demand so that any losses are avoided (Fink, 2012, p. 55). A similar situation applies to joint ventures and other partnerships, such as co-development projects or cooperative marketing, where both parties perform valuation on their knowledge contribution (Contractor, 2001, p. 4). By assessing each participant's value of input, equity shares are apportioned and fees, e.g. royalties, are determined (DePamphilis, 2013, p. 549). This does not only apply to unrelated parties, but also to ventures within a multinational enterprise (Boos, 2003, p. 36). The last transaction motive refers to negotiating the deal price in M&A due diligence (Biel, 2007, p. 26). Many M&A deals are made to capitalise on synergies, especially those obtained from technology and knowledge bases (Contractor, 2001, p. 4). The authors of the Purchase Price Allocation Study (2017, p. 6) have analysed deal prices for M&A transactions and found that during these transactions comparatively modest attention is given to identifying and valuating intangible assets, despite accounting for up to three-quarters of the transaction price along with goodwill. In that context, Lev (2003, p. 19) highlights the example of Cisco Systems Inc.'s acquisition of Cerent Corp. in 1999, which was acquired at nearly $7 billion in stock. As the start-up had generated a total revenue of only $15 million, he emphasises "Clearly, the [acquisition was] not made for the chairs or buildings, but for the company's intangible assets" (ibid). Moreover, valuation does not only yield information on value drivers, but also on incompatibilities, such as with cultural differences between enterprises (Fink, 2012, p. 55). Therefore, poor assessment of the impact and value of a firm's intangible assets, may lead to acquisitions at high costs without meeting expected future inflows, and consequently destroy shareholder wealth (Andriessen, 2004, p. 7).

In conclusion, the motives for valuing intangible assets are diverse. Due to different audiences and differences in required information detail, different valuation approaches may be applied to serve specific needs (Van der Walt, 2000, p. 9; Sveiby, 2010, n. pag.). Possible methods for determining the monetary value of intangible assets are further elucidated in the following subchapters.

3.2 Method categorisation

For intangible assets, a variety of valuation methods has emerged and due to similarities in their approaches, categories can be formulated (Slee, 2011, p. 199). Therein methods are regularly distinguished by two characteristics, namely their value criterion and valuation level (Fink, 2012, pp. 56). Methods determining a value of monetary nature are called “financial valuation methods” by Luthy (1998, n. pag.) and “monetary valuation approaches” by Sveiby (2010, n. pag.), as opposed to “non-financial methods” or “non-monetary approaches” which include indicator or scoring based methods (Savickaitė, 2014, p. 135). For the second characteristic, methods which assess the value at the organisation level are referred to as “Global approaches” by Malkmus (2002, p. 29) or “Holistic models” by Savickaitė (2014, p. 135), while those identifying a value on an individual asset level are labelled as “Detailed models” (ibid) or “Component-by-Component evaluation” (Luthy, 1998, n. pag.). Sveiby’s categorisation approach is an expansion of the classifications suggested by Luthy (1998) und Williams (2000) and it is increasingly applied in Anglo-American literature (Sveiby, 2010, n. pag.; Malkmus, 2002, p. 30). According to Fink (2002, p. 58) it represents the most detailed state-of-the-art knowledge measurement methods, for which reason his concept will be used throughout this thesis and is illustrated in the following figure.

Figure 2 Categorisation of valuation methods



Source: own source based on Sveiby, 2010, Methods for Measuring Intangible Assets, n. pag.

For holistic models, which determine a monetary value, Sveiby distinguishes between two groups, namely “Market Capitalisation Methods” (in the following “MCM”) and “Return on Assets methods” (in the following “ROA”) (Fink, 2012, p. 57). MCMs are market-oriented business valuation approaches, whereby the stock market value forms the basis and is regarded as the total value of the intangible and

tangible assets of a company (Luthy, 1998, n. pag.; also Savickaitė, 2014, p. 136). ROA methods represent the second group of monetary valuation methods at organisation level (Sveiby, 2010, n. pag.). These are industry-oriented valuation approaches, with the principle to compare a company's ratio of average pre-tax earnings to tied-up capital with their industry average (Housel & Nelson, 2005, p. 222; Savickaitė, 2014, p. 135). By this means, intangible assets are put in relation to the return of the investments they were realised with (Malkmus, 2002, p. 37). Resulting above-average earnings are, therefore used to calculate the value of the entity's intangible assets (Fink, 2012, p. 58). Holistic models that determine a non-monetary value do not exist (Villanueva, 2011, p. 4). For methods whose outcome is expressed in monetary terms at the individual level, Sveiby (2010, n. pag.) uses the label "Direct Intellectual Capital methods" (in the following "DIC"). DIC methods first identify the different components of a firm's intangible assets (Savickaitė, 2014, p. 135). Thereby their monetary value can be determined directly (Slee, 2011, p. 199). The aggregation of the individual values results the total monetary value of all intangible assets (Biel, 2007, p. 98). Non-monetary valuation methods at individual level belong to the last category "Scorecard methods" (Sveiby, 2010, n. pag.). However, a discussion of these is beyond the scope of this paper. Further details on monetary valuation methods are provided in the following subchapters and their limitations with respect to practical application are discussed in chapter four.

3.3 Monetary valuation methods

3.3.1 Market capitalisation methods

The MCM category contains five methods (Villanueva, 2011, p. 5). The first is the Market-to-Book value method (in the following "MBV"), which compares the company's value of net assets indicated on the balance sheet to its stock market value (Slee, 2011, p. 199). The stock market value, i.e. market capitalisation, equals its number of outstanding shares multiplied by their stock market price (Fink, 2012, p. 58). By deducting the book value of net assets from the market capitalisation, the approximate monetary value of intangible assets not captured by traditional accounting is received (Luthy, 1998, n. pag.). The MBV can be adjusted to a multiplication method, called MBV ratio, where the market capitalisation is divided by the shareholders' equity (Malkmus, 2002, p. 31). Thereby the MBV ratio yields the relative value of a company compared to its stock market value, wherein a ratio greater one indicates a company has been undervalued (Savickaitė, 2014, p. 136).

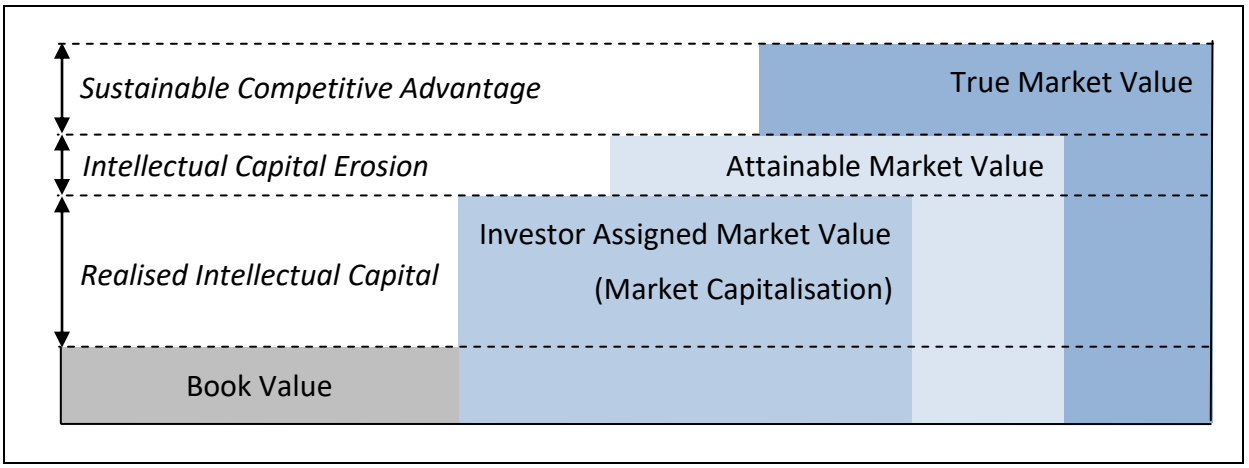
The Invisible Balance Sheet, as a second method, was developed by Sveiby in 1989 (Matos, 2013, p. 267). Similar to the MBV it determines the value of intangible assets by subtracting the book value of net assets from a company's market capitalisation (Sveiby, 2010, n. pag.). However, Villanueva (2011, p. 7) claims that the Invisible Balance Sheet is not just a method, but instead it is a model to valuate intangible assets. This is because it not only determines the total value of intangible assets but also aims to explain it by assigning the value to the interrelated classes of their origin (Rodov & Leliaert, 2002, pp. 4). The intangible asset classes developed for this method are individual capital and structural capital, which can be further distinguished in organisational capital and customer capital (Sveiby, 2010, n. pag.).

