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Intangible Asset Disclosure and Impact on Firm Value
Evidence from Swedish Listed IT Firms

Bachelor Thesis: Financial Accounting

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Abstract

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Title: Intangible Asset Disclosure and Impact on Firm Value - *Evidence from Swedish Listed IT Firms*

Background: In this changing economy, firms are gaining larger amounts of intangible assets. Along with these changes there are several challenges, including not only reporting these intangibles but also measuring them. Many of these intangible assets are treated as expenditures and are therefore not capitalized. As a result, a firm's external reporting might become less likely to fully mirror the firm's true value.

Purpose: Our study aims to examine whether a larger gap between market and book values of equity (also, hidden values) may explain a higher voluntary firm disclosure of intangible assets. We also aim to examine whether firms with higher disclosures of intangible assets might contribute to higher market values.

Methodology: By analyzing the annual reports from listed firms, we retrieve the total length of their disclosures of intangible assets. In order to test our first hypothesis and see whether hidden values impact the intangible asset disclosure, we use a model based on a study by Whiting and Miller (2008). To test the second hypothesis and examine the impact of the intangible asset disclosure on market capitalization, we use a model based on Abdolmohammadi's (2005) study. The study has a focus on Swedish listed IT companies, and studies the years 2010-2014.

Findings: When analyzing the impact of hidden values on the intangible asset disclosures, we find evidence suggesting a positive relationship. This indicates that firms which have more (identifiable and non-identifiable) intangible assets have a tendency to disclose more of these intangible assets. In the second analysis we find a positive relationship between intangible asset disclosure and market capitalization, suggesting that firms that disclose more about their intangible assets have higher market capitalizations.

Keywords: Intangible asset disclosure, intangible assets, hidden value, market capitalization, market value, Information Technology firms, Swedish firms, content analysis.

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1. Introduction

The nature of companies is rapidly changing along with the expanding knowledge economy and becoming less capital intensive. Instead of heavily relying on these capital intensive, tangible assets, firms are spending a larger portion of investments on a newer type of capital, namely digital capital (McKinsey & Company, 2013). This digital capital, as explained by McKinsey & Company (2013) consists of two forms: firstly, traditional assets such as servers, routers and basic internet software, which normally appear as capital investments in company reports. The second part of digital capital consists of intangible assets, stretching from big data analytic capabilities, to patents and brand equity. According to an article from Skroupa (2017), these intangible assets are becoming more important to investors and firms as their sizes in the balance sheet have also grown - from previously occupying 20% of the balance sheet to currently almost up to 80% in corporate firms.

As the economy is undergoing such a shift, the current accounting standards struggle with accounting for and developing methods for measuring these newer types of intangibles (i.e. ACCA, 2012, McKinsey & Company, 2013). Further, traditional accounting standards were developed to acknowledge and account for physical, fixed, tangible assets (i.e. Seetharaman and Saravanan, 2002; McKinsey & Company, 2013; Skroupa, 2017). However, as the emergence of digital assets in the knowledge company brings new types of value-creating assets, there is an increasing need for the traditional definitions and reporting standards to be refined (Govindarajan, Rajgopal and Srivastava, 2018). This emergence of a “mismatch” (McKinsey and Company, 2013) between the accounting of assets and the digital economy leads to for instance difficulties in properly valuing firms with large amounts of intangible assets. This mismatch is what some describe supposedly leading to an increased irrelevance of accounting (Govindarajan et al., 2018; Lev, 2018).

As companies are gaining more intangible assets, a challenge is not only reporting these intangibles but also measuring them (ACCA, 2012). The current accounting conventions, such as those from IFRS, treat company investments on intangible assets such that they are not capitalized, rather they are treated as expenditures. The impact of the reporting standards is that fewer intangible assets are reported and the investments are expensed leading to less net income. (Dinh, Sidhu and Yu, 2019; McKinsey & Company, 2013; Lev, 2018).

A study by Dinh, Sidhu and Yu (2019), found that hi-tech firms in particular suffer the consequences from these accounting standards, experiencing under-investment. Due to the inability to capitalize investments in for instance intangibles, the authors found, hi-tech firms have less incentives to make investments which become expensed. Further, Seetharaman and Saravanan (2002) highlight how technology firms in particular become affected by these mismatches in accounting standards. For these reasons, the external reporting might become less likely to fully mirror a firm's true value, as the reported earnings “no longer reflect enterprise performance” (Lev, 2018).

It is therefore of interest in our study to investigate how the voluntary external reporting of these intangible assets might impact the stakeholders' perceptions of the companies, and thus how they assign a value to the companies. In particular, our study chooses to investigate listed Information Technology (IT) firms in Sweden, with the rationale that intangible assets might be value drivers within this sector (i.e. Seetharaman and Saravanan, 2002; McKinsey & Company, 2016). Also, IT firms might have higher tendencies to investment in intangibles, for instance on software and development, customer relations and patents. Since not all these intangible assets may be capitalized, we believe that firms will compensate for the inability to capitalize investments by disclosing more information about these investments in the final notes sections of the annual reports. Therefore, we motivate the use of investigating annual reports.

1.1 Purpose

The first purpose of our study is to build upon the existing literature by investigating how the presence of intangible assets might impact firms' voluntary disclosures of intangible assets. To capture the values of these intangible assets, we follow previous literature and use a common proxy. Our chosen proxy includes measuring the difference between the market and book values of equity, also referred to as hidden values (i.e. Edvinsson, 1997; Brennan, 2001; Chen, Cheng, Hwang and Bontis 2005; Whiting and Miller, 2008; Wang, 2008; Haji and Mohd Ghazali, 2018). Previous studies discussing hidden values examine the relationships between the disclosure of intangible assets and hidden values, with a smaller sample size and with varying economies (i.e. Brennan, 2001; Whiting and Miller, 2008; Wang, 2008). Therefore, we hope to help expand the research within this area and gain more understanding of the disclosure of intangible assets by testing a large sample size and with data from a more recent time period. Further, we hope to understand more whether a larger gap between market and book values of equity (hidden values) may explain a higher voluntary firm disclosure of intangible assets.

The second purpose of the study is to examine how the intangible asset disclosure from listed companies may impact investors' perceptions of the firm values, and whether firms with higher disclosures of intangible assets might contribute to higher market values (also referred to as market capitalization). By testing this relationship, we hope to understand whether firms that voluntarily disclose *more* about intangible assets might gain higher market values, a result of more information being disclosed to the market.

Previous studies study a wide variety of industries, which therefore also brings our purpose to enhance the understanding of intangible assets within one specific sector. The Swedish IT sector in particular becomes interesting to investigate as it remains a strong driver of innovation within the Nordic countries and in Europe (Business Sweden, 2019). Further, Sweden's advanced economy and the advance of many technological firms also motivates our choice of studying Sweden and Swedish IT firms. We find few studies investigate specifically how Swedish firms disclose intangible assets (i.e. Vandemaele, Vergauwen and Smits, 2005; Vergauwen, Bollen and Oirbans, 2007). Therefore, we choose to achieve our

purpose by limiting our study to Swedish listed IT firms and studying their disclosures of intangible assets.

1.2 Findings

Our findings from our first hypothesis test show that hidden values have a positive and significant effect on the length of disclosure firms. Since the evidence we find does not contradict the first hypothesis, we therefore do not reject the hypothesis. This suggest that firms which have more (identifiable and non-identifiable) intangible assets also have a tendency to disclose more intangible assets.

In a second hypothesis test, we examine how the voluntary intangible asset disclosure from listed companies may impact the investors' perception of the firm value, and test whether firms that disclose more about their intangible assets have higher market values. Our regression results show that intangible asset disclosure has a positive effect on market capitalization. As a result, our evidence leads us to not reject the second hypothesis. Despite these findings, we hope future research may further investigate other explanatory variables to add to the current models.

