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Master's thesis

Due diligence during a mergers and acquisition process and the impact of artificial intelligence

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Die Due Diligence während eines M&A Prozesses und der Einfluss von Künstlicher Intelligenz

Submitted by

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Martinshöhe, 12 July 2019

Jens Jung

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I List of Abbreviations

Artificial intelligence	AI
Capital asset pricing model	CAPM
Discounted cash flow	DCF
Due diligence	DD
Earnings before interest and taxes	EBIT
Earnings before interest, taxes, depreciation and amortization	EBITDA
Equity value	EQV
Enterprise value	EV
Financial due diligence	FDD
Free cash flow	FCF
Gross domestic product	GDP
Human resources	HR
Information memorandum	IM
Information technology	IT
Initial public offering	IPO
Letter of intent	LOI
Material adverse change	MAC
Mergers and acquisitions	M&A
Non-disclosure agreement	NDA
Question and answers	Q&A
Unique selling proposition	USP
Weighted average cost of capital	WACC

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1 Introduction

"I'm working on artificial intelligence. Actually, natural language understanding, which is to get computers to understand the meaning of documents."

Ray Kurzweil

Today's business world is more complex than ever. Every task is expected to be performed in a faster, more efficient and cost-effective way. One possible solution for achieving these goals could be the implementation of artificial intelligence (AI). The above-mentioned quote introduces a solution to these requirements and at the same time poses various questions: To what extent is artificial intelligence able to assist us? What limits the capability of machines? Are machines able to deliver the same work as humans? How significant will the impact be on our daily working life? In this regard, a McKinsey & Company press release from 2018 resulted in heated discussions through its claim that the global gross domestic product (GDP) will increase annually by 1.2% to the year 2030. This is accompanied by a 2018 Pricewaterhouse-Coopers study which states that the German GDP is going to increase by 11.3% by 2030.

In order to challenge the questions and predictions relating to AI, this master's thesis combines AI with a business field which has signalled a high potential regarding the use of AI tools – due diligence. The process of mergers and acquisitions (M&A)[1] is a challenging and comprehensive process which includes a number of different aspects. A particular issue is the fact that the seller has more information regarding the company (target) than the potential buyer. A due diligence is performed in order to solve this problem and to provide as many opportunities and reduce as many risks as possible for all parties involved. Naturally, a due diligence consumes several resources during the process – first and foremost being time. In this instance, the application of AI tools could reduce the requirements for human assets and thus the overall time frame of the transaction.

An analysis of due diligence and artificial intelligence is highly challenging. Nevertheless, it provides an opportunity to deliver meaningful insights and findings for the practical application of AI throughout the transaction process. Creating value and new perspectives is therefore a major goal of this thesis.

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[1] M&A is the process of the "merger" or "acquisition" by one organisation of another, its subsidiaries or its operating units (Dreher & Ernst, 2014)

1.1   Scope of work and procedure

The current thesis is organized into three main parts, where the first two chapters provide a foundation for the fourth chapter which is the core of this work.

The first chapter provides the reader with basic information on the definition of the concept of due diligence and a description of the different phases of a due diligence. Moreover, it includes an explanation of the importance of due diligence within the M&A process.

The focus of the second chapter is the various types of due diligence, taking into account those which are the most relevant and commonly performed. Additionally, the participants in a due diligence are described, together with an illustrated practical summary.

Together, Chapters 1 and 2 provide the basic knowledge necessary for understanding the complexity and importance of due diligence and why it is so suitable for AI applications. Furthermore, it helps to understand why the questions and hypothesis in the fourth chapter were chosen and how they are relevant to providing meaningful answers to the overall research purpose of this work.

With this information, the fourth chapter investigates the relevance of AI to the due diligence process. The chapter begins with a definition of the concept of artificial intelligence and a categorization of the different types of AI. In the following step, the author aims to delimit the origin and actual meaning of the term as it is applied to many alleged AI tools and applications. Through a selection of the various AI tools, the reader is made aware of which services are available for the various due diligence participants. The empirical part of the thesis is carried out in the final section of Chapter 4. For this, a survey was created, analyzed and evaluated.

The research material is predominantly based on books from the library of the Goethe University Frankfurt, the German National Library (Deutsche Nationalbibliothek), various online platforms (e.g. SpringerLink) and sources of literature from online articles, magazines and other freely accessible data.

It should be pointed out that all illustrations and figures are self-designed and developed. However, the content is mostly extracted from the available literature (sources are referenced where appropriate).

1.2 Defining the topic

Limiting the topic and range of the research area is a challenge in academic research. This difficulty increases where the title comprises three complex sub-areas. Consequently, the author was forced to narrow the main focus down to what is relevant in order to answer the key research questions.

Three major research fields are identified:

(1) Artificial intelligence
(2) Mergers and acquisitions
(3) Due diligence

Mergers and acquisitions

The term M&A is only used in this thesis in order to clarify the role of the due diligence. It is sufficient that the reader is aware of the fundamental process and that due diligence is a significant part of this process. However, the latter will be investigated more detailed at the end of Chapter 2.

Due diligence

Although this work includes a background on this topic, it is not possible to cover all aspects of a due diligence. The focus is on the aspects where AI may be applied to create value.

Artificial intelligence

As mentioned above, this part of the thesis will be discussed briefly and will only include explanations which are directly related to the research question. The topic is too versatile and comprehensive to explore all areas of application.

1.3   Survey and research questions

This section aims to illustrate the framework of the survey, how the author experienced the process and which difficulties were encountered. The analysis and evaluation are included in the last chapter and will not be covered here.

The title of the thesis leads to the core research question: **What impact does AI have on the instrument of due diligence?** In order to provide meaningful and valuable answers, a survey with the following ten questions was created (the complete survey can be found in the appendix):

(1) Do you use AI tools within your company? If yes, which one(s)?

(2) For which kind of due diligence do you believe that AI is going to have the biggest impact?

(3) How significant is AI going to be in a due diligence process in 5 years' time?

(4) How important is the time factor for a due diligence process?

(5) In your opinion, what impact should AI have on a due diligence process?

(6) Which of the innovations mentioned below is going to have the biggest impact on a due diligence process?

(7) For which business could AI be especially useful?

(8) In your opinion, which country is currently leading the development of AI?

(9) Is your average client aware of the possible integration of AI and would they rely on solutions delivered by machines?

(10) How urgent is the implementation of AI tools in your company?

An additional optional question was included to reveal the desires, hopes and most urgent requirements the survey participants associate with AI in their daily profession.

It is obvious that the totality of these questions cannot deliver a final and ultimate answer to the overall question. The goal is therefore to understand the trends relating to this topic which has not been much investigated before now. Moreover, this research might provide the basis for additional and more detailed studies in the future.

After formulating the questions, the next step involved the identification of suitable candidates. Quite early on in the investigation of the topic, it became apparent that most AI tools

are connected to the legal component of a due diligence process. In fact, most of the research agrees that most areas of due diligence are not influenced by AI applications at all. This led to the **first reason** why the legal and financial components of the due diligence were identified as suitable candidates as follows (a detailed description of these two components of the due diligence is provided in Chapter 3):

- Group 1: Large and small law firms (law component)
- Group 2: M&A service providers including investment banks, M&A boutiques, private banks and audit companies (financial & advisory component)

An initial exploration which involved contacting relevant firms revealed that M&A advisory boutiques do not qualify as adequate targets. Proof for this can be seen in the following quotes:

"On the basis of our experiences, AI has not taken place in any M&A/due diligence processes. Moreover, I expect a small impact in the near future."

− Well known German private bank

"Unfortunately, we do not involve any AI tools in the process of the due diligence. Try to contact law or audit firms." − German M&A boutique

"You should probably reach out to DD providers like EY, pwc, etc,. not M&A boutiques and investment banks, in order to get more meaningful answers." − US investment bank

"Currently the issue is that many programs are accessible for large companies only (for instance Kira)." − German mid-cap M&A advisory firm

"We are the wrong contact for such a survey." − well known German private bank

The size and main business of these kinds of companies are currently not responsive to the advantages of AI and the cost-benefit relationship is not favourable. The numerous responses received provide evidence for this. Hence, M&A boutiques were excluded.

In this respect, it is important to point out that nine out of the ten questions are not related exclusively to one group. The first question is an exception and has two intentions. First, it aims to highlight the tools which are most frequently used within the company and in this

case group 1 was the target. Additionally, the purpose of question one was also to identify if group 2 uses AI tools, and if yes, which ones.

Overall, approximately 600 e-mails (including multiple e-mails to companies in order to increase the chances of feedback) were sent all over the world. Figure 1 summarizes the response:
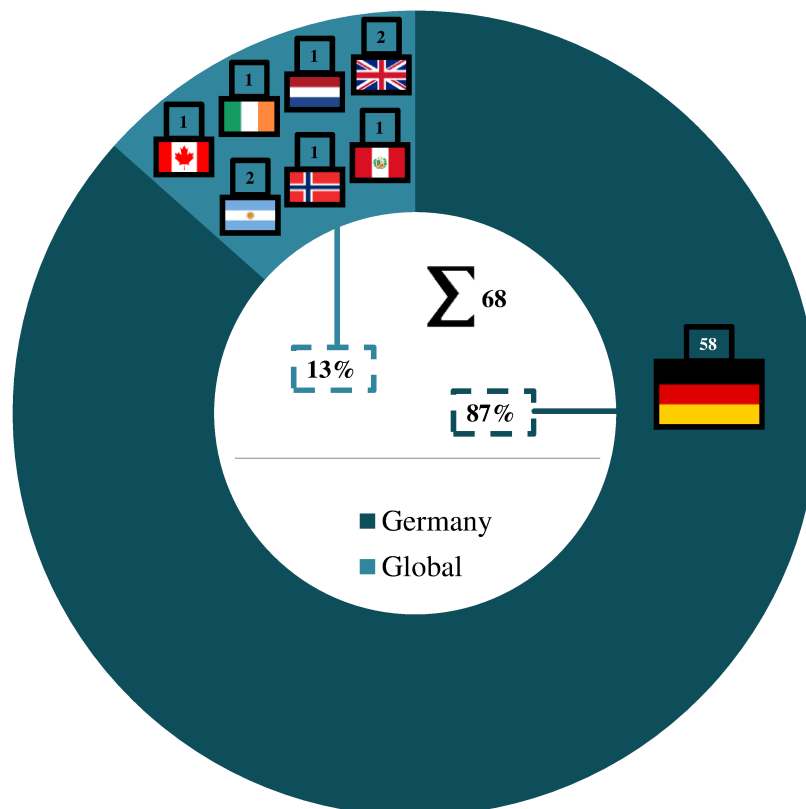
Figure 1: Respondents to the survey

Source: Own graphic

As one can see, 68 responses were received (group 1 with 35 and group 2 with 33) of which 87% were from Germany and 13% from the rest of the world[2]. This equates to an overall feedback score of just 11%. A potential explanation for the weak response outside of Germany might be related to data protection, compliance or maybe restraint related to the use of a German e-mail address. As a consequence, a distinction by country is not meaningful and is not included.

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[2] Canada [1 answer], Ireland [1 answer], Netherlands [1 answer], United Kingdom [2 answers], Argentina [2 answers], Norway [1 answer] and Peru [1 answer] – from top left to bottom right in Figure 1.

In terms of the quality of the firms addressed and the respectable number of 68 respondents, the survey is considered as a comprehensive and representative success which exceeds even the initial expectations of the author.

2 Due diligence and mergers and acquisitions: background knowledge

The second part of the thesis provides a solid background of knowledge relating to the fundamentals of due diligence.

2.1 Origin, definition and occasions

The term due diligence derives from the historically Anglo-Saxon areas where it was used for security regulations relating to the trading of securities. These regulations were based on the Security Laws, the Security Act and the Security Exchange Act. Basically, it functioned as a shield against wrong or misleading statements in the sales prospectus (Balz & Arlinghaus, 2007 and Berman, 2013). From this, we can assume that the purpose of due diligence in the past is strongly connected to its current purpose.

However, finding a definition which covers all the subtleties and complexities of due diligence is challenging. Insight in this matter can be gained in the following quotes:

"Due Diligence is a process whereby an individual, or an organization, seeks sufficient information about a business entity to reach an informed judgement as to its value for a specific purpose" (Crilly, 1993, p.1).

"The due diligence is the comprehensive; on a single, potential acquisition object- related company analysis to determine all information relevant to the acquisition decision" (Rockholtz, 1998, p.70).

"[The due diligence is a] systematic analysis and evaluation of quantitative and qualitative information of a company [...] which includes the goal to increase the process of demission making in various circumstances" (Nothardt & Hofmann, 2009, p. 11).

"The due diligence is an instrument to identify and quantify synergies, synergy costs and risks within a transaction process" (Becker, Ulrich & Botzkowski, 2016, p. 109).

This knowledge should equip the reader with a better understanding of the term due diligence. Apart from merger and acquisition activities, numerous occasions where a due diligence is performed exist. All these events have one thing in common: The systematic and rigorous advance analysis is of vital importance. The following list includes some of the most common events (Scott, 2001; Nothardt & Hofmann, 2001 and Wirtz, 2006):

- Restructuring of a company
- Rating or bank credit
- Initial public offering (IPO)
- Change processes within the company
- Tax-related controls

Nevertheless, the transaction process is the most frequently encountered reason (Wirtz, 2006).

2.2   Due diligence within the transaction process

Figure 2 illustrates the basic structure of an M&A process in order to understand why due diligence is such an important instrument for the transaction process, where it is performed and what impact it has on other parts.
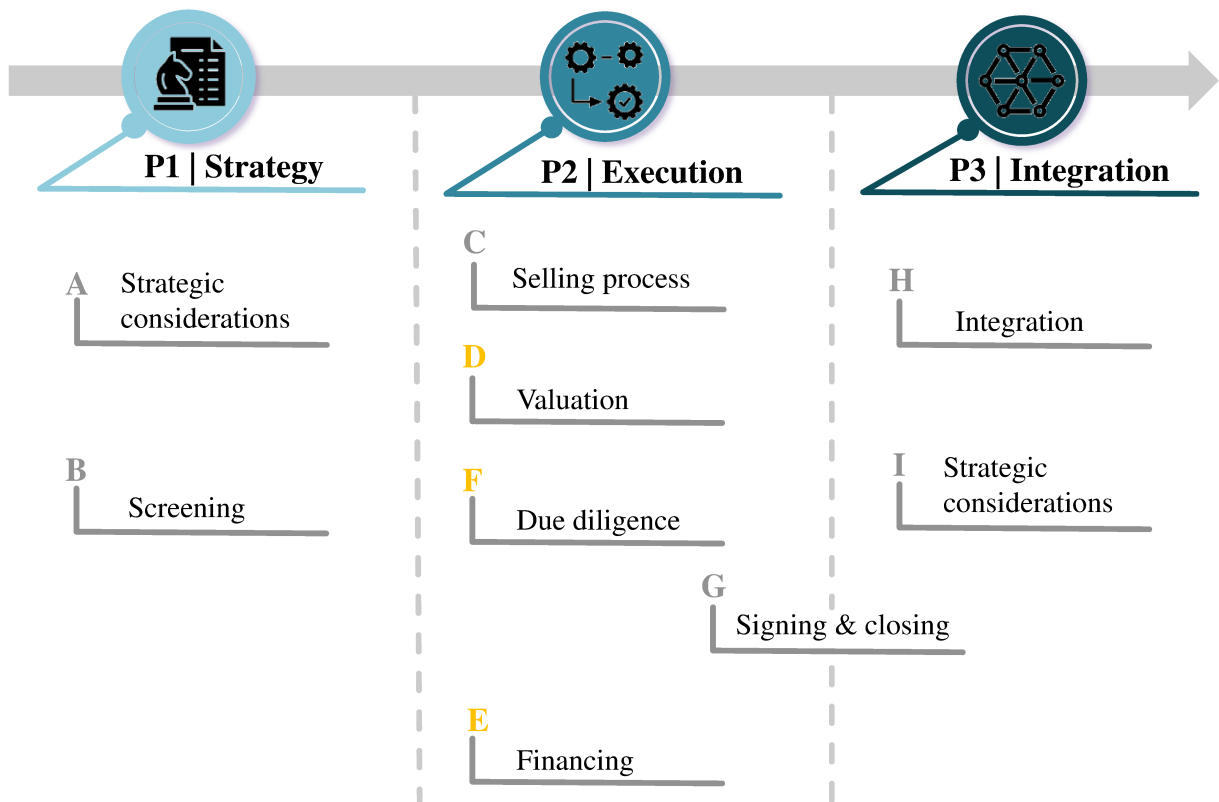
Figure 2: The three phases of a transaction

Source: Own graphic based on pwc 2016; Büchler 2017; Horzella 2010; Bauer 2012 and Zentes, Swoboda, Morschett & Schramm-Klein, 2012

Of particular noteworthiness was an article by PricewaterhouseCoopers in 2016 in which strategic considerations simultaneously represent a key component at both the beginning and end of a transaction. Consequently, the transaction process is described as a circle in the sense that each transaction could, potentially, be the start of the following acquisition or merger. The following explanations include a simplified description of the core milestones.