Another well-received method for valuation of intangible assets at the organisation level is the Tobin's q, developed by the economist and Nobel laureate James Tobin and first presented in 1968 (Schnorrenberger, 2005, 73). It is a relative measure similar to the aforementioned MBV ratio, except that it uses replacement costs of a company's net assets, as opposed to their book value indicated on the balance sheet (Gerpott & Thomas, 2006, p. 453). These replacement costs are calculated by re-adding accumulative depreciation and amortization to tangible and intangible assets (the author uses intangible capital) and by making adjustments to their price, due to possible changes since from the time of their purchase (Luthy, 1998, n. pag.). Thereon if the adjusted book value of net assets corresponds to the market value, the q ratio equals one, while a higher ratio indicates unregistered assets, usually of intangible nature (Savickaitė, 2014, pp. 136). In that case the value of the investment in intangible assets is greater than its replacement costs (Van der Walt, 2000, p. 85).

The IAMV^{TM} (Investor Assigned Market Value) is the fourth method of this group and was developed by Standfield in 1998 (Matos, Lopes & Matos, 2013, p. 280). As opposed to aforementioned methods, Standfield (2001, p. 320) does not consider the market capitalisation as the company's true market value, because it fluctuates in response to investor's activities and thus it is the "Investor Assigned Market Value" (in the following "IAMV"). Following this thought, the true market value of a company is higher than its IAMV when stockbrokers recommend the purchase of its shares (Rodov & Leliaert, 2002, p. 16). This is because a purchase at current price is only recommended, if at that point in time, profitability beyond its current price is expected (Standfield, 2001, p. 320). Following this approach, the true market value is comprised of the organisation's tangible capital, reflected on its balance sheet, its

realised intangible capital as well as intangible capital erosion and the firm's sustainable competitive advantage (Müller, 2006, p. 20). The following figure illustrates Standfield's concept of a firm's true market value.

Figure 3 Components of market value for the IAVM™ method



Source: own based on Standfield, 2001, Time Capital and Intangible Accounting, p. 320 cited in: Y. Malhotra, 2001, Knowledge Management and Business Model Innovation, pp. 316 - 325

Herein, the realised intangible capital refers to the difference of an organisation's IAMV and its book value of net assets, while intangible capital erosion results from inefficiencies of the organisational structure of the company (Standfield, 2001, p. 320). Without these inefficiencies, the IAMV would equal the attainable market value (Rodov & Leliaert, 2002, p. 16).

FiMIAM (Financial method of intangible asset measurement) is the last method of the MCM category and belongs to the group of DIC methods as well (Sveiby, 2010, n. pag.) It was developed by Rodov & Leliaert in 2002 and builds up on the IAMV™ model (Matos, 2013, p. 268). The FiMIAM requires a six-step process, within which the realised intellectual capital is determined first (Villanueva, 2011, p. 7, also Pastor et al., 2016, p. 396). Rodov & Leliaert (2002, pp. 17) describe the remaining steps as follows. Based on historical financial and non-financial data, the most relevant components of the firm's intangible assets are identified in the second step. These components are further assigned with coefficients, reflecting their relative weight of profit contribution within the firm's overall intangible assets. Step four consists of choosing the three components with the highest coefficients, i.e. the most valuable. On an individual basis, the coefficients are then multiplied by the realised intellectual capital, which results in their monetary value. For the last step, these will be added to the company's book value and provide the "new market value bottom line".

3.3.2 Return on assets methods

For the second method category, four methods can be grouped as ROA methods (Villanueva, 2011, p. 5). Calculated Intangible Value (in the following “CIV”) is the first ROA method and was published by Stewart in 1997 (Matos, 2013, p. 268). It determines the value of a company’s intangible assets based on its excess return resulting from a comparison with its competitors (Schnorrenberger, 2005, p. 80). In order to determine the value of intangible assets, first the three-year averages of pre-tax earnings and tangible assets of the entity and its industry are calculated (Kok, 2007, p. 3). Thereafter the return on assets for the industry is determined, by dividing its earnings for the period by its average tangible assets (Syskowski, 2006, p. 55). For the fifth measure, the excess return of the entity is calculated, by multiplying the industry’s ratio by the company’s average tangible assets and subtracting the result from its pre-tax earnings (Luthy, 1998, n. pag.). For estimating the premium earnings after tax attributable to intangible assets, the excess return is adjusted by the average income tax rate (Sveiby, 2010, n. pag.). In order to compute the present value of the intangible assets, the last step is to adjust the premium by an interest rate or the average cost of capital of the entity (Schnorrenberger, 2005, p. 80).

The Knowledge Capital Earnings method (in the following “KCE”) was developed by Lev in 1999 (Matos et al., 2013, p. 280). Similar to the aforementioned method this residual income model uses the excess earnings of the company in comparison to its industry average for determining the total value of the firm’s intangible assets (Syskowski, 2006, p. 88). With this method, however, the basis for calculating the return on assets of the company and its industry is the combination of average three-year earnings and a average three-years income forecast (Malkmus, 2002, p. 40). The residual, referring to the portion of normalised earnings over and above expected earnings attributable to tangible book asset, equals the earnings gained by intangible assets (Schnorrenberger, 2005, p. 81). Same as for the CIV, these are further capitalised at an appropriate discount rate in order to receive the value of the entity’s intangible assets (Housel & Nelson, 2005, p. 547).

EVA^{TM} (Economic Value Added) is the third ROA method and was developed in 1997 by the consulting company Stern & Stewart (Savickaitė, 2014, p. 137). It is a comprehensive performance measure that indicates the businesses effectiveness in employing invested capital (Bontis, 2001, p. 52). The three main components for this method are the company’s net operating profit after tax (in the following “NOPAT”), its

capital employed (in the following “CE”) and its capital charges on equity and debt, i.e. its weighted average cost of capital (in the following “WACC”) (Fink, 2012 p. 73). The WACC corresponds to the minimum rate of return demanded by lenders and shareholders (Schultze & Hirsch, 2005, p. 39). The method was not developed specifically for use on intangible assets; however, if applied in this context, the NOPAT is adjusted in accordance to the company’s expenses related to intangible assets (Bontis, 2001, p. 52; also Savickaitė, 2014, p. 136). Thereby the general capital charge method for EVA™ is to multiply the businesses CE by its WACC and deducting the result from its NOPAT (Villanueva, 2011, p. 7; also Andriessen, 2004, p. 7). The spread method represents the second approach to calculate EVA™ (Van der Walt, 2000, p. 87). Therein its return on CE is determined, the WACC subtracted and the result is multiplied by the company’s CE (Schultze & Hirsch, 2005, p. 39). A change in EVA™ indicates whether or not an investment is profitable (Schnorrenberger, 2005, p. 78).

The VAIC™ (Value Added Intellectual Coefficient) is a method developed by Pulic in 1997 (Matos, 2013, p. 268). Despite the fact that Sveiby (2010, n. pag.) claims that this methods does not fit into any of his categories, he lists it in the ROA group. The method aims to measure productivity and efficiency of a firm’s intangible assets (Schnorrenberger, 2005, p. 81). This is based on the interaction of three major components namely, value added of a time period, human capital and structural capital, where the latter two terms are defined very differently from the concept provided in chapter 2.2 (Syskowski, 2006, p. 89). For the developer of this method intangible assets (he uses IC) consist of a set of knowledge workers and “human capital” represents their wages and all investments on their training (Iazzolino & Laise, 2012, pp. 551). For this method, the value added of a time period is determined by deducting the firm’s output from its input, including all spending of the company, except for those on intangible assets, that is human capital (Pulic, 2000, p. 706). Structural capital represents the remaining value after deducting human capital from the determined value added (ibid). In order to determine the productivity of knowledge workers and their environment, further steps include the assessment of coefficients for each components value added (Iazzolino & Laise, 2012, pp. 553). Finally, the sum of the three coefficients results the company’s “intellectual ability”, its value added intellectual coefficient (Syskowski, 2006, p. 89).

