11 JANUARY 2024

BUILDING A DASHBOARD FOR PRE-DEAL EVALUATION OF MERGERS AND ACQUISITIONS

JASPER HOEKSTRA
VICTA BUSINESS INTELLIGENCE
BSc. Thesis Industrial Engineering and Management
Academic Supervisors: dr. R.A.M.G. Joosten, H. Kroon
Company Supervisors: M. Baart, R. Huitema

Acknowledgements

Management Summary

In this thesis we address the research gap on the use of business intelligence in the pre-deal mergers and acquisitions (M&A) phase. The market of M&A is growing and has an untapped potential. On behalf of Victa Business Intelligence, we want to increase the limited use of decision-support systems in this pre-deal phase in M&A. The company realizes that they can potentially provide their customers with an extra product through the development of such system.

We apply the Design Science Research Method (DSRM) to develop a conceptual framework that integrates the fields of mergers and acquisitions, decision support systems, and benchmarking theory. This conceptual framework is the foundation for the conceptual design of the dashboard. Which consist of a target selection screen, a cockpit and pages for further analyses, the cockpit serves as a starting point for valuation and due diligence steps in the pre-deal M&A process. The analysis pages allow the user to delve deeper into the aspects of M&A. This results in lower cost during the pre-deal M&A phase, because the time it takes to complete the phase and the level of information is higher.

This approach results in a more data driven approach to decision-making in mergers and acquisitions and gives a practical solution to the problem we want to address, namely that there is limited use in the M&A process. This thesis is written at the intersection of business intelligence, decision support systems, benchmarking, and benchmarking, and proposes a new perspective of decision-making in M&A processes, a perspective that allows for data-driven and informed decisions.

Table of Contents

1 Introduction

1.1 Research Context

Victa is a Business Intelligence company based in Hengelo. The company offers a wide range of Business Intelligence related services. It employs around fifty persons, with the most part working in Hengelo, and a small team in Amsterdam.

In more than ten years, Victa has offered solutions to more than 800 companies. The company provides services in Business Intelligence solutions and consultancy, and performs Data Management, Data Analytics, and Data Science tasks for clients using several platforms. The most important platforms are Qlik and Microsoft Power BI. Additionally, Victa also uses the products TimeXtender, Alteryx, and Snowflake to handle data (Victa, 2023).

We focus on the development of a dashboard for Microsoft's Business Intelligence Platform Power BI, an end-to-end platform that helps customers create insights into their data. With the software, companies can use data to drive and argue their decision (Microsoft, 2023).

1.2 Research Motivation

As a fast-growing company with a large number of clients, Victa is always on the lookout for new opportunities for itself and its clients. These can arise in the form of possible acquisitions or mergers. They sometimes consider taking over other parties in the business intelligence sector. Clients also acquire or consider acquiring new companies, or even consider merging with other parties. This makes the topic of Mergers and Acquisitions (M&A) interesting and relevant both for Victa and customers, as they might both benefit from such a dashboard.

The number of mergers and acquisitions in the Netherlands has increased in the past decades and has nearly tripled from 2500 in 2007 to 7235 in 2021, showing a short period of stagnation during COVID-19. Interestingly, in the IT services industry, this number has quadrupled in the same period, from 115 to 525 (CBS, 2022).
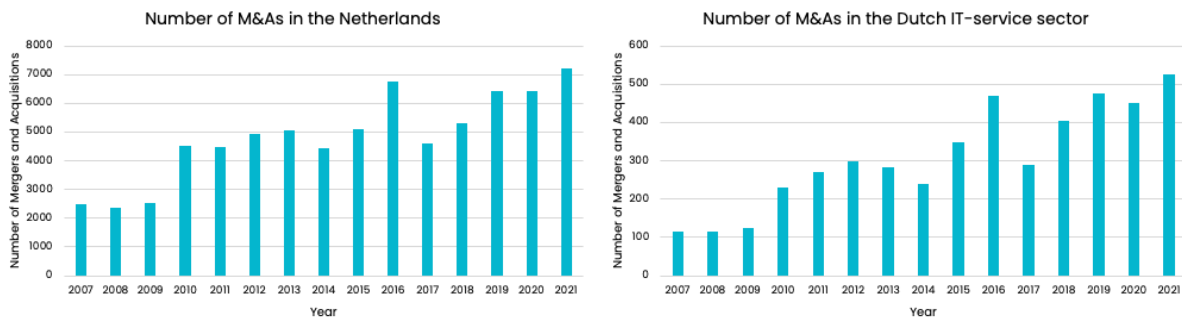
FIGURE 1.1, GRAPHS OF NUMBER OF M&A

There are several motives for companies to pursue a merger or acquisition. According to Rabier (2017), potential motives can consist of operating synergies (combining resources, cost savings, new product offerings), and financial synergies (gains due to a combination of financial structures, tax, savings, lower cost of capital, diverse cash flow streams, etc.)

The field of Business Intelligence (BI) evolved over the past decade. However, there is almost no writing on the use of BI in decision making within M&A processes. This indicates that there is a research gap that we can investigate.

1.3 Problem Definition

Using a dashboard for due diligence and valuation in a merger or acquisition could prove to be worthwhile. The M&A process is long and costly, and costs can start in the early phase of an

M&A process because a lot of valuation and due diligence is done by accountants. Victa wants to reduce these costs for itself and sees an opportunity to offer the dashboard to its clients as a Software as a Service solution (SaaS).

With a large number valuation methods and a large amount of data the complexity of creating such a dashboard increases. However, as a provider of BI Solutions, Victa emphasizes the need to create a dashboard that supports organizations in making decisions in their M&A process. Victa wants to create an M&A dashboard to improve the decision-making process. Besides the multiple methods to value a business, the due diligence process is also complex.

In the M&A process, we know now there are numerous steps that need to be taken. The goal of the dashboard is to reduce the number of steps and to make the process more transparent. Victa wants to provide insight into the valuation and into due diligence steps. Additionally, time to completion should decrease and the cost efficiency should increase. We define the time to completion as the time it takes to complete steps in the pre-merger phases, we outline these steps later in the thesis.

In the Managerial Problem-Solving Method (MPSM) (Heerkens, Winden, & Tjooitink, 2017) the first phase describes how we can find the core problem. Often, there are multiple problems of which you can only solve one. Therefore, we identify the core problem following the systematic approach consisting of the following steps: making an inventory of problems, indicating causes and effects, place them in a problem cluster, and finally: choosing the problem to deal with:

We improve upon decision-making in M&A processes, improved decision making is indicated by lower cost, higher information availability, and a higher level of insight in the pre-deal M&A phase.

To operationalize the decision-making process for M&A and to measure norm and reality we use Key Performance Indicators (KPIs), being the time to complete a due diligence process, and the advisory costs. Furthermore, the cost of the pre-deal M&A phase also decreases, due to the reduction of advisory costs.

To find out what lies at the root of the sub-optimal decision-making process we use the problem cluster from the appendix. The core problems we can choose from are *Complex due diligence and valuation* or *Limited data-driven decision-making (DDDM) in M&A.*

On the other side, we have the potential core problem that states there is limited use of data-driven decision-making in M&A. This does not mean that data-driven decision-making in M&A is not possible or does not take place. It is clear that data are needed for valuation, but there are certain aspects that are not used completely (Nissim, 2022). Mueller (2019), concludes that using business intelligence makes companies more independent from external consultants and the scale effect repays the one-time set-up cost after a number of transactions.

We choose the limited usage of DDDM as the core cause for the lack of integration of BI in standard M&A processes. Data are used for valuation purposes, but could also be used for topics like benchmarking, determining market potential, etc. This in turn leads to the need to rely on the judgment of others and on others interpreting the data. The insights generated currently are also insufficient, it is difficult to calculate synergy effects or evaluate employee satisfaction. This could result in a misjudgment of performance and potential risk. Furthermore, there is no automated model (i.e., dashboard) that does data analysis, resulting in the need to perform these tasks manually.

Unfortunately, we are not able to solve all core problems, we have to choose. In this case, the choice is easy. The M&A process is complex and only gets more complex in the future. That is a problem we cannot solve. Therefore, the *Limited use of data-driven decision-making in M&A* is the core problem.

We envision the M&A decision-making process to be fully supported by data. We want organizations to be able to make their decision on accurate, timely, and comprehensive data. In reality, however, the decision-making process is not data-driven, contributing to a high M&A failure rate (Koi-Akrofi, 2016) and the risk of increased deal failure and underperformance. Furthermore, M&A activities are time-intensive and costly, and do not guarantee success. In short, we formulate the core problem as:

There is limited use of data-driven decision-making in M&A processes.

To make the gap between norm and reality measurable we try to quantify the variable term DDDM. When making data-driven decisions, the quality of the data is measurable in multiple dimensions (Pipino et al., 2002). Relevant dimensions are accessibility and the appropriate amount of data; however, data are of no value if they do not provide information. We make this one variable: **information availability** and define it as the ratio between the information we have and the information we want. A higher data availability results in a more data-driven process. The second variable we define is the **level of insight generated by the dashboard**. These are both difficult to scale, however with respect to the current state, the difference is clear.