2.2.1 Phase 1: Strategy

Each transaction should start with at least some of the following strategic considerations **[A]** (pwc, 2016; Keuper, Häfner & Glahn, 2012; Borowicz & Mittermair, 2008; Lucks & Meckl, 2015 and Olbrich, 2005):

- Do we need a deal? Sometimes organisations do not know where to invest their money which could lead to transactions which are not based on strategic and long-term considerations and eventually cause more problems than benefits

- Are there departments within our company which (1) do not suit the core business anymore or (2) do not deliver the expected returns? In both scenarios, a company could decide to close down a department. However, selling it would be significantly more profitable

- Are we confronted with a succession problem? This is a typical German mid-cap market issue. In cases where no-one (e.g. the children of the current owner) intends to accept the responsibility of taking leadership of the company, a sale is often the only remaining option

- Do we want to grow in the future or to implement a new department? Primarily, large firms expand through the acquisition of competitors. Additionally, implementing a new department may often involve many cost components (research and development, market research, feasibility or the hiring of experts). Buying an existing department may be less time-consuming and less expensive

In cases where these questions lead to the conclusion that M&A activity is the most suitable solution, the next step is to consult a specialised advisor, e.g. M&A boutiques, investment banks, auditors and legal support (Klamar, Sommer and Weber, 2013). Their job involves the screening **[B]** which includes a longlist of all suitable candidates for a potential sale (Oeser & Altmann, 2012). Generally, this longlist consists of two major groups: financial and strategic investors. The former includes companies which acquire the target as an investment for their portfolio with the aim of selling it profitably later on, i.e. there is no strategic and long-term integration. The latter, in most cases, is a competitor who aims to strengthen their position in the market, i.e. sustainable, strategic and long-term integration (Gamble, 20017 and Schmitz-Valckenberg, 2013). The number of companies on the longlist depends on the size of the transaction and market (usually 30–50 companies).

2.2.2 Phase 2: Execution

After discussing the results with the client, the longlist is revised into a shortlist (approximately five to ten companies), which is determined by many factors including seller preferences, strategic fit, location, market position, possible intentions of the investors or purchasing power (Rippe, 2017). Subsequently, the actual selling process **[C]** is introduced which includes the development of five essential documents (Höhne, 2013):

(1) Teaser: the target is described superficially, anonymously and contains only that information which is relevant in order to reveal whether the potential buyer is interested (in most cases a maximum of one to three pages). This information could include (Iannotta, 2010; Hooke, 2015 and Very, 2005):

- key financial figures
- business areas
- products
- investment highlights – delivering the unique selling proposition (USP) of a company without revealing its identity

(2) Letter of intent (LOI): this document proves that the buyer has a serious interest in acquiring the target. The letter of intent is not legally binding but is rather a symbolic proof of the participants involved (Klamar et al., 2013).

(3) Information memorandum (IM): Unlike the teaser, the IM is a comprehensive and detailed collection of essential data relating to the targeted company, such as company structure, financial figures, employees, history and much more (Hooke, 2015 and Bergau, 2015).

(4) Non-disclosure agreement (NDA): The NDA is a contract which guarantees the secrecy of the negotiations and all the related sensitive and confidential information between the seller and the potential buyer (Sinewe, 2010). This results in the information being exclusively applicable to the acquisition of the target (Klamar et al., 2013).

(5) Management presentations: This is an important presentation in which the management of the company presents the target to the potential buyer. During the M&A activity, the management will make many of these presentations at different stages of the process (Whitaker, 2016).

The valuation **[D]** represents a crucial part within any transaction process – no transaction can proceed without a valuation. Therefore, this part will be investigated more thoroughly. The specific goal of this section is to provide readers who are not familiar with this field with the knowledge they require to understand what the basic models are, which are the most common models and how the valuations are performed.

According to Gröger (2009), there is no such thing as one single value of a company. In this regard, the owner of a company and the potential buyer certainly do not share the same understanding of the value of the target – value is subjective and depends on the reason for the valuation (Mandl & Rabel, 1999; Moxter, 1991 and Matschke & Brösel, 2013). In more detail, we can identify four principles of valuation (Große-Frericks, 2015):

(1) Overall valuation

(2) Future-related

(3) Depending on the purpose

(4) Subjectivity

At the same time, it appears logical that achieving a subjective company value will not be successful. The value has to be objective since many parties and their various intentions are involved (Große-Frericks, 2015).

There are multiple occasions that require a valuation (Schacht, 2009): compensations, arbitrator's award, value-based management, acquisition of equity or debt, restructuring and, of course, the valuation of a company, which will be the focus of the following paragraphs.

As an overview, Figure 3 introduces the most common methods and differentiates them from each other.
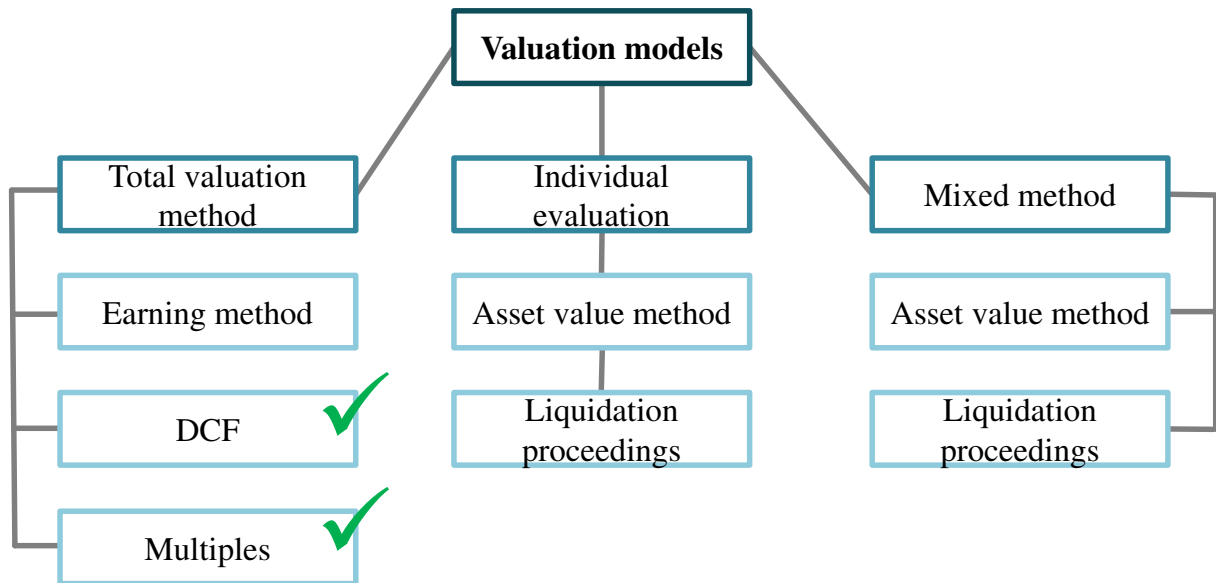
Figure 3: Valuation models in a transaction process
Source: Own graphic based on Heesen,2019; Hofbauer, 2011 and Kreyer, 2009

Overall, three main categories can be distinguished (Heesen, 2019; Massari, Gianfrate & Zanetti, 2016 and Schütte-Biastoch, 2011):

(1) The total valuation method considers the company as a whole with the assumption that the value of a company is directly connected to the future return potential of the company. This method represents the most popular approach

(2) With the individual evaluation, the balance sheet (assets and liabilities) is assessed in order to value the company

(3) The mixed method simply describes a combination of the total valuation and individual evaluation methods. However, this technique is not relevant

The focus will be on the key models which are used most frequently. As shown in Figure 3, this thesis will cover the two most practiced forms of the total valuation method according to Hardtmann (2013) – the discounted cash flow and the multiples approach.

The discounted cash flow (DCF)

As the term reveals, the DCF includes two steps: First one has to calculate the cash flow of a company and second, it has to be discounted. Although several kinds of cash flows exist, we will concentrate on free cash flow (FCF). Basically, it describes the free and available money which is not linked to or blocked by any activity of the company (Voigt C., Voigt J., Voigt J. F. & Voigt R., 2005). The starting point of the FCF calculation is the annual net profit. Thereafter, all expenses which do not result in cash outflows (e.g. depreciations, increase in liabilities or provisions) should be added and all profits which do not result in cash inflows (e.g. decrease in provisions or increase in receivables) should be subtracted (DePamphilis, 2003). The result is the FCF.

It should be noted at this stage, that this picture of the process is greatly simplified. However, a more detailed analysis would not add any value at this point. Figure 4 describes a step-by-step discounting of the cash flow model.
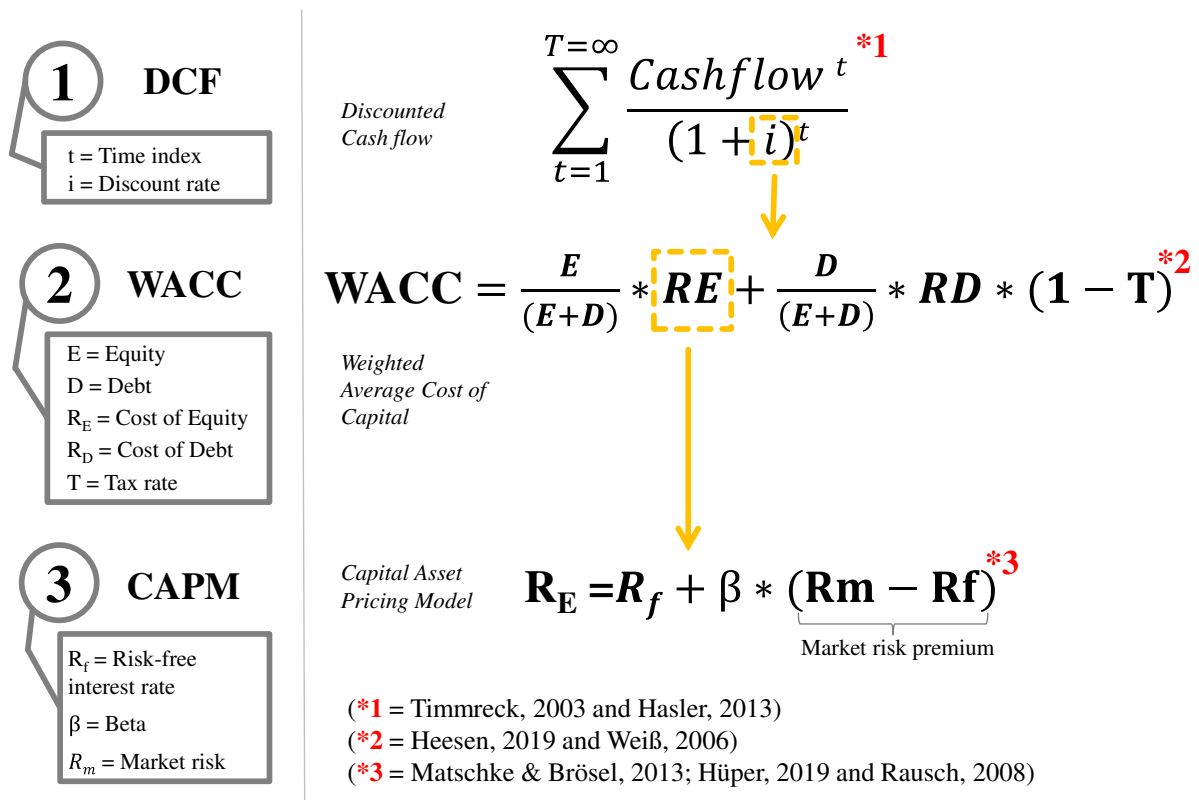

Figure 4: DCF – WACC – CAPM

Source: Own graphic

The first step describes mathematically the discounting of the cash flow where i represents the discount rate and t the year. This operation is additionally visually illustrated in Figure 5.
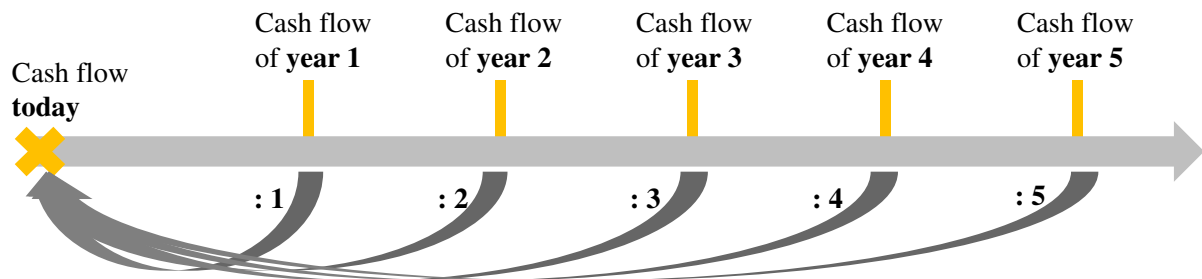

Figure 5: The process of discounting the cash flow

Source: Own graphic

The value of future cash flows needs to be discounted to the present day since the potential buyers and the owner seek to know what the company is worth today. A substantial hurdle in this rather simple calculation is the identification of i, the discount rate. Without complicating things more, we can rely on a regularly-used technique (Dreher & Ernst, 2014): the **weighted average cost of capital (WACC)**. According to Schawel & Billing (2012), the WACC expresses the average cost of all sources of equity and all sources of debt through which a company is financed. Initially, the WACC formula might appear confusing. However, most of the variables (equity E, debt D or taxes T) may be obtained without much effort, research or calculations since they can be extracted from the financial statements. Even the cost of debt, R_D, is commonly associated with the current interest rate of a bank's loan or a bond's coupon, e.g. 5% (Damodaran, 2010). One variable remains which cannot be identified at first glance: the cost of equity, R_E. An established approach to solve this problem is to use the **capital asset pricing model (CAPM)** (Rausch, 2008). This model is based on the assumptions of modern portfolio theory which states that every investment decision is based on the future risk and return of that investment (Schacht, 2009). This fundamental statement of the model can only be understood if each component is analyzed individually. Starting with the risk-free interest rate, R_f, the risk-free investment is assumed to be government bonds from countries such as Norway or Switzerland (Hasler, 2013).

In theory, these bonds have to meet the following criteria (Hasler, 2013 and Schacht, 2009):

- No default risk

- No inflation risk

- No currency risk

- No correlation to the capital markets

- Exchangeable at any time

As there is no such thing as a "risk-free" investment, this remains theory. Nevertheless, looking at the current average expected return from countries such as Australia, Belgium, Denmark, Germany, Finland, France, Great Britain, Canada, Ireland, Japan, Norway, Netherlands, Austria, Sweden and Switzerland, we can assume a percentage of 0,51 (Deutsche Börse, 2019).
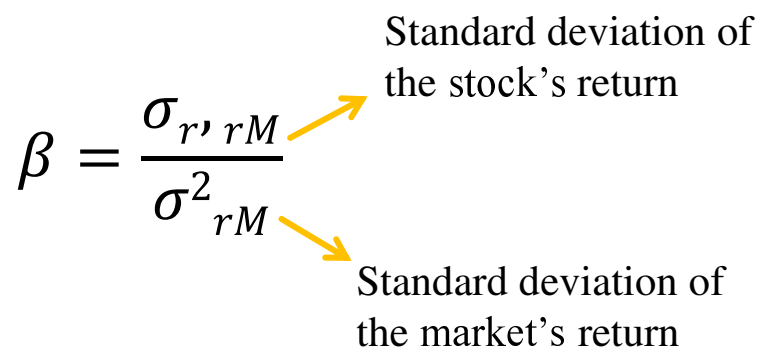
In order to obtain the market risk premium, the remaining missing variable, R_m, has to be calculated. According to Schacht (2009) and Voigt et al. (2005), the equivalent to market risk is the returns on a market portfolio represented by all stocks of a market. In Germany, this would be the DAX. Consequently, the market risk premium is an expression of how much a market portfolio (R_m) outperforms a risk-free investment (R_f). In this context, the Institute of Public Auditors in Germany (IDW) suggests a range of 5.5–7.0% before personal taxes or 5.0–6.0% after personal taxes (Zwirner, 2018).

The final variable is the beta factor, β. This describes the systematic risk of an investment, the sensitivity of the expected return of the single instrument and the expected return of the market portfolio. Further clarity is obtained through the mathematical expression (Hasler, 2013):

$$\beta = \frac{\sigma_{r,\,rM}}{\sigma^2{}_{rM}}$$

Standard deviation of the stock's return

Standard deviation of the market's return

Consequently, we investigate how much the stock of a company reacts to changes in the chosen market (Heesen, 2019). In other words (Hasler, 2013):

- $\beta = 1$ (the stock reacts precisely to the market's performance – high correlation)
- $\beta < 1$ (stocks react less than the market's performance – low correlation)
- $\beta > 1$ (stronger reaction than the market – disproportionately high correlation)

The higher beta is, the higher is the risk and vice versa.

The valuation of listed companies is, in this respect, comparably straightforward. One only has to compare the beta factor of the company with the factors of other companies in the stock market. These factors can be found in the newspaper or, nowadays, on the Internet (Voigt et al., 2005). Another approach is an industry comparison, rather than a comparison with other companies. The latter approach is one of three alternatives for companies which are not listed on the stock market. Moreover, they may have to identify beta by comparing themselves with a similar company (Schacht, 2009).

According to Hasler (2013), 80% of the companies listed on the German stock market have a beta value between 0.75 and 1.25.

Equipped with this knowledge, one is able to elaborate a discounted cash flow model by starting with the calculation of free cash flow, then employing instruments like WACC and CAPM and understanding how they eventually connect.