1.3 Thesis contribution

Our findings from this study aim to have three main contributions. Firstly, we aim to contribute to the current international literature by further testing the models within the intangible asset and intellectual capital research. By testing the relationships between intangible asset disclosure and hidden values as well as market values within the IT sector more specifically, we help bring a more varied understanding of these relationships to the literature. This necessity to expand the research is something we justify since many of the studies, including those that are the basis for our own study, discuss the need to develop more ways to measure the value and disclosure of intangible assets (i.e. Brennan, 2001; Rodov and Leliart, 2002; Osinski, Selig, Matos and Roman, 2017; Haji and Mohd Ghazali, 2018). By testing models within this field, we are able to not only further develop them, but also test them to a larger sample size, to a more specific industry as well as with more recent data.

Secondly, we also contribute to studies of contextual analysis of Swedish listed IT firms. Previous research within the Swedish context of intangible asset has been rather small (i.e. Vandemaele et al., 2005; Vergauwen et al., 2007). Therefore, we hope our contribution of analyzing the disclosure of intangible assets from Swedish annual reports of Swedish listed IT companies can bring further insight into how intangibles are reported in practice.

Lastly, we also hope that our findings may provide a useful insight to practitioners within accounting in firms, who report intangibles in the annual reports. We hope our findings may help provide more incentives for firms to voluntarily disclosure more intangible assets to the market as these will help reduce the information asymmetry between the firm and investors. These main implications of our study will hopefully be valuable for listed firms which are in possession of different intangible assets.

1.4 Thesis outline

The thesis will have the following structure. This first chapter consists of an introduction to the field of study, including a discussion surrounding the problem we have identified. In the second chapter, we will briefly describe the Swedish context of which the firms within our sample operate. Chapter three, Literature Review and Hypothesis Development, will present and examine the current literature relating to studies on intangible assets and textual analysis. These studies will become the foundations for building our two hypotheses. Furthermore, the Data and Research Design chapter describes the models used to test our hypotheses as well as presenting our chosen sample and the data collection process. In chapter five, we will present the descriptive statistics and correlation results before discussing and analyzing our multivariate regression results for testing the two hypotheses. In the final chapter, we will present our final conclusions from the study, including a discussion relating to the purpose, our contribution and limitations.

2. Institutional background

2.1 The Swedish Context

2.1.1 Overview of the IT Sector

This study uses the GIC standard for the Information Technology Sector (GIC 45), which includes a broad category of industry groups such as Software and Services, Technology Hardware and Equipment and Semiconductors and Semiconductor Equipment. Some of the largest companies in Sweden within this GIC sector include for instance Telefonaktiebolaget LM Ericsson, Hexagon AB or Ework AB.

The Swedish IT sector has expanded throughout the years and remains a strong driver of innovation in the Nordic countries and Europe, placing second in the Global Innovation Index (Business Sweden, 2019). According to a report from Breman and Felländer (2014), the Swedish economy has entered a “second wave of a technological shift” including many structural changes to the economy to a broad variety of industries. Sweden has the highest R&D expenditure within Europe, spending roughly 3.3% of its GDP on R&D (OECD, 2019a). According to Business Sweden (2019), the Swedish capital Stockholm is the most “prolific tech hub in the world on a per capita basis” after Silicon Valley. A big area of growth within the technological sector is Fintech which accounts for a high number of private placements in Stockholm (Business Sweden, 2019).

The impact of this technological shift, according to Breman and Felländer (2014), is however that smaller companies are being outcompeted by larger competitors such as Skype or Spotify.

For these reasons, Sweden’s advanced economy and the advancement of technological firms make it an interesting country to explore. Further, the existence of many technology firms ensures a large pool of data to explore our research.

2.1.2 Overview of the Swedish Stock Market

Our study examines the intangibles of companies publicly listed in three Swedish stock markets. The largest stock market in Sweden is the Nasdaq Stockholm OMX Stock Exchange. The Nasdaq Stock Exchange includes three main listings, namely large cap, mid cap and small cap, categorized by firm market values (Nasdaq Nordic, 2019). Nasdaq Stock Exchange further includes the First North multilateral trading facility (MTF) for Nordic growth companies, where the regulations are less extensive than the other markets (Nasdaq Nordic, 2019).

The second stock exchange, Nordic Growth Market (NGM), includes stocks for companies listed in Sweden, Denmark, Finland and Norway, where the majority of the listed firms are growth companies (NGM, 2019). The third market is the Spotlight Stockmarket (previously Aktietorget) which includes both stocks and financial derivatives (Spotlight Stockmarket, 2019).

2.2 Reporting Intangible Assets in Sweden

This section will focus on the reporting of intangible assets for Swedish listed firms, due to our chosen sample. Since there are many different legal frameworks and accounting norms that exist regarding the reporting of intangible assets, this overview will briefly discuss the relevant principles.

Firstly, according to the International Accounting Standards Board (2016) an intangible asset is defined as “identifiable non-monetary asset without physical substance”, and is identifiable when it is “separable, or when it arises from contractual or other legal rights”. According to the International Accounting Standards (IAS) 38, these separable assets “can be sold, transferred, licensed, etc”. Moreover, intangible assets may include “computer software, licences, trademarks, patents, films, copyrights and import quotas”. (International Accounting Standards Board, 2016, IAS 38).

The rules regarding the reporting of intangible assets in annual reports vary and mainly depend on the size and nature of the firms¹. However, due to the harmonization of accounting standards in the EU, many Swedish accounting standards are converging to international standards (Marton, Lundqvist and Pettersson, 2016).

The two distinctions made within the accounting practice of intangible assets are between assets that are purchased and those that are internally generated. For internally generated intangible assets, the primary criteria for capitalizing the expenses for the assets include differentiating between the research and the development phases. According to IAS 38, all expenses related to research are not allowed to be capitalized, whereas the expenses related to development may be capitalized but only if the expense fulfills certain criteria. Internally generated goodwill does not meet the definition of an intangible asset, and therefore cannot be recognized. Goodwill that has been acquired through a business transaction, may on the other hand, be recognized. (International Accounting Standards Board, 2016, IAS 38).

¹ For consolidating firms, which are listed in Sweden, the required legal frameworks to follow include IFRS and additional rules from the Swedish RFR 1. Listed parent companies in Sweden are required to follow the laws concerning annual reports (ÅRL) as well as an harmonization of IFRS to the Swedish law, namely RFR 2. Swedish subsidiaries shall also follow ÅRL, but may also choose between RFR 2, the K2 framework or the K3 framework (depending on the size of the firm). Finally, those firms which are not part of any consolidation, may follow the ÅRL and the RFR 2 legal frameworks. (Marton, J., Lundqvist, P., & Pettersson, A. (2016). *IFRS - i teori och praktik* [IFRS - in theory and practice] (4th ed.), p.32). For further readings, see each respective regulatory framework.

3. Literature review and hypothesis development

3.1 Studies of intangible assets and value relevance

3.1.1 Intangible Assets

The discussions and literature surrounding intangible assets have long been varied and broad, with no clear consensus. The primary discussions within the literature (i.e. Wrigley, 2008; Wyatt, 2008; Sriram, 2008; Dahmash, Durand and Watson, 2009) and in practice (i.e. Govindarajan et al. 2018; Justenhoven, Loitz and Sechser, 2018; Skroupa, 2017) revolve around the difficulties in reflecting and reporting the actual values of firms due to these intangibles. The differences between the actual values of a firm (often in terms of market values) and reported book values give further indications of existing intangible assets. The literature therefore suggests the differences between the market value of a firm minus the tangible book values being equal to the intangible assets or intellectual capital (Rodov and Leliaert, 2002; Wrigley, 2008; Osinski et al., 2017; Castilla-Polo and Ruiz-Rodriguez, 2017; Haji and Mohd Ghazali, 2018). However, these differences in market and books values should only be viewed as a “proxy for intellectual capital” to explain the “importance of intellectual capital” (Rodov and Leliaert 2002, p.324) and thus should not be equal to intellectual capital nor intangible assets. In our study, we will follow a similar route as in the literature and use the market and book values as proxies for intangible assets and intellectual capital. In addition to intangible assets, there are also studies showing the existence of intangible liabilities such as poor corporate culture or negative environmental externalities (Haji and Mohd Ghazali, 2018; De Santis and Giuliani, 2013).