3.3.3 Direct intellectual capital methods

The last category for methods includes thirteen methods, two of which are only applications of other methods (Villanueva, 2011, p. 5). The HRCA 1 and 2 (HR Costing & Accounting), developed in 1985 by Flamholtz and renewed by Johanson in 1996, represent the first two DIC methods that concentrate on the valuation of human capital only (Matos, 20013, p. 268; Pastor et al., 2016, p. 396). The components investigated by these methods are profits gained and costs incurred by HR and their activities (Johanson, 1999, p. 1). Therein performance indicators, such as spending on education per employee or internal promotion rates are analysed with respect to their financial utility for the firm (Lönnqvist, 2004, p. 72). For the HRCA 2, Johanson adjusted the profit and loss statement (Sveiby, 2010, n. pag.). The value of human capital in both methods is assessed by dividing the profit contribution of human capital by the company's capitalised salary expenses (Syskowski, 2006, p. 91).

In 1998, Ahonen developed the HR Statement, which is a management application of the HRCA method mentioned above (Sveiby 2010, n. pag.). It indicates the firm's vision and strategies and includes a detailed description of HR and their development (Ahonen, 2000, pp. 46). For the valuation purpose, a profit and loss account is included, which distinguishes between three classes of costs related to HR, namely development costs, renewal costs and exhaustion costs (Sveiby, 2010, n. pag.).

The last method focussing on human capital is the Dynamic Monetary Model, developed by Milost in 2007 (Matos et al., 2013, p. 280). It is a relatively new method that has gained little traction within the available literature. As one of the contributing authors, Sveiby (2010, n. pag.) describes the methodology to assess an employee's value to the firm as the sum of his or her purchase value and the value of investments since date of entry, deducted by value adjustments.

The method Citation-Weighted Patents, also referred to as "Dow model" was originally applied by the company Dow Chemical and published by Bontis in 1996 (Matos, 2013, p. 268). The idea of the Dow model is to assess the performance of patents and their value for the company by estimating a "technology factor" (Syskowski, 2006, p. 57). Bontis, (2001, p. 56) reasons the need for the technology factor with the erroneous value assigned to patents by accounting, which is based on purchase costs and does not take foregoing costs from R&D or its future potential into account. Thereon the technology factor creates multiple indices based on R&D efforts undertaken by the firm and patents developed in the past (Schnorrenberger,

2005, p. 68). Examples for this indices are realised income per R&D expense, relation of total number of patents registered to total initiatives and cost of patent to sales turnover (Bontis, 2001, p. 56). These indices are further used to determine the total value of the entity's patents (Sveiby, 2010, n. pag.).

The Value Explorer™ is a method proposed by KMPG Netherlands and published by Andriessen & Tiessen in 2010 (Matos et al., 2013, p. 280). It is an accounting based approach and uses the traditional discounted cash flow (in the following "DCF") (Pastor et al., 2016, p. 396). A DCF estimates future cash flows generated by assets and discounts them by a market-determined rate, in order to assess the current value of these cash flows (Housel & Nelson, 2005, p. 547). For application in this context, the discount rate has to be adjusted by a risk factor, which reflects the uncertainty associated with intangible assets (Van der Walt, 2000, p. 98). The objective of The Value Explorer™ is to identify existing intangible assets by analyzing the core competencies of the company and to determine their value (Villanueva, 2011, p. 9). Therein each competence of the company is subject to five tests by which most relevant intangible assets are identified and rated (Fink, 2012, p.64). The model can be applied to five selected intangible assets from the categories human capital and structural capital (Müller, 2006, p. 20). These include identifiable intangible assets, primary and management processes, explicit knowledge and technology, tacit knowledge and skills as well as collective norms and values (Sveiby, 2010, n. pag.).

The valuation model initiated by the Canadian Institute of Chartered Accountants and effectively developed in 2000 by Anderson and McLean is called TVC™ (Total Value Creation) (Matos, 2013, p. 268). Similar to The Value Explorer™, it is based on DCFs (Müller, 2006, p. 20). With this model, however, the DCFs are used in order to re-examine the effects of events on planned activities (Sveiby, 2010, n. pag.). It aims to identify which assets, of intangible and tangible nature, contributed to a financial result and to what monetary amount (Syskowski, 2006, p. 59). This enables the company to make more profound strategic decisions and to invest in its value drivers (Schnorrenberger, 2005, p. 71). The main difference to the aforementioned The Value Explorer™ is that the TVC™ model does not limit its scope to selected intangible assets (Pastor et al., 2016, p. 396).

For the eights method, the AFTF (Accounting for the Future), developed by Nash in 1998, builds up on the traditional DCF as well (Sveiby, 2010, n. pag.). It aims to replace existing financial reporting by providing a new balance sheet, wherein asset

values are based solely on their present value of expected future cash flows (Syskowski, 2006, p. 64). With this method the value added by intangible assets for a given time period is determined by comparing the DCF at the beginning of the period with the DCF at the end of the same period (Müller, 2006, p. 20). The difference equals the value added by intangible assets during that period (Schnorrenberger, 2005, p. 72). The method can be applied for any intangible asset, on an individual base as well as on a cumulative base (Pastor et al., 2016, p. 396).

The ninth method of the DIC category is the Technology Broker, developed by Brooking in 1996 (Matos et al., 2013, p. 280). Brooking's approach differs from other methodologies as it is based on the traditional market-, income- and cost approaches (Pastor et al., 2016, p. 396). First the method uses an audit questionnaire of twenty questions to identify which intangible asset categories exist in the company (Sveiby, 2010, n. pag.). Following the identification, one of the following three approaches can be applied to determine the monetary value of an individual intangible asset (Bontis, 2001, p. 51). Market approaches determine the value of intangible assets by using benchmarks, i.e. market comparables from identical or similar assets that have been traded (Van der Walt, 2000, p. 54). The cost approach relies on input indicators, such as the asset's cost for development or its replacement costs (Boos, 2003, p. 75). The income approach, on the other hand, estimates an assets value based on its capability to generate returns (Scholich et al., 2004, p. 499). Therein future earnings are estimated by using, for instance, discounting cash flows or calculating future royalty payments receivable for a licence (Moser & Goddar, 2010, p. 116). These approaches are applied for assessing the monetary value of different categories of intangible assets (Housel & Nelson, 2005, p. 547). Thereby the Technology Broker is not limited to a specific type of intangible asset and allows individual valuation based on the method most applicable per asset (Moser & Goddar, 2010, p. 116; Pastor et al., 2016, p. 396). The sum of all individual values results in the total value of the company's intangible assets (Slee, 2011, p. 206). Furthermore, the model includes the firm's market capitalisation, as it is assumed to equal the sum of its tangible capital and its intangible assets (Villanueva, 2011, pp. 5).

The Intellectual Asset Valuation method (in the following "IAV"), published in 2000 by Sullivan, is used for determining the value of intellectual property only (Sveiby, 2010, n. pag.). It is based on an analysis of market variations and forgoing interactions between companies, thus it is a market approach, which allows an estimation of the

price the market would be willing to pay (Schnorrenberger, 2005, p. 71). However, this method does not enable the assessor to estimate an individual intangible asset, but concentrates on the total value of intellectual property (Pastor et al., 2016, p. 396). Another method listed separately by Sveiby (2010, n. pag) is the EVVICAE^{TM} (Estimated Value via Intellectual Capital Analysis) which, in fact, represents the web based toolkit of Sullivan's IAV, described above and does not represent an individual method. It was developed by the Intellectual Assets Centre in Scotland and published by McCutcheon, in 2008 (Matos, 2013, p. 268).