Multiples

The instrument of multiples, or the comparison tool, is a financial figure which is composed of a reference value (for instance revenue), the market value of a company and a corresponding multiple (Schacht, 2009). According to Große-Frericks (2015), a multiple can only deliver a first and overall inaccurate impression of the company value. Voigt C. et al. (2005), on the other hand, claim that they have not attended any negotiations relating to the value of a company where multiples did not play a significant role. Either way, we can distinguish two major types of multiples (Schacht, 2009):

- Transaction multiples: Multiples based on similar/comparable transactions in the recent past
- Trading multiples: These multiples are based on similar/comparable listed companies

After choosing one of the above approaches, the following formula is used as the basis of any multiples calculation (Hasler, 2013 and Kuhner & Maltry, 2017):

$$Company\ value = \frac{market\ price\ (Peer\ group)}{choosen\ key\ figure\ (Peer\ group)} * choosen\ key\ figure\ (company)$$

Again, each component should be separately described. First, the correct peer group should be identified. This group should consist of similar and comparable companies/transactions as the target (Meyer, 2006). Subsequently, a suitable market price has to be evaluated between equity value (EQV)[3] and enterprise value (EV)[4]. Commonly the enterprise value is preferred due to the fact that it considers the entire company (assets, equity and liabilities) and not just equity (Meyer, 2006). Second, the key figures for the peer group and accordingly for the target company are discussed. Popular factors are earnings before interest, taxes, depreciation and amortization (EBITDA), earnings before interest and taxes (EBIT), sales or revenue (Kuhner & Maltry, 2017; Meyer, 2006 and Schacht, 2009). Since elements such as taxes, depreciations or amortization are excluded, the EBITDA, as the most comparable factor, is the focus here. Combining the two components, the following formula is the most used within valuation processes (Dreher & Ernst, 2014):

$$\frac{EV}{EBITDA}$$

Although all the aforementioned input is true, it is advisable to summarize the gathered information visually as in Figure 6.

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[3] The equity value describes the value of the equity within the company. For a listed company this would be the value of one share multiplied by the number of shares (Hasler, 2013).
[4] The enterprise value is the sum of the assets, equity and liabilities of a company – therefore often called transaction volume (Kaup, 2009).
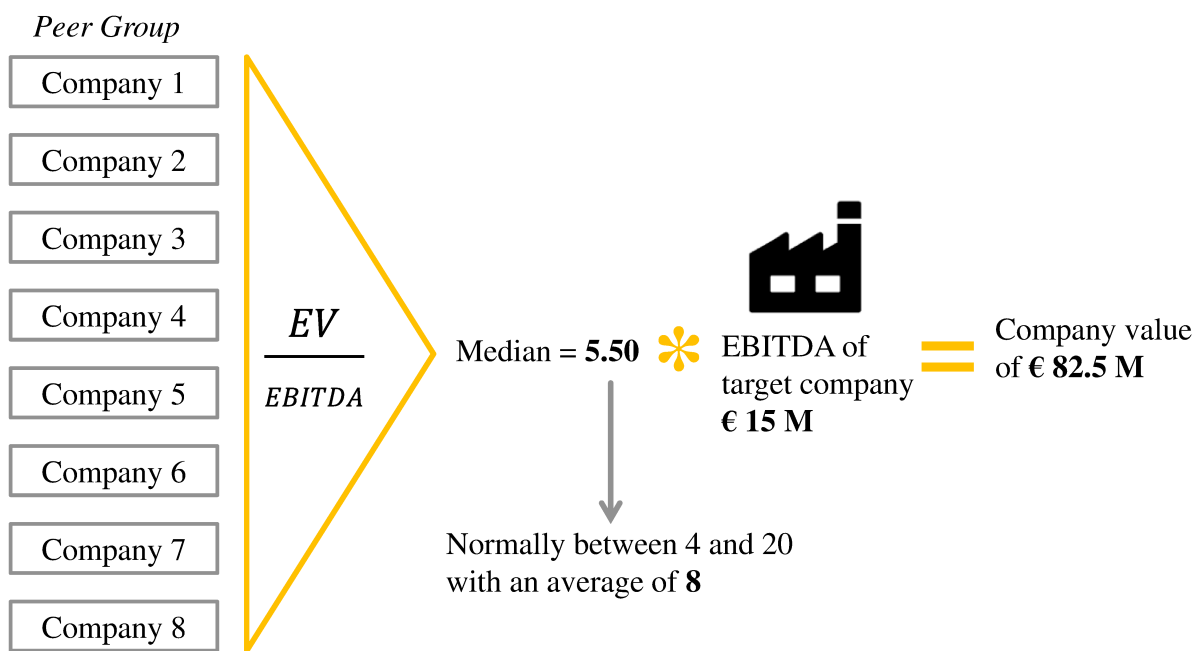
Figure 6: The multiples method process

Source: Own graphic based on Dreher & Ernst, 2014 and Voigt C.et al., 2005

According to this figure (the numbers are selected randomly) the EV and EBITDA median of the appropriate peer group is 5.50. Multiplied with the EBITDA of the target company, we end up with a company value of € 82.5 M. However, in reality this process involves a greater in-depth analysis and is significantly more complex. Nevertheless, it represents a sufficient overview of the fundamentals of the process and highlights the crucial aspects.

Both approaches involve some advantages and disadvantages (Dreher, Ernst 2014):

- Multiples:
    + Easy and fast to apply
    + Can be performed at an early stage of the transaction
    − Many important indicators are not involved
    − Hard to identify an appropriate peer group
- Discounted cash flow:
    + Considers the future not the past
    + Comparable and exact company value
    − Requires a large amount of information
    − Difficult to perform

To conclude, both the DCF and the multiples method represent very important elements of a valuation process that should not be overlooked. The method used depends to a great extent on the timing, the available information and the purpose of the valuation (Hasler, 2013).

Financing **[E]** a company can generally be differentiated into equity and debt financing (Grill, 2011). The most common sources of both are summarized in Figure 7.
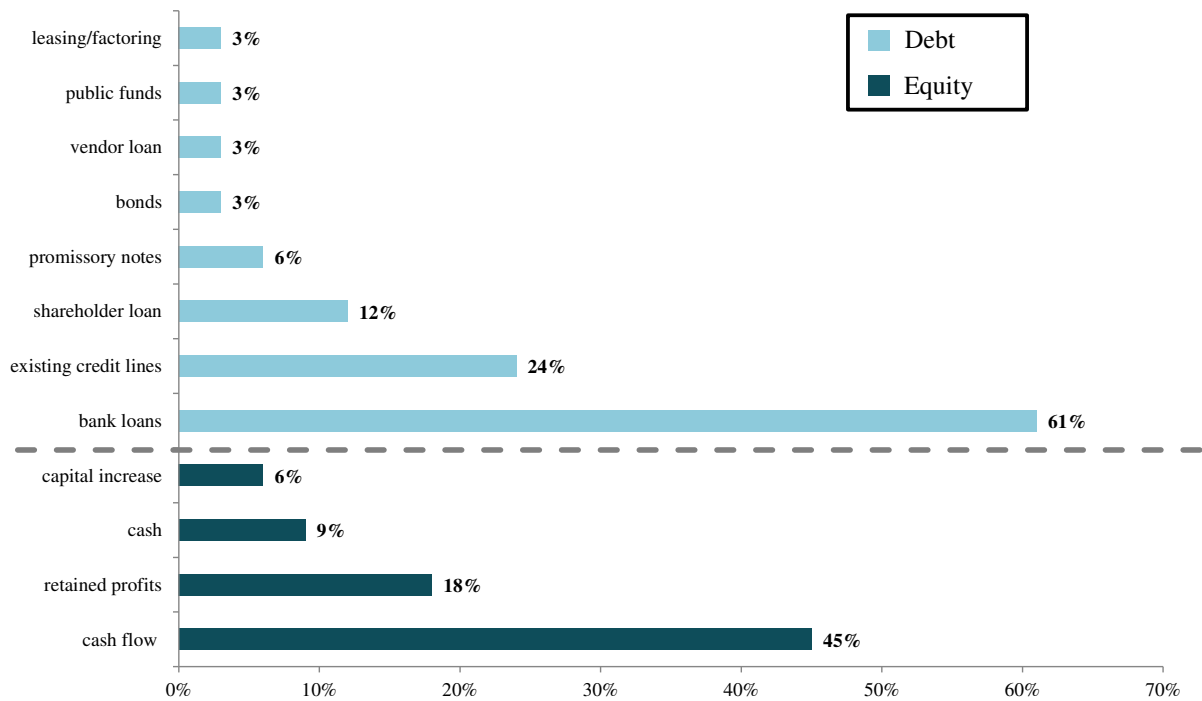
Figure 7: Sources of financing a transaction
Source: Own graphic based on Becker et al., 2016

Figure 7 shows that a combination of bank loans and cash flow financing appears to be the most attractive method (at least in Germany).

The topic of due diligence **[F]** is so crucial that it is described separately the following section. However, it can be stated that the process of making the company transparent and revealing potential risks and threats will certainly influence the **valuation** and **financing** in particular.

The transition from execution to integration is characterized by the signing and closing **[G]** of a transaction. Signing describes the act of the participants actually signing the final contract (Höhne, 2013 and Grill, 2011). This step also includes a notarial certification according to German law, especially where properties or company shares are involved (Engelhardt, 2017 and Becker & Villinger, 2017). Closing describes the transfer of the company (Lucks & Meckl, 2015). This separation (i.e. signing and closing) is especially important in German property law (Jansen, 2008). However, in most scenarios, closing takes place at the same time as signing except where the so-called closing conditions result in a temporal separation (Engelhardt, 2017). Where there is a separation between the two steps, the most frequent risk involved is the material adverse change (MAC) clause. This describes the occurrence of un-expected events which impairs the condition of the target (Wollersheim & Welpe, 2015). Such events could include (Wollersheim & Welpe, 2015):

- Natural disasters
- Political crises
- Macroeconomic failures
- Destruction of important production facilities
- Other unforeseeable events

2.2.3 Phase 3: Integration

The penultimate step of each transaction is integration **[H]**. In this stage, the actual combina-tion of the two companies takes place – the two individual components become one (Witt, 2019). Engelhardt (2017) criticized the majority of M&A participants for not valuing the spe-cific effects of a transaction in this stage. According to his concerns, the people responsible evaluate the overall potential benefits but an investigation of the synergies of the separate departments is often inadequate. The following points highlight the different stages where integration has an impact (Stafflage, 2005, Jansen, 2008 and Gösche 1991):

- Operative integration (products, locations, logistics, marketing or research and devel-opment)
- Personal integration (salary structure, project management, leadership styles, employ-ment benefits or social services)
- Organisational integration (processes, financial integration, law, taxes or control).
- Strategic integration (strategic focus of the companies or future goals)

- External integration (communication to the stakeholders)
- Cultural integration (preservation of the national cultures and, at the same time, the identification of a common ground)

Based on these findings, it becomes obvious that an early analysis of how the integration can be performed successfully is absolutely crucial. Moreover, the starting point for these considerations needs to be set at an early stage in the transaction process – phase 3 is unquestionably too late (Grill, 2011). In this regard, public awareness is raised by Grill (2011) who notes that a major factor of transaction failures is based on an insufficient or delayed integration process.

In the end, the process repeats itself by entering the strategic considerations **[I]** stage where the same questions as above are again asked.

2.3 Necessity of a due diligence within the transaction process

As mentioned, we will now investigate what purpose due diligence serves depending on the occasion and the particular requirements. Figure 7 summarizes the most crucial functions and ranks them from zero to 100 (Dreher & Ernst, 2014 and Birk, 2008).
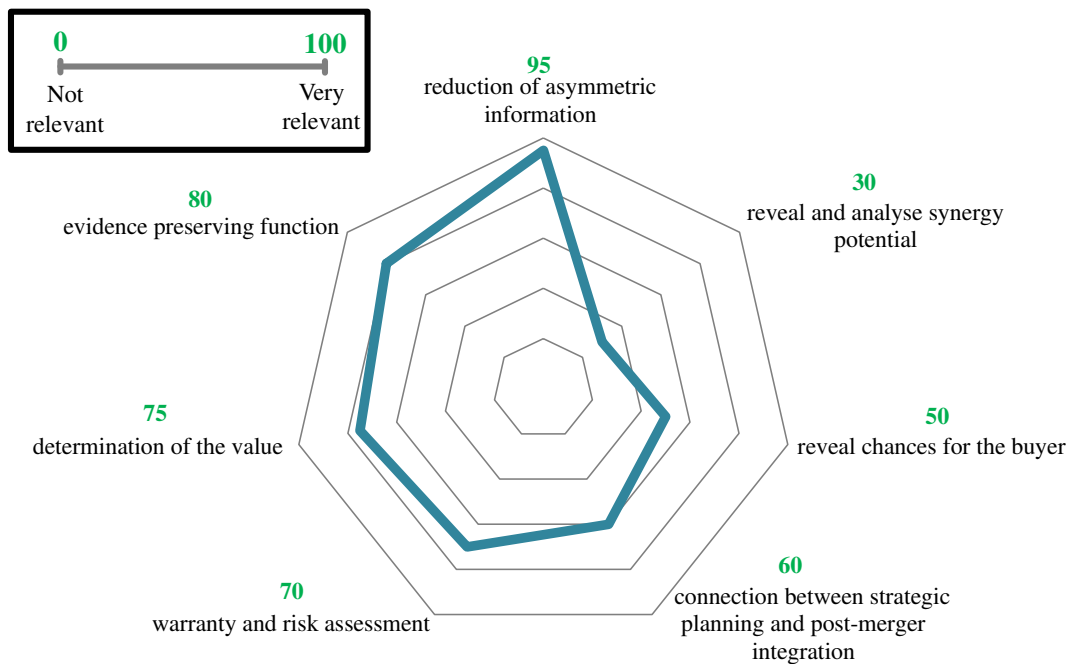

Figure 8: Functions of a due diligence

Source: *Own graphic based on Dreher & Ernst, 2014 and Birk, 2008*

The ranking is based on the frequency of how often the author encountered the respective function in the literature and based on the author's own practical experience. The four most relevant factors will be investigated in more detail.

Reduction of asymmetric information: At the starting point of any transaction, the owner of a company has noticeably more information regarding the targeted object than the potential buyer. Hence, the essential task of the due diligence is to eliminate this so-called asymmetry (Horzella, 2010). However, at the same time, this fundamental task of the due diligence involves a conflict of interest. Naturally, the owner does not wish to share a significant amount of information for two major reasons (Berens, Brauner & Strauch, 2011). First, the disclosure of sensitive company information involves a risk that the potential buyer walks away from the acquisition, collects the data and uses it in their favour. Second, there is the chance of unveiling unwelcome information (old liabilities, lawsuits and other hidden or forgotten obligations) resulting in an adjustment of the purchase price.

Evidence-preserving function: The idea is that a due diligence documents the present condition of a company and the information is exchanged between the seller and buyer (Birk, 2008). Consequently, the seller discloses all data and is therefore not responsible for future liabilities (Wirtz, 2006). The buyer cannot claim that he did not know about certain circumstances since the opportunity was given to discover the risks (Jansen, 2008). According to Rippe (2017), if the seller hides information or provides insufficient information, the buyer will not be protected by law (applicable to US and German jurisdiction).

Determination of the value: In particular, the comprehensive and profound screening of the essential financial statements (balance sheet, profit and loss statement, cash flow statement) provides the basis for the valuation of the target (Birk, 2008 and Büchler, 2017). Together with the marketing, organisation, IT, personal, culture, taxes and law departments, a first proposal for a purchase price can be given (Büchler, 2017). All the required analysis is done through the due diligence.

Warranty and risk assessment: In Germany, the warranty is mainly regulated through complex regulations within the transaction contract (Hinne, 2008 and Picot, 2000). However, the content depends on the parties to the transaction and the individual circumstances of the deal. In this regard, different types of risks are possible (Birk, 2008):

- Risk with a **certain** likelihood of occurring
- Risks with a **high** likelihood of occurring

- ▪ Risks with a **possible** likelihood of occurring
- ▪ Risks with a **low** likelihood of occurring

Some risks will be accepted in exchange for a decrease in the purchase price, others will result in certain obligations for the seller while yet others will be ignored due their nature (Wegmann, 2013 and Sinewe, 2013 and Pomp, 2015).

3 Due diligence at a glance

After defining the framework for the topics of due diligence and M&A in general, the third chapter contains a valuable practical approach towards the topic and will focus on the participants and the different types of due diligence.

3.1 Different types of due diligence

The intensity of the due diligence process depends on the knowledge of the possible buyers of the respective industry, the legal situation or the general business activity. Moreover, the individual circumstances of a target have a large impact on the development of the due diligence as the acquisition of a large listed company is naturally more comprehensive than that of a small production company (Dreher & Ernst, 2014).

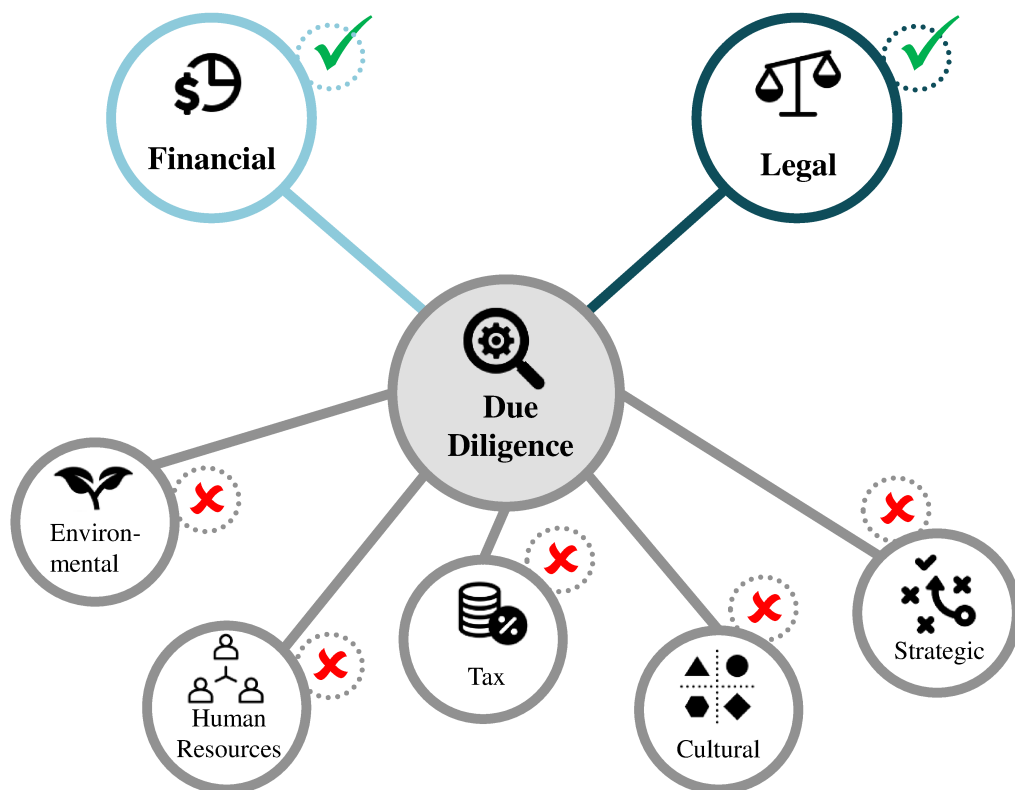A selection of due diligence instruments is summarized in Figure 9 below.