1.4 Research Objective

The goal of our research is of course to solve the action problem. The way to do this is by solving the core problem. The main deliverable besides the thesis is a working dashboard in Power BI that can be used in the M&A decision process. To formulate this in a neat and concise way our objective is to build a dashboard that uses data to aid in data-driven decision-making in M&A processes. To achieve this objective, we investigate the M&A process and how BI can be used to support DDDM in M&A processes. We also identify data sources and obtain the know-how to develop a dashboard.

To frame the subject, we can impose some boundaries. The dashboard should only focus on due diligence and valuation in the pre-deal phase of the M&A process. Furthermore, it should be focused on Dutch companies. Therefore, we need to use the most relevant statistics about the markets and commercial situations, focused on the Dutch and European market.

The main research question can be formulated as:

How to design a business intelligence dashboard to support decision-making in pre-deal mergers & acquisition processes?

This research question uses the core problem and highlights why we want to solve it because we want to do something about the decision-making process. Furthermore, it also incorporates the wish of Victa for the creation of a dashboard.

1.5 Problem-Solving Approach

In the problem-solving approach, the way we conduct our research is explained in detail. The methodology is explained, and RQs are formulated in line with the methodology. The research design, and the way in which the knowledge problems are handled, are also outlined.

Where there are problems, there are solutions. The question is: how do we arrive at a theoretically sound and methodically good solution? It is often useful to use a research methodology for that. Because we focus on developing a dashboard, we use the Design Science Research Method (Peffers et al., 2007). The DSRM method focusses on the design of an artifact created with the purpose of addressing the problem. To make this artifact the method defines six activities. Besides focusing on an artifact, the DSRM method is specifically made for information systems research, which applies to building a dashboard.

Activity 1: Problem Identification and Motivation
The first activity is partly in this chapter. The problem is identified with the first phase of the Managerial Problem Solving Method. Furthermore, the need for a solution is expressed in the research motivation. To complete this activity, we need to obtain knowledge of the current state of the problem. Another common design process element in problem identification and motivation is to construct a theoretical or conceptual framework in order to capture the complexity of the solution. This done with the following Research Questions:

- RQ 1: Which concepts, key constructs, variables, and theoretical perspectives apply in decision-making in the pre-deal M&A phase?
  - Which concepts, key constructs, variables, and theoretical perspectives apply in decision-making?
  - Which concepts, key constructs, variables, and theoretical perspectives apply in M&A?
- RQ 2: What is the current state of decision-making in M&A processes?
- RQ 3: Which current solutions for data-driven decision-making in M&A are there?

RQ1 helps in looking at the current M&A field and provides insight into the basics of M&A and its decision-making processes, whereas RQ2 focuses on creating a comprehensive framework that also focuses on constructs in data-driven decision-making.

Once these questions are answered we can develop a theoretical and conceptual framework. Consequently, we can determine what the limitations of the thesis are. For the purpose of this thesis, we call this the context analysis and theoretical framework. It should result in a clearer problem definition and problem statement with variables and concepts based on the literature. Another result of finishing Activity 1 is defining what the current situation of the problem is.

Activity 2: Define the Objectives of the Solution
After identifying and defining the problems we define the objectives for the solution, based on the knowledge of what is possible and feasible. The objectives can be deduced from the problem statement. In order to do this, we need to include knowledge of current solutions and how they perform. This is investigated in the first activity.

- RQ 4: Which data are available?

To support the activity, we also need to uncover the availability of the data. This makes sure we keep our feet on the ground and do not venture out of the realm of reality.

Activity 3: Design & Development
In this phase, we create the artifact, which is the dashboard. The activity includes determining the functionality of the artifact and building the required architecture and then move to the design. To move from objectives to the design phase we need to include knowledge of the theory that can be brought to use for the solution. Therefore, this is the phase where we need to answer the most RQs. We need to discover which concepts, key constructs, and variables should be reflected by the dashboard and how the dashboard should be made.

- RQ 5: Which decisions are there in the pre-deal M&A process?
- RQ 6: How can a dashboard be designed to assist in due diligence for M&A decisions?
- RQ 7: How can a dashboard be designed to assist in benchmarking for M&A decisions?
- RQ 8: How can a dashboard be designed to assist in valuation for M&A decisions?

Answering these questions should provide the means to build the dashboard. Building the dashboard also means that we need extra knowledge, but that is "Know how" knowledge, which is present in the company and not relevant to the field of M&A.

Activity 4: Demonstration

The fourth activity is used to demonstrate the use of the artifact to solve the problem. Here we need to make a proof of concept using for instance an experiment, case study, simulation, proof, etc.

- RQ 9: To what extent does the dashboard perform the way it was intended to?

Activity 6: Evaluation

Here we measure to what extent the artifact helps in solving the problem. We need to compare the objectives to the observed results of the solution. This evaluation should contain empirical evidence and logical proof. After completing this activity, it is possible to reiterate the design and development activity. The evaluation activity results in the conclusion and discussion section of the thesis.

- RQ 10: What empirical evidence and logical proof do we have that the dashboard solves the problem and what are the limitations of the research?

Activity 7: Communication

The communication phase revolves around communicating what has been done in the activities towards researchers and other audiences that are relevant. In this case, the method of communication is a thesis or report and finally a presentation. It is important to keep the disciplinary culture in mind. Since a company is different from a university, it is important to keep in mind that the output should also be easily adaptable to use for the company.

1.6 Research Design

Most of our research is of a descriptive nature and is qualitative. For the research, we review literature. For two of the RQs, we perform a systematic literature review (SLR), we do this for RQ1. Using this we get a conceptual matrix that we can refine into a framework for the thesis. The final two RQs focus on the evaluation of the dashboard and are used to measure the performance of the dashboard.

Special attention is needed for RQ4 because data analysis is performed in order to find out which data are available, whether the available data are appropriate for use, or additional operations are required to obtain the right information from the data. Data collection is about obtaining market data from openly available sources such as the KvK Handelsregister, Centraal Bureau voor de Statistiek, the OECD, and commercial parties like Company.info, Lexis Nexis, Statista, etc. We analyze the data with Power BI. The steps are to extract the data, transform it with PowerQuery, and find sectoral and time-bound trends. We explain the ETL in further detail in the relevant chapter. Once this is done the context analysis results in more key variables and a conceptual framework.

Difficulties in the study mostly arise because the focus is on the Dutch market. Unfortunately, most of the literature about M&A focuses on publicly traded companies in the United States, whereas in the Netherlands and for Victa we focus on Small and Medium Enterprises. Data for SMEs are harder to come by.

The validity of the research can be strengthened by the focus of RQ8 and RQ9 on evaluating the results. Data are obtained from multiple sources and thorough data analysis. The ethical perspective of the research is highlighted in the Ethics Report part of this thesis.

2 Context Analysis

For the purpose of creating a theoretical perspective, we first delve into the current situation and answer RQ1 and RQ2. We use a systematic literature review and provide insight into the context and into which data we want to know for determining the measurement values of the variables.

2.1 Concepts, Key Constructs, Variables, Theoretical Perspectives

We have formulated RQ one as follows: *What concepts, key constructs, variables, and theoretical perspectives apply in data-driven decision-making and M&A?* which is a combination of two questions. We do this with the intent of having a conceptual matrix that can apply to both questions at once. The question has an AND/OR operator incorporated in it and has the purpose of gaining general insights into data-driven decision-making, M&A, and both topics combined. We added the systematic literature review protocol in the appendix. In the remainder of this section, we synthesize a conceptual framework based on the findings. Though useful and relevant to the field of mergers and acquisitions, not all constructs apply to pre-deal M&A, thus not all elements are included in the theoretical framework.

We first divide the conceptual matrix in subjects and topics. The subject of the papers reflects the broad and general area of the paper, whereas the topic is a subset of the subject. Based on the conceptual matrix we devise a conceptual framework. This helps to ensure that we use the same language throughout the thesis. The conceptual matrix can be found in the appendix.

2.1.1 Concepts in the field of the pre-deal M&A-phase

Pre-deal M&A process
According to Welch et al. (2020), the pre-deal M&A process can be divided into several steps: initiation, target selection, bidding and negotiation, valuation, financial and financing, announcement, and closure. Welch et al. (2020) focus more on the process steps than on actual activities performed in the pre-Deal M&A process. This definition of the pre-deal M&A process is not sufficient as is and needs to be expanded upon. In each step, a key question that is answered before going to the next step is defined (Sirower & Weirens, 2022). The initiation and target selection phase asks the question: Am I a prepared acquirer? In the bidding and negotiation, valuation, financial, and financing phases the questions are: Does it make sense and how much do I need? The decision support system we aim to build, focuses on these questions. Valuation, due diligence, and benchmarking are concepts that are used. Thus, the part of the pre-deal M&A process we focus on is the bidding and negotiation, valuation, financial, and financing parts. We refer to this as the evaluation of a target company.

M&A Motivation
The motivation for pursuing a merger or acquisition is very important for the M&A process. As stated by Welch et al. (2020), M&As can be motivated by market power, economies of scale, economies of scope, diversification, and coinsurance. Motivation has an important effect on the target selection and on the methods used further in the process. The motivation determines what the relevant criteria are for the target selection.

Target Selection
The target selection follows from the motivation and is about determining which company to pursue. The selection of a firm to acquire depends on the acquirers' characteristics, the target firm's characteristics, and the M&A layout. Hassan et al. (2016) highlight that acquiring firm's characteristics are mostly defined by the objective, management structure, and viability of the acquisition. Paul et al. (2013) conclude that target-firm characteristics can range from size and sector to more concrete characteristics, such as the number of employees and offices. The features or characteristics that an acquiree should have, depend on the motivation and the type of merger or acquisition.