3.1.2 Distinction between intangible assets and intellectual capital

It is worth noting that the literature surrounding intangibles assets is closely related to the intellectual capital literature. As highlighted by Petty and Guthrie (2000), the differences between intellectual capital and intangible assets within the literature have been somewhat unclear. The two terms are often used synonymously but an important distinction made is that intellectual capital can be seen as a “subset” of intangible assets, rather than being the same (Petty and Guthrie, 2000). Therefore, we find difficulties arise when comparing the literature due to these mentioned variations definitions where they are often used as synonyms.

Firms’ expenditures in intellectual capital, as with intangible assets, are linked towards important sources of competitive advantages (Whitwell, Lukas and Hill, 2007; Osinski et al, 2017; Haji and Mohd Ghazali, 2018). The term “intellectual capital” was early used by the Swedish financial services company Skandia and by Edvinsson (1997). Intellectual capital replaced the term intangible assets, as was used a new way to explain and understand the coming era of knowledge as valuable resource for companies. The main components of intellectual capital include organisational (also structural) capital and human capital (Petty and Guthrie, 2000; Edvinsson, 1997). Later studies expand this definition to for instance

include further categories (i.e. Abdolmohammadi, 2005; Guthrie, Petty, Yongvanich and Ricceri, 2004)².

Although intellectual capital and intangible assets are not entirely the same, we will choose to study and focus on a broad definition of intangible assets. Therefore, we include internally and externally generated intangibles, including its subcategories (such as intellectual capital and goodwill) and including those assets that are identifiable and non-identifiable. This choice of a broad definition is consistent with authors such as Castilla-Polo and Ruiz-Rodriguez (2017) and will follow the entire study.

3.1.3 Value relevance of reporting intangible assets

The relevance of a firm's information becomes valuable when the information is tangent to investors' own valuations of the firms. The value that investors place on a firm is mirrored by the firm's stock price. Thus, market and book values tend to converge as the value relevance of accounting information increases. We find that the literature agrees on the challenges within the accounting profession, such as with determining the value relevance of intangibles (i.e. Wrigley, 2008; Wyatt, 2008; Sriram, 2008; Dahmash et al., 2009; Vafaei, Taylor and Ahmed, 2011). Some presented examples of these difficulties include reporting intangible assets which are not entirely fitting within the definition of an accounting asset, and thus not reported in the balance sheet. As a result, these intangibles that are not capitalized are more subjective and difficult to measure and therefore less relevant to investors. Further, even allocating values within and between the different intangibles is problematic (Wrigley, 2008).

Both Wyatt (2008) and Oliveira, Rodrigues, and Craig, (2010) pinpoint how the research regarding the value relevance of accounting information over the years gives mixed findings. According to the same authors, as intangible assets are increasing in scope, the unreported intangibles also increase. Therefore, due to less information being captured in the balance sheet, it is suggested that the financial reports resultantly become less relevant for investors. In Wyatt's (2008, p.217) literature review evaluating the value relevance of reliability information on intangibles, there is evidence suggesting that areas such as research and development (R&D), purchased goodwill and brand and customer loyalty are not reliably measured and are less value relevant in some contexts. Wyatt's review makes another concluding point regarding the difficulty of precisely determining the reliability and/or value relevance of for instance financial and non-financial information. Therefore, Wyatt calls for further research into value relevance and reliability to include for instance direct tests on reliability.

In a study by Oliveira et al. (2010), the value relevance of intangible assets and goodwill in the Portuguese stock market was analyzed. The study analyzes and compares the value

² Further categories within internal capital include for instance intellectual property and management processes, categories within external capital further include i.e. brands and customer relations and categories within human capital include for instance training and education (Abdolmohammadi, 2005; Guthrie et al., 2004). For further explanations on intellectual capital, see Abdolmohammadi (2005), Guthrie et al. (2004) or Oliveira, Rodriguez and Craig (2006).

relevance of listed firms before and after the adoption of IFRS and thus infer whether IFRS/IAS has had an impact on the value relevance. Using an accounting-based valuation model, their findings suggest that although the value relevance of intangible assets as a whole did not increase, there is evidence for the value relevance of goodwill and other identifiable assets. Similar to Oliveira et al, a study by Dahmash et al. (2009) tests the value relevance of reported goodwill and identifiable assets but additionally analyzes the reliability of these assets. Although the study studies Australian firms, using Australian GAAP, their findings are similar to those of Oliveira et al., where they conclude that goodwill and identifiable intangible assets are value relevant. However, the evidence from Dahmash et al. suggests that the reporting of these various assets are not reliable, as “goodwill tends to be reported *conservatively*”, while identifiable assets tend to be “reported *aggressively*”. Therefore, Dahmash et al’s (2009) findings may show some congruence to Wyatt’s previous findings on the reliability of the reporting of for instance purchased goodwill. Ji and Lu’s (2014) more recent study on Australian firms found that intangibles are value relevant (both in pre and post adoption of IFRS), and that more reliable information leads to higher value relevance. However, compared to the findings of Dahmash et al. and Oliveira et al, Ji and Lu (2014) found that the value relevance has declined post IFRS, something that is possibly due to the “failure to recognize” (p.211) internally generated intangibles.

Moreover, the value relevance of intangibles also appears to be influenced by various external factors. For instance, Ali and Hwang (2000) in an early study find how the value relevance of financial statements vary between countries and those countries with more market-oriented financial systems yield higher value relevance of reporting (and vice versa). Wyatt (2008) also finds that reporting on research and development (R&D) and goodwill are value relevant “in countries where management has limited discretion to report more precise indicators of future benefits”, indicating more country-wide differences due to reporting standards and conventions. In an earlier study by Oliveira, Rodriguez and Craig (2006), they find that factors such as size, industry and type of auditor might influence the disclosures of intangibles. Abdolmohammadi (2005) studies the intellectual capital disclosure within 58 Fortune 500 companies by categorizing the disclosure of intellectual capital into its various components using a content analysis. Abdolmohammadi finds differences in reporting between “old” economy sectors and “new” economy sectors, where newer economy sectors (i.e. IT companies) in general exhibit higher disclosures of intangible assets. Further, Abdolmohammadi findings reveal that firms with a higher disclosure of intellectual capital have a higher market value.

3.2 Models measuring “hidden values”

An area of research for quantitatively measuring intangible assets and intellectual capital centers around the term “hidden values” or invisible values. The term “hidden values” was used by Skandia and further discussed by Edvinsson (1997) as a notion for measuring and understanding intellectual capital. Such a hidden value is conceptualized as the difference between the market value of equity and book value of equity of a firm (i.e. Edvinsson, 1997; Brennan, 2001; Whiting and Miller, 2008; Haji and Mohd Ghazali, 2018). Brennan (2001)

makes an important contribution to exploring the concept of hidden values by comparing the market-to-book values of 11 listed companies in Ireland, as an indirect way to measure intellectual capital (and intangible assets). The findings reveal large gaps between market and book values of firms, however the disclosure of intellectual capital in annual reports was fairly small. In the cases where intellectual capital was reported, Brennan (2001) finds that the reporting is mostly qualitative.