Figure 9: Types of due diligence

Source: *Own graphic based on Hinne, 2008; Zentes et al., 2012; Drescher, 2017and Nothardt & Hofmann, 2009*

According to Bauer & Düsterlho (2016), Becker et al. (2016) and Höhne (2013), the most frequent types are financial and legal due diligence. This fact is the **second reason** why precisely these two categories were contacted in the first place, after the assumptions expressed in Chapter 2 regarding the expected feedback. Hence, the subsequent pages will focus on these two emphasized methods.

3.1.1 Financial due diligence

Essentially, the financial due diligence (FDD) is an operation to clarify and predict the financial situation of the company. Therefore, the annual report and its individual elements are extremely relevant (Howson, 2003). However, the financial due diligence is by no means comparable to an annual audit since it focuses on an analysis of the numbers, rather than a review of the legal regulations (Bauer & Düsterlho, 2016). Moreover, the data generated by the FDD represents the basis for the aforementioned valuation (Broda, 2005).

For the purposes of this thesis, the following three sub-areas will be discussed (Lucks & Meckl, 2015 and Dreher & Ernst, 2014): balance sheet, profit and loss statement and cash flow statement; adjusted company result and forecast calculations.

(1) Balance sheet, profit and loss statement and cash flow statement:

Balance sheet

The balance sheet reflects the assets and liabilities of a company, of which the previous five years are commonly investigated. The fundamental task is to evaluate whether the accounting and valuation principles have been applied consistently over the years (Balz & Arlinghaus, 2009). A possible checklist to obtain meaningful and substantial information could include (Bauer & Düsterlho, 2016; Balz & Arlinghaus, 2009; Marks, Slee, Blees & Nall, 2012 and Rosenbloom, 2010):

- Is there an existing investment backlog[5]?
- Are there any hidden reserves[6]?
- Which deprecation models are applied? Potential applications include linear, degressive, progressive or the performance-based method. The impact on EBITDA and the cash flow statement will depend on the option chosen (Pomp, 2015).

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[5] An intentional blockade of investments even though these were necessary, appropriate or logical (Beckmann, Brost & Faust, 2018).
[6] These can appear as undervalued equity or overvalued debt and are also known as invisible equity (Wulf, 2013).

- ▪ Is the valuation of the assets and the inventory appropriate?
- ▪ Are the accounts receivable valid? For instance, old accounts receivable might have to be adjusted (Pomp, 2015)
- ▪ Are the liabilities fully accounted for?
- ▪ Are the provisions reasonably established?

Profit and loss statement

From the findings of the balance sheet analysis, an investigation of the profit and loss statement should be applied to the previous five years. A focus of the investigations should be the growth in earnings and the reasons for this (Balz & Arlinghaus, 2009). A possible checklist for this task could include (Balz & Arlinghaus, 2009; Pomp, 2015, Marks et al., 2012 and Howson, 2003):

- ▪ Additional detail on any important items? For instance, expenses for legal advice might lead to current or future law suits and consequently to future costs
- ▪ Which of the above items are important for the subsequent cash flow analysis?
- ▪ Which profit and loss events are once-off and which ones are recurring?

Cash flow statement

The cash flow statement has already been discussed Chapter 2 and therefore requires no further explanation. However, it should be noted that the focus during the FDD is on topics which include (Bauer & Düsterlho, 2016 and Pomp, 2015):

- ▪ How much cash is available to pay interest?
- ▪ How much cash is available for amortisation purposes?
- ▪ How much cash is available to interest the placed equity?

(2) Adjusted company result

The adjustment of the company result is one of the most crucial and most common tasks in FDD. Basically, the goal is to present the profit and loss statement in a sustainable and realistic way. However, this naturally involves a conflict of interest since the owner desires an interpretation in his favour and the potential buyer would prefer a less favourable view (Lucks & Meckl, 2015). According to Bauer & Düsterlho (2016), Marks et al. (2012) and Mulford & Comiskey (2005), items in the profit and loss statement are relevant if they are:

- Not operational
- Relating to other periods
- Unique
- Not operational-related
- Exceptional

It is also important to note whether these actions are cash-related or not. In this regard, a selection of realistic scenarios are given which should be taken into account (Bauer & Düsterlho, 2016 and Klamar et al., 2013):

- Loss of sale due to loss of customer
- Sale of assets in order to pay bills
- Expenses related to the restructuring of the company
- The release of provisions

As mentioned above, the potential for bias is significant. Therefore, this task is performed by a third party (mostly an audit company) in order to obtain objective results.

(3) Forecast calculations

The forecast calculation is used to prove and verify the aforementioned calculations. This is performed by examining how precise and reliable the forecasts for previous years were. In cases where the target-actual comparison differs significantly, the trust of the transaction may suffer (Schmeisser et al., 2007). Thus the forecast calculation is important as a basis for the valuation of the target and the associated negotiations (Bauer & Düsterlho, 2016).

A checklist might include (Wirtz, 2006; Bauer & Düsterlho, 2016 and Wegmann, 2013):

- Integrating a target-actual comparison to reveal general positive and negative factors which have had an impact on performance in the past and potentially also in the future
- Analysis of the planning methods the company applies to reveal which assumptions were made and if they were implemented
- In addition, a forecast calculation should always value the economic framework and the market and competitor situations

3.1.2 Legal due diligence

The legal due diligence includes all tasks which contribute to the documentation and verification of the target's legal situation (Lucks & Meckl, 2015). In this regard, it is especially worth highlighting that the legal due diligence covers the guarantee which protects the seller from damages which may occur subsequent to the transaction (Broda, 2005).

A more detailed investigation of the risks and opportunities from a legal perspective could include the following core topics (Höhne, 2013 and Dreher & Ernst, 2014):

(1) Real estate and properties

(2) Corporate law

(3) Contractual relations

(4) Public law

Real estate and properties

First, it should be investigated whether the company is indeed the owner of the properties and buildings by inspecting the land register (Rottke, Goepfert & Hamberger, 2016). In this regard, a clarification of potential charges, such as leasehold or other third-party rights, should also be included (Wegmann, 2013). In addition, a distinction should be made between asset deal[7] and share deal[8] since this determines whether the assets remain with the seller or if they are transferred to the purchaser (Klamar et al., 2013).

Corporate Law

A fundamental part of the legal due diligence is the clarification of changes relating to ownership and also the investigation of shareholdings in other companies (Klamar et al., 2013). This includes (Rottke et al., 2016 and Klamar et al., 2013):

- Establishing whether the organization was correctly founded
- Checking that laws and statutes have been complied with
- Accuracy of the paid in equity by the shareholders
- Review of the certificates of registration

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[7] This describes the acquisition of single assets of the company (single property or building) (Hohmann, 2012 and Gondring, Zoller & Dinauer, 2013)

[8] This describes the majoritarian acquisition of the shares of the company (Hohmann, 2012 and Gondring, Zoller & Dinauer, 2013)

Contractual relations

A company, regardless of the industry, enters many contracts over time with several stake-holders and consequently increases its overall risk potential. Such contracts could include (Rottke et al., 2016; Klamar et al., 2013 and Wegmann, 2013):

- Rental contracts
- Distribution contracts
- Procurement contracts
- Service contracts
- Loan agreements
- Financing contracts

Potential risks associated with these contracts are contractual terms, the risk of cancellation, warranties or other obligations or guarantees (Rottke et al., 2016 and Klamar et al., 2013).

Public law

Lastly, it is essential that a company fulfils its public obligations since the company's value and the success of a transaction is closely linked to this (Klamar et al., 2013). These obligations could include (Klamar et al., 2013 and Rottke et al., 2016):

- Public sector approvals
- Licenses
- Environmental regulations

3.1.3 Selection of other types of due diligence

Even though financial and legal due diligence are the focus of this chapter, the remaining types of due diligences mentioned in Figure 8 are briefly explained.

Environmental due diligence

This due diligence is the audit of the external and internal environmental influences on the company (Klamar et al., 2013). Areas where risks and significant potential cost factors are suspected include (Hofmann, 2009 and Zentes et al., 2012):

- Contaminated sites
- Pollutant emission
- Analysis of the environmental regulations
- Ecological risk

HR due diligence

This due diligence concerns the human capital of an organisation and all the associated regulations (Broda, 2005). The following topics are important (Hofmann, 2009 and Zentes et al., 2012):

- Quality of management
- Analysis of the employment structure and contractual regulations
- Personal costs
- Influence of the work council/unions
- Analysis of the corporate culture and atmosphere

Tax due diligence

The main goal of the tax due diligence is to reveal all tax-related risks (Broda, 2005). These commonly include (Jansen, 2008; Hofmann & Nothardt 2009 and Höhne, 2013):

- Tax-saving potential
- Identification of tax risks related to the past (additional tax payments)
- Identification of opportunities related to the future

Cultural due diligence

Without analyzing whether the companies fit together on a cultural basis, no transaction should be concluded (Jansen, 2008). In other words, the two companies need to find a common denominator for (Keuper & Groten, 2007):

- Employee benefits (overtime, holiday or payment)
- Position regarding political and environmental views
- Position concerning the stakeholders

Strategic due diligence

From a strategic point of view, the major goal is to analyze the business model, the synergy potential, value-creating factors and the overall strategic orientation of the company for now and for the future (Pidun, 2019 and Hofmann & Nothardt 2009).

3.2 Participants in a due diligence process

The number of parties involved in a due diligence process depends mainly on the size of the deal and the participating companies (Dreher & Ernst, 2014). In this thesis, the focus is on the participants who are usually involved and the following stakeholders and their roles are described (Hinne, 2008 and Klamar et al., 2013):

- Auditors
- Tax advisors
- M&A advisors
- Lawyers
- Banks (financing)

Auditors

Due to the overall finance-related work of an auditor, their role within a due diligence process is naturally also strongly connected to the financial due diligence (Lucks & Meckl, 2015). Moreover, the above mentioned "forecast calculations" and the "adjusted company result" is also carried out by the audit team (Wegmann, 2013). Well known and reputable audit firms include KPMG, Ernst & Young, PricewaterhouseCoopers or Deloitte. An important benefit of an audit firm is the combination of various services. Hypothetically, they could be responsible for the financial, tax, advisory and even the legal components (Jansen, 2008).

Tax advisors

These advisors handle all the tax-related questions and issues during a transaction. They are usually responsible for the adjustment of the optimal price and for the process of tax due diligence (Wegmann, 2013).

M&A advisors

Valuable support also comes from the M&A advisor. They assist the buyer or seller throughout the entire process, mainly in terms of strategic and administrative questions including, for instance (Wegmann, 2013 and Phieler, 2008):

- Contacting the potential buyer/seller
- Moderating and solving of conflicts between the parties
- Conducting and supervising the milestones of the transaction
- Creating many of the meaningful documents (teaser, management presentation or information memorandum)

Generally, this role is filled by an M&A boutique or an investment bank. The major differ-ence between the two is that investment banks have a greater capacity for the above tasks due to their size and experience (Lucks, 2015). This is especially true for jobs like valuation, where M&A boutiques cannot provide the same service. However, in recent years, M&A bou-tiques have managed to position themselves within the mid-cap market. A crucial reason for this is the targets' increased trust in smaller boutique firms (from mid-market to mid-market) and the lack of interest from large investment banks since mid-cap deals are naturally less profitable (Wegmann, 2013).

Lawyers

The legal analysis is done by law firms and the legal due diligence is their area of responsibil-ity (Phieler, 2008). Some tasks include (Becker et al., 2016 and Wegmann, 2013):

- Preparation of the letter of intent
- Creation of the purchase contract
- Monitoring the legal regulations
- Legal aftercare

Banks (financing)

In most M&A deals, the acquisition of the target cannot be achievable without financing from a bank (Wegmann, 2013). Hence, it is advisable for the potential buyer to clarify at an early stage in the process which requirements the bank puts forward and how they can be met.

In addition to the above, the group which is always involved in every transaction are the em-ployees of the target company. A significant number of departments, such as the finance, le-gal, tax or operating department, make a significant contribution to the degree of success of the transaction (Ernst & Dreher, 2014 and Piehler, 2008). The employees of the respective departments are the experts and deliver a high degree of input regarding special circumstances or hidden characteristics. Hence, it is particularly important to involve these driving forces (knowledge carriers) in the process to prevent disappointment, uncertainty or frustration (Ott, 2009). The degree to which the employees should be integrated always depends on the indi-vidual case and the relationship between the owner and workforce (Dreher & Ernst, 2014).

3.3 Practical clarification

Up to this point, the thesis has presented a theoretical investigation based on the available literature. However, a reader who is not familiar with the topic might ask the following questions: What does the process look like in reality? How do all the participants interact witch each other? What is the big picture behind the theoretical knowledge? In order to provide meaningful answers to these questions, this section aims to visualise the entire process of a due diligence. Note that the following summary is based on the personal experience of the author and partly on the statements of Balz & Arlinghaus (2009).
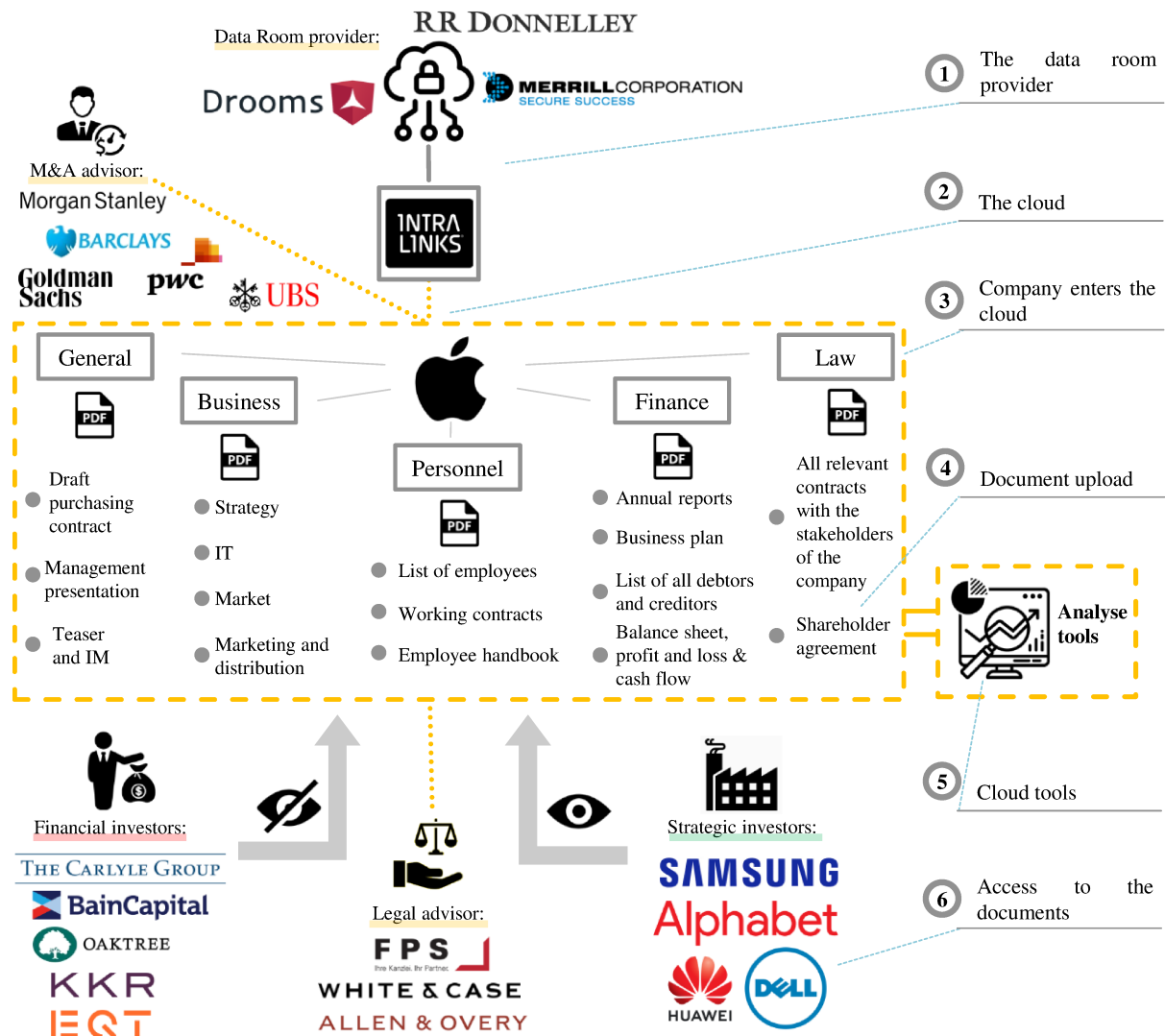

Figure 10: The due diligence process at a glance

Source: *Own graphic*

(1) <u>The data room provider:</u> The first step of every due diligence process is the selection of a suitable data room provider (note that the group of companies in Figure 10 is arbitrary). This decision is dictated by criteria including past experience, deal size, reputation and, most importantly, price. The M&A advisor and the company owner make this decision together. In this scenario, we hypothetically assume that Intralinks was chosen.