9

Due Diligence

Due diligence is concerned with answering the question "Does it make sense?" and it consists of three areas: operational, commercial, and financial (Sirower & Weirens, 2022). In the financial due diligence step, we take a harder look at the numbers; we investigate whether the numbers reflect what we think about the company. Do the numbers make sense? Are there any skeletons in the closet, what one-time events took place that can inflate or deflate the numbers?

Commercial due diligence is concerned with analyzing the market and determining whether your view about the target conforms with the view you have of the market. In the operational due diligence, we assess the value a merger or acquisition might add. What synergies might be realized and what value do they represent? There are different types of synergies and different ways to assess them. Examples of synergy types are operational, financial, tax, etc. (Garzella & Fiorentino, 2014). The type of the desired synergy is connected to the M&A motives. A desired synergy is more valuable than a synergy that might occur but is not in line with the M&A motives. All results of the due diligence are considered inputs for the valuation and synergy steps.

Benchmarking

Benchmarking is concerned with comparing the performance, processes, and practices of a business against peers, the market, and best practices. Benchmarking is divided into four phases: planning, information gathering, analysis, and adoption (St-Pierre & Delisle, 2006). By integrating this into the M&A process, we can link the planning phase to the Motives and Target Selection. This planning phase is about determining what information we need for benchmarking. The second phase is about gathering the information. In the due diligence information about the target is gathered, whereas in the benchmarking step information about the market and other companies is gathered. Then the gaps between the target and the peers are analyzed. This analysis can be applied to both the due diligence and the synergy analysis. All obtained knowledge can be transferred to the valuation in the adoption step of the benchmarking process.

To perform a structured benchmarking process, there more guidelines are necessary than only the proposed steps. Therefore, we use an adaptation of the seven-step (7S) framework (Battagello, Cricelli, & Grimaldi, 2016). This framework is selected because it links performance with value. Additionally, performance is measured not only over time but also with respect to other companies. This is especially relevant to benchmarking in M&A.

The 7S framework can be applied to the benchmarking and due diligence steps. It is a way to plan the benchmarking process, in the information and analysis phase the framework is used and executed, and in the adoption phase, the conclusions are used. The 7S framework is the interface between the benchmarking process and the M&A process.

Synergy

Synergy in M&A can be defined as an increase in performance as a result of combining two companies. It is difficult to measure the value of synergies beforehand. However, we can operationalize it as the present value of the expected synergy flows. Discounted at a rate that reflects the risk associated with these flows (Garzella & Fiorentino, 2014).

Valuation

In the simplest terms valuation is about estimating the value of a company. There are different methods, streams, and viewpoints on valuation. There are four main streams that can be identified in valuation: discounted cashflow valuation, relative valuation, contingent claim valuation (real options valuation), and liquidation and accounting valuation (Damodaran, 2006).

Discounted Cashflow (DCF) valuation is based on the present value of the expected cash flows of an asset. Discounted for the risk that is associated with it. It is based on the notion that the value of something is a function of the expected cash flow of the asset and its risk.

Relative valuation is based on how similar companies or assets are priced in the market. Imagine you buy a house, and to determine the price you compare the house to other houses in the neighborhood. Comparison for companies is mostly done by looking at standardized values and multiples, such as a PE ratio, Tobin's Q, etc.

Liquidation and accounting (L&A) valuation is based on the value of the assets of a firm when it would be liquidated. Based on the assets of the company the value is determined. There is a focus on the assets in place, growth potential, and future investments are not considered. However, some L&A valuation-based methods are currently expanded to also consider these factors. The principle remains based on the book value of the company.

Finally, there is real options valuation. This principle is based on using option pricing models for the valuation of assets that share characteristics of options. Researchers have been applying real options valuation models to M&A (Kinnunen, 2010; Kinnunen & Georgescu, 2023).

Because there is a lot of variability in valuation methods, depending on the situation, the country you are in, and other contextual frames, it would be unwise to pick one of the valuation methods. However, we categorize the valuation methods used by these four types of valuation. Furthermore, according to Fernández (2002) there are pitfalls in company valuations we must be aware of. Firstly, value does not equal price and valuation is not a scientific fact. Companies do not have the same value for each buyer and valuation is based on forecasts. Furthermore, we must be aware of inconsistencies and conceptual errors, errors in the discount rate.

Value drivers influence the value of an organization. They can be categorized as growth, return, risk, and interest rate-related value drivers. Based on the method the value of a company can differ greatly and we are probably not able to give an exact value but could possibly provide a valuation range in which the price for a company should lie.

2.1.2 Concepts in the field of Decision-Making

Data-Driven Decision-Making
Decision-making always follows a process. The rational model consists of four steps. Establish the objectives, generate alternatives, explore alternatives, and evaluate and choose the best alternatives. To increase the understanding of the data and decision, visualization techniques can be used. To assist the decision-making process a Decision Support System can be employed. A DSS is an information system that uses data models to help managers analyze problems (Hamzah, Sobey, & Koronios, 2010). The definition of a DSS works to our advantage, however, the steps are not directly applicable to all steps of the M&A process we consider. The target selection phase follows these steps, but the due diligence phase does not use these steps for instance. We conclude that a decision support system forms the interface between (data-driven) decision-making and M&A.

Wen et al. (2005) has designed a DSS system for mergers and acquisitions. Coming from 2005 it is outdated but can function as a starting point for a DSS for M&A. The DSS contains six components: the data-, case, model, and rule base. An inference engine and the user interface form the linkage between decision-making and the M&A process. The database accumulates all data necessary for the model and rule base that gives all information. Examples of the data in the database are the parameters of the model and financial data. The database serves as the basis for the DSS.

The knowledge base is the place where all knowledge needed for the DSS is stored and divided into the rule base, case base, and model base. The rules in the rule base represent relations, strategies, recommendations, etc. The case base contains basic financial data, data about problems, challenges, predictors, etc. The model base is responsible for storing the right models, for instance, the DCF model and the Real Options Valuation model. So, based on the rules and information from the case base, the model and the right parameters are chosen from the database. The inference engine and user interface then form the link toward the decision model.

The rule base is responsible for choosing the right models and parameters, and strongly depends on the type of target and on the motivation for the acquisition. The rule base is therefore associated with the motivation and target step of the M&A process.

What are the external factors to consider, how does the company perform in the market, and what does the sector do? What is the sector growth rate, etc.? These are all examples of the questions the case base has to select. In each case, different factors might apply. Based on the rules the right case has to be made and selected.

Eventually, the case and rule base determine which models are appropriate, a sector with high growth and high volatility might benefit from different valuation models or a higher discount factor due to higher risk. The model base also applies to the synergy valuation step. Different types of synergy have different values and desirable synergies (based on motivation) are more important than additional synergies.
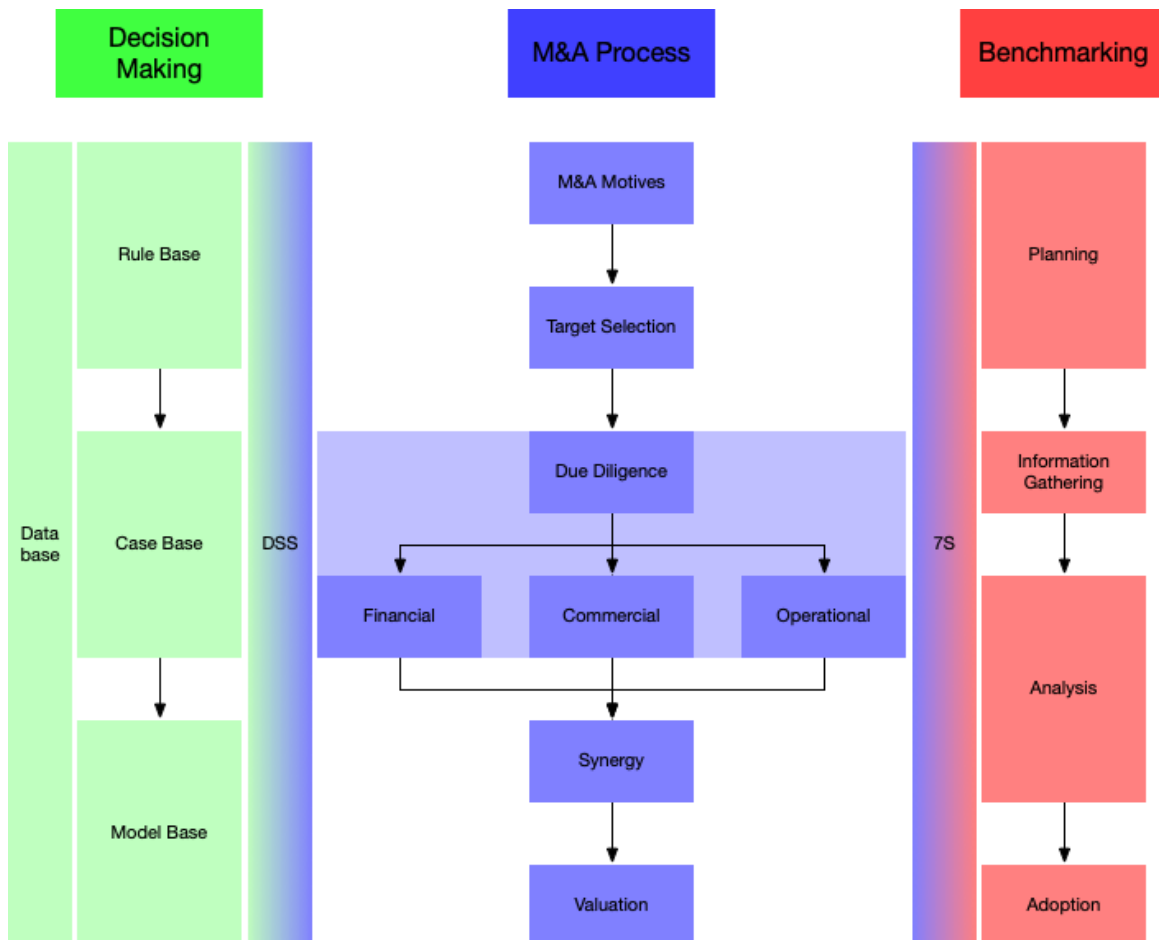