Further studies use a similar framework as Brennan to measure these intangible hidden values, by measuring the market to book values. Whiting and Miller (2008) provide a significant study to test this framework, using a larger sample size than Brennan and testing publicly listed firms in New Zealand. Their sample size is however rather small, at 70 observations. Whiting and Miller's findings are multiple. Firstly, the hidden values of firms might not entirely be due to the sole presence of intellectual capital, but growth expectations of the firms might also have an impact on the market-to-book values. Further, the hidden values have a significant positive relationship to the intangible asset disclosure, but only for firms reevaluating book values ("re-valuating firms"). Their study also brings a further discussion of reliability tests of the figures in the annual reports and evaluates the underlying values of book value. They also discuss the impact of the underlying accounting standards and policies on the reporting. Finally, a recent study from Haji and Mohd Ghazali (2018) examines hidden values and their impact on firm performance on the largest 300 Malaysian companies. Using hidden values as a proxy for intangible assets and using financial ratios for measuring firm performance (i.e. ROA, ROE, net income), their findings indicate that hidden values "have a significant and positive impact on firm performance" (p. 56).

3.3 Studies on Content analysis

Throughout the years there have been several studies examining the effect of companies' disclosures of information in their reports, using various methods (i.e. Li, 2008; You and Zhang, 2009; Miller, 2010; Chung, Hrazdil, and Suwanyangyuan, 2016). One approach to evaluate the disclosure of information is using the content analysis, which is often used in the field of intellectual capital and intangible assets (i.e. Guthrie et al., 2004; Bellora and Guenther, 2013; Castilla-Polo and Ruiz-Rodríguez, 2017). The content analysis method includes "codifying qualitative and quantified information into pre-defined categories in order to derive patterns in the presentation and reporting of information" (Guthrie and Petty, 2000, p.244). Further, Castilla-Polo and Ruiz-Rodríguez (2017) point to the coding phase as a fundamental part of the analysis. They present different "accounting rules" in conjunction with the analysis, including "the presence (or absence) of the information, the frequency with which the information appears and the order in which the information appears" (Castilla-Polo and Ruiz-Rodríguez, 2017, p.511). The different approaches they suggest, show the flexible possibilities of using the method.

In the literature surrounding content analysis, the complexity and readability of the report has often been of focus. When studying the readability of annual reports, Li (2008) makes two conclusions showing the relation between the complexity of the annual report and the firm

performance. By using the Fog index³ and the reporting length as measures of readability, the results show that poor firm performance is associated with a lower degree of readability while persistent earnings are associated with a higher degree of readability, indicating a clear association between the performance of the company and complexity of the report.

A similar study, by Miller (2010), examines the complexity of 10-K reports and the resulting impact on investors trading behavior. By measuring the complexity using the reporting length and the Fog index, Miller concluded that a higher level of complexity in the reports had a clear impact on trading activity by leading to a lower overall trading. You and Zhang (2009) provide an additional study that examines the effect of reporting complexity in 10-K reports. While You and Zhang's study focuses on the reporting complexity, their study differs from previous studies as they measure the complexity of the reports using a "word-count proxy" (p.561). Their findings indicate that investors tend to underreact to the information presented in the 10-K reports if it is too complex. Further, the results suggest that the level of complexity in the information provided in the company report has a clear impact on the investors' perceptions.

Several studies presented previously in this section showed results pointing to a negative relationship between the reporting length and the economic outcome of the company. Yet, we find there is also literature suggesting opposite results. In a study of Canadian companies' annual reports, Chung et al. (2016) investigate the association between the extent of the disclosure and the stock price. Their findings suggest a positive relationship between the reporting length with for instance higher trading activity. Moreover, the authors suggest an overall high quality in the financial reports and find that "the quality and integrity of reporting has never been higher" and that annual reports may not, in fact, be too complex for the users. (Chung et al., 2016, p.123).

Moreover, the findings of Whiting and Miller (2008) provide additional evidence of the positive impact that disclosure of intangibles might have on a firm. By performing a content analysis, Whiting and Miller (2008) present three measures of IC disclosure; IC no, IC score, IC percent⁴. They examine the association with hidden values and IC no and find a positive association, indicating that higher hidden values might bring higher disclosures of intellectual capital. Additional analysis included an interaction term to control for growth expectations, indicated that only firms that reevaluate their book values exhibit a positive relationship between these variables. Abdolmohammadi (2005) on the other hand, analyzes the extent of companies' IC disclosures and the effect on market capitalization. With a content analysis Abdolmohammadi measures the IC disclosure by the frequency with which different items of intellectual capital is disclosed in the annual report. The findings indicate that the reporting

³ The Fog Index is based on "the number of words per sentence, and the number of syllables per word" (Li, 2008, p.222).

⁴ The IC no is defined as total number of sentences included in the disclosure. The IC score is calculated by giving different weights to the quantitative and qualitative disclosures. The IC percent is defined as the percentage of sentences that includes IC disclosure by the total amount of sentences in the annual report. (Whiting and Miller, 2008).

disclosure is positively associated with the market capitalization, therefore providing incentives for firms to disclose information relating to these intangible assets.

Further, Wyatt's (2008) literature review suggests that providing information about intangible assets, even internally generated, could be relevant for the users of the financial reports, regardless if the reported value is correct. As the disclosure of such intangibles reveal the existence of the underlying assets, it could be "pointing investors in the direction of additional relevant information sources" (Wyatt, 2008, p.247), and thus provide relevance beyond the value reported in the financial report. Despite this, in a literature review by Oliveira et. al (2006, p.13), the authors explain that intangibles and intellectual capital have often been underreported in firms. Oliveira et al. (2006) find however that firm sizes, industries and types of auditors might have positive effects on firm disclosures of intangibles.

3.4 Hypothesis development

The literature previously presented indicates an association between the disclosure of information and the value relevance of intangible assets. However, the literature does not agree whether this relationship is negative or positive. Li (2008) indicated that a poor firm performance resulted in a lower readability and that persistent earnings were connected to higher readability. The findings from Miller (2010) and You and Zhang (2009) show that a longer and more complex report has a negative impact on investors and the overall trading activity. However, Wyatt (2008) finds that the disclosure of intangibles could have a positive impact on the user of the report, even if reported content is of lower quality. Furthermore, Chung et al. (2016) shows results indicating a positive relationship between the extent of the disclosure and the trading activity of the stock.

Further studies on value relevance by Wyatt (2008) and Dahmash et al. (2009), suggest the reporting of goodwill in particular may not be accurately reported and therefore may not be as value relevant to investors. In contrast, studies from Vafaei et al. (2011) and Oliveira et al. (2010) find in fact that intellectual capital disclosure is value relevant to investors, and therefore positively associated with market price. Further, Oliveira et al. reveal that the value relevance of intangible assets and goodwill specifically have increased. Although the reporting of specific types of intangibles might not always be certainly reliably reported by firms, there is still an indication suggesting an overall value relevance of intangible assets to users. Therefore, these findings from the literature gives us the indication that using the stock price may be useful and value relevant for measuring market values, and thus hidden values.

From our literature review, we find there is also indication that the disclosure of intangibles might be related to the size of the underlying intangible assets (or hidden values). Whiting and Miller's study (2008), which builded upon Brennan's (2001) earlier study, has been important for investigating the disclosure of intangibles and how these might be related to hidden values. Vergauwen et al. (2007) find that with firms which possess more intellectual capital also have a higher disclosure of intellectual capital. Yet, these authors also find that the reporting of intangibles and intellectual capital specifically is often rather small.

Therefore, we choose to further test this relationship between the disclosure of intangible assets and hidden values to a specific industry and country and see to what extent it may hold. Based on these findings, we formulate our first hypothesis:

H1: Firms with higher hidden values have longer text disclosures of intangible assets

We hypothesize that the firms in this study with a larger difference between market value and book value (a higher hidden value), will have a longer text disclosure of intangible assets. A longer disclosure implies *more* disclosure of text, such that there is a higher number of words. We further hypothesize that this is because firms that have more to disclose, will in fact disclose more intangible assets. Also, firms which cannot capitalize all intangibles, may choose to compensate by disclosing more about these. We believe that a more transparent and informative disclosure might lead investors to for instance make better valuations of these intangible assets and thus value these companies higher.