In 1998, McPherson proposed the Inclusive Valuation Methodology for determining the relative intangible value added, by developing a hierarchy of weighted indicators (Syskowski, 2006, p. 88). Another indicator assessed by this model is the monetary value added of the company, which results from comparison between the firm's value at the beginning and the end of a period (Schnorrenberger, 2005, p. 69). Same as for the IAV and EVVICAE^{TM} it does not determine the monetary value of individual intangible assets (Pastor et al., 2016, p. 396). Instead the combined value added of intangible assets is believed to correspond to the sum of the intangible value added and the monetary value added (Fink, 2012, p. 63).

The last DIC method is the FiMIAM, which is categorised as both, MCM and DIC (Sveiby, 2010, n. pag.), and has been discussed in chapter 3.3.1.

4 Practical limitations

4.1 Generic limitations

Monetary valuation of intangible assets in practice is a difficult topic for multiple reasons. A core difficulty within this context arises from the diversity of the researchers' understanding of the concept (Villanueva, 2011, p. 3, Mard et al. 2002, pp. 16). The varieties of existing definitions for intangible assets, characteristics attributed to them, as well as dissimilar categorisation approaches demonstrate that there is no clear or consistent understanding of the concept (Savickaitė, 2014, p. 149). For their further valuation, however a common basis, such as an agreed-up on definition is essential, as argued by Piwinger (2006 cited in Biel, 2007, p. 95). This is reasoned with the argument that having no common understanding of the concept leads to different assessment criteria and uncertainty as to which method can be applied and which cannot (Savickaitė, 2014, p. 149; Villanueva, 2011, p. 3).

With respect to existing methods, several of them have a strong academic character with leads to restricted usefulness for managers (Malkmus, 2002, p. 28). Ghezzi & Manzini (2012, p. 2) point out, that their implementation of academic methods is hindered for three reasons, wherein the first is the requirement of exhaustive data, which in reality might not be available. Because most methods are complex, impairments secondly arise from limited resources and competencies within the organisation (Ramanauskaite & Rudzioniene, 2013 p. 557). The last reason listed in this context is the claim of managers for the valuation to be accurate and of timeliness (Ghezzi & Manzini, 2012, p. 2). This is problematic, as stated by Sveiby (2010, n. pag.) who argues, “it is not possible to measure social phenomena with anything close to scientific accuracy”. Furthermore, because valuation often refers to a value generated in the future it is based on predictions, which are by nature subject to change (Moser & Goddar, 2010, pp. 115; Syskowski, 2006, p. 61). Villanueva (2011, p. 14) states for this reason, that it is not possible to determine the exact value of intangible assets, regardless of the method applied.

In contrast to academic models, numerous financial advisory firms have developed their own methodologies for valuation of intangible assets (Matos et al., 2013 p. 281). Some of these methods, however, lack in consistency and scientific reference, as they are individualised and tailored to the needs of the investigated company (Savickaitė 2014, p. 146). For illustration purposes, brand values are used as an example, as their relevance for Western economies increased and they are considered the most important type of intangible asset (Guenther, 2004, p. 552; Villanueva, 2011, p. 13; deviant Green & Ryan, 2005, p. 44). Hoepfner & Bentele (2009, p. 162) provide a comparison of published brand value rankings for Google in 2008, wherein the brand consultancy Interbrand rated the it with $ 26 billion, while the market research company Millaward Brown awarded it more than three times that value with a total of $ 86 billion. Reasons for this significant difference are general divergences in the definition of a brand value and the underlying valuation methods (exemplary Cohen, 2005, p. 2; Barth, Clement, Foster & Kasznik, 2003, p. 154). For the two brand values mentioned above, it is not clearly stated which components were included and on what basis the valuation was carried out (Hoepfner & Bentele 2009, p. 162). This, however, is particularly critical for the assessment of a brand value, as it can account for more than one third of a company's total value and even more for consumer goods manufacturers (Leliuc Cosmulese et al., 2017, p. 2;

Scholich et al., 2004, p. 492). Therefore, due to underlying subjectivity of tailored valuation methodologies, published statements about the value of a firm's intangible assets lose credibility, limiting the use of their outcome for comparison of, for instance, different companies (Savickaitė, 2014, p. 146).

It is further criticised, that the great amount of exciting methods impairs practical implementation (Lönnqvist, 2004, p. 3). The research of Villanueva, (2011, p. 14) yields that firms have restricted knowledge about the methodologies and their use. However, with respect to the motives presented in chapter 3.1, it becomes apparent that not every method category is suitable to serve each purpose (Malkmus, 2002, p. 30). By this means, methods can be applied to support selected needs but may have limited to no use in other situations (Van der Walt, 2000, p. 9; Pastor et al., 2016, pp. 388). Because in practice the circumstances and purposes of valuation may vary widely from case to case, Andriessen (2003, p. 22) claims that it is precisely this diversity of valuation methods that is necessary, which in turn justifies the number of developed and individualised approaches. The following subchapter provides insight on how the implementation of MCMs is affected by practical limitations and which methods are applicable for which purposes.

4.2 Limitations of market capitalisation methods

The first general limitation that affects practical application of all MCMs relates to the available scope of firms they can be applied on (Schnorrenberger, 2005, p. 73). Sveiby (2010, n. pag.) claims that these methods are appropriate for supporting investment decisions in the context of M&A transactions. This is reasoned with the relative ease to determine the market value and because these methods can be adapted easily (Villanueva, 2011, p. 6). However, due to the necessity of a market capitalisation, these methods only allow comparison and valuation of stock market listed companies (Ramanauskaite & Rudzioniene, 2013, p. 560). The impact this limitation may have for managers, appears when considering statistics on past M&A transactions (Schnorrenberger, 2005, p. 73). Between 2002 and 2004, for example, more than 70 percent of all acquisitions between US companies were made for privately held firms (Capron & Shen, 2007, p. 38).

Another limitation to name when investigating practicability of MCM's refers to the identification of value drivers (Kok, 2007, p. 187). Upton (2001, cited in Kristandl & Bontis, 2007, p. 1511) claims, that the main problem with methods such as the MBV relates to the assumption that "one is done with the exercise" after deducting the

book value from the enterprise's market capitalisation. However, since MCM's determine the value of intangible assets at the organisation level information on what precisely contributed to the value is not provided (Slee, 2011, p. 200). To illustrate the information value generated by applying the MBV method, the following table provides an example of its value allocation to intangible assets. For exemplary purposes, the three companies with the highest market capitalisation according to Forbes' 2018 "Global 2000" list are used (Forbes, 2018). The following values are calculated based on the market capitalisation provided by Forbes' 2018 Global 2000 list and book values derived from Investing.com's Financials, Balance Sheet for the second quarter of 2018. An extract of both databases is provided in the Appendix.

Table 1 MBV example of three companies [in million USD]

	Apple Inc.	Amazon.com Inc.	Alphabet Inc.
Market Capitalisation	$ 926 900	$ 777 800	$ 766 400
Total Book Value	$ 349 197	$ 134 100	$ 211 610
Net Assets	$ 114 949	$ 34 995	$ 162 000
Intangible Assets	$ -	$ -	$ 2 662
Goodwill	$ -	$ 13 944	$ 17 895
MBV	$ 811 951	$ 742 805	$ 604 400
Net Tangible Assets	$ 114 949	$ 21 051	$ 141 443
MBV, total intangible assets	$ 811 951	$ 756 749	$ 624 957

Source: own, based on Forbes, 2018, Global 2000, per 6-June-2018 and Investing.com, 2018 Financials, Balance Sheet, per 30-Jun-2018

Hereby Apple Inc. has a market capitalisation of $926.9 billion and a net asset value of $114.9 billion. Applying the MBV method by calculating market capitalisation minus net assets, its intangible assets have a value of almost $812 billion. For Amazon.com Inc., the market capitalisation exceeds its net book value by $742.8 billion, wherein goodwill from past M&A transactions is incorporated in its net asset value. When, for simplification, assigning goodwill exclusively to intangible assets, their resulting total value reaches $756.7 billion. As last example, Alphabet Inc. has according to the MBV method intangible assets worth almost $625 billion, taking in their intangible assets indicated on their balance sheet as well as goodwill. Besides this information, no further insight may be gained from the MBV method (Kok, 2007, p. 187). Thereafter it can be concluded that its outcome has low significance to multiple motives, which require knowledge on individual intangible assets

(Andriessen, 2004, pp. 22). These include, inter alia, the identification and strategic alignment of the firm's core competencies and value drivers and also signalling the firm's potential comprehensively to stakeholders (Ghezzi & Manzini, 2012, p. 1; Hunter et al., 2005, p. 12).