FIGURE 2.1, OUR CONCEPTUAL MODEL FOR AN EX-ANTE M&A DSS BASED ON THE LITERATURE WE REVIEWED

2.1.3 Conclusion: A Conceptual Model for an ex-ante M&A Decision Support System

Combining Sections 2.1.1 and 2.1.2 we compose a conceptual model for an ex-ante M&A DSS, represented in Figure 2.1. It consists of three aspects. Decision-making and benchmarking surround the M&A process. On the sides the motivation and target selection parallel with the planning of the benchmarking and the determination of the rules from the rule base. Hamzah et al. and Wen (2010; 2005) provide the basis for the decision making part. The M&A motives and target selection are based on the work of Hassan et al. (2016), Paul et al. (2013), and Welch et al. (2020).

In the due diligence areas from Sirower and Weirens (2022) (financial, operational, commercial) information about the target company and its environment, such as market, competitors, etc. is collected from the case base. This is specific information used in the benchmarking steps as well. The benchmarking side of the conceptual model is based on the work of Battagello et al. (2016), St-Pierre and Delisle (2006) Valuation is inspired by Damodaran (2006).

Eventually, all inputs are processed into the model base, which chooses the most fitting models to evaluate the synergy and to give insights into the valuation method. The result is a Decision Support System that gives insights into all parameters, used data, and methods. The central pillar of mergers and acquisitions is reflected in the DSS.

2.2 Current State of Decision-Making in M&A

| Merger and Acquisition Data | Value Calculation | Suggestion |

B/S — Balance Sheet (in thousand)

	X1	Y1
Current Assets	54846828	31183531
Long-term Investment	2452968	1893855
Property, Plant, and Euipment	2521926	1975234
Other Assets	1573622	3381362
Total Assets	61395344	38433982
Liabilities	34972655	26941324
Common Stock	11725000	7026854
Paid in Capital	5316563	4209542
Retained Earnings	9381126	256262
Tatol Stockholders' Equity	26422689	11492658
Tatol Liabilities and Stockholders' Equity	61395344	38433982

Cash Flow

	89	90	91	92	93
X1	4537644	4676775	4821750	4972814	5130222
Y1	1689990	1726511	1765396	1806786	8150831
X1+Y1	6227634	6403286	6587146	6779600	13281053
X1 Y1 (Conservative)	6046462	6191320	6341973	6498652	6661598
X1 Y1 (Normal)	6929253	7118432	7315556	7520960	7734990
X1 Y1 (Optimistic)	7554844	7770298	7994800	8228732	8472488

Table

	Market Price	Outstanding Stocks Number	Stockholders' Equity	Debt Ration	Equity Ration	Earning Growth
X1	34.6	1172500000	40568500	46.30%	53.70%	4.20%
Y1	21.2	702700000	14897240	64.39%	35.61%	5.20%
X1 Y1	34.6	1641000000	56778600	52.16%	47.84%	4.20%

FIGURE 2.2, EXAMPLE OF A DASHBOARD FROM 2005 (WEN ET AL., 2005)

The purpose of this section is to identify the current state of the variables we have used to operationalize data-driven decision-making in M&A, Data Availability, and the Level of Insight (LOI). An example of one of the few dashboards that we can find is found in Wen et al. (2005).

2.2.1 Information Availability and Processing Steps

For most companies, clear-cut valuations and due diligence are not available. In order to reflect on and calculate the data available we classify data as need-to-have and nice-to-have and on the number of processing steps. The number of processing steps is the number of transformations or operations needed on the data.

13

2.2.2 Level of Insight

The level of insight is hard to measure as a number. However, it can be seen as an ordinal variable. The DSS mentioned in the previous section (Wen et al., 2005), is very outdated and hard to read. Furthermore, there are no visualizations and there is no insight into why certain methods are used and what the inputs are.

Additionally, Mueller (2019) provides some insight into the usage of Business Intelligence in M&A and reflects on the potential applications of BI especially focusing on Due Diligence. While they propose some visualizations, they are far from being used in practice. The key takeaway is that using BI in M&A could lead to cost reductions. We conclude that, currently, the level of insight is low, due to the lack of visualization and argumentation with respect to the choices that are made.

2.3 Conclusion

In this chapter, we created a conceptual framework that can be used to guide the development of a dashboard for M&A. It consists of three pillars, with at its center M&A processes. The benchmarking pillar supports the M&A process by providing a structured way to compare a target company to its peers. The decision support system pillar is responsible for determining which models and figures are appropriate.

The current state of decision-making in M&A is difficult to investigate and assess. Current models are outdated and do not yet use the full capabilities of modern technology. Therefore, it is difficult to measure the current situation.

3 Solution Objectives

In the solution design, it is imperative to come up with a list of criteria the desired artifact needs to have. We divide criteria into need-to-haves and nice-to-haves. In order to make sure criteria are attainable we must uncover what data are available.

3.1 Data Availability

We use several data sources. Most notable are the Central Bureau of Statistics (CBS), the Chamber of Commerce (CoC) and the Organizations for Economic Co-creation and Development. The CBS provides access to data in the Netherlands. Their data can be accessed using the Open Data Protocol, an easy way to access data sources.

The CBS has around twenty useful datasets, giving insight into sectoral standards and trends. Data are quarterly for most datasets and divided based on SBI numbers, the Dutch equivalent of SIC codes. The data can be primarily used for benchmarking. There are datasets with information about company size, type, and financial results.

Furthermore, The University of Twente provides access to Statista. Statista provides market and consumer data. They combine data sources and analyze these. These analyses are compiled into industry reports. Consulting companies, such as Bain, McKinsey, and Deloitte also build industry reports. It is important to note that for the intention use of data is allowed, however for commercial purposes, Victa would need to investigate what the licensing requirements are as provided by Statista.

The CoC has two free data sources. One is the trade registry, based on the registry number. This database allows you to look up basic information about companies. The CoC also offers an anonymized set of annual reports with SIC codes. This could prove useful, however, most Dutch companies have a holding structure, so the dataset contains a lot of financial holdings.

Besides the free data sources, the CoC also offers the annual reports of companies. These can be purchased as PDFs or using a connection to the CoC database. However, there is a difference with regard to the number of things companies have to file. For a company to be required to hand in detailed annual reports it has to have a revenue of more than 12 million euros and 50 employees (Kamer van Koophandel, 2023).

3.2 Objectives

We have sufficient information to determine the objectives of the solution. Objectives reflect what the solution should achieve. The desired functionality and architecture of the dashboard are part of the design. We discuss both in this section.

The objectives have been mentioned briefly in the earlier chapters. Because there currently is nothing to compare the solution with it is not possible to say that an X percent increase in Y is the objective. Using the dashboard should result in higher information availability, fewer process steps, a higher level of insight, and a shorter time to completion, as outlined in Section 1.3.

The desired functionality and architecture depend on the wishes of Victa, the information gathered in the previous section gives information about what is possible. Additionally, from the theoretical framework we derive more demands for functionality and architecture. The functionalities are divided into two domains. Whether they are a need-to-have or nice-to-have and whether they are input or output. Hereby we specify an input as something the end user enters.

Need-to-have inputs are the acquiree sector, acquiree company size, budget to spend, acquiring party characteristics, M&A motive, and M&A objective. These inputs are needed to select the right case from the case base. These inputs all give a better insight into the methods

to use and what is important. In a factory, for instance, material capital is more important than in an IT company, which is mostly about human capital. To limit the scope of the thesis we focus on the IT sector specifically. The IT sector falls under SIC class J – Information and Communication (Kamer van Koophandel, 2022). Specifically, SIC code 62 is relevant for Victa, it is the code they have themselves which is denoted by *Support activities in the field of information technology*. Code 62.02 is the code specific to Victa: *Computer consultancy and support*. In this code, there are 28390 companies, of which there are 335 with 20 to 50 employees (Centraal bureau voor de Statistiek, 2023a).

Additional inputs which are not required are the financials of the company. In the first steps, the financials are not available or might be difficult to obtain. Later in the pre-deal process, more information about the financials might be obtained. Other company information might also be relevant for different sectors, such as employee age, trends, developments, etc. These are all optional inputs, which can be entered once they are known, estimated, or remain empty. The rule of thumb is the more information the more accurate the results of the dashboard. As the process progresses, more data are obtained.