(2) <u>The cloud:</u> Intralinks provides the platform for the due diligence process and is a cloud-based application. Generally, the M&A advisor then creates the structure including all required sections "offline" and later transfers it to the cloud.

(3) <u>Company enters the cloud:</u> In this example, the company Apple was chosen. The previously prepared structure of the company, including all relevant business departments, is then uploaded into the cloud. Only a small overview is shown in Figure 10. In reality the structure is significantly more detailed.

(4) <u>Document upload:</u> The company then uploads the relevant documents (mostly in PDF format) to the data room. This is usually performed by the M&A advisor. Each document requires screening by the legal advisor due to the sensitive nature of many documents and sometimes certain content from the document may have to get blacked out before uploaded. This can be extremely time-consuming and challenging.

(5) <u>Cloud tools:</u> The tools of the data room are useful for analyzing which section is especially interesting to the potential buyers and reveal information such as who accessed which documents how many times, how active are the several representatives on the buyer's side and which documents were downloaded. By analyzing these activities, relevant conclusions can be drawn. Generally, the more active a buyer is, the greater the interest.

(6) <u>Access to the documents:</u> The M&A advisor, selling company and legal advisor work closely together throughout the entire selling process. They decide together which investor gets full, limited or restricted access to the documents provided. Usually, the legal advisor gives the permission and the M&A advisor implements the instruction. Moreover, the download of documents is a feature which also requires activation by the advisors. In general, the more an investor commits to a potential acquisition, the more allowances and privileges are granted. Technical support is ensured by the data room provider at all times.

Accompanying the review and information gathering is the crucial "questions and answers" (Q&A). At this stage, the remaining investors ask questions regarding the disclosed documents and the associated sell-side, M&A and legal advisors provide answers.

4   Artificial intelligence and due diligence

The challenge of this chapter is to introduce the topic of artificial intelligence (AI). However, due to its wide and complex nature, the focus will only be on the sub-areas which contribute to answers for the overall research question.

The term artificial intelligence is defined, different types of AI are presented and a selection of AI tools (legal and financial) are listed. Subsequently, we will test whether the term "AI tool" lives up to the main characteristics of AI according to the relevant literature.

Connected to this chapter is the fifth and final section which is the analysis and evaluation of the survey.

4.1   AI at a glance

4.1.1   Definition: an attempt

Presenting one, true definition for the term "artificial intelligence" is a challenging task. The approach in this thesis is therefore to gather various possible definitions and extract the relevant parts.

Mainzer (2019) introduces his thoughts by describing AI as more or less a simulation of intelligent acting and human thought processes. After locating uncertainty in the term "intelligence", he improves his initial idea:

"A system may be called intelligent, if it is able to solve issues independently. The degree of intelligence depends on the degree of independency, the degree of difficulty and the degree of efficiency of the problem-solving process." (p.3)

Essential aspects:

- ▪ Independent acting
- ▪ Problem-solving

Great insight is also given by Gentsch (2019). Like Mainzer, he focuses on the definition of the term intelligence to reveal the true meaning of AI. He makes use of the classification in the Duden (2019) which describes it as follows:

"AI is the ability (of humans) to apply purposeful acting based on abstract and reasonable thinking" (p.17).

He concludes that intelligence is mostly a mental ability which includes the identification of rules and reasoning to learn from mistakes and develop complex ideas.

Moreover, he includes a well-known quote from Rich (2009):

"Artificial Intelligence is the study of how to make computers do things at which, at the moment, people are better"(p.18).

Essential aspects:

- Better than humans
- Abstract and reasonable thinking

Another potential approach is added by Bünte (2018). According to her study, the term AI consists of three fundamental criteria: learning, problem-solving and pattern recognition. A survey carried out by the foundation "Offensive Mittelstand - Gut für Deutschland" (2018) agrees with the findings of Bünte and mentions interpretation and acting as additional factors.

Essential aspects:

- Learning
- Pattern recognition
- Interpretation

Another interesting way to recognize AI is the Turing test reviewed by Barthelmeß & Furbach (2019). At this stage we will focus on the essential statement of the experiment and keep it simple. The experiment includes three components: a computer (robot), a human and a questioner (also human). The goal is for the computer to convince the questioner that it is also human. To achieve this, the questioner asks several questions (on all topics) which are supposed to separate the human from the computer based on the quality and characteristics of the answers given. Although the Turing test is a valid approach to tackle the problem of identifying AI, it does not fit the needs and circumstances of the present work. The tools applied in a due diligence process are substantially different. Nevertheless, the test should be mentioned since many would argue that true AI can only be verified through this method. However, we

will discover that it is not that simple and that the standards we require from AI are highly ambitious and excessive in many cases.

The last approach taken into account is that of Lenzen (2018). At the beginning of his considerations, the author proposes that an action carried out by a machine is "intelligent" if a human requires intelligence to perform the same action. However, the inadequacy of this first approach is apparent after considering that a calculator solving a mathematical calculation does not qualify as AI in this regard, even though a human would require intelligence to do the same thing. This approach is too superficial and does not lead to a definition of AI.

Contrary to this previous approach, Lenzen no longer focuses on a definition of the term "intelligence", but rather on the relevance of "cognition". As, however, the understanding of the conscious experience of a human being is not adequately understood, it cannot be associated with a machine or robot.

Since both approaches are unsatisfactory, Lenzen concludes that a separation of classical intelligence (calculations or puzzles) and emotional intelligence (artistic, social or spiritual intelligence) is required. According to Lenzen, implementing both aspects in a machine at the same time is not possible, since only human beings are able to do this.

All of the attempts reveal that the requirements for an AI definition are too many. The desire for a machine which is able to solve issues (for which a human has to apply intelligence) and perform tasks by applying all facets of cognition simultaneously, would surpass the current possibilities. Hence, Lenzen narrows it down to the following conclusion which is a realistic definition according to today's standards:

"AI is a system which can learn and react flexible to changes within a certain situation. Moreover, the system can perform the tasks without the assistance of a human."

Essential aspects:

- Learning
- Adjustment to changes
- Independent acting

When summarizing all the essential aspects, it appears that the expectations of today's science should not be too high (abstract and reasonable thinking belong to the world of cognition and

cannot currently be achieved) and at the same time should not be too simple (it remains a complex area which cannot be simplified to a point where essential characteristics are sacrificed for the benefit of simplification). Consequently, the following five attributes represent a definition of the term AI for this thesis:

(1) **Independence:** The system can operate without the assistance or the guidance of a human

(2) **Learning:** The system adapts its mistakes and develops automatic improvements. Moreover, it remembers and adjusts the commands of operating humans

(3) **Problem-solving/reacting to changes:** The system is able to handle unexpected and unknown issues

(4) **Pattern recognition:** The system is able to recognise patterns within documents and sequences

(5) **Interpretation:** The system understands the meaning of certain actions

One might ask how many of these criteria a machine needs to fulfil to be called AI and moreover, are the criteria equally important? From the frequency and the importance emphasised in the literature, the first three points are especially relevant. The answer to the question of how many characteristics a machine should represent is speculation. A logical approach would be to say: the more, the better.

4.1.2 Types of AI

In the following step, the different types of AI are investigated and presented using two approaches.

The first method is based on Kreutzer & Sirrenberg (2019). According to their findings, three major types of AI can be distinguished:

- Supervised learning
- Unsupervised learning
- Reinforcement learning

Supervised learning

The first scenario describes a situation in which the goal is defined and the system (the machine) is programed with all possible answers (Kreutzer & Sirrenberg, 2019). Also, the limits are set in advance and the entire learning process of the machine is supervised and observed (Gentsch, 2019 and Kulkarni, 2012). The goal is to teach the system in the same way a human

would be educated (Buxmann & Schmidt, 2019). An example could be a system delivering different prices for specific automotive models by valuing features like brand, power or equipment (Gentsch, 2019).

Unsupervised Learning

Unlike for supervised learning, the system does not have any goals or predefined frames. The challenge is for the system to identify similarities and hidden patterns independently and without human assistance. Essentially, this second type of learning enables machines to unveil patterns and data which were previously unknown to humans (Gentsch, 2019 and Baruque, 2010). This practice was used for the US presidential election and the Brexit vote for Great Britain leaving the European Union (Kreutzer & Sirrenberg, 2019).

Reinforcement Learning

Similar to unsupervised learning, the human being does not provide any plan or goal. Rather, the system develops/creates its own solution applying a reward and punishment technique (Kreutzer & Sirrenberg, 2019 and Baruque, 2010). This operation allows for possibilities which exceed the power of imagination, since problems which appeared to be unsolvable are solved (Kreutzer & Sirrenberg, 2019). The machine takes various external factors into considerations. An example of such a system is a chess computer or similar strategy game system with rewards for "victory" and punishments for "defeat" (Gentsch, 2019).

A second and comparable method which is used to classify AI is derived by Bünte (2018). She separates AI into two fundamental groups:

(1) Preprogramed systems

    a) Assisted machines without learning process: These support humans in their work (e.g. a robot in a factory which supports a human)

    b) Independent machines without learning process: These complete the work of a human independent of humans (e.g. a robot in a factory works independently)

(2) Adaptive systems

    a) Assisting intelligence: The system copies the actions of a human (e.g. a machine assists a doctor during surgery)

    b) Independent intelligence: The system works independently and can react to different and new situations (e.g. face recognition systems)

Thus, we distinguish between preprogramed machines which support a human in their work (1/a) or do the work independently (1/b) and machines which learn constantly while they assist a human (2/a) or machines which work without any human participation while learning at the same time (2/b).

4.2   Selection of AI tools for the due diligence

This section aims to provide a general overview of the legal and financial AI tools and their functions and focuses on the tools which are used most frequently according to the survey (a comprehensive evaluation of the results is included in the last chapter). Due to their greater relevance, there are four examples of legal tools and two examples of financial tools. The following information is extracted from the respective websites.

4.2.1   Legal tools

Kira (Kira website, 2019)

The Canadian-developed machine-learning software is among the leading instruments for analyzing, systematic processing and uncovering of documents and contracts. It was initially created to only support due diligence processes. Nowadays it is also used for consulting, project management, lease, audit, accounting and almost all industries where the analysis of contracts is involved. According to the company, it is used by the leading law firms in over 40 countries. The fundamental advantages are:

- Import all documents into Kira; the program then prepares and organizes the data in a clean presentation
- Documents are transformed into machine-readable forms
- Through several search and analyze tools, "prebuild searches (machine learning algorithms)", Kira identifies concepts in contracts/documents, recognizes patterns and automatically extracts information

According to the company, by implementing Kira in a due diligence, one can complete the process "in half the time, increase the accuracy of their review and devote more of their time to the most demanding aspects of their files".

iManage (iManage website, 2019)

Similar to the applications offered by Kira, iManage provides a large range of services for law firms' corporate and legal departments or even financial services. They claim to equip more than 3,000 organisations and over one million professionals all over the world. Their service can be divided into three major segments:

(1) Document and e-mail management: This aims to enhance productivity in a firm. The focus is on features like smart worklists, document timelines, personalised search functions or the adaption of the e-mail habits of the user. Moreover, one can work offline or online on any device. Additionally, the cloud-based tool allows secure file sharing and collaboration with external third parties.

(2) RAVN artificial intelligence: The instrument is able to understand and classify organizational content, automatically read, interpret, and extract key information from documents or apply advanced enterprise searches and expertise identification.

(3) Security, risk and governances: With this last component, iManage manages global security policies and provides protection of data from internal and external threats.

The AI application of iManage is especially relevant. The starting point for this service was the acquisition of RAVN in May 2017. Users of RAVN are equipped with the following benefits:

- Documents are automatically classified
- RAVN extracts key information such as date, obligations or amounts
- RAVN reveals compliance requirements from documents to enhance the overall management
- RAVN automatically identifies the relevant terms and clauses for reuse, connectivity purposes or task-related applications

Luminance (Luminance website, 2019)

The company was launched in 2016 and currently has over 120 customers in 40 countries and is used by 14 out of the 100 top law firms. Like its previously-mentioned competitors, the program offers a large portfolio of services:

(1) Compliance: Enabled through a clustering process, lawyers obtain deep insights into a client's legal contracts, data and the overall landscape.

(2) Diligence: Reveals risks which are likely to be overlooked by a manual reviewer.

(3) Discovery: The system visualizes information in the early stages of the due diligence process and reveals clearly structured insights on the available data.

(4) Property: The relevant information is organised and clustered in way which allows the early detection of potential risks, such as expiration dates.

The technology (especially for the service "diligence") provided by Luminance has the following highlights:

- The program reads and understands corporate documents and learns from the interactions with the respective lawyer
- It understands the entire corporation and clusters the information accordingly
- It automatically recognizes key clauses and data points
- It uncovers hidden risks, even in areas which were not the focus of the considerations
- It saves time through collaboration tools

ANALYZELAW (ANALYZELAW website, 2019)

This software claims to be the perfect solution for handling contracts (rental, supply, work, loan or customer contracts) through their tool called "Contract Analyzer". It has the following advantages:

- An intelligent reading assistant
- Supports while analyzing contracts which enables a comparison with multiple documents and clauses
- Optimizes contracts and reveals risks faster

As for the previous tools, the technology is supported by AI which sets up the following features:

- Classification of contracts: Allocates the contracts automatically to the corresponding area of law

- Extraction of passages: Software converts the relevant contents and clauses

- Recognition of entities: Relevant information (parties, contract value, contract date) is extracted

- Natural language processing: Allows the research to be performed with one word or a whole sentence

4.2.2 Financial tools

Alteryx (Alteryx website, 2019)

Founded in California, the organisation focuses on the topics of analytics and data science. In simple words, the goal of the company is to provide data processors with a tool which assists them in understanding what information is available for analyzing data from various sources and how to apply and use this information.

The company describes it as follows:

"With Alteryx, business analysts and data scientists alike can discover, transform, model, and analyse data using a single governed, collaborative, and scalable enterprise analytic solution" (Alteryx datasheet, 2018, p.1).

The service provided by the company can be divided in four categories:

- Discover and cooperate: Makes data more searchable and trackable and at the same time increases data security. Increases the level of collaboration and sharing significantly within the organisation

- Prepare and analyze/model: Enables the creation of statistical, predictive, prescriptive and spatial models without programing knowledge

- Share and scale: Automatization and scheduling of intensive analytic processes in order to secure, scale and centrally manage data assets and workflows

- Provide and manage: The process of managing, administration, and supply of models on one platform

Qlik Sense (Qlik website, 2019)

Founded and developed in Sweden, the Qlik Sense software is all about intelligent visualization, connection and the analysis of data.

The tool offers four applications:

- Qlik Analytics Platform: Creates customized analytical tools and applies meaningful analytical functions
- QlikView: Clear dashboard including strong and interactive "data discovery" tools with fast and targeted access
- Qlik Core: Integrates interactive and data-driven third-party applications in a cloud where they can be developed and optimized
- Qlik Data Catalyst: Releases the full potential of your big data investments and speeds up the amortization process. Optimizes the way you catalogue, manage and prepare the relevant and used data

4.3   Critical reflection – AI tools: realistic or misleading

In the previous sections, the term artificial intelligence was defined and a selection of regularly used tools which claim to make use of AI were presented. It is important to check whether this "AI branding" is deserved or just a marketing technique. To address this issue, the first and the second chapter will be combined to provide meaningful answers to the following questions:

(1) Do the tools introduced comply with the identified AI characteristics of this thesis?
(2) If yes, to which type of AI do they belong?

In order to answer the first question, Figure 11 compares the AI definition of this thesis with the selected tools.

AI tool provider	Indi-pendency	Learning	Problem solving / react to changes	Inter-pretation	Pattern recognition
kira	✘	(✔)	(✔)	✘	✔
iManage	✘	(✔)	(✔)	✘	✔
Luminance	(✔)	(✔)	✘	✘	✔
ANALYZELAW	✘	(✔)	✘	✘	✔
alteryx	✘	✘	✘	✘	✔
Qlik Sense	✘	✘	✘	✘	(✔)

Figure 11: AI tool analysis

Source: *Own graphic*

It is clear that the first four tools (**legal applications**) are able to learn and to recognize patterns. However, it should be noted that the tools do not correspond completely with the definition given in the literature. According to the Duden, learning is a combination of acquiring knowledge and skills or memorising things. This definition of learning is strongly connected to a human being and should not be applied to learning by a machine. As Lenzen (2018) suggests, we should not expect machines to perform in the same way as humans, since they are not human. Nevertheless, the learning that eventually delivers the desired results is surprisingly close to what we understand as learning.

Only Kira and iManage are partly capable of problem-solving and reacting to sudden changes in a process. However, the capability to operate completely independently, without any human assistance and therefore just like a human, cannot be verified. Moreover, based on the research, machines are not able to interpret certain situations. It can be assumed that all the investigated AI providers use the term "automatization" to mean "independence". Unfortunately, this is misleading and does not match the definition in the literature. The author concludes that none of these tools can fulfil all the requirements in the literature and certainly do not come close to passing the Turing test which would be the ultimate proof of AI.