Other frequently expressed critics question the two individual variables of which these methods are based. Therein the assertion that a market value exceeding an organisation's book value, adjusted or not, is attributable solely to intangible assets, is highly criticised (Luthy, 1998, n. pag.; Andriessen, 2004, pp. 9). As noticed by Standfield (2001, p. 320) when developing the IAMV^{TM}, the market capitalisation is influenced by investor activities. It is an ever changing and thus unreliable value, as it fluctuates in response to speculations that may not be related to intangible assets (Rodov & Leliaert, 2002, p. 16; also Biel, 2007, p. 100). Furthermore, exogenous factors, such as industrial policies, timing and other economic factors influence stock prices (Kristandl & Bontis, 2007, p. 1511; Van der Walt, 2000, p. 84). Similar criticisms are expressed for the inclusion of book values to determine the value of intangible assets (Luthy, 1998, n. pag.). Values provided on the balance sheet are influenced by national accounting standards and do not reflect reality (Ramanauskaite & Rudzioniene, 2013, p. 560). Therein companies may choose, for instance, whether to capitalise self-constructed assets and in addition fixed assets are rarely amortised in accordance to their actual impairments (Biel, 2007, p. 100). Consequently, the value of tangible assets illustrated on a firm's balance sheet does not correspond to their real value, but to depreciated historical costs (Luthy, 1998, n. pag.). This limits the use of these methods for comparisons between companies as national law and regulations may differ, resulting in incomparable book values (Van der Walt, 2000, p. 84). Although the Tobin's q recognises the limited significance of book values, Barker (2001, 114) argues that it still does not determine their exact value, despite its adjustments for price changes and accumulated depreciation and amortisation. Smirlock, Gilligan & Marshall (1984, p. 1211) agree and claim that adjustments made for determining the replacement costs of assets are influenced by the subjectivity of the valuator. In addition, they are complicated and require information which may be difficult to access (Villanueva, 2011, p. 6). The high effort involved in this valuation and resulting inaccuracy thus limits the information value that the assessor had desired and may furnish a misconception of the value of intangible assets (Gerpott & Thomas, 2006, p. 453).

Another point to be questioned is the assumption that the values contained in these methods can be compared with each other (Andriessen, 2004, p. 10). In general, all five methods in this category determine the value of intangible assets by deducting either adjusted or original book values from the balance sheet from a firm's market capitalisation (Leliuc Cosmulese et al., 2017, p. 1; Malkmus, 2002, p. 30). Initially, the market and book values result from dissimilar calculation procedures, with the balance sheet reflecting historical costs and market capitalisation resulting from potential future earnings based on expectations (Luthy, 1998, n. pag; Rodov & Leliaert, 2002, p. 16). Hence, either an internal or external perspectives are taken, which according to Andriessen (2003, p. 10) by definition cannot be subtracted from each other. Furthermore, market capitalisation does not only reflect strategic objectives, but also incorporates a firm's current policies regarding their book value (Van der Walt, 2000, p. 84). Consequently, these two values cannot be accurately separated from each other (Ramanauskaite & Rudzioniene, 2013, p. 560). A similar situation applies to the two asset types within these methods (M'Pherson & Pike, 2001, p. 252). A conversion of the original MBV equation implies that an organisation's market value should correspond to book value plus intangible assets (Andriessen, 2004, p. 10). Yet, book values are, to some extent, influenced by profits gained from the exploitation of knowledge and several intangible assets may create value only in combination with tangible assets, such as IT systems developed to coordinate machinery (Lev, 2000, p. 22; M'Pherson & Pike, 2001, p. 253). Thereafter these two types of assets are inseparable as well (Andriessen, 2004, p. 10). Although the equation, which determines the total value of intangible assets, may be defective, these methods are supportive under certain circumstances (Kristandl & Bontis, 2007, p.1511; Ramanauskaite & Rudzioniene, 2013, p. 560). MBV, Tobin's q and IAMV^{TM} are useful for comparisons of public listed companies, provided that particular attention is given to the values included, concerning subjectivity on book values and external factors influencing market value (Malkmus, 2002, p. 30). Moreover, results may be used for benchmarking on the condition that those firms operate on the same market and are of similar capital structure in respect to their tangible assets (Sveiby, 2010, n. pag.; Van der Walt, 2000, p. 86). Luthy (1998, n. pag.) argues that for investment decisions between companies comparison of ratios, such as Tobin's q, is required, as opposed to total numbers, because they are more reliable and serve as strainers for general economic cycles and other external factors. Therein the return

on investment is most promising if, at the margin, a ratio exceeds unity (Lindenberg & Ross 1981, p. 2). CEC (2003, p. 162, cited in Van der Walt, 2000, p. 86) even suggest a combined approach of the MBV ratio and Tobin's q to monitor trends, as a decline of these two indicators implies uncertainty about a company's ability to generate future profit. It should, however, be kept in mind, that calculating the Tobin's q requires a high effort (Villanueva, 2011, p. 6).

The aforementioned limitation, regarding the lack of determining the origin does not apply to the models Invisible Balance Sheet and FiMIAM (Rodov & Leliaert, 2002, p. 15; Sveiby, 2010, n. pag.). As the application of these two models involves the creation of specific intangible assets categories, they provide more information on the value drivers within a firm's intangible assets (Syskowski, 2006, p. 62). However, these methods are influenced by the subjectivity of the valuator, who decides which components or to what extent they contribute to the profit (Villanueva, 2011, p. 6).

For practical limitations of MCM's it can be concluded, that their scope, as well as the validity of their outcome is restricted and that they are value indicators for intangible assets, but neither of these methods provides their exact value (Biel, 2007, p. 100). Thus, their decision-usefulness may be treated with caution, especially if relying on one estimate only (Kristandl & Bontis, 2007, p.1511). The following subchapter provides insight on how the implementation of ROA methods is affected by practical limitations and which methods are applicable for which purposes.

4.3 Limitations of return on assets methods

A general limitation to mention when investigating the practical application of ROA methods refers to their nature and is comparable to critics on MCMs. Because these are holistic approaches, they do not serve purposes that require determining the value of individual intangible assets (Slee, 2011, p. 200). Generally, ROA methods have similar use as MCMs, accordingly are considered appropriate for benchmarking and comparisons between companies (Villanueva, 2011, p. 6). However, same as for MCMs, ROA methods tend to be based on historical costs rather than on future profits and therefore they are criticised for their short-term focus (Bontis, 2001, p. 55). An exception to this critic is the KCE method as it includes a forecast on future earnings (Malkmus, 2002, p. 42). This forecast, however, is again criticised as a consequence of subjectivity and is therefore considered only conditionally reliable (Savickaitė 2014, p. 140).

A specific limitation, which needs to be emphasised for residual income models of this category, namely the CIV and the KCE, is that they are of no use if the firm's return on assets does not exceed its industry average (Villanueva, 2011, p. 8). According to Luthy (1998, n. pag.), his CIV model serves as a benchmark measure for performance control, because it provides information on whether investments are profitable. Without excess earnings, however, there is no premium on intangible assets and hence their present value cannot be determined (Aho, Ståhle & Ståhle, 2011, p. 8). Furthermore Aho et al. (ibid) performed a critical assessment on the CIV, and claim that it actually is no measure of a firm's intangible assets, as it does not distinguish excess earnings between all available types of assets in an organisation.