Furthermore, other areas within the research explore how the market performance of the firm might be influenced by the disclosure of various intangible assets. Abdolmohammadi (2005) and Chen et al.'s (2005) findings reveal how the disclosure of intellectual capital has had a significant impact on the market capitalization of the firm, and also may be an indicator of future firm performance. According to Abdolmohammadi, these findings suggest there are incentives for firms to voluntarily disclose more intangible assets and achieve a higher market value. Abdolmohammadi also reported how the disclosure between different sectors varies. Chen et al.'s study on Taiwanese firms finds that "investors still grasp the invisible value of intellectual capital" even if the accounting standards may limit the recognising of intellectual capital (p.174). The findings from Haji and Mohd Ghazali (2018), also suggest that reported intangible assets may positively impact firm performance.

Moreover, examining the quality and quantity of firms' disclosures of intellectual capital, Bellora and Guenther (2013) find that size of a firm might have an impact on the quality of disclosure. Oliveira et al.'s (2006) earlier study finds that firm size has positive impact on the disclosure of intangible assets. Therefore, examining to what extent the size of a firm might be influenced by the disclosure of a firm's intangible assets becomes of interest for this study. Therefore, we choose to explore another area of intangible asset disclosure and study how the disclosure of reported intangible assets may influence firm sizes, measured as market capitalization. These findings lead us to formulate our second hypothesis:

H2: Firms with longer text disclosures of intangible assets have higher market capitalizations

We hypothesize that the firms in this study with a longer text disclosure of intangible assets will be larger in size (measured terms of market capitalization). We suspect not only that larger firms will have more intangibles to report, but also that larger firms with more intangibles will allocate more resources to reporting these as the intangibles become more important to the firm.

4. Data and Research Design

4.1 Models for testing hypothesis

In order to test the two hypotheses of the thesis, we will perform multivariate regressions in STATA. We will use two different models, one for each hypothesis. The models and the variables will be described in more detail below and will form the basis for our results and analysis.

4.1.1 Model for Hypothesis 1

To test our first hypothesis and capture the “hidden value” we will perform a multivariate regression on the same model as Whiting and Miller (2008), a later adaption of Brennan (2001). The original model by Whiting and Miller, measuring the intellectual capital (IC) disclosure as the dependent variable and hidden values and the interaction term as the independent variables: $IC\ Disclosure = \alpha + \beta_1\ hidden\ value + \beta_2\ Interaction + \varepsilon$

A subset of this original model by Whiting and Miller therefore leads to our first model, model 1, which includes the disclosure of intangible asset instead of intellectual capital:

$$\text{Model (1): } IAD_{it} = \alpha + \beta_1 HV_{Diff, it} + \beta_2 HV_{Diff} \times P/E_{it} + \varepsilon_{it}$$

Intangible Asset Disclosure (IAD) is the dependent variable denoting the firm’s level of intangible asset disclosure. In our study, IAD is derived from the data obtained from the content analysis where we use the word count as a method. The value for IAD will be the total number of words included in the disclosure. Model 1 uses the hidden value as a proxy for measuring intangible assets (and intellectual capital), a proxy which previously mentioned is commonly used within the literature. The independent variable HV_{diff} is the difference between the market value and book value of equity for each firm. It is worth noting that independent variable hidden value takes two variations in Whiting and Miller’s (2008) study, namely HV_{Diff} and HV_{ratio} , where HV_{Ratio} equals to: (Market value of equity – Book value of equity) / Market value of equity. However, we choose to omit this variation of the HV variable in this study as Whiting and Miller (2008) found “no significant relationship” (p. 38) to the intangible asset disclosure. Furthermore, α is the constant for the model and β_1 and β_2 are coefficients which will be produced by the regression, ε is the error term and i is denoted for firm i and t is year t .

Whiting and Miller (2008) point to the factor of investors’ growth expectations as a possible flaw in the explanatory power of the hidden value. Therefore, to control for the effect that these growth expectations might have on the hidden value measure, we will use the company P/E ratios, where P is the company stock price at balance sheet day and E is the earnings per share on the balance sheet day. The P/E ratio will be used as a factor to adjust the independent variable HV_{Diff} in the data. This factor adjustment variable is part of the $\beta_2 Interaction$ term of the above model from Whiting and Miller. For more detailed explanation of the variables included in the model, see table 1.

Model 1 will primarily be analyzed with a multivariate regression in Chapter 5.

Table 1: Explanations of variables

Variables	Definition
<i>IAD</i>	Intangible asset disclosure (also denoted IA Disclosure), is the firm's level of intangible asset disclosure. The variable is measured as the total number of words included in the disclosure.
<i>HV_{Diff}</i>	The hidden value difference, is calculated as the market capitalization of a firm minus the book value of equity of a firm.
P/E	The price-to-earnings ratio of a firm. The measure is calculated as the firm stock price divided by the firm earning per share.
<i>LogMC</i>	The natural logarithm of firm market capitalization, where the market capitalization is calculated as the number of shares outstanding multiplied by the stock price.
<i>ROA</i>	Return on asset, measured as a firm's net income for the period divided by its total value of assets.
<i>ROADiff</i>	The difference between firms' return on asset (ROA) with its industry ROA. The industry ROA is calculated as an average from all the sampled firm ROA for each year.

Note: Table 1 presents the definitions and explanations of the dependent and independent variables used in the models within this study.

4.1.2 Model for Hypothesis 2

To test the second hypothesis, regarding the level of disclosure of the intangible assets and the market capitalization of a firm, we choose to use the model proposed by Abdolmohammadi (2005) and perform a multivariate regression.

$$\text{Model (2): } \text{LogMC}_{it} = \alpha_0 + \alpha_1 \text{IAD}_{it} + \alpha_2 \text{ROADiff}_{it} + \varepsilon_{it}$$

The dependent variable LogMC is the logarithm of market capitalization. The logarithm of the market values will be used to better compare values for different sizes. The variable IAD is, as in model 1, the total number of words included in the intangible asset disclosure. This model by Abdolmohammadi, however, uses IAD as an independent variable. The independent variable ROADiff is calculated from the difference between the firm's return on asset (ROA) and its industry average. The term α_0 is the constant for the model and α_1 and α_2 are coefficients which will be produced by the regression. ε is the error term and i is denoted for firm i and t is year t .

The purpose of using the model proposed by Abdolmohammadi (2005), is to examine the association between the disclosure of intangibles and firm size, measured as market capitalization which relates to our second purpose. Moreover, the author suggests there are other variables affecting the market capitalization and includes two control variables in the

model, namely the book value of equity and the difference between the firm ROA and the industry average ROA (denoted ROADiff in the model)⁵. As a proxy for the industry average ROA, we will use the average calculated from all firm ROA in our sample. The average ROA will be calculated for each year separately to adjust for new companies in the sample and to adjust for any industry changes in ROA. For more detailed explanation of the variables included in the model, see table 1.

Model 2 will be primarily be analyzed with a multivariate regression in Chapter 5.

4.2 Sample Selection

The dataset in the study consists of Swedish listed companies, which fall under the GIC Sector category code 45, Information Technology. The majority of companies included in the sample are listed on the Nasdaq stock market. Our sample also includes some companies from the NGM and Spotlight stock markets as we choose to not limit ourselves to one particular market. Choosing several markets should not impact our data as these listed companies operate under similar accounting regulations. The companies included in this sample were obtained from the database Compustat, showing only listed companies. Although many studies examine several sectors and industries (Brennan, 2001; Abdolmohammadi, 2005; Sujan and Abeysekera, 2007; Whiting and Miller, 2008; Haji and Mohd Ghazali, 2018), our study will investigate the impact of the disclosure of intangible assets within the IT sector and thus we aim to gain more understanding of how this specific sector is affected. Further, we motivate the use of only one sector from the discussion of Whiting and Miller (2008, p.42), stating that “future research could be limited to companies in the same sector” as, for instance share prices, would be “equally affected by exogenous factors”.