The reason why the tool providers highlight the AI factor of their products is summarized by Lenzen (2018):

"It is a label which makes machines more interesting and is therefore used in an inflationary fashion on cars, search machines or smartphones."

Even though this quote is not entirely true for the tools described above, it describes the heart of the matter. Therefore, a better approach would be to describe the tools as automatized, supportive and analytical instruments with – stronger or weaker – characteristics of artificial intelligence. In contrast to the former instruments, the last two tools (**financial applications**) do not include any AI element. After reviewing the individual instruments, it can be seen that their primary focus includes:

- Analysis
- Collaboration
- Automatization

All-encompassing AI is not a feature, only a detection of patterns.

Since we have confirmed that the tools presented in this thesis do include at least a small degree of AI, we now answer the second question. Which category can they be allocated to?

Group 1 (legal component)

Beginning with the first method discussed, it becomes obvious that a combination of supervised and unsupervised learning might present an appropriate approach. All legal tools include the characteristics of supervised learning since they follow a set structure and the limits are precisely defined. The user knows exactly what is to be expected and uses the machine for support while the machine adopts and "memorizes" certain pattern or behaviours, i.e. it learns. Some unsupervised learning was encountered with Luminance since the application is able to reveal risks which were hidden and were unknown to the user.

Using Bünte's (2018) method, we can conclude that these tools are all "assisting machines" and even "assisting intelligence". However, they all depend on the participation of human beings and their active impact on the program.

Group 2 (financial tools)

The necessity of a "learning feature" is an obstacle of the first method and cannot be implemented in the financial tools. These are purely assisting, preprogramed machines which assist a human during their work without including a learning/improvement process in any way.

Based on these findings, it can be noted that legal tools contain a noticeable number of AI characteristics. In this context, it is significant to note how far science has already come.

On the other hand, financial tools have not yet focused on AI solutions since the tasks involved in their work do not yet provide an access point.

However, it is also true that both legal and financial tools still function as support sources which partly represent the "spirit of AI", but have not yet reached the definition suggested by the literature.

5   The survey: analysis and evaluation

At this stage, we will evaluate the survey questions defined in Chapter 1.3. Each question is evaluated separately and the most important findings are highlighted in orange. The answers to the questions are documented in the footnotes. In addition, the percentages in the graphics are related to the respective groups (see Figure 12 for the groups). The cumulative values (group 1 and 2 together) are highlighted in orange above the respective bar in the diagram.
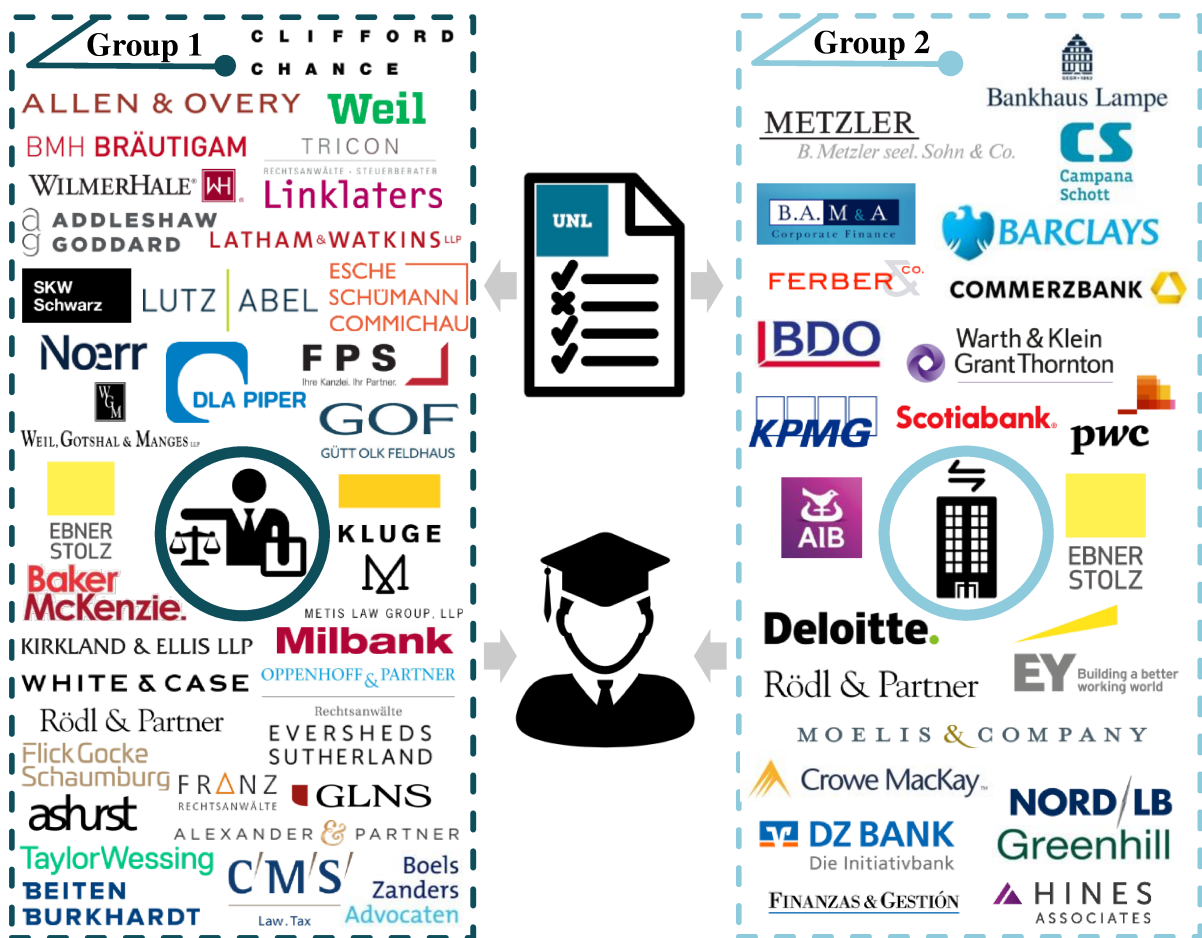

Figure 12: The companies of the survey

Source: *Own graphic*

Figure 12 illustrates the companies contacted and splits them, as previously mentioned, into two groups. It should again be noted that the quality of the companies (size, reputation and relevance) in the survey is highly satisfactory. Since the importance of audit firms for the financial component of the due diligence has been discussed (see Chapter 2.2) it is also a huge achievement to present not only the "big four" (Ernst & Young, KPMG, Pricewaterhouse-

Coopers and Deloitte), but also the largest German audit firms (BDO, Ebner Stolz, Rödl & Partner and Warth & Klein Grant Thornton).

Question 1: Do you use AI tools within your company? If yes, which one(s)?[9]

Results:
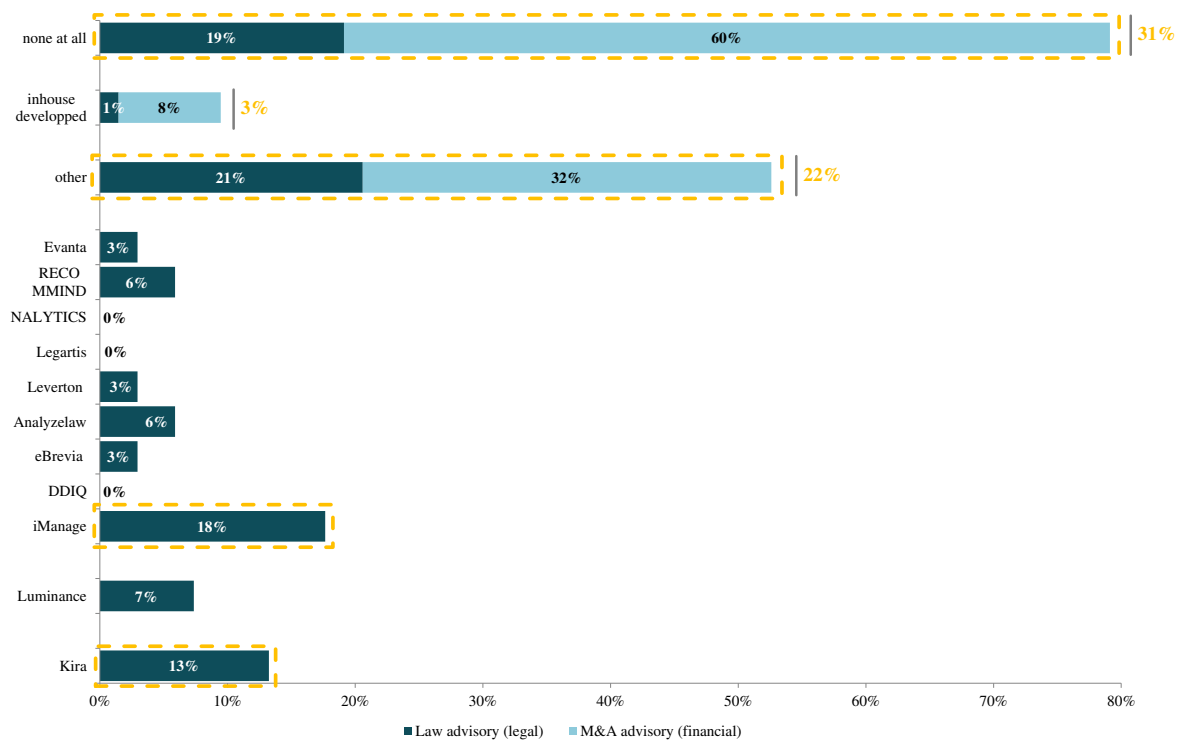
Analysis of the legal group: First, it is worth noting that the favourite tools used are **iManage** (18%) and **Kira** (13%). At the same time, however, 19% of the surveyed companies do not use any AI tools at all and 21% use tools not listed here. The tool mentioned in this regard, and used by more than one firm, is **HighQ**.

Analysis of the financial group: The largest proportion of this group (60%) do not use AI support, which was expected. However, the first question was also expected to present the tools which are actually used by financially-related M&A advisors. These included:

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[9] Available answers: Kira, NALYTICS, Luminance, Recommind, iManage, Other, DDIQ, None at all, eBrevia, ANALYZELAW, Leverton and Legartis.

- **Alteryx (2)**
- **Qlik Sense (3)**
- **IntraFind (1)**
- **Python (1)**
- **MATLAB (1)**

It should be noted that 8% of the M&A advisors still use tools developed in-house. Unfortunately, no more insights regarding these tools have been given.

Question 2: For which kind of due diligence do you believe that AI is going to have the biggest impact?[10]

Results:
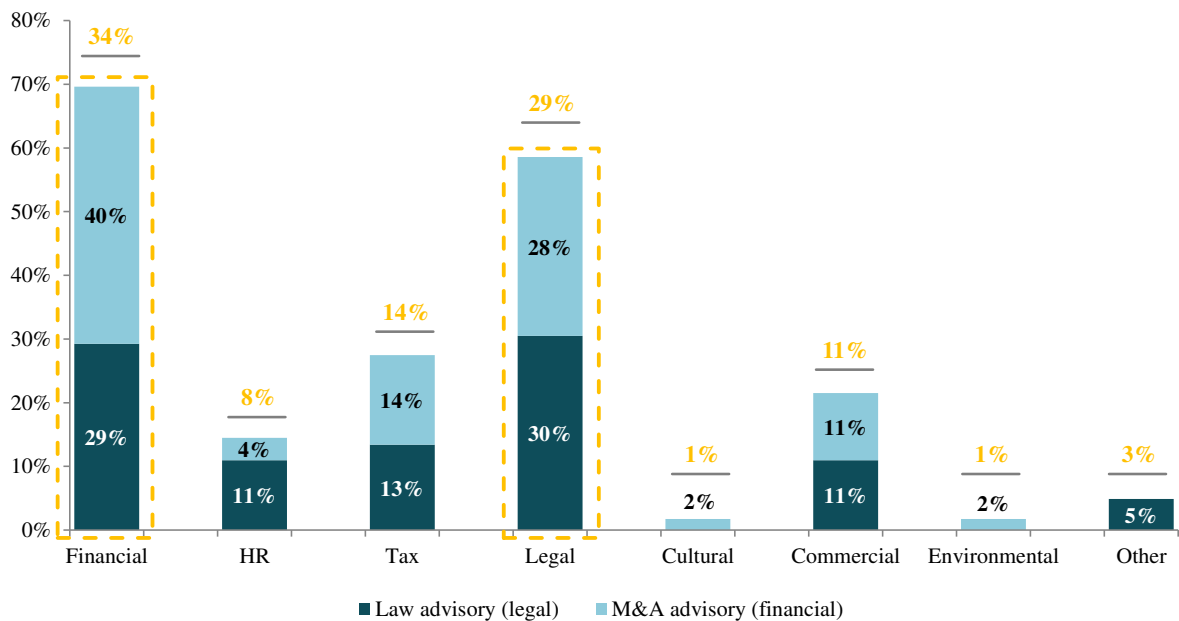
Both groups agree that the biggest impact will be in the **financial** (cumulatively 34%) and **legal** (cumulatively 29%) industries, followed by tax (cumulatively 14%), commercial (cumulatively 11%) and HR (cumulatively 8%).

The other industries, as given by the law group, include:

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[10] Available answers: Financial, HR, Tax, Legal, Cultural, Commercial, Environmental, Other (please note which DD).

- Real estate
- IT
- Compliance

The cultural and environmental industries will not benefit from the advantages of AI according to the companies surveyed.

Question 3: How significant is AI going to be in a due diligence process in 5 years' time?[11]

Results:
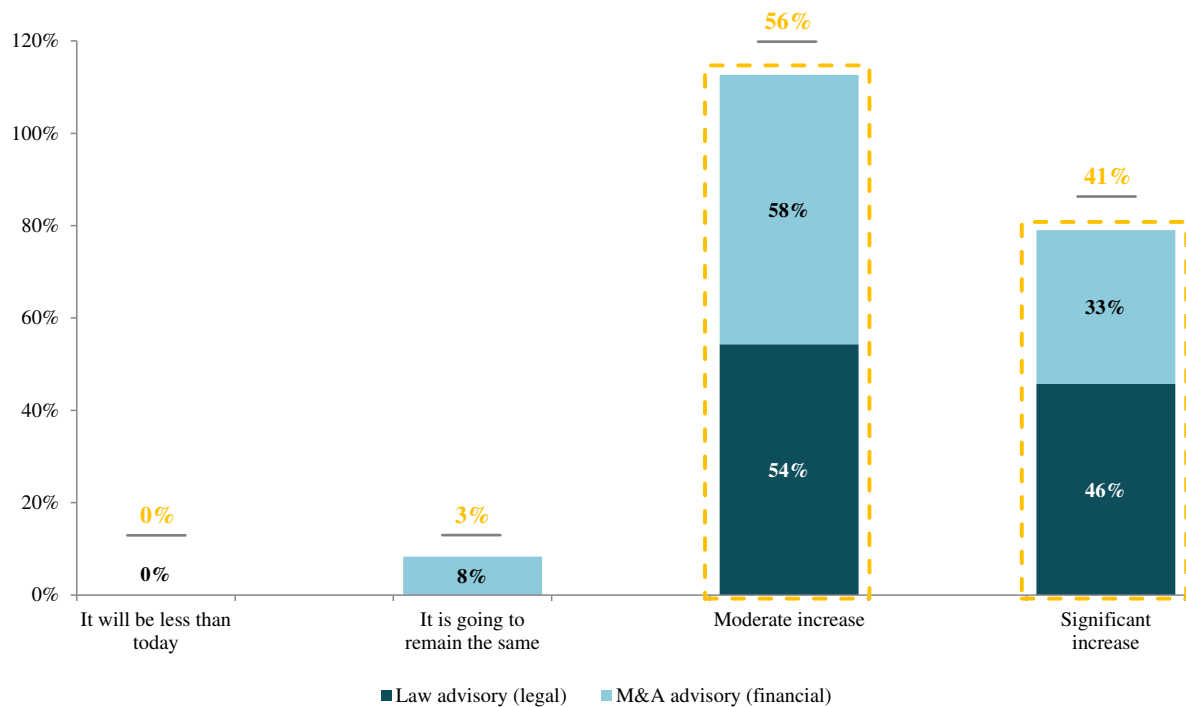
A moderate increase is predicted by 56% of the interviewed companies, while 41% think there will be a significant increase within the next five years.

It is particularly interesting to note that just 33% of the financial group think there will be a significant increase, meaning that the legal group is overall more committed to the topic.

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[11]Available answers: It will be less than today, It is going to remain the same, Moderate increase, Significant increase.

Another aspect shared by both groups is the conviction that the development will not decrease over the next five years.