The dashboard should provide benchmarks in the due diligence steps. For each step, the Go/No-go criteria should be given, based on the information reflected in the dashboard. At one point the appropriate valuation method is chosen, and a valuation is given. The dashboard is in such a way that it can be reproduced for other sectors. Furthermore, per step, the dashboard should give recommendations and focus points.

Regarding the architecture of the dashboard, it should reflect the theoretical framework. With a rule, case, model, and database supporting the M&A evaluation and the usage of benchmarks to support the outcomes of the evaluation.

4   Conceptual Design

To build the case, model, and rule we need to obtain the right models and formulate the right rules. To do so, we first must delve deeper into these models and answer RQs six and seven. We determine which valuation methods to use, how to assist in due diligence, and what BI tools and techniques we should use. For all three cases, we first do some broadening research, then choices are made of which models, tools, theory, etc. to use and finally we study the specificities of each choice.

4.1   Decisions in the pre-deal M&A process

In this section we describe what decisions there are in the pre-deal M&A process. We do this according to steps from the theoretical framework, respectively: M&A motives, target selection, due diligence, synergy, and valuation. Because the results of the benchmarking process are applied in the valuation step, we research benchmarking before the valuation models and methods.

4.1.1   Strategy: Motives and target selection

The motivation for M&A and target selection depends on the acquirer. There are two types of acquirers: strategic and financial (Lajoux, 2019). Strategic acquirers want to grow or narrow their own business in order to strengthen their enterprise. By building a portfolio of companies they can reduce costs, increase market share to increase pricing power, etc. Financial acquirers purely obtain a company to generate a profit for themselves. They can be seen as opportunists. To keep the scope of the research focused, and according to the solution objectives, we investigate what motivates the strategic buyer. This section is mostly ased on Lajoux (2019, Chapter 2).

Lajoux (2019) distinguishes between four main strategic acquirer motivations:

1.   Diversification.
2.   Savings.
3.   Growth.
4.   Hedging.

The motives and target selection are a strategic part themselves and the acquirer should look to the own company first. A good way to do this is using a SWOT analysis, in which the strengths, weaknesses, opportunities, and threats of a company are investigated. Based on the SWOT analysis, companies can do an acquisition that uses the strengths and mitigate the weaknesses of the acquirer. Based on the SWOT analysis, the fit and opportunity of a company can be evaluated. A strategic plan quantitively measures how well potential opportunities fit. This can be done using checklists. For instance, a checklist that looks at the complements or supplements, or a checklist that evaluates the risk of certain threats or opportunities.

As referred to earlier Lajoux (2019, Chapter 2) distinguishes four main motivations for M&A. The diversification strategy is about having a good product or company portfolio. A company can choose to pursue diversification for a multitude of reasons, for instance, to reduce risk by going into a new sector, to get tax gains, to complement an existing investment, etc. The strategic objective of an M&A can also be to cut costs. Savings are generated by integrating research and development, operations, sales and marketing, or technology. In addition to generating savings another objective is to increase revenue, by offering new products or more products in existing or new markets.

The last basic M&A strategy is the real options strategy (Lajoux, 2019, Chapter 2). In this case, the company is positioned in such a way that the acquisition does not create value immediately but could create value depending on the steps that follow and on future circumstances. An example is the acquisition of an oil field which only generates revenue if the oil price is higher

than $100 per barrel, the oil field has value because the oil price might achieve this level. Thus, real options could provide a basis for value creation. To determine the value of a real option it often suffices to estimate the key variables. Such as the price, the probability of a favorable outcome, and the return if that outcome happens.

Real options can be categorized into three categories according to Lajoux (2019, Chapter 2), growth options provide the potential to pursue alternate markets in the future. Flexibility options allow a company to use acquired assets in different scenarios, and divestiture options reduce risk by helping a company dispose (part) of acquisitions in the future.

Furthermore, M&A opportunities can be classified along a certain path: horizontal, vertical, or diagonal (diversifying) according to Lajoux (2019, Chapter 2). Horizontal transactions are transactions between direct competitors or with companies in the same business in another market. They work best in mature markets with decelerating growth. Horizontal acquisitions often result in cost-cutting to increase margins. Vertical acquisitions take place in the same supply chain. It can be seen as the acquisition of a company's suppliers (backward) or of a customer (forward). Vertical acquisitions provide control over quality but can also reduce costs because there is more fit in the supply chain, for example, parts are produced exactly to the specifications needed for manufacturing. Diagonal acquisitions result in product and market extensions. For instance, new products in existing markets, or new markets for existing products. Diagonal acquisitions are often focused on revenue growth.

Lajoux (2019, Chapter 2) concludes that boards of directors often make the decision on mergers or acquisitions. It is important to employ some techniques to ensure that the strategic objectives and strategic plan of the takeover are clear. To do that the decision needs to be defined and answered. The reason, importance, timing, agents, and information are defined.

Search is another important part of the process. Once the evaluation of the strategy is complete, the search-and-screen process can start. A multitude of steps that need to be followed according to Lajoux (2019, Chapter 2). The target industry should be defined, information about the M&A activity in the industry should be found, and an industry analysis should be done. A list of companies in the industry has to be given, and a list of industry experts could be compiled. Online you could look for targets and start to build company profiles. Now the valuation and due diligence process can start. Somewhere in the process, the target(s) can be contacted to gain more information.

The list of targets needs to be narrowed down. Two types of criteria need to be considered, those that determine the likelihood of a deal and those that determine the attractiveness of a target. The basics about the industry and target should contain an understanding of the business, products, competitive position, structure, financial performance, etc. Additionally, financial ratios, industry comparisons, etc. should be determined. Finally, customers can be surveyed, and management can be evaluated by external companies.

After assessing the company as an individual company, Lajoux (2019, Chapter 2) states the target should be assessed in combination with the acquiring company. Companies that want to grow their revenue or decrease their costs should look closely to cost or revenue synergies and they should estimate the value of this synergy.

4.1.2 Due diligence

Due diligence begins when a buyer senses that an acquisition is possible (Lajoux, 2019, Chapter 6) and is all about answering the question *Does it makes sense?* Sirower et al. (2022) divide due diligence into three areas: financial, commercial, and operational. Due diligence can be split into due diligence before an acquisition agreement is signed and after an agreement is signed (Wangerin, 2019). In the phase where no agreement is signed, we distinguish between a preliminary due diligence phase, in which the acquirer looks at public information,

and in which the negotiations start. On the other hand, we distinguish the due diligence review. In this review, the acquirer has signed a confidentiality agreement and negotiates the terms of the acquisition. This is the stage where the acquirer obtains financial information about the target, albeit limited.

In the preliminary due diligence, we inspect the market more closely. Do the assumptions about the company make sense with respect to what is known? This is part of the commercial due diligence steps. We also see this as the starting point for the benchmarking, we use information gathered earlier or gather information about the industry standards, challenges, players, etc. to be able to compare what the market or industry does to the numbers of the company.

Elements of commercial due diligence are an analysis of the market size, growth, and trends. Researching the competitive position of the target and the preferences and behavior of customers. Furthermore, revenue enhancement opportunities are researched in commercial due diligence (Sirower & Weirens, 2022).

Financial due diligence is about gaining an accurate view of the business of the target and of the financial performance of the target. One-time events, changes in accounting, adjustments, etc. all need to be considered. It is important to consider these factors because the quality of earnings (QoE) needs to be investigated in detail, especially the Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA). Financial due diligence also helps in understanding historical sales, operating expenses, working capital, and capital expenditures (CAPEX). Gaining an understanding of this financial information helps to get a better view of the business performance and forms the basis for the valuation. Financial due diligence helps in asserting whether the numbers are correct, what the normalized profit and loss and balance sheet are and helps explain what the adjusted numbers tell you (Sirower & Weirens, 2022).

Finally, operational due diligence provides an overview of the operations of the target and is the first way to evaluate the fit between the acquirer and the acquiree. Another important aspect of operational due diligence is assessing the synergies that could be created as a result of the takeover. According to Sirower and Weirens (2022) Operational due diligence focuses on the efficiency of the selling, general, and administrative costs and on the costs of goods sold (SG&A and COGS). Operational Due Diligence should uncover any issues that can threaten the business case and impact the valuation of the acquiree. In the operational due diligence areas like HR and IT are also included. Operational due diligence requires the most cooperation between the acquirer and the acquiree to evaluate and benchmark the operations, merger, and bottom-up synergy analysis.

4.1.3 Synergy

A broad definition of synergy is *the performance increase of a combined firm, compared to the performance that the two companies had independently* (Garzella & Fiorentino, 2014). Consequentially, synergy has value. The factors relevant for measuring its value are the type, size, timing, and likelihood of achievement.

The type, or form, of synergy is divided into three categories: operations, financial, and tax (Garzella & Fiorentino, 2014). Operations synergies allow companies to increase their operating income, either through revenue enhancement or through cost savings. Financial synergies decrease financing costs. Taxation synergies produce tax benefits. The expected size of the synergy refers to the impact of the synergy. Synergy timing is important because of two factors, it impacts the likelihood of achievement, and it influences the discount value. If the time to achieve the synergy is higher the payoff of the investment starts later, which affects the present value of the synergy. The discount rate is affected by the likelihood of achievement, if the likelihood is lower, the discount rate is higher because there is more risk involved.