The companies included were based on a list received from the database Compustat and sorted by ISIN codes. The sample includes companies that were or became listed during the period 2010-2014. Companies that were listed only partially during this time period were also included (i.e. listings starting from 2012-2014 or 2010-2011), this enables us to keep more observations in our sample. We only included observations in which companies were listed before or starting the new financial year, in order to ensure that the annual reports were only relevant to the period of a company being listed and thus ensuring better comparability within our data. Moreover, there were some companies in the dataset that had more than one observation for the same year, either by providing financial data beyond the balance sheet day or because they changed their balance sheet day. As we only wanted one firm observation per year, we eliminated those observations that were not based on the balance sheet day.

⁵ Abdolmohammadi's (2005) original model uses a third control variable, the logarithm of the book value of equity (logBV). Abdolmohammadi's correlation results (p. 410) find that LogBV has a negative and weak correlation with LogMC and therefore LogBV is included in the regression model. However, as our correlation results show a strong positive correlation between LogBV and LogMC, of almost 0.9, there is an indication of multicollinearity between the two variables. Therefore, we choose to omit the independent variable LogBV value from our regression model to avoid any misleading regression results.

Further eliminations to our dataset include removing observations where the book value of equity of the firm is negative, as consistent with previous studies (Chen et al., 2005; Oliveira et al., 2010). After eliminating the company observations which did not fulfill our criteria, our final sample resulted in a total of 62 listed companies in Sweden within the Information Technology sector giving a total amount of 284 observations. The sample selection process is shown in Table 2 below.

Table 2: Sample selection process

Selection Criteria	Firms	Observations
Swedish listed IT-firms (GIC 45) 2010–2014	108	445
Not listed before beginning of the year	(45)	(152)
More than one observation for the same year	(0)	(4)
Observations with negative book value	(1)	(5)
Final Sample	62	284

Note: Table 2 depicts the sample selection process and shows the various eliminations that were made after our initial sample selection. The number of observations after eliminations become 284 in total, after originally starting at 445 observations.

4.3 Data Collection

Our data collection for our sample consists of two main sources, namely from annual reports and from financial data obtained from various databases.

4.3.1 Annual Reports

The primary source of data for analyzing the disclosure of the intangible assets was obtained by downloading the annual reports from the 62 companies. The use of annual reports as the primary source of data is supported by the literature, suggesting the annual report is a valuable and useful source of corporate information (Botosan, 1997; Guthrie and Petty, 2000; Chung et al., 2016). The annual reports were primarily downloaded from each company’s website. In the cases which the annual reports were not publicly available from the websites, the reports were downloaded from the Retriever Business database. Since a majority of the companies only provided annual reports in Swedish, this led us to choose to only download annual reports in Swedish for our analysis, even when English reports were available. A reasoning for this is to be consistent when performing the content analysis.

For each annual report corresponding to each observation, we performed a content analysis. In order to perform the content analysis, we chose to analyze only portions of text under the “notes” sections in the annual reports⁶. Further, we chose to analyze only the portions of texts within the notes section which relate to intangible assets. Therefore, all text under the headers relating to intangible assets, for instance “goodwill” or “capitalized expenditures for development” were extracted in order to perform the content analysis and basis for our data

⁶ For further understanding of guidelines for the “notes” section (“noter” in Swedish) of the annual reports in Sweden, see the regulatory framework BFL 6 ch 5 § (Swedish).

for the dependent variable intangible assets disclosure (IAD). After each portion of text was extracted, we conducted a word count of the number of words in the extracted text and recorded the data for all observations. The use of word count as a measure of length of the report has been used by previous studies (Li, 2008; You and Zhang, 2009; Chung et al., 2016), and will also be used for this study as a measure of the length of intangible asset disclosure. The word count will be used as the value of IAD for each observation in the analysis.

The main difficulties we observed whilst performing the content analysis included the variations of the text for the content analysis. Whilst many firms follow a very similar structure of the notes section of the annual reports, there were cases where text pertaining to the intangible assets was intertwined with text regarding non-intangible asset information. Also, we found that there were many different variations of text regarding the intangible asset disclosure. To ensure accuracy and comparability between data we had a standard procedure of including all text related to any intangible assets and we excluded any portions of text which were not explicitly related to intangibles. Where information regarding intangibles was provided in a table with mainly numerical details, these were not counted as continuous text, and therefore not included in the word count.

4.3.2 Financial Data

A second part of our data collection consists of the financial data necessary for testing the models. Using the database Compustat and retrieving the ISIN codes, we obtained the remaining data for each observation regarding the values for the companies' book values, share prices, P/E values, as well as firm ROA. As the market values were not provided by the database, these values were instead calculated by multiplying the data obtained for share prices by the data obtained for the number of shares outstanding. For the few observations where there was missing data from Compustat, such as share prices, values for net income or shares outstanding, we obtained the necessary values from the annual reports or from Nasdaq, Spotlight Stock market, or Nordic Growth Market (NGM). The industry ROA was also calculated as an average of all individual firm ROA per year within the sample.

In order to make a more meaningful comparison between the book values and market values, we choose to follow the methodology of Whiting and Miller (2008) (or for instance Chen et al., 2005) and use the values from the last day of the financial year (typically December 31st). Furthermore, we will use the share prices, and market values from the end of each firm's financial year.

We acknowledge the choice of using stock prices from the end of the financial year comes with the disadvantage with of the price not directly reflecting the stock market's reactions to the financial reports. Although it is difficult to generally capture investor's perceptions, an alternative method to capture the market reaction is used by for instance Oliveira et al (2010) or Vafaei et al. (2011) and uses stock prices from three months after the financial year. We however choose to use market values from the same time as book values for the purpose of

giving a better comparison of the two values and remaining consistent with Whiting and Miller's study. Further, since our study will take data from several years, a longitudinal study, investors' perceptions might be reflected in price levels in the following years.

4.3.3 Evaluation of data

The majority of the data included in the study was collected from the S&P database Compustat. As we received the data directly from the database, there may be a possibility that some values are incorrect. Given the size of the data included, it would be impossible to control for every value in order to ensure that they are correct. However, as the database is known for providing accurate financial data, we can consider the data collected from the database accurate. Since not all financial data was available through Compustat, we had to retrieve the remaining data from other sources. To ensure that the any additional data retrieved was reliable, we mainly turned to the companies' annual reports as they provide data directly from the company. As the stock price is not usually provided in the annual reports, we turned to the websites of the stock markets Nasdaq, NGM and Spotlight where the company was listed in order to retrieve the missing stock prices.

5. Results and Analysis

5.1 Descriptive Statistics

In Table 3 the descriptive statistics of both models is presented, where the total number of observations is at 284. As the tables shows, the intangible asset disclosure (IA Disclosure) ranges between 0 and 1335, has a mean of around 383 and a high standard deviation of around 282.59 words, which suggests a high variation amongst firms' disclosures of intangible assets. Furthermore, there were some companies with a market value lower than the book value of equity. Therefore, the hidden value difference ranges between -205.65 and 142,829. Moreover, as the interaction variable includes multiplying the independent variable with the P/E value, it has a much larger range and is presented in the table below. As the values for market capitalization and book value are presented as logarithmic values, the true values for the variables will differ from those shown in table 3. Moreover, the table shows that the variable ROADiff has a mean close to zero ($4.62e-18$) and that it ranges between -1.077 and 0.595.

Table 3: Descriptive statistics

Variables	Observations	Mean	Std. Dev.	Min	Max
IA Disclosure	284	383.4296	282.5905	0	1335
Hidden value diff	284	2968.7830	14596.1600	-205.6478	142829
P/E	284	18.6305	132.7445	-632.8000	1841.4330
LogMC	284	2.3604	0.8957	-0.1675	5.4581
ROADiff	284	4.62e-18	0.2540	-1.0767	0.5952

Note: Table 3 shows the outputs from the descriptive statistics for models 1 and 2. The descriptive statistics include the mean, standard deviation and range for all variables in the models. See table 1 for more detailed descriptions of the variables. The number of observations is 284.