Question 4: How important is the time factor for a due diligence process?[12]

Results:
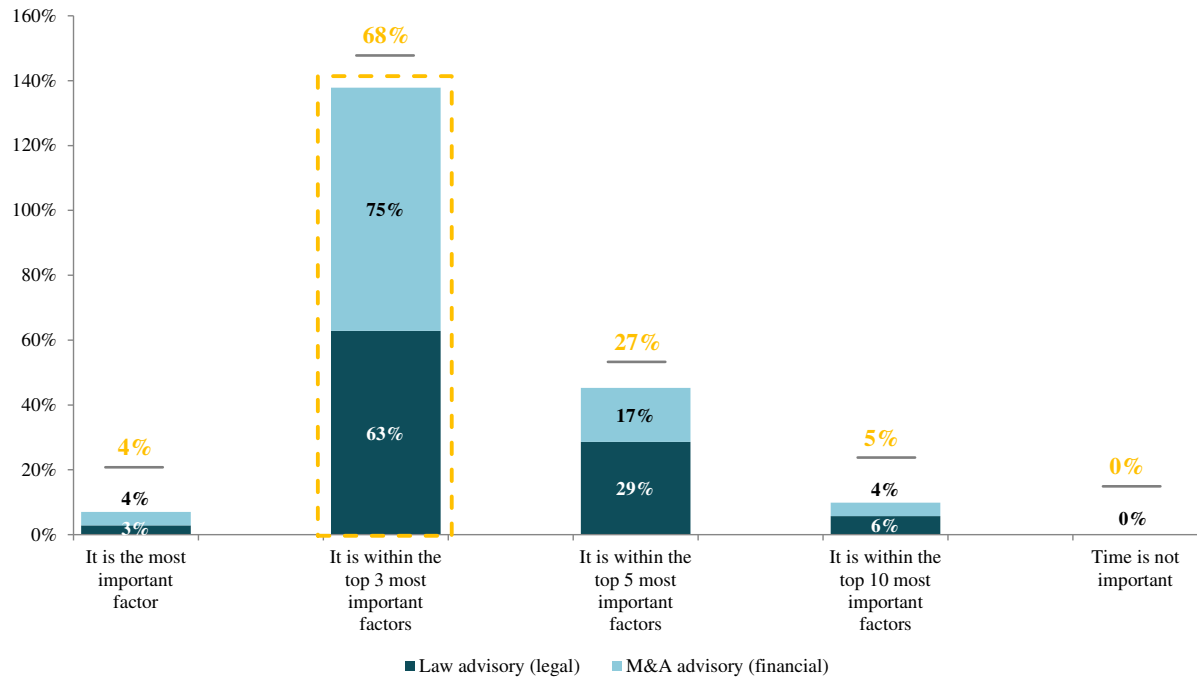
Both groups agree to a large extent (68%) that time is a significant factor during a due diligence process and within the top three priorities.

On the other hand, none of the companies believe that time plays no role in a due diligence.

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[12] Available answers: It is the most important factor, It is within the top 3 most important factors, It is within the top 5 most important factors, It is within the top 10 most important factors, Time is not important.

Question 5: In your opinion, what impact should AI have on a due diligence process? (Choose up to 3.)[13]

Results:
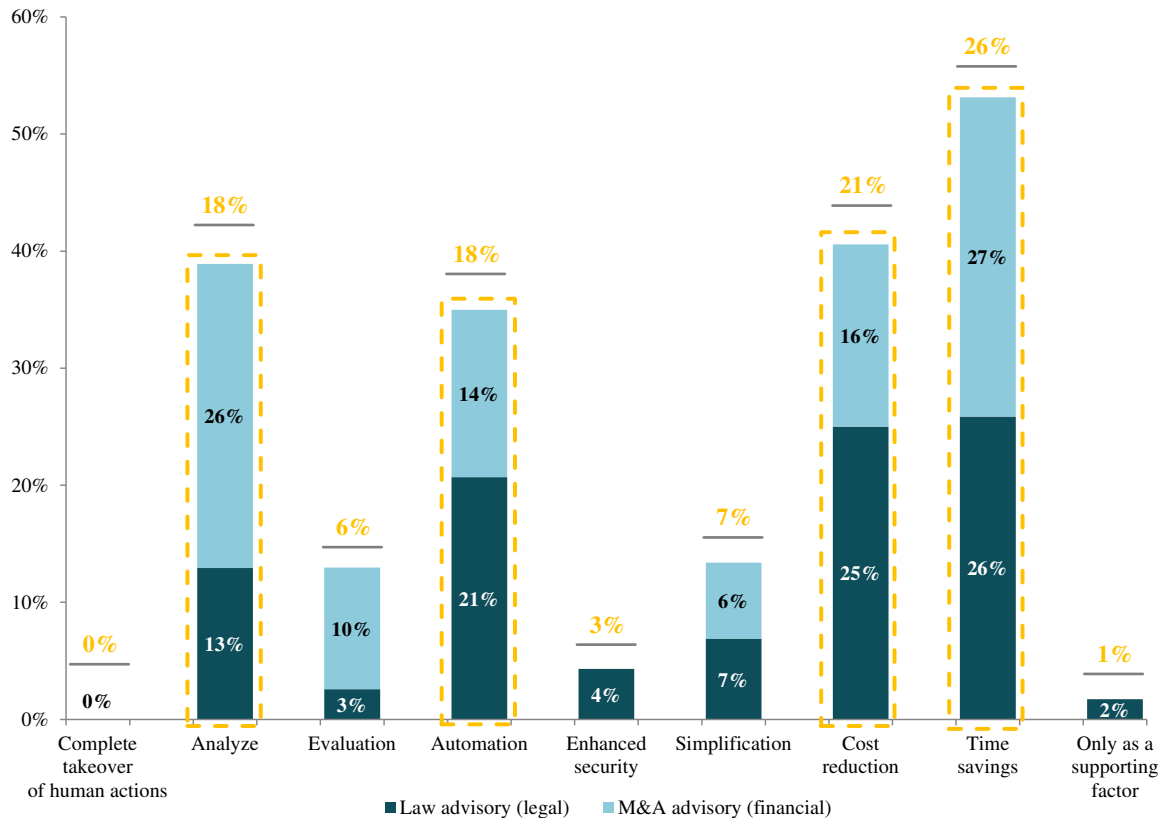
Analysis of the legal group: For this group, the factors of cost reduction (25%) and time savings (26%) are especially important. However, they do not require AI for analysis purposes (13%).

Analysis of the financial group: This group also requires AI for time-saving purposes. Unlike the legal group, the financial group believes that AI should be used in the analysis component (26%) of a due diligence. This fact is not surprising due to the numbers-based daily profession.

The results are similar for evaluation (10%), which is a topic related to analysis.

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[13] Available answers: Complete takeover of human actions, Analyze, Evaluation, Automation, Enhanced security, Simplification, Cost reduction, Time savings, Only as a supporting factor.

Cumulatively, both groups value time savings (26%) the most, followed by cost reduction (21%) and then analysis and automatization (both 18%). Additionally, nobody believes in a complete takeover of AI within their daily profession.

Question 6: Which of the innovations mentioned below is going to have the biggest impact on a due diligence process:[14]

Results:
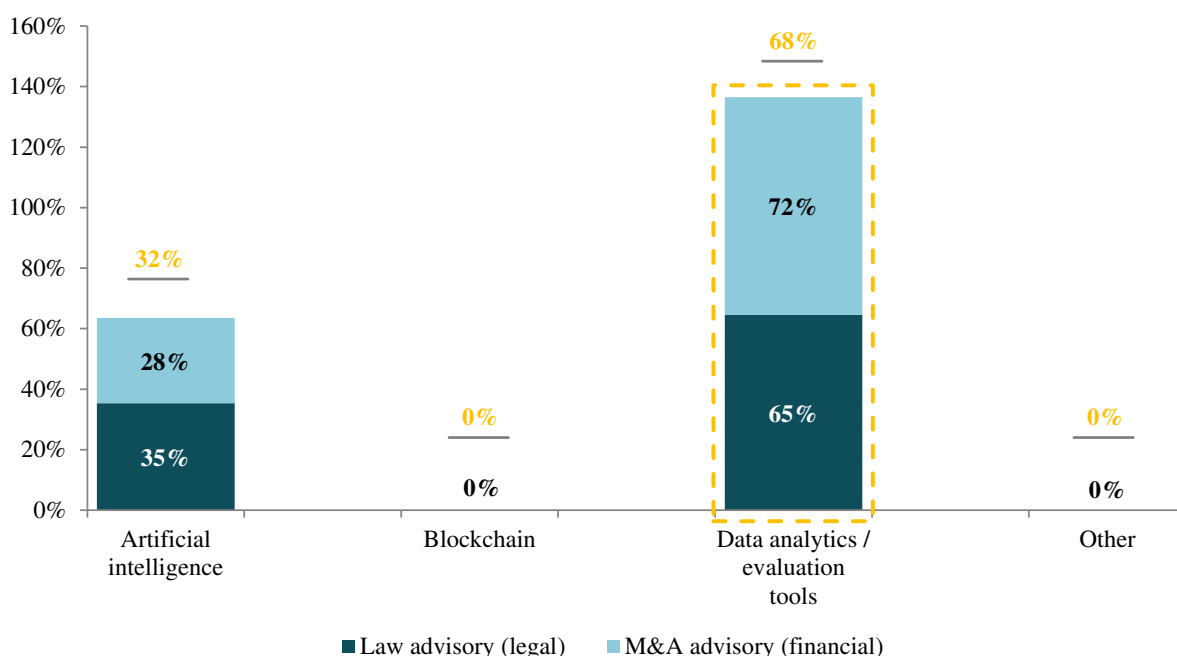
The sixth question gave some interesting results. Contrary to the initial expectations of the author, 68% of the surveyed organisations believe that data analytics will have a greater impact than artificial intelligence.

This opinion is even more strongly represented by the financial component (72%).

A potential explanation for this might be that given in the previous chapter. Apparently, the end users know or assume that the predominant usage is (will be) delivered by analytical and evaluation tools. At the same time, however, the impact of AI is not completely negated. The

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[14] Available answers: Artificial intelligence, Blockchain, Data analytics/evaluation tools, Other (please specify).

graph shows that the financial group aligns itself more strongly with this view. As discussed in the previous chapter, this is due to the fact that their contact with AI is substantially lower as the tools they use do not include this application.

Moreover, this might also reflect what the targeted audience requires and what they desire rather than what they assume will develop strongly in the future.

Question 7: For which business could AI be especially useful?[15]

Results:
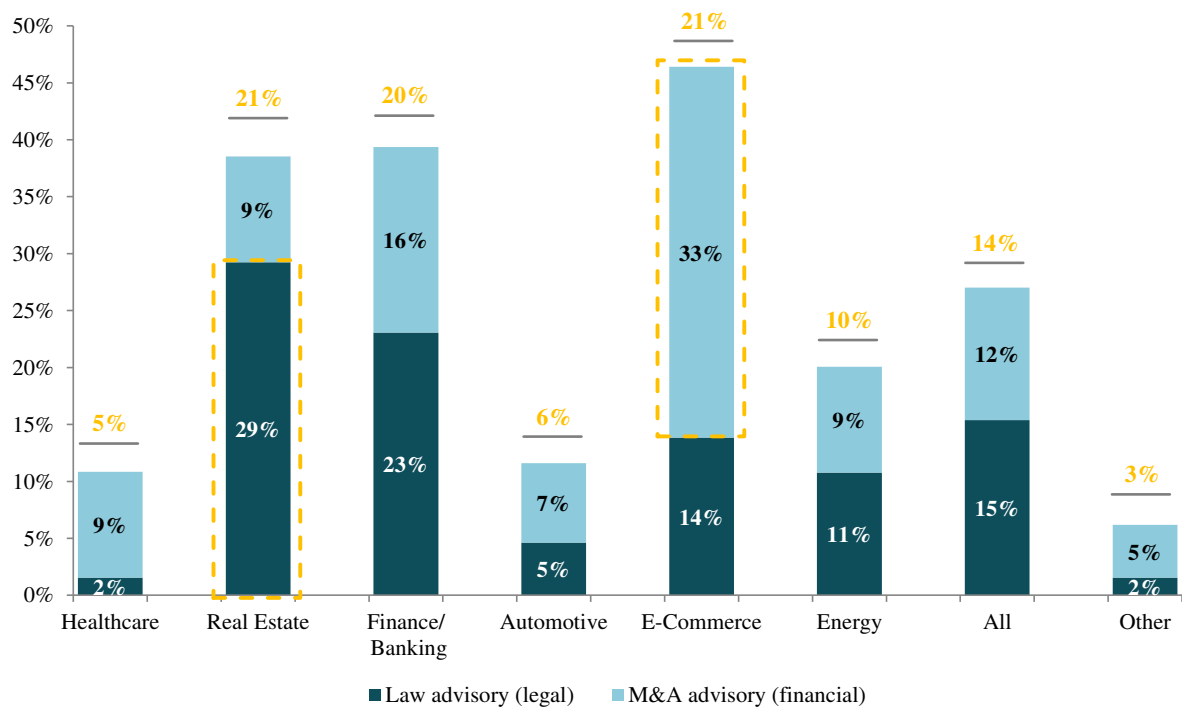
The legal and the M&A advisors both conclude that AI could be particularly useful for the industries of e-commerce and real estate (both 21%) and finance/banking (20%).

Real estate is a particular focus for the legal component (29%) and e-commerce is a particular focus for finance (33%).

According to the replies, this results from the fact that these industries are currently their main targets. It can also be assumed that both groups desire AI for precisely these sectors.

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[15] Available answers: Healthcare, Real-Estate, Finance/Banking, Automotive, E-Commerce, Energy, Other (please specify).

Also reflected by this evaluation is the fact that almost every industry will be influenced by the innovations of AI according to the targeted audience.

Question 8: In your opinion, which country is currently leading in the development of AI? (Choose up to **3.**)[16]

Results:
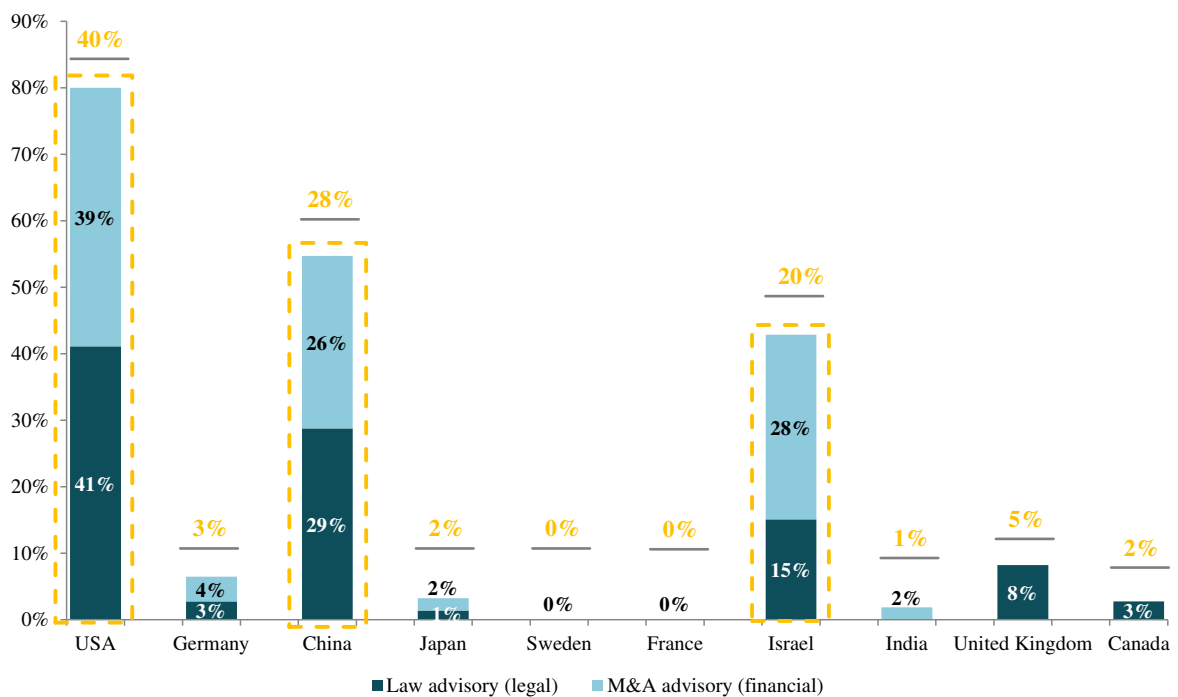
Question 8 reveals that the leading countries in the world of artificial intelligence are cumulatively believed to be the USA (40%), China (28%) and Israel (20%).

While the USA and China are no surprise, Israel is, at first glance, an unexpected candidate.

One potential explanation is offered in the "WELT" article by Eckert (2019). He notes that this Middle Eastern country is the leading force for AI-related start-ups.

The same message is shared by Demary & Goecke (2019). In their report, Israel is in fourth place when it comes to AI start-ups. In addition, per 1,000 enterprises and per million inhabitants, Israel is in first place in both cases, ahead of the USA and China.

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[16] Available answers: USA, Germany, China, Japan, Sweden, France, Israel, India, United Kingdom, Canada.

Question 9: Is your average client aware of the possible integration of AI and would they rely on solutions delivered by machines? (Choose up to **2.**)[17]

Results:
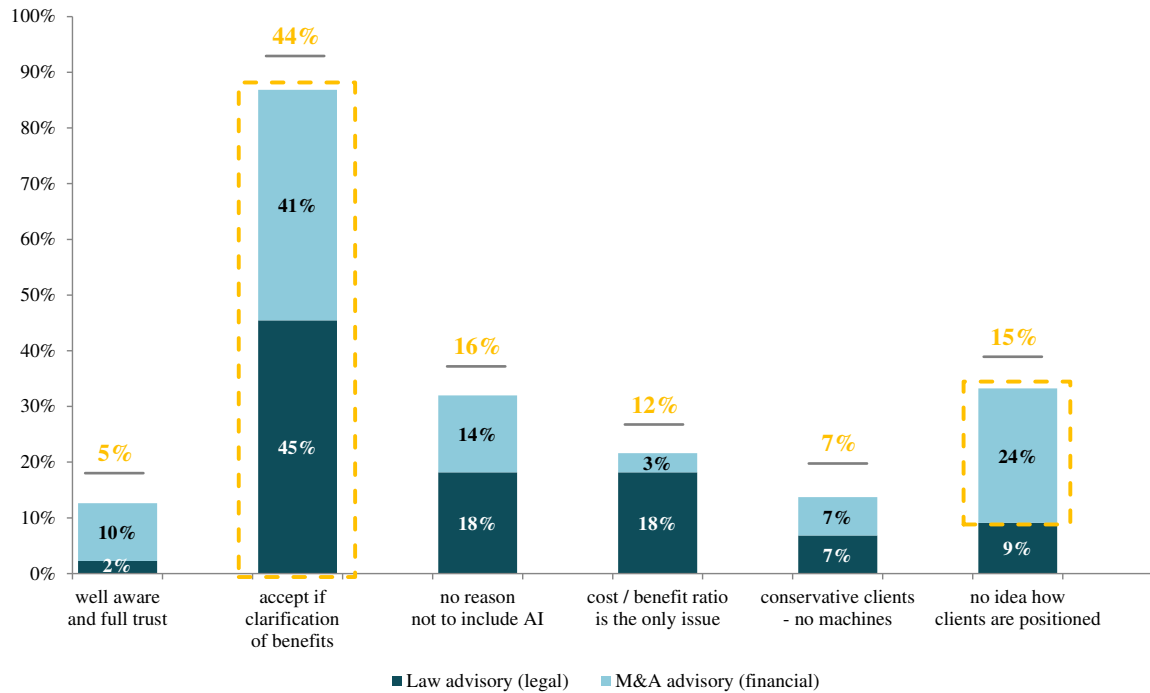
When considering the legal and finance groups together, a majority (44%) believes that their clients would accept AI if the benefits of its implementation were clarified.