4.1.4 Benchmarking

The aforementioned 7S framework is used to benchmark the company. The first step is a strategic assessment. Which focuses on determining what the relevant aspects are to look for when benchmarking a specific company, manufacturing competencies are not relevant for IT companies for instance. Value routing, the second step decomposes the relevant aspects into building blocks. What building blocks can we find that give information about the relevant aspects we uncover? The prioritization step tells us what the most important building blocks are. Subsequentially, for each building block, we define Key Performance Indicators (KPIs), once defined, and measured, the KPIs can be normalized using weights. Step five links value to the performance, meaning the KPIs are multiplied by the value object. Step six further categorizes the value objects and step seven generates indicators for the value objects (Battagello et al., 2016).

We conclude the framework cannot be applied completely to the dashboard because it requires too much data and measurements. However, we choose to use it because of the general idea and structural approach. The conceptual model is transformed into four phases: the planning, information gathering, analysis, and adoption phase.

4.1.5 Valuation

To gain more insight into valuation we provide an overview of valuation methods and assess what data they need to be used. We start investigating Damodaran (2007), a survey of the theory and evidence for valuation approaches and metrics. It assesses both the theory and performance of valuation methods.

Discounted Cash Flow Methods

Discounted Cash Flow methods are the most well-known model and have the best theoretical basis. DCF models assert that the value of an asset is based on its expected cash flows. In practice, there are four variants of DCF models: using the risk-adjusted discount rate, certainty equivalent cash flows, adjusted present value approach, or excess returns. To discount a cash flow means that the cash flow is discounted with a certain value, for instance, the risk or replacement cost. Discounted Cash Flow models calculate the Net Present Value of the future cash flows.

In equity valuation models the expected cash flows are discounted with a rate that reflects the equity risk of the company. If you hold equity in a company, it can be compared to owning stocks in a company. Owning stocks can come with upside, but also comes with risk. The dividend discount model is based on the expected dividends of a share in a company. It forms the basis of other models, but for the work we are doing it is less relevant. It is best suited for companies that are stable and have a history of paying consistent dividends. These data are often only found for public companies. Damodaran (2006) also states that many analysts have moved on from the dividend model because its focus on dividends is not broad enough.

The Free Cash Flow to Equity model (FCFE) is a measure that uses the cash flow that is left after all reinvestment needs and debt payments are fulfilled. The constant growth variant of the FCFE model is used to value companies that are growing at a steady rate. The Expected FCFE is discounted by the cost of equity minus the stable growth rate. The assumption is that the risk is average, and capital expenditures are not disproportionate.

A whole firm can also be valued. This is done using the Free Cash Flow to Firm method (FCFF). It is based on the notion that the value of a firm can be seen as the present value of the after-tax operating cash flows. Thus, we take the operating cash flows and subtract the investment needs and reinvestment needs. The difference with respect to the FCFE models is that it does not consider interest payments and debt cash flows. The FCFF is applicable to companies that have complex capital structures.

Certainty Equivalent Models adjust the expected cash flows for risk instead of the discount rate. Uncertain expected cash flows are replaced with certainty equivalent cash flows, by taking the statistical or probabilistic expected value of the cash flow. For each cash flow, the risk is adjusted. Using this type of model only results in a difference if the certainty equivalents are calculated with different discount rates per cash flow.

Excess Return Models separate cash flows into excess return cash flows and normal return cash flows. The value of a business consists of two components: capital invested in the firm today, and the present value of excess return cash flows from projects. The most used flavor of an excess return model is the Economic Value Added (EVA). Economic Value Added is an extension of the Net Present Value, with firm value being the sum of the capital invested in place, the net present value of the assets in place, and the net present value of future projects. EVA needs three inputs, the return on capital, the cost of capital, and the capital invested. Under the same assumptions, Excess Return models should yield the same result as other DCF models.

Adjusted Present Value (APV) models start with the value of the firm without debt. Then the debt is added. Debt has the benefit that it creates tax benefits, however, it increases bankruptcy risks. The value of the business consists of the value of the business with 100% equity financing and the present value of the expected tax benefits of debt, minus the expected bankruptcy costs. The APV is calculated using three steps. First, the value of the unlevered firm is calculated using the FCFF method. Then it is adjusted for the value of the tax benefits and the present value of expected bankruptcy costs. The APV method is suitable for complex financing situations.

Liquidation and Accounting Valuation

Liquidation and accounting valuation assert that the value of a business is the sum of the individual values of all assets. This is also called asset-based valuation. Asset-based valuations often result in lower values for companies with a lot of growth opportunities.

Book Value Based valuation uses the assets and equity of the balance sheet to present a reliable estimate of value. For mature firms with little to no growth opportunities book value of the assets could result in a reasonable value for the company. The value of equity in a firm is then calculated as the sum of the current book value of the equity and the present value of the expected excess returns.

A special case is liquidation valuation. In this case, we assume the company is liquidated and has to be sold now. The urgency in which the assets have to be liquidated can result in a discount, the discount is also dependent on the number of buyers, the state of the economy, and the asset characteristics. Liquidation valuation gives a realistic value for firms that are in distress. For firms with good health and growth, it provides a conservative estimation.

Relative Valuation

Relative valuation is based on the price of other assets in the market. A potential acquirer decides the price by looking at the price of other comparable companies. It all starts with finding comparable companies. For instance, by looking at companies in the same sector. The second step is to scale market prices to a normal variable. Market prices need to be normalized, so they can be used to compare companies of different sizes. All else equal, a company with a higher production capacity has a higher value than a company with less production capacity.

To perform this normalization, financial ratios are often computed. For instance, the market value is converted into an earnings or book value multiple. Once these multiples are determined they can be used to compare standardized assets. Differences between companies are often distinguished qualitatively, by analysts themselves. The better the story, the more credibility is given to the valuation.

21

A comparable firm has comparable cash flows, growth potential, and risk with respect to the company being valued. This definition does not state that the companies have to be in the same sector. However, most companies in the same sector have comparable growth potential and risk. Therefore, most companies come from the same sector in comparative company analysis. Another relative valuation method is comparable transaction analysis (CTA). CTA looks at transactions that took place in the past that are similar to the acquisitions that are researched.

4.1.6 Valuation in practice

Different types of valuation methods apply to different kinds of takeovers. In this section, we give a more practical overview of the valuation methods that are used in M&A. It is important to note that value is what you get, and that price is what you pay. The price paid for a company does not always reflect the value. The valuation approach depends on the strategic objective of the takeover (Lajoux, 2019, Chapter 3). Below is a list of strategic objectives and their links with valuation methods.

- Growth: valuation multiples focusing on sales.
- Diversification: DCF-modeling.
- Progress (achieve goals more quickly): DCF of the combined entity.
- Vertical: DCF with a different postmerger cost structure.
- Horizontal: valuation multiples or DCF.
- Financial offset (smooth financial performance): multiples.
- Efficiency: DCF.
- Bargain hunting: multiples, DCF.
- Control: Total Shareholder Return.

We discuss two methods of application to M&A in further detail. Discounted Cash Flow valuation and comparable analysis.

Comparable companies

Comparable companies analysis uses valuation multiples. There are two basic types of multiples. Equity multiples are about the value of ownership of the company. An equity multiple communicates the value of the ownership relative to a financial metric. The second type of multiples is enterprise value multiples, which refer to the value of the entire company. An enterprise value multiple gives the value relative to relate to a financial metric that is about the entire enterprise (Lajoux, 2019, Chapter 3).

According to Lajoux (2019, Chapter 3),there are several reasons for using valuation multiples in M&A. Firstly, they increase objectivity. Valuation is partly subjective; the use of valuation multiples can help to double-check these subjective valuations. Furthermore, valuation multiples are easy to use and are less subject to misperceptions, for instance when risk has to be assessed for DCF models. Finally, valuation multiples are relevant, because they focus on the metrics that are used widely by investors. Such as revenue and earnings.

However, multiples valuation can be regarded as too simplistic. It tries to combine a lot of information into one figure. Furthermore, a multiple is a snapshot in time, it does not reflect the changes over time in the business. Finally, Lajoux (2019, Chapter 3) asserts that multiples can be misleading. For instance, a change in accounting policy can lead to a big change in the value of a multiple.

In comparable companies' analysis the multiples of the target are compared to the multiples of a peer group of comparable companies, oftentimes called comps. An analyst calculates certain averages for the companies and tries to arrive at an approximate valuation. Keep in mind that this method does not include an acquisition premium or discount (Lajoux, 2019,

Chapter 3). We conclude that the multiples from comparable companies' analysis are suitable for usage in the benchmarking process.

The most used valuation multiples use EBITDA, earnings per share (EPS), sales, revenue, cash flow, or book value. The multiples that are used depend largely on the industry of the target company. The price-to-earnings ratio always is an equity metric, which does not account for debt. On the other side, the EV/EBITDA multiples are enterprise metrics. Generally, enterprise metrics give better results for comparison because they are neutral to capital structure (Lajoux, 2019, Chapter 3). This leads us to the conclusion that EV/EBITDA multiples are generally more suitable for most companies.

For companies such as banks, or other institutions for which interest is an operating expense (part of the day-to-day activities) the P/E ratio is the best valuation measure. It is part of that direct operation. Equity multiples are especially useful in industries where it is common that companies carry amounts of debt that are negligible (Lajoux, 2019, Chapter 3). When using the financial ratios, it is important to adjust the numbers based on the quality of the earnings report that results from the due diligence, as stated before.