5.2 Correlation analysis

Our analysis of the data also includes a correlation analysis of each variable in each model. The purpose of testing correlations between each variable in each model is to test for any potential multicollinearity, which might be indicated by strong correlations between variables. Tables 4 and 5 present the correlations for the variables included in model 1 and model 2 respectively. For the first model we can see that the variables IAD and hidden value have a weak and significant correlation between each other. This weak correlation indicates a lower risk for multicollinearity between the variables, and therefore we choose to include the hidden value variable in the regression. In table 5, for model 2, we find however higher correlation values.

Table 4: Matrix of correlations for model 1⁷

	IA Disclosure	Hidden value diff	PE
IA Disclosure	1.0000		
Hidden value diff	0.2694*	1.0000	
PE	0.1927*	0.3541*	1.0000

Note: Table 4 shows the univariate matrix correlation results for model 1. See table 1 for more detailed descriptions of the variables. * indicates statistical significance at 5% level.

Table 5: Matrix of correlations for model 2

	LogMC	IA Disclosure	ROADiff
LogMC	1.0000		
IA Disclosure	0.5750 *	1.0000	
ROADiff	0.4223 *	0.1262 *	1.0000

Note: Table 5 shows the univariate matrix correlation results for model 2. See table 1 for more detailed descriptions of the variables. * indicates statistical significance at 5% level.

5.3 Effects of hidden values on Intangible Asset Disclosure (H1)

We first choose to test the model from Whiting and Miller (2008), which includes the total value of intangible asset disclosure and the hidden value difference. The output from the regression is shown in Table 6, and the results indicate that both hidden value difference and the control variable showed a high level of significance (at a 1% level). With a coefficient of 0.010 the results suggest that the variable hidden value difference is significantly positively associated with IA Disclosure. This finding thus indicates that hidden values have a positive impact on the disclosure of intangible assets.

Moreover, the control variable in the model, which included each firm's P/E value, was added to the model to see what effect growth expectations might have on the hidden value measure. With a negative coefficient of -0.0001 at a 1% significance level, this result suggests there is a significant negative association between the control variable and the IA Disclosure.

When comparing the results from our first regression with those from Whiting and Miller (2008), we can make a few observations. Firstly, the independent variable hidden value difference, is positively associated with IA disclosure. The association is consistent with the results from Whiting and Miller, where the positive association between the hidden value difference and the IC disclosure⁸ was found significant at a 5 percent level. Our results,

⁷ Due to the non-normal nature of the data, the Spearman correlation test will used, as consistent with Whiting and Miller (2008).

⁸ Whiting and Miller (2008) used three measures of IC disclosure when studying the relationship with the hidden value. Although their measures of IC disclosure are not entirely the same as our measure of IA

however, provide a more significant association between the variables (1% significance). Although it may be difficult to precisely pinpoint reasons for our higher significance, a potential explanation could be due to our choice of studying one specific sector.

Table 6: Multivariate regression results for model (1)

Variables	Coefficient	t-stat	sig.
hidden value Diff	0.0102***	6.9190	0.0000
hidden value Diff x P/E	-0.0001***	-6.9310	0.0000
Constant	364.9734***	23.0980	0.0000
Observations	284		
R-squared	16.2%		
Adjusted R-squared	15.6%		
Model F-statistic (sig.)	25.57 (0.0000)		

Note: Table 6 shows the multivariate regression results for model 1 using the sample of 284 observations. See table 1 for more detailed descriptions of the variables. *** indicate statistical significance at 1% level. Robust standard errors in parentheses.

Regression model: $IA\ Disclosure_{it} = \alpha + \beta_1 HV_{Diff, it} + \beta_2 HV_{Diff} \times P/E_{it} + \epsilon_{it}$.

Moreover, when looking at the output for the control variable we find different results from Whiting and Miller. The authors indicated that adding the interaction term to the model increased the explanatory power but lowered the significance (p. 38). Adding the interaction term to our model did not lower the significance level at 1 percent, rather, it increased the overall explanatory power of the model⁹.

Further, the interaction term has a negative effect on IAD, compared to Whiting and Miller's positive coefficient. An explanation for this difference in sign could consequently be due to using the P/E factor as a control variable. It is possible that some of these differences could be attributed to the different industries in our studies. As previously mentioned, Whiting and Miller study a multitude of sectors, whereas we only choose to study the IT sector. The impact of studying only one sector could possibly explain the different P/E values and contribute to these differing results. Moreover, some areas of research provide insight that industry differences could impact the quantity of the disclosure (Bozzolan, Favotto, and Ricceri, 2003; Oliveira et al., 2006; Bellora and Guenther, 2013). Other differences might also be contributed to our larger sample size or differences in the time period of the two

disclosure, we use the measure most similar to our own, namely the IC No. The measure IC No is calculated as the total number of sentences which include IC disclosure.

⁹ Whiting and Miller provide a comparison of their regression model output to another regression excluding the interaction term for the hidden value difference. In appendix 1, we provide a similar regression output by excluding the interaction term.

samples. Whether there is an underreporting of intangible assets, as suggested by prior literature, could be hinted by the significant constant term in the regression but it is difficult to determine without further analysis.

To summarize the result from the analysis testing hypothesis 1, the evidence supports the first hypothesis. Therefore, by not rejecting the first hypothesis we can infer that a larger difference between the market value and book value of equity (hidden value) has an impact on the disclosure of intangible assets.

5.4 Effects of Intangible Asset Disclosure on Market Capitalizations (H2)

For our test of the second hypothesis, regarding how the intangible asset disclosure impacts the market capitalization of a firm, we use model 2, proposed by Abdolmohammadi (2005). From our multivariate regression on the model, presented in Table 7, we gain a number of findings.

Firstly, for variable IA Disclosure, of which is the number of words disclosed, the regression results give a positive coefficient of 0.0016, which is statistically significant to the model at a 1% level. Moreover, the independent variable ROADiff has a positive and significant coefficient of 1.0370 to the market capitalization in the model. These regression outputs thus confirm that the disclosure of intangibles has a positive impact on the firm's market capitalization. Lastly, the coefficient for the constant has a positive value of 1.7291 and is significant to the model, implying there may be more unidentified variables that may help explain market capitalization.

Table 7: Multivariate regression results for model (2)

Variables	Coefficient	t-stat	sig.
IA Disclosure	0.0016***	9.1770	0.0000
ROADiff	1.0370***	6.7500	0.0000
Constant	1.7291***	22.5130	0.0000
Observations	284		
R-squared	40.0%		
Adjusted R-squared	39.6%		
Model F-statistic (sig.)	84.34 (0.0000)		

Note: Table 7 shows the multivariate regression results for model 3 using the sample of 284 observations. See table 1 for more detailed descriptions of the variables. *** indicate statistical significance at 1% level. Robust standard errors in parentheses.

Regression model: $\text{Log}MC_{it} = \alpha_0 + \alpha_1 IAD_{it} + \alpha_2 \text{ROADiff}_{it} + \epsilon_{it}$.

We can also compare the results from our model to those results of Abdolmohammadi's study. In contrast to our results, Abdolmohammadi finds that ROADiff was not significant in explaining firms' market capitalizations. Further, Abdolmohammadi chooses to include book values in the regression model (unlike our model) but finds this is not significant with explaining market capitalization. Abdolmohammadi's coefficients for IC Disclosure give a highly significant, positive coefficient (0.04), which is similar to our own positive significant results. Both our and Abdolmohammadi's results can therefore infer that a higher disclosure of intangible assets may lead to a higher market capitalization. However, Abdolmohammadi finds that only the variable IC disclosure has a positive impact on the market capitalization, whereas we find ROADiff is also significant in explaining market capitalization. Despite this, Abdolmohammadi highlights that the high significance for the constant in the model may indicate more missing variables from the model (p. 410). We can make a similar claim from our results and suggest that our highly significant constant may indicate the presence of missing variables, as also the case with the results from model 1.