For the third ROA method, EVA^{TM} is relatively simple to calculate as it is based on information that is derived from accounting reports the firm already possess, its balance sheet and profit and loss statement (Malkmus, 2002, p. 38). The model is deemed useful for assessing whether the firm's intangible assets are productive or not (Sveiby, 2010, n. pag.). However, when applying EVA^{TM} for intangible asset valuation, the incorporated numbers have to be adjusted, which increases its complexity (Syskowski, 2006, p. 89). According to Bontis (2001, p. 55) 164 performance adjustments may be necessary, depending on the situation. Due to these adjustments, this model is exposed to subjectivity and though it has usage for comparison, these adjustments lead to inconsistencies, which on the other hand limit the significance of compared EVA^{TM} measures between enterprises (Villanueva, 2011, p. 7; Fink, 2012, pp. 74). Values added calculated by EVA^{TM} also cannot be assigned exclusively to intangible assets, as they are influenced by, e.g. changes in the cost of capital, which may not be related to the firm's performance (Savickaitė, 2014, p. p.137). However, EVA^{TM} is regarded as a good starting point for valuation on intangible assets, as it incorporates cost of capital and because needed information are said to be easy to obtain by external analyst (Malkmus, 2002, p. 40).

For the last ROA method, the VAIC^{TM}, it should be kept in mind that it does not exactly fit into one of Sveiby's method categories. The general limitations of ROA methods mentioned above then may not apply (Sveiby, 2010, n. pag.). The method calculates productivity of the workforce and their environment by estimating their value added coefficients (Syskowski, 2006, p. 89). Thus, as opposed to other methods discussed so far, it provides insight into value drivers and may serve different motives from MCMs and other ROA methods (Iazzolino & Laise, 2012, pp.

553). However, limitations that do apply to this method relate to its nature, as it does not determine the monetary value of intangible assets (Villanueva, 2011, pp. 5). It should be noted, that there is much criticism of the components included in this calculation, however, as noted by Iazzolino & Laise (2012, pp. 555), this is mainly due to misunderstandings about Pulic's concept, which deviates strongly in its definitions of terms used and their relationship to each other.

For ROA methods it can be concluded, that assessed results have limited validity for the value of intangible assets (Malkmus, 2002, p. 44). These methods are an indicator of a firm’s performance, but the extent to which it is attributable to intangible assets is unspecified (Aho et al. 2011, p. 8). However, because they are relatively simple to apply they support benchmarking (Schnorrenberger, 2005, p. 77). The last subchapter provides insight on how the implementation of DIC methods is affected by practical limitations and which methods are applicable for which purposes.

4.4 Limitations of direct intellectual capital methods

DIC methods are diverse, which is why only few general limitations apply to all methods, but a greater amount of individual limitations (Fink, 2012, p. 100). As opposed to the holistic approaches, DIC methods focus on individual components of intangible assets (Slee, 2011, p. 199; Savickaitė, 2014, p. 135). They aim to determine the value of individual intangible assets and thereby offer potential support all motives which require a component-by-component view (Sveiby, 2010, n. pag.).These include, inter alia, identifying value drivers for managers and disclosure to stakeholders, as well as assessing transaction prices for trade of single intangible assets (Villanueva, 2011, p. 6). However, a core difficulty of these methods refers to this aim and derives from the nature of intangible assets (Ramanauskaite & Rudzioniene, 2013 p. 557). Because many of these are strongly linked to or bound in tangible assets or other intangible assets, one faces great difficulty in separating them and assessing their individual value contribution (M'Pherson & Pike, 2001, p. 252). This applies particularly to human capital, which is tacit or implicit knowledge, since their value cannot be directly inferred from input indicators, such as wages and or salaries, used to determine the value of other intangible asset types (Pastor et al., 2016, p. 398, Collins, 2010, p. 11). Ramanauskaite & Rudzioniene, (2013, p. 557) provide for this limitation the example of an airplane, which value derives from the strong interaction of knowledge and materials during its development and manufacture. Accordingly, to pinpoint the drivers accountable for an increase in value

and the extent to which they do so is based on subjectivity (Villanueva, 2011, p. 6). Furthermore, methods that assess individual values do not take synergies between intangible assets into account (ibid, p. 9). Outcomes determined through DIC methods, therefore, depend on the context they are applied in and as they are individualised in accordance to this context, these methods have limited practicability for comparisons (Slee, 2011, p. 200; Kok, 2007, p.188; Sveiby, 2010, n. pag).

The first set of limitations for individual methods of the DIC category relate to the Technology Broker. It offers three traditional assessment approaches for intangible assets valuation, which all are subject to limitations (Pastor et al., 2016, p. 396; Syskowski, 2006, p. 53). The first to look at refers to the cost approach. They are based on input indicators, such as costs for replacing, development or transferring an asset for the determination of their individual intangible asset values (Hunter et al., 2005, p. 10; Housel & Nelson, 2005, p. 547). However, this implies that costs equal values, which does not hold true (Andriessen, 2004 pp. 14). As opposed to costs, values are output indicators, which are subject to demand and supply (Boos, 2003, p. 77). In other words, high demand for an intangible asset increases its value, but does not increase its development costs, nor do high input costs inevitably make an intangible asset more valuable (ibid, p. 78). Thereby using a cost approach for valuation of intangible assets may lead to a misconception of their actual value and thus is generally said to be a weak surrogate in the context of intangible asset valuation (Andriessen, 2004, p. 3; Cohen, 2005, p. 6). The second option offered by the Technology Broker, is a market approach that relies on estimates derived from prices paid during transactions of the same assets in the past (Van der Walt, 2000, p. 54). If the specific asset which value is to be determined has not been traded actively on markets, the guideline method proposes to use assets that are comparable to the one in focus (Moser & Goddar, 2010, p. 115). In comparison to cost approaches, market approaches have more significance for determining a value; however, in the context of intangible asset valuation it also faces limitations (Bontis, 2001, p. 51). The reason for this emerges from the definition proposed in chapter 2.1, whereby intangible assets are considered unique sources for value, which value derives from their characteristics of being not substitutable or imitable by competitors (Kristandl & Bontis, 2007, pp. 1516). This implies that comparable assets do not exist and if they would, the intangible asset would be of no value (ibid, p. 1517; Van der Walt, 2000, p. 54). In addition, multiple intangible assets are not separable from other assets, and

thus by definition cannot be traded individually (Villanueva, 2011, pp. 3; Pastor et al., 2016, p. 397). This applies to e.g. human capital, a firm's reputation or corporate culture (Cohen, 2005, p. 23; Meritum, 2001, p. 10). Following this thought, foregoing transactions do not exist and consequently benchmarks to assess their fair value do not either (Barker, 2001, p. 114). The remaining assessment option offered by the Technology Broker is the income approach (Syskowski, 2006, p. 53). As opposed to the cost approach and market approach, it determines the value of intangible assets based on its potential to generate future earnings (Moser & Goddar, 2010, pp. 114; Van der Walt, 2000, p. 63). One way to do so is by using a DCF, which is also incorporated in the AFTF, TVC™ and The Value Explorer™ (Schnorrenberger, 2005, p. 72). Limitations that one faces with DCF based methods refer to the subjectivity of the assessor (Bontis, 2001, p. 51). The calculations are based on multiple assumptions that need to be made, for example predictions on expected income that can be generated from the asset and the selection of an appropriate discount rate to calculate its net present value (Moser & Goddar, 2010, pp. 115; also Syskowsky, 2006, p. 60). Therefore, to determine reliable values through an income approach, estimated cash flows need to be stable to some extent and the valuator has to be able to estimate a discount rate that incorporates risks associated with the uncertainty of intangible assets appropriately (Housel & Nelson, 2005, pp. 547). Though, methods which build up on DCFs serve the purpose of valuing and comparing alternative investment projects with each other and are said to be most comprehensive (Van der Walt, 2000, p. 97, Sveiby, 2010, n. pag.). Furthermore, since the Technology Broker offers these three different valuation alternatives, it is possible to choose the method that best suits the intangible asset in question and therefore its result is expected to be somewhat reliable (Bontis, 2001, p. 51). However, it needs to be emphasised that the Technology Broker includes the market capitalisation, which, as discussed in chapter 4.2, is attributable to intangible assets only to a limited extent (Biel, 2007, p. 100; Syskowski, 2006, p. 54). Moreover, for the audit questionnaire used by this method to identify the intangible assets, underlying subjectivity within the identification process has to be considered, when interpreting determined results (Villanueva, 2011, p. 9).