According to Lajoux (2019, Chapter 3), in the selection of comparable companies it is important to look at the similarity of industry, size, profitability, growth rate, credit, capital structure, and business model. The time period that is selected for the multiples should be long enough to compensate for cycles. A multiple that includes stock price should not be distorted by that market and a multiple that uses revenue or earnings should be measured over cycles of boom and bust.

Furthermore Lajoux (2019, Chapter 3) asserts that multiples might vary even if businesses seem similar. There might be a difference in enterprise quality, a business with higher quality has higher valuation multiples. This is impacted by management experience, strategy, etc. There are four metrics that give more information about these qualitative factors: return on capital, cost of capital, rate of growth, and duration of growth. Another influence comes from variations in accounting. Often the way in which depreciation is handled can differ, this is normalized by adopting a standard method to handle depreciation. Extraordinary payments, such as one-time payments also need to be adjusted for. These should be excluded from the EBIT and income figures. Leased material is also accounted for in different ways.

Some metrics are more affected by accounting differences than others. The one least affected is cash flow, it is either there or it is not. Furthermore, metrics such as EBITDA and sales are often used for multiples. Cash flow is helpful because if it is calculated correctly, it is not affected by accounting assumptions. Cash flow, however, varies from period to period. Therefore, Lajoux (2019, Chapter 3) advises to use the forecasted cash flow for the next 12 months. EBITDA is the most used metric; however, it does neglect capital expenditure (CAPEX), which can affect the value strongly. Sales or revenue tells something about the market share and sales volume of the company. The comparable company approach is not suited for companies that are looking at bankruptcy or are navigating through difficult times. If the company is expected to go bankrupt, the liquidation value should be used. Otherwise, look at the forecasted ratios over several years.

When performing a comparable company analysis, the equity capitalization, enterprise value, and book value of each comparable company are summarized. Furthermore, we look at revenue, EBITDA, and EPS. In the Netherlands accounting standards are good. Because we only have anonymous data, it could prove difficult to perform comparable company analysis with respect to specific companies. However, SIC-based averages can definitely be calculated to determine valuation multiples.

23

Discounted Cash Flow Valuation

In DCF valuation the present value of the future cash flows of the company. To do so, the future cash flows are discounted. Cash flows in the future are worth less than current cash flows. DCF looks at the future of one company, whereas multiples analysis looks at the value of multiple companies. The basic equation for DCF is given by:

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \cdots + \frac{CF_n}{(1+r)^n}$$

CF is the cash flow for a certain period, *r* is the discount or interest rate, and *n* is the period number (Lajoux, 2019, Chapter 3). It is important to note that the first cash flow is often a negative cash flow, because it reflects the initial investment.

To use the DCF model we need several numbers. Namely, the target's cash flows over time, the target's capital structure, the discount rate, and the terminal value. This depends on the industry, life cycle of the company, capital structure, market conditions, acquirer's requirements, objectives, et cetera. Depending on the purpose of the decision and deal complexity the number of variables can vary greatly. Lajoux (2019, Chapter 3) concludes that a plug-and-chug model does not work because the analyst cannot understand the model. Therefore, we must ensure that it is clear which assumptions we make.

The DCF process consists of four steps. The first step is forecasting the free cash flow of the targets. Therefore, the components and drivers of the cash flow must be determined, the same goes for an appropriate horizon of the forecast and operating assumptions. Secondly, the cost of capital is estimated. This is done by developing a target capital structure and estimating the cost of equity capital and debt capital. It also calculates the weighted-average cost of capital. Then the terminal value is calculated. Finally, everything is calculated and needs to be interpreted.

DCF analysis knows several benefits. It determines the value of a company on itself instead of comparing it to others. Another benefit of DCF valuation is that it is more objective than measures like EBITDA and sales, which are all subject to the accounting practices of companies. Additionally, the DCF framework is flexible, which ensures that we can use it for the valuation of a whole company or a set of companies (Lajoux, 2019, Chapter 3). We watch out for building in too much flexibility, the scope of this research is about acquiring complete companies and not about parts of companies.

Just like other valuation methods, the DCF model has its drawbacks. The model depends highly on using numbers that are good estimates in case they are not known. Additionally, the model is extremely sensitive to the discount rate that is used. Furthermore, the terminal value may be a too large part of the total value. If the terminal value is a large proportion of the value, the analysis might be meaningless because all interim cash flows are less relevant (Lajoux, 2019, Chapter 3).

The largest influences on the outcome of the model are the three key inputs: cash flows, discount rate, and terminal value. Typically, the biggest influence comes from the terminal value and discount rate. If the forecast period is longer, the influence of the terminal value becomes smaller. Therefore, the forecasting period often is between five and seven years.

4.2 Summary: building the rule, case, and model base

In the previous section, we found out what models there are and what we want to show in the optimal form of the dashboard. For each step we determine the rules, cases, models, and potentially how they inform or impact other stages. Below we give a summary of what it is we want to reflect in the dashboard.

4.2.1 M&A Motives & Target Selection

Based on the motive of the merger or acquisition it is possible to give the merger a direction (horizontal, vertical, diagonal). The motives are divided into three categories, we leave out real options, because the analysis of real options is a whole different field, and due to the limited scope, it is not possible to include this in the research. Besides, for the IT industry on the SME level, the cost-cutting and revenue growth motives are the most relevant. Real options are more relevant for larger companies with more spending power. A list of the motives and their strategies is given below (Lajoux, 2019, Chapter 3):

- Diversification.
  - Reduce risk by going into a different sector.
  - Improve the return on current investments by buying better stocks.
  - Gain tax credits by buying a business that has these.
  - Complement an existing investment for strategic reasons.
  - Create a franchise through the acquisition of multiple companies (roll-up).
- Cost-cutting.
  - R&D Synergies.
    - Diversify the risk by spreading R&D efforts.
    - Optimize development process.
  - Operations
    - Economies of scale.
    - Elimination of manufacturing and distribution redundancies.
    - Reduction of data centers.
    - Combining operations.
    - Combining IT, HR, Sales, Marketing.
- Revenue growth.
  - Within the current market, with new offerings.
  - Within the current market, with current offerings.
  - New market, with new offerings.
  - New market, with current offerings.

Horizontal acquisitions often occur in industries that experience decelerating growth, as it is difficult to grow organically. By buying competitors, this growth can be realized. Buying direct competitors increases market share and is often an indicator of cost-cutting strategies. A company is acquired that does the same. Reflecting on companies with SIC code 6062, the activity is consultancy. However, in the same sector activities such as programming, auditing, and automatization also occur and are done by different businesses.

An example of vertical integration would be that a company that does automatization would acquire a programming company that they normally need to employ. A characteristic of a vertical acquisition is that between the parties there is either a vendor or customer relationship. A vertical acquisition gives more control over quality and alignment within the supply chain. This leads to reduced costs and higher margins.

Diagonal opportunities are about product and market extensions. So, when a new product enters an existing market, or when a new market for existing products is generated. This means that there is a horizontal and a vertical integration. Often diagonal opportunities are aimed at increasing revenue.

After we determine the strategic objective and the type of acquisition it is possible to determine what is the most relevant valuation approach. A vertical acquisition uses a DCF model in which the post-merger cost structure is valued. The dashboard will show what method is used and why it is applicable. It also shows all multiples and highlights the most relevant ones. First, the

user fills in the objective(s), then the direction is determined. The direction depends on the sector, objective, and company type.

After the direction and motives have been defined, we also know the target industry. We perform a market analysis and compile a list of companies. With more information about the market, we generate a shortlist using a company profile we set up. The profile is based on both the industry/market analysis and the extra wishes of the acquirer. This is the moment the target company is eventually selected. The target with the most priority is the target that has the highest attractiveness and the highest likelihood of a deal.

4.2.2 Due Diligence

The next step is the due diligence phase, this is the phase where contact with the target company is made. Here the target is requested to supply its numbers to the acquirer. The due diligence steps consist of requesting and obtaining the bookkeeping of the target company. Performing a quality of earnings assessment is part of this step. The financial numbers of the target can be imported into the dashboard, they can be inspected, and outliers can be identified using the quality of earnings assessment. After assessing and adjusting the numbers, they are exported and used in the dashboard. The numbers and financial ratios of the company are compared with those of the sector and key performance indicators are given. This is where the benchmarking starts. Due diligence is split into three parts:

1. Commercial.
2. Financial.
3. Operational.

Secondly, a deeper dive into the market is performed, assessing growth potential, value drivers, etc. The dashboard takes a look at the mergers and acquisitions market, as well as the economic climate. Doing this gives an insight into the competitive positioning of the target, customer behavior, and the targets market.

Third, operational due diligence (ODD) starts. Here we test the efficiency of the target's operational aspects. The synergy assessment also starts here. The size, timing, and complexity of synergies are assessed. ODD requires the most cooperation (Sirower & Weirens, 2022) and it is not completely sure whether it is possible to perform this step to the full extent as it is described in the literature. Ideally, we start by creating cost and functional baselines. An assessment of where costs come from is made across different functions. Subsequently, the dashboard is used to assess where the cost reductions can be. Then, there is a further deep dive into where we can combine functions, use practices, and where can we cut costs. With due diligence, we identify potential synergies. In the next step, we assess the synergies.