The results from our study pose similar findings regarding the relationship between market capitalization and the disclosure of intangible assets. The differences between our results, however, may be contributed to differences in the sample data. Firstly, the author uses a variety of different industries (both "new" and "old") and these industries in turn may show differences in reporting intangible disclosures. Abdolmohammadi finds that the newer economies, such as IT companies, in general exhibit a higher disclosure of intellectual capital. It is also possible that some differences between our results and those of Abdolmohammadi may be due to other factors, such as differences in economic factors at the different times of the studies or other, country-wide differences which may affect the Swedish accounting institutions and reporting, as suggested by Ali and Hwang (2000), Vandemaele et al. (2005) or Wyatt (2008). Another difference between our studies which might have an impact on the results is the method of content analysis, where Abdolmohammadi measures the frequencies of intellectual capital disclosure and assigns these into categories¹⁰. However, more precise explanations for these differences cannot be fully determined without further analysis and studies.

Therefore, with the results from this analysis on hypothesis 2, the evidence supports the second hypothesis. Therefore, by not rejecting this second hypothesis we can infer that the disclosure of more intangible assets has an impact on firm market capitalizations. Yet, this intangible asset disclosure does not solely explain the market capitalizations of firms as we find that other factors, such as the difference between the firm ROA and its industry average, might also have an impact on the market capitalizations.

¹⁰ Refer to our previous discussion on intellectual capital and intangible assets, where Abdolmohammadi's definition of intellectual capital is included within our own broad definition of intangible assets.

6. Conclusions

The first purpose of this study was to build upon the existing literature and investigate how the presence of intangible assets may affect firms' voluntary disclosures of intangible assets. To capture these values of intangible assets, we used hidden values, which is equal to the difference between market and book value of equity for a firm. Our findings from the first model show that hidden values have a positive and highly significant effect on the length of disclosure of a firm. This suggests that firms which have more (identifiable and non-identifiable) intangible assets have a tendency to disclose more intangible assets. The results from testing our first hypothesis reveal a more significant association between the intangible asset disclosure and hidden value, compared Whiting and Miller's study. We propose that industry differences between our two studies could possibly explain some differences in results by affecting the industry P/E values or the quantity of disclosure. Alternatively, differences in sample sizes or methods for content analysis might also contribute to these differences.

Our second purpose was to examine how the voluntary intangible asset disclosure from listed companies may impact the investors' perception of the firm value and find whether firms that disclose more intangible assets might have higher market values as a result. Our regression results show a positive effect of intangible asset disclosure on market capitalization. This suggests that firms that disclose more about their intangible assets have higher market capitalizations. Our results are therefore tangent to those from Abdolmohammadi showing a positive relationship between disclosure and market capitalizations.

Due to the evidence from our results, we do not reject either hypothesis. This therefore leads us to conclude that there is evidence suggesting that more intangibles in fact lead to a longer text disclosure of intangibles assets. Therefore, firms in possession of more intangibles are more likely to disclose these. We also find support that there is a positive relationship between the text disclosure of intangible assets and the market capitalization of the firm. This suggests that higher text disclosures lead to larger firm market value and size. Therefore, the reporting (and possession) of intangibles may be an indication of firm market performance and firm size, in the IT sector.

The findings of our study bring numerous implications for both researchers and practitioners within the field accounting. Firstly, our results find existing relationships between the disclosures of intangible assets with both market capitalization and with the size of intangibles (measured by hidden values). These results imply that firms with a high presence of intangibles, use the disclosure of the intangibles within their annual reports to reduce the information asymmetry between the market. Thus, as a higher disclosure leads to a higher market value, there become more incentives for firms to report and disclose their assets. Likewise, there also become more incentives for firms to develop their intangible assets, as a source of gaining competitive advantages. Despite this, it is not certain that all intangibles are fully disclosed for by firms, even if firms are in possession of these intangibles, as it is

possible that intangibles are still rather underreported. In spite of these findings, we find these relationships are not quite simple, as other factors may also have an impact on firm values and hidden values.

Our study is also relevant for regulators within accounting, where our analysis highlights that current reporting standards need to be adapted to our new-age economy in order to make better estimations of the values of companies and the values of intangibles. These challenges to properly establish a unified measurement for the real value of intangible assets continues to be challenging within the research and accounting profession. As it is likely that intangibles will continue to grow in importance for firms, the need for an update within the accounting standards becomes more imminent, in order to ensure future relevance of accounting.

6.1 Limitations of the study

Whilst our study has been successful in achieving the purpose of studying the disclosure of intangible assets and how this disclosure might impact the value of a firm, we identify a number of limitations which hopefully future studies may undertake.

Our primary limitations within this study are those relating to the aspect of time. Firstly, due to limited time we are unable to conduct further and more detailed content analysis of the firms' annual reports for IAD data. We find that many studies within the field of content analysis and intangible assets look at more areas of the financial reports or make more analyzes relating to the quality of the annual reports (i.e. Brennan, 2001; Whiting and Miller, 2008; Bellora and Guenther, 2013; Chung et al., 2016). However, since analyzing the word count may give some indication of the nature of detail of the disclosure, our conclusions may still provide some general indications and therefore valid findings. Yet, we further note that quantity of text does not necessarily equal quality. We also acknowledge difficulties with undertaking further tests for a sensitivity analysis, such as a robustness test. More specifically, we were limited by time to collect more data to conduct these further tests, which might have also proved useful for gaining further understanding of the variables.

Secondly, we identify the limitation with using annual reports as the main sources of data for our variables. Whilst we, and other scholars, justify the value and practicality of analyzing external annual reports, companies may choose to also use other channels to communicate information to investors. As a result, there may be other channels where companies might disclose other information regarding the intangible assets that stockholders may use to assess the value of a firm.

Finally, other limitations include those relating to the investors' perceptions. As discussed by Wyatt (2008), there is no certainty to know whether investors actually used the information set of interest to make valuations of the firms. In addition to this, we cannot tell whether the fluctuations in market values may be from a direct effect of the disclosure of intangible assets and can only use indirect ways to measure these perceptions. Therefore, isolating the direct effect of disclosing intangibles to the market is challenging.

6.2 Future research

Our study contributes to the research by studying the disclosure of intangible assets and testing how the length of disclosure may impact or explain various firm values. As we included a broad definition of intangible assets in our study, we did not limit ourselves to any specific types or subsets of intangible assets. As a result, we could not exactly pinpoint which specific parts of firms' intangible asset disclosure were more or less relevant in explaining the hidden value difference or the market capitalization of the firms. In order to capture these differences in relevance between different types of intangible assets, future research could further include a more detailed analysis of the disclosure of intangibles assets and separate these into more components. Moreover, due to our own time limitations, we were unable to conduct a more rigorous content analysis. Therefore, we recommend future research to conduct a content analysis in more detail in order to gain more data on quality of information of the annual reports.

Finally, our analysis of the two models indicates that some explanatory variables are missing. In order to better explain the dependent variables in both models, future studies could develop and include additional variables in order to provide a better a more explanatory model. Future studies may also include testing further relationships between the variables, such as by investigating the causality between the variables or finding other explanatory models. Lastly, our study investigated the intangibles assets within the IT sector. It would be of interest for future research to investigate the disclosure of intangible assets, also but within other sectors.

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8. Appendix

Appendix 1: Multivariate regression

Multivariate regression results for model 1, excluding interaction term

Variables	Coefficient	t-stat	sig.
hidden value Diff	0.0065***	4.5900	0.0000
Constant	364.0279***	23.1100	0.0000
Observations	284		
R-squared	11.39%		
Adjusted R-squared	11.08%		
Model F-statistic (sig.)	21.08 (0.0000)		

Notes: Appendix 1 shows the multivariate regression results for model 1 using the sample of 284 observations. See table 1 for more detailed descriptions of the variables. *** indicate statistical significance at 1% level. Robust standard errors in parentheses.

$$\text{Model: } IAD_{it} = \alpha + \beta_1 HV_{Diff, it} + \epsilon_{it}$$