For the Citation-Weighted Patents method or Dow model, which determines indices based on previously developed patents and related R&D expenses, method specific practical limitations arise due to data availability (Schnorrenberger, 2005, p. 70).

Generally, the method is considered useful for determining the productivity and efficiency of R&D activities (Syskowski, 2006, p. 58). However, determined indices are only reliable if the company has comprehensive data from which they can be derived (Bontis, 2001, p. 56). This becomes problematic for external auditors, as R&D expenditure is rarely capitalised on a company's balance sheet and firms rarely provide comprehensive information about it in other reports (Fink, 2012, p. 59). Thus the Dow Model is useful for internal management purposes with respect to control and decision making, but not for determining values in terms of transactions or disclosure to stakeholders (Syskowski, 2006, p. 59).

The Value Explorer™ is criticised for focusing only on essential competences, while intangible assets such as distribution channels or customer relationships are out of scope (Schnorrenberger, 2005, p. 70). Therefore, it does not provide comprehensive values insofar that the significance of determined results is limited (Villanueva, 2011, p. 9). Furthermore, because the method relies on DCFs, which are based on assumptions and can be manipulated, its informative value has to be treated with cautions (Pastor et al., 2016, p. 392; Syskowski, 2006, p. 61). The same applies to the results determined with the AFTF and the TVC™, which both also include of the DCF (Van der Walt, 2000, p. 88). In particular, the practicability of the TVC™ method is challenged, as the implementation of the model is associated with a high effort due to its complexity, which is not in proportion to the usefulness of the results (Syskowski, 2006, p. 61). For the IAV, by Sullivan and the supplementing EVVICAE™, as well as for the methods concentrating on HR value contribution, namely HRCA 1 and 2, HR Statement and Dynamic Monetary Model, no method specific practical limitations have been stated in the extant literature.

In conclusion, DIC methods are more supportive for investment decisions that are not related to M&As than other methods discussed (Andriessen, 2004, pp. 22). Housel & Nelson (2005, p. 548) claim however, that intangible assets, other than certain types of intellectual property, cannot be valued individually and must therefore be valued as an aggregate. The informative value of most of these methods is limited due to subjectivity, manipulability and ignorance of synergies (Villanueva, 2011, pp. 6). They are therefore, still insufficient for supporting management motives effectively and comprehensively and for identifying value drivers. For this reason, these methods are only conditionally considered as practicable approaches (Biel, 2007, p. 99).

5 Conclusion

5.1 Summary

For intangible assets various terms have emerged out of various disciplines, where no one agreed up on definition exists. However, if one were to define it in somewhat agreeable and simple terms, intangible assets refers to strategic corporate resources of non-physical, non-financial nature, with probable future economic benefits and a finite, influential life. Such assets are composed of human capital, relational capital and structural capital. Due to structural changes in more recent decades, as well as to enhanced competition brought by globalisation, intangible assets' relationship with business performance is both substantive and significant, and its importance to business affairs appears to be ever-present and increasing.

Monetary valuation of intangible assets serves different purposes. Firstly, intangible asset valuation serves a disclosure to stakeholders, since traditional finance statements do not provide comprehensive information on them. Secondly, the analysis of intangible assets serves to focus on core competencies and value drivers, as well as to the associated strategic decision-making process. Finally, the valuation of intangible assets is indispensable for successful business transactions in the context of trading with individual intangible assets, M&A deal pricing and the assessment of partnership contributions. Monetary valuation methods can be categorised into MCM, ROA and DIC methods, which contain an overall of twenty-one methods. Both MCMs and ROA methods aim to determine the value of intangible assets on the organisation level. On the one hand, five methods belong to the group of MCMs, all of which the basic approach to the valuation consists of a comparison of market capitalization and book values. On the other hand, the four methods in the ROA category are industry-based valuation approaches that aim to determine the value of intangible assets based on the ratio of pre-tax profit to tied-up capital. In contrast to these holistic approaches, DIC methods aim to determine the value of individual intangible assets. Thirteen methods are listed, with some focusing only on certain types of intangible assets, while others may cover all types.

General limitations when aiming to valuate intangible assets tend to be a result from the fact that there is no uniform understanding of the concept of intangible assets. Because they are diverse and unique to each enterprise, an abundance of methods has emerged. However, these regularly demand exhaustive amounts of data, require a high implementation effort, or are susceptible to subjectivity, which can cause the

results to lose their significance. In particular, the latter is an impediment to internal motives such as the identification and management of value drivers. In addition, several methods are only applicable to selected companies or under certain circumstances. This applies to MCMs that can only be applied to publicly listed firms and ROA methods, which often demand a firm's performance to exceed its industry average. Due to specific limitations, holistic approaches do not provide information on value drivers, nor do they serve motives such as communication to stakeholders or the assessment of individual intangible asset values. Although they can be useful for benchmarking and for M&A's deal pricing, holistic approaches are not in a position to expose incomparability or to uncover synergy potentials between companies. Thereafter MCM and ROA methods serve only as indicators for the value of intangible assets and the performance of a company, to the extent that no further insights are reachable. In contrast, DIC methods have little to no usefulness for assessing the total value of intangible assets. Instead, they support internal investment decisions and the identification of value drivers when properly interpreting the results. DIC methods in particular are then characterised by subjectivity and complexity. Results achieved through applying monetary valuation methods should generally be treated with caution, as the including variables are habitually sensitive to influences independent of intangible assets. In addition, the expectations of managers regarding accuracy of results and timeliness are at odds with monetary valuation of intangible assets. This tends to be because such methods rely on historical data, projected future returns or inconsistent values.

To answer the research question provided in chapter 1.1, methodological limitations in the monetary valuation of intangible assets affect practical applicability in terms of three reasons: one, required capabilities, two, limited significance, and three, complexity. In the first instance, the diversity of methods and their individual limitations affect the selection of a method that appropriately serves the objective of valuation in practise. This is because in order to serve a certain motive, comprehensive knowledge of the methods, of which validity is often situational, is required. Second, methodological limitations affect the significance of the values determined by these methods, which lead to limited decision-usefulness. This is because, depending on the monetary valuation method chosen, the assessor needs to include historical data, inconsistent values, make predictions about the future or decide upon which intangible assets to concentrate. Finally, the practical applicability

of comprehensive monetary valuation methods is affected by their complexity, as well as by data requirements. What follows is either such data is not available, in particular for external auditors use, or the cost of carrying out the valuation exceeds the benefits.

5.2 Critical acclaim

This paper addresses the concept of intangible assets from a general viewpoint of a general literature study without much restriction to any particular discipline, only excluding the accounting treatment of intangible assets. However, the diverse application of terms for related concepts in the academic literature, as well as rare, comprehensive explanations by contributors to these terms impedes a comprehensive comparison of proposed definitions and understandings. Intangible assets, although always have been present, are considered a relatively recent concept. For this reason, research into their impact and significance for future profitability can be critically questioned in a long-term perspective at this time.

In terms of the proposed valuation motives for intangible assets, it should be noted that there may well be additional motives which have not been addressed or mentioned in this paper. With this in mind, this paper does not intend nor attempt to claim completeness and its writing should not bound its reader. Nevertheless, the motives discussed in chapter 3.1 have been identified as the most relevant for valuation of intangible assets, based on the agreeable nature of existing literature around this topic.

The methods examined in this paper have been discussed with regard to the valuation of intangible assets as an overall concept, without further examination into their application to a particular type of intangible asset. Furthermore, the focus of this paper does not rely on a selected method, but rather on monetary valuation methods in the context of Sveiby's categorization approach. The practical applicability of these methods may very well be challenged by a detailed and thorough examination of the individual methods. In addition, it should be understood that there may well be other monetary valuation methods, which are not subject to the limitations stated, that are under certain circumstances or for specific intangible asset types more conductive when determining the monetary value of intangible assets.