4.2.3 Synergy

The first step of the synergy assessment is to segment and prioritize the synergy opportunities. We estimate the performance increase of the combined entity in comparison to the separated companies. They are categorized into several classes e.g. the synergy type: operational, financial, and tax. They can be cost saving, or revenue enhancing. Finally, they are assessed with respect to the time to achieve the synergy, the likelihood to achieve the synergy, and the size of the synergy. This is all reflected in the valuation steps. The synergy assessment is focused on determining what is an appropriate discount rate.

4.2.4 Benchmarking

For the benchmarking process, we have assigned four phases to the seven-step framework. By adapting the philosophy and steps of the framework we methodologically create a replicable benchmarking process. The four phases we use are planning, information gathering, analysis, and adoption. The planning phase is executed simultaneously with the M&A motives and target

selection. The motives for an acquisition help decide what are relevant benchmarks and the industry analysis also helps to determine the most important figures to benchmark with. The result of the planning phase is that we obtain the domains in which the benchmarks fall.

In the information gathering phase, parallel to part of the due diligence step of the M&A process, we gain information on what the relevant key performance indicators (KPIs) are for each domain. We determine what KPIs carry the most weight and gather information about what their value is within the market. After the information-gathering phase, it is time to analyze what the value of the KPIs are, this is done with the information that is gathered in the due diligence process.

Finally, we are able to use the information in the synergy assessment. If the target has a better-performing operation in a department, it is likely a synergy can be realized by adopting the practices of the target. Here we give value to the KPIs. Eventually, the results from the analysis are used for the valuation, again they are considered in determining the discount rate, but also in determining future growth potential, terminal value, etc.

4.2.5 Valuation

By selecting the right rules and cases from the rule and case base, we are able to select the right valuation model and determine the right input variables for the model. In the valuation step, we first reflect on the valuation multiples and how they relate to the multiples in the market. For these multiples and for the DCF valuation, we use the numbers that are adjusted with the findings from the Quality of Earnings report.

In the valuation step, we follow the DCF Analysis process that is outlined by Lajoux (2019, Chapter 3). We first forecast the free cash flow. To do this we identify its components and build out the historical financials of the company. Then we use the information from the case base to fill the model with the right numbers and scenarios. If relevant, we also consider the synergies and savings. Then we can prepare the forecast.

Secondly, we give an estimation of the cost of capital. To do so, we first determine the capital structure of the acquisition. Subsequently, we estimate the cost of both equity and debt. Then we are able to calculate the weighted average cost of capital. After estimating the cost of capital, we estimate the terminal value, based on the results of earlier steps we select an appropriate means to do this.

The last step is to calculate and interpret the results of the valuation. We calculate the net present value of the annual cash flows and terminal value. Then we perform a sensitivity analysis and think of ways we can improve the valuation.

4.2.6 Conclusion

This section outlines the way the model in the dashboard functions conceptually. The way in which the case, rule, and model base function are described reflects the way it works in practice.

5 The development of the dashboard

5.1 Data

5.1.1 Chamber of commerce

We source data from multiple parties. For the financial statements we use a publicly available dataset with annual accounts from the Dutch chamber of commerce. This dataset contains more than one million annual accounts. They are delivered separately in compressed folders. These compressed folders are extracted and using python all annual accounts are merged into one file.

The file with all annual accounts is imported into PowerBI, where we extract and transform the data further. This starts with data cleaning. Half the annual accounts are immediately excluded, since they do not come with an SIC code, rendering it impossible to know what type of company we are dealing with. Subsequently, as mentioned earlier in this thesis smaller companies have to hand in less information, therefore a part of the annual accounts does not contain enough information. For each company we want to be able to at least have the Earnings Before Interest and Taxes (EBIT), since it is fundamental for determining the Free Cash Flows and for EBIT(DA) multiples valuation. Because the focus of this thesis is on companies that are in SIC code 62, we also filter the data on this demand, which reduces the amount of data that are imported into the data model. We end up with 85 IT companies in our dataset.

After filtering the data in such a way that we have only annual accounts of SIC 62 left, it is time to split op the annual accounts into an income statement, balance sheet, and a cashflow statement. The income statement is what shows what goes into the company and (income) and what comes out of the company over a specific time period. A balance sheet shows the company's assets, liabilities, and equity. Finally, the cashflow statement reports how cash has entered and left the company during the reporting period.

Once this is done, the three tables are loaded into the data model of Power BI. Financial ratios, returns, and other financial information can now be calculated with the use of calculated columns. Later on in this chapter, we discuss how these values are calculated.

5.1.2 Central statistics office

The Dutch statistics office also provides data for the dashboard. We gather data from about the economy and about the industry demographics, which are used in the commercial due diligence steps. These data looks straightforward but have several dimensions. Part of the data is provided on a yearly basis and part of the data is provided on a quarterly basis. Since Power BI handles all calculations, we need to remove the yearly totals from all tables that are provided on a quarterly level. If we do not do this, we obtain double results. For instance, if each quarter a growth of 100 companies would be registered (400 companies per year), this would result in 800 companies per year if the yearly totals would not be removed. The same applies to the company size, the central statistics office keeps track of these in multiple ways. This is also unified in the data transformation.

The data we obtain from the central statistics office are fast growers, companies founded, total number of companies and the number of mergers and acquisitions. A fast growing company has maintained a growth in personnel of over ten percent for three years straight (Centraal bureau voor de Statistiek, 2023)

5.1.3 Statista

Statista offers a portal for market data and insights. They also offer a report for the Dutch and global IT-services industry and an outlook for the economy, reflecting on employment rates and GDP growth. The growth rate Statista implies for the IT services industry is 6%, and is

based on the compound annual growth rate, the rate of constant return over a certain time period (Statista, 2023)

5.1.4 Damodaran
Aswath Damadoran is a well-known corporate finance and valuation professor at the Stern School of Business in at New York University. On his website he provides information about European industries and countries. The data he provides are updated yearly in the first two weeks of the year. The data he provides is gathered by Damodaran (2023), and largely derived from industry grouping from raw data providers used by Damodaran.

5.1.5 Brookz "Overnamebaromer"
Brookz is the Dutch Ebay for companies. As an M&A platform they perform biennial market research into the characteristics of M&A deals in the Netherlands, based on this research they calculate valuation multiples per industry, one of these industries is the IT-services industry (Brookz, 2023).

5.2 Target selection and screening
The target selection and screening are the first steps of the M&A process and are the starting point for the dashboard. On the first page the target and acquirer are selected. The number of options is limited by the selection of country and industry. Due to the scope of this project, this is bound by the Netherlands and the Information Services industry. With the future in mind however, the selection options for other industries and countries are added, but the datasets are limited to the bounds of the project.
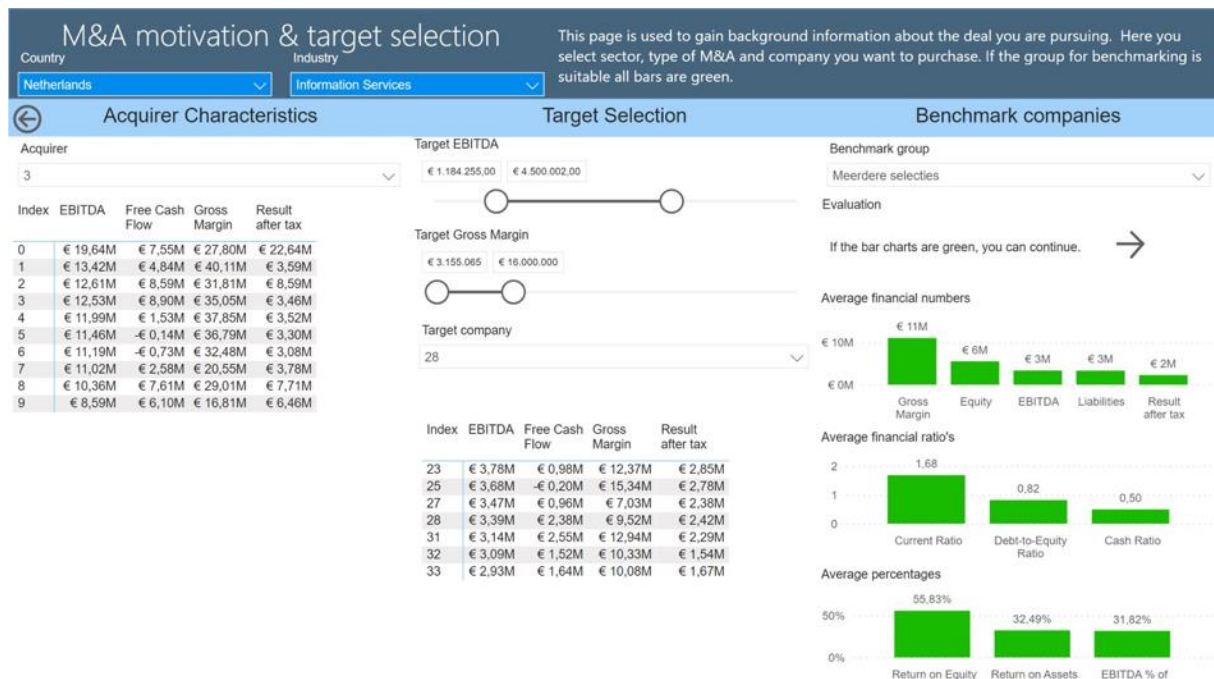

FIGURE 5