It should also be noted that law firms (18%) identify an issue regarding the cost-benefit ratio, while the financial group (3%) does not.

Of greater importance, though, is the fact that 24% of the M&A advisory firms do not know how their clients are positioned regarding AI. For the legal component, this is only 9%.

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[17] Available answers: Our clients are well aware and have full trust in a machines function, They would accept it if we clarified the benefits, There is no reason why AI should not be included, The cost/benefit relationship is the only issue, Our clients are mostly conservative and do not want machines to be included, We do not know how our clients are positioned regarding this topic.

Question 10: How urgent is the implementation of AI tools in your company? (Choose up to **2.**)[18]

Results:
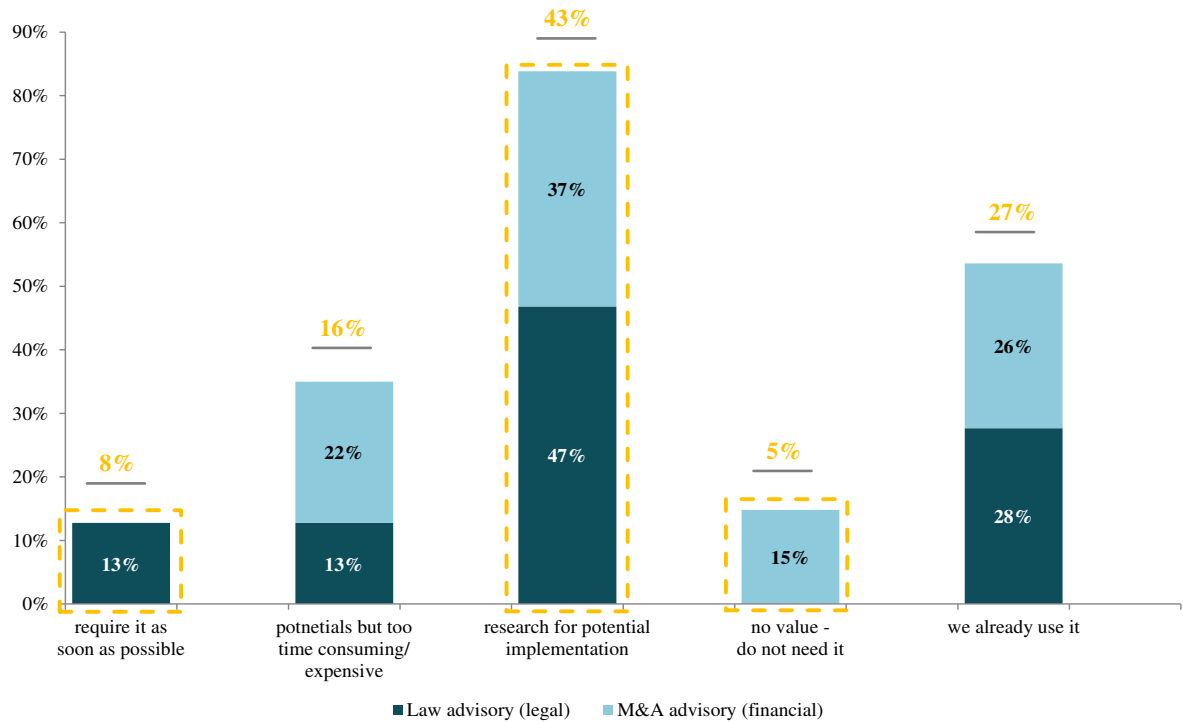
In both groups, 43% of the companies say that they are currently conducting research to iden-tify potential business areas which signal a need.

Analysis of the legal group: Even though 28% of the legal group state that they are already using AI in their company, 13% say that they require AI as soon as possible (most of them are included in the number of companies which already use AI).

Analysis of the financial group: For the financial group, the following points are especially worth mentioning:

- 15% of these firms believe AI cannot deliver any value (compared to no law firms).
- Not a single M&A advisory company stated that they required AI as soon as possible.
- 71% of the M&A advisory firms which already use AI are audit companies.

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[18] Available answers: We require it as soon as possible, Many areas signal potential but the implementation is too time-consuming/expensive, We are currently running analysis/gathering information regarding potential fields of implementation, AI cannot deliver value to our work, We do not need it at all.

In conclusion, Figure 13 summarises the most noticeable findings.
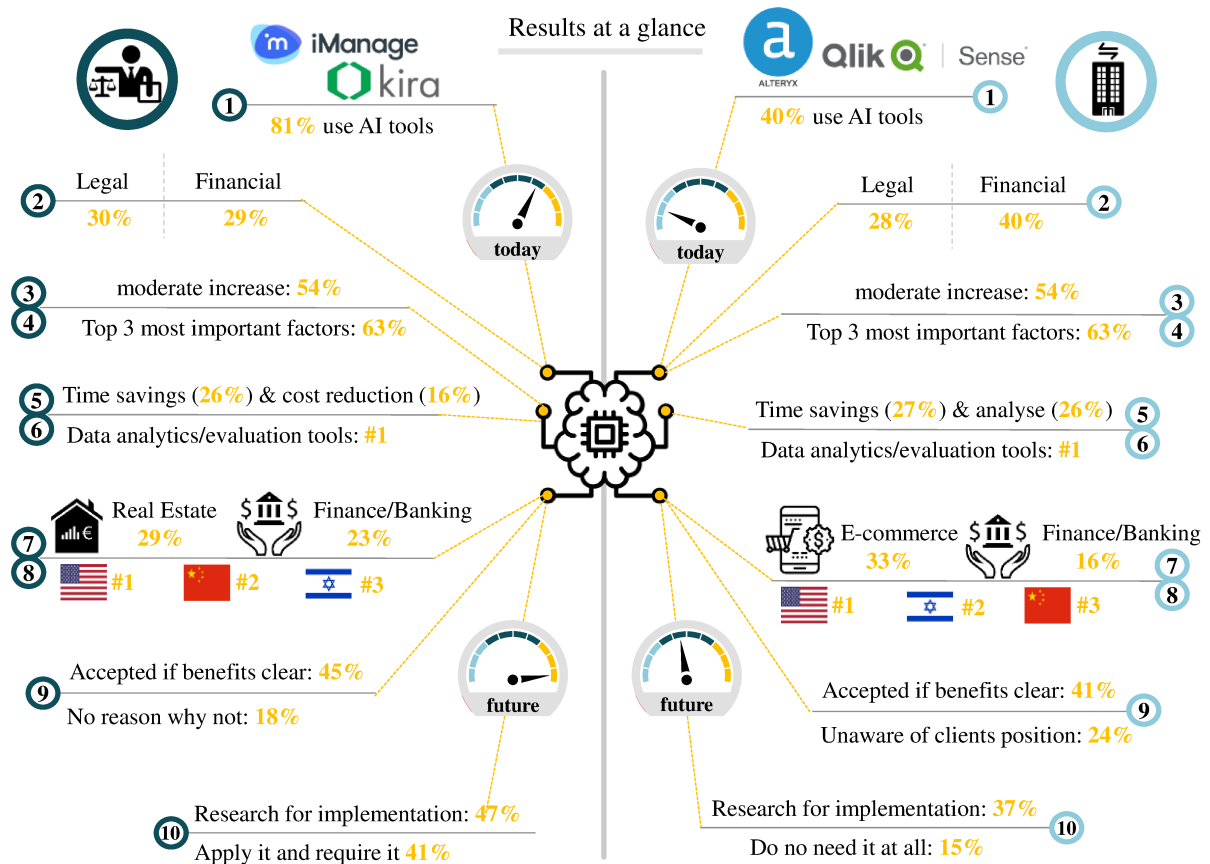
Figure 13: Summary of the survey

Source: *Own graphic*

These results are also summarised below and are complemented with a selection of quotes from the "additional input (last question)"[19] of the survey:

Conclusions from the **law advisory component** (legal):

- More than three-quarters of the law firms contacted use AI tools on a regular basis
- They require it mainly for time-saving and cost-reduction purposes
- Real estate appears to be the main area of application
- Almost half of the companies surveyed are currently researching the potential implementation of AI

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[19] Which requirements/expectations relating to AI do you claim in your daily professional work? (bullet points)

The following quotes complete these findings:

"Ability to implement training data (good and bad) and the influence to the training/learning process in general" – Large international law firm – partner – 20 years' work experience.

"It needs to be clarified what the AI tool actually do, and assisting us in understanding how the functionality may provide value to us or our clients (preferably both), will make the tool easier to use and implement" – Large Norwegian law firm – senior associate – 5 years' work experience.

"We are further in the process of exploring the right solution for AI in project and matter management in order to more efficiently use our data from past projects (precedents, prediction of project cost development etc.)" – Large international law firm – partner – 15 years' work experience.

"Data protection and privacy needs to be safeguarded; cloud-based systems (such as Leverton) might be problematic for confidentiality reasons" – Large international law firm – partner – 10 years' work experience.

"Couple of issues still to be solved such as liability (100% security not expected)" – Large international law firm – partner – 20 years' work experience.

Consequently, we can add the desire of having a greater access to the tools and an overall more customizable frame, especially in terms of learning ability to the general findings.
In addition, the factors of security and liability were raised by several participants (including some not listed here).

Conclusions from the **M&A advisory component** (finance):

- Most companies do not currently use AI

- Companies which use AI are audit-related

- They require it especially for time-saving and analytical purposes

- E-commerce appears to be the main area of application

- Nearly one-third of the companies are uncertain how their clients are positioned

- A majority of the companies are currently researching the potential for implementation

- A small number of the companies do not need it at all

The following quotes complete these findings:

"None. AI does not play a material role in any M&A due diligence process that I have been involved in" – Large Canadian Bank – head of global M&A – 25 years' work experience.

"Currently limited perspective on AI use for our specific business" – Large German bank – managing director – 20 years' work experience.

"We do not see, in the short term, AI being that important for due diligence reports" – Large M&A advisor – director – 15 years' work experience.

"AI will change the way how we deliver the diligence process and will enable us to dig way deeper in the details and achieve better results in the same period of time. In 5 years' AI is a 'must have' for professional services firms" – Large audit firm – partner – 30 years' work experience.

"Greatest need is for law firms and Due Diligence consultants. Nevertheless, we do observe very closely the developments of AI in our business field and expect it to have significant impacts on the way, M&A transactions are to be executed in the future (in terms of resources, timing, transaction cost, estimation of risks etc.)" – German bank – head of corporate finance – 20 years' work experience.

Unlike the legal group, the financial group is separated into a further two groups, where some believe AI will not have any impact on the financial due diligence process (now or in the future) while others expect a significant increase in the next years. The latter were also included in the result of question 10 where almost 40% of the participants confirmed that they are currently researching the potential implementation of AI.

Conclusions for **both groups**:

- AI is a focus for the financial and legal industries.
- Both groups expect a moderate increase in AI.
- According to the companies surveyed, AI is within the top three most important innovation factors.
- Data analytics and evaluation is the suspected number one innovation before AI.
- USA, China and Israel are the leading AI countries.

6 Conclusion, criticism and future expectations

The aim of this thesis is to provide the reader with relevant knowledge of the terms mergers and acquisitions, due diligence and artificial intelligence and then combining these fields of study. The reader gains important knowledge in all three sub-areas. One now understand what is meant by the term mergers and acquisitions, what the different stages of this complex process are and where the due diligence process is required, including its importance for the overall task. The reader is also made aware of the most well-known types of due diligence and the parties involved and is presented with a practical visualisation of due diligence. In addition, the aim was to supply a solid definition for the elusive word artificial intelligence, to categorize it and explain why AI tools for the due diligence process, in their real nature of an artificially intelligent machine, are only important in the legal component of the due diligence. The financial component focuses on analysis and automatization and does not use AI applications at all.

Most importantly, however, am I able to provide meaningful answers to the main question in this work: What impact can AI have on a due diligence process? First, it is important to note that the survey in this thesis does not intend to answer this question conclusively and entirely. The intention is to create a first point of access to the topic as there is currently only limited information available. In this context, and without reproducing every single finding mentioned in the study, I can conclude that the survey was a significant success. I find noticeable gaps in the application of AI, the awareness of AI and the expectations for AI as they relate to financial and legal firms. The most obvious difference is that the respective groups do not use any tools of the other group. Their current needs and requirements are fundamentally different and mean that lawyers already benefit from the advantages of AI while financial advisors rely more on analysis and evaluation.

Moreover, I explored the future expectations relating to the current usage of AI. Where group 1 has high hopes for the future, group 2 does not share this conviction. However, both groups are investigating the potential implementation of AI carefully and remain informed regarding changes and new implementations.

In addition to these findings, two fundamental conclusions can be drawn:

(1) The AI demand by **legal advisors** is currently already high and AI will be indispensable in the future

(2) The AI demand by **financial advisors** is currently hardly measurable and an increase, if at all, in the future will be moderate

From an objective point of view, it could be argued that the number of companies contacted is not representative. However, one should consider the nature of the companies involved and the fixed time limit which applies to the study. Another argument in support of the companies contacted is their reputation and importance, which is consistently high in both groups. One could also argue that the number of questions is insufficient. In this respect, it should be noted that the framework provided is deliberately condensed. Contacting companies, predominantly large concerns, requires a survey which is, by necessity, easy to process and not too time-consuming. Evidence for this is seen in the response of a noticeable number of respondents who said that they only replied because of the compact nature of the survey.

Developments in the future can only be estimated. However, considering the feedback and the overall increasing importance of AI for many industries, it is highly likely that there will be a continuation of the AI success story. Of particular importance in this regard, is the investigation of the requirements of the various due diligences in order to provide the correct and most suitable service. Although a financial due diligence, for instance, signals willingness and potential, there is currently no solution which can improve this kind of work and assist in a meaningful way.

V Appendix

Appendix 1: Survey   VIII

Appendix 1: Survey

Survey on the topic:

Due diligence during a mergers and acquisition process and the impact of artificial intelligence

Master's thesis

by Jens Jung

General information:

Company:

Position in the company:

Working experience:

Question 1: Do you use AI tools within your company? If yes which one(s)?

Kira	NALYTICS
Luminance	Recommind
iManage	Other
DDIQ	None at all
eBrevia	Legartis
ANALYZELAW	Leverton

Question 2: For what kind of due diligence do you believe that AI is going to have the biggest impact?

Financial

HR

Tax

Legal

Cultural

Commercial

Environmental

Other (please note which DD)

Question 3: How significant is AI going to be in a due diligence process in 5 years' time?

It will be less than today

It is going to remain the same

Moderate increase

Significant increase

Question 4: How important is the time factor for a due diligence process?

It is the most important factor

It is within the top 3 most important fac-
tors

It is within the top 5 most important fac-
tors

It is within the top 10 most important fac-
tors

Time is not important

Question 5: In your opinion, what impact should AI have on a due diligence process? (Choose up to 3.)

Complete takeover of human actions

Analyze

Evaluation

Automation

Enhanced security

Simplification

Cost reduction

Time savings

Only as a supporting factor

Question 6: Which of the innovations mentioned below is going to have the biggest impact on a due diligence process?

Artificial intelligence

Blockchain

Data analytics/evaluation tools

Other (please specify)

Question 7: For which business could AI be especially useful?

Healthcare

Real Estate

Finance/Banking

Automotive

E-Commerce

Energy

Other (please specify)

Question 8: In your opinion, which country is currently leading in the development of AI? (Choose up to 3.)

USA

Germany

China

Japan

Sweden

France

Israel

India

United Kingdom

Canada

Question 9: Is your average client aware of the possible integration of AI and would they rely on solutions delivered by machines? (Choose up to 2.)

Our clients are well aware and have full trust in a machines function

They would accept it if we clarified the benefits

There is no reason why AI should not be included

The cost/benefit relationship is the only issue

Our clients are mostly conservative and do not want machines to be included

We do not know how our clients are positioned regarding this topic

Question 10: How urgent is the implementation of AI tools in your company? (Choose up to 2.)

We require it as soon as possible

Many areas signal potential but the implementation is too time-consuming/expensive

We are currently running analysis/gathering information regarding potential fields of implementation

AI cannot deliver value to our work

We do not need it at all

Additional input (optional)

Which requirements/expectations regarding AI do you claim for your daily professional work? (Bullet points.)

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Martinshöhe, 12 July 2019

Jens Jung