5.3 Outlook

The valuation of intangible assets has found much admiration within the study of business administration disciplines and it is the subject of considerable research and discussion. A major hurdle in the development of reliable monetary valuation methods for intangible assets can be attributed to their accounting treatment. Although the accounting treatment of intangible assets is not relevant to their economic value, intangible assets do not receive sufficient credit from management due to a lack of measurement requirements. Therefore, the need for an appropriate valuation of intangible assets is currently not recognised.

However, economies will increasingly be reliant on knowledge and services. Whilst residing within a globalising era where competition appears endlessly increasing, the importance of intangible assets will continue to grow. Moreover, as regulations become less restrictive for worldwide transactions, there will be further convergence of accounting standards. This could eliminate much of the limitations of existing monetary valuation methods.

Inevitably, this will lead to a further intensification of research into the study of intangible assets. By this, a common understanding of the concept of intangible assets may be reached, as well as a set level of standards developed that will ultimately reduce the uncertainty associated with intangible assets and allow further development of more reliable monetary valuation methods.

IV Glossary

Accumulative depreciation	The sum of a tangible assets depreciation up to a specific point in its life.
Amortisation	The act of allocating the cost of an intangible asset over the period of its estimated useful life.
Benchmarking	The continuous orientation towards or comparison with the performance of other high-performance companies, in order to close performance gaps.
Capital employed	The capital required by the company to operate and to which the investors claim a return. It is calculated by deducting a firm’s current liabilities from its carrying amount stated on the balance sheet.
Cost of capital	The calculative interest on operating capital. It derives from a weighted aggregation of the interest payable on debt capital and opportunity costs for equity.
Depreciation	The act to account scheduled or unscheduled impairment of tangible assets due to normal wear and tear and economic obsolescence over the period of its estimated useful life.
Goodwill	The premium value recognised in an acquisition where purchase price is higher than the sum of fair value of all tangible and identifiable intangible assets acquired and liabilities assumed.
Market capitalisation	The current stock price of all outstanding shares. It is calculated by multiplying a company's shares outstanding by the current market price of one share
Net assets	The net value of a firm’s total assets. The carrying amount of a firm stated on its balance sheet, deducted by its total liabilities. It equals shareholder equity.

New economy firms	A term used to describe new, high-growth industries that are on the cutting edge of technology and are considered the driving force behind economic growth.
Old economy companies	A term used to describe nationally recognized, well-established, and financially sound companies that enjoyed substantial growth during the early parts of the century due to industrialisation.
R&D	The investigative activities to develop new products and procedures and to improve existing products and procedures. The work a business conducts for the innovation, introduction and improvement of its products and procedures.
Residual income	An income resulting from the difference between revenues and expenses. It represents the net result generated in excess of the minimum rate of return.
Shareholder equity	The owner's residual claim after debts have been paid. The carrying amount of a firm stated on its balance sheet, deducted by its total liabilities. It equals net assets.
WACC	Weighted arithmetic average of a company's cost of equity and debt capital. For equity, company-related risk premiums and risk factors are incorporated For debt capital, the interest rate payable to lenders is applied. Both individual interest rates are put in relation to the capital structure of the company.

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VI Appendix

1 Market capitalisation by Forbes' Global 2000 list (extract)

Used in chapter 4.2, Table 1

Forbes Global 2000 (extract)
The World's Largest Public Companies

[Sorted by]

Rank	Company	Country	Sales [Billion USD]	Profits [Billion USD]	Assets [Billion USD]	Market Value [Billion USD]
8	Apple	United States	247,50	53,30	367,50	926,90
53	Amazon.com	United States	193,20	3,90	126,40	777,80
23	Alphabet	United States	117,90	16,60	206,90	766,40
20	Microsoft	United States	103,30	14,20	245,50	750,60
77	Facebook	United States	44,60	17,80	88,90	541,50
81	Alibaba	China	37,90	9,60	114,00	499,40
105	Tencent Holdings	China	35,30	10,60	85,20	491,30
145	Johnson & Johnson	United States	78,70	1,20	156,60	341,30
14	Samsung Electronics	South Korea	224,60	41,00	293,20	325,90
164	Visa	United States	19,40	9,00	69,00	295,10
49	Intel	United States	64,00	11,10	128,60	254,80
24	Walmart	United States	500,30	9,90	204,50	246,20
48	Nestle	Switzerland	91,20	7,30	133,80	237,30
28	UnitedHealth Group	United States	207,60	11,20	155,60	229,00
444	Cisco Systems	United States	48,10	- 1,40	131,50	221,30
...	...	...	...	...	...	...
...	...	...	...	...	...	...

Source: Forbes, 2018, Global 2000, per 6-June-2018

2 Book values by Investing.com (extract)

Used in chapter 4.2, Table 1

Investing.com (extract)
Financials, Balance Sheet

Balance Sheet	Apple Inc	Amazon.com Inc	Alphabet Inc
Period Ending:	2018 30. Jun	2018 30. Jun	2018 30. Jun
Total Current Assets	115.761	54.481	124.157
Cash and Short Term Investments	70.970	27.050	102.254
Cash	9.973	-	-
Cash & Equivalents	21.998	19.823	14.148
Short Term Investments	38.999	7.227	88.106
Total Receivables, Net	26.367	12.607	17.244
Accounts Receivables - Trade, Net	14.104	12.607	17.043
Total Inventory	5.936	14.824	698
Prepaid Expenses	-	-	3.540
Other Current Assets, Total	12.488	-	421
Total Assets	349.197	134.100	211.610
Property/Plant/Equipment, Total - Net	38.117	54.768	51.672
Property/Plant/Equipment, Total - Gross	85.368	-	71.876
Accumulated Depreciation, Total	- 47.251	-	- 20.204
Goodwill, Net	-	13.944	17.895
Intangibles, Net	-	-	2.662
Long Term Investments	172.773	593	11.487
Note Receivable - Long Term	-	-	-
Other Long Term Assets, Total	22.546	10.314	3.737
Other Assets, Total	-	-	-
Total Current Liabilities	88.548	50.801	29.903
Accounts Payable	38.489	27.657	3.369
Payable/Accrued	-	-	-
Accrued Expenses	25.184	10.189	10.321
Notes Payable/Short Term Debt	11.974	-	-
Current Port. of LT Debt/Capital Leases	5.498	6.951	-
Other Current liabilities, Total	7.403	6.004	16.213
Total Liabilities	234.248	99.105	49.610
Total Long Term Debt	97.128	38.838	3.981
Long Term Debt	97.128	24.638	3.947
Capital Lease Obligations	-	14.200	34
Total Debt	114.600	45.789	3.981
Deferred Income Tax	398	-	479
Minority Interest	-	-	-
Other Liabilities, Total	48.174	9.466	15.247
Total Equity	114.949	34.995	162.000
Redeemable Preferred Stock, Total	-	-	-
Preferred Stock - Non Redeemable, Net	-	-	-
Common Stock, Total	38.624	5	0.7
Additional Paid-In Capital	-	24.028	42242.3
Retained Earnings (Accumulated Deficit)	79.436	13.733	121.282
Treasury Stock - Common	-	- 1.837	-
ESOP Debt Guarantee	-	-	-
Unrealized Gain (Loss)	- 3.242	-	- 188
Other Equity, Total	131	- 934	- 1.337
Total Liabilities & Shareholders' Equity	349.197	134.100	211.610
Total Common Shares Outstanding	4842.92	487	695.95
Total Preferred Shares Outstanding	-	-	-
* In Millions of USD (except for per share items)			

Source: Investing.com, 2018 Financials, Balance Sheet, per 30-Jun-2018

VII Declaration of originality

I hereby declare that the submitted thesis and the work reported herein was composed by and originated entirely by me without further assistance. Appropriate credit has been given where reference has been made to the work of others. The thesis was not examined before, nor has it been published. The submitted electronic version of the thesis matches the printed version.

Place, Date Hamburg, 11-Feb-2019

Signature 

VIII Declaration of consent

I hereby declare that I,

⊗ agree

○ not agree

that a copy of my bachelor thesis will be included in the library of the department; rights of third parties will not be infringed.

Place, Date Hamburg, 11-Feb-2019

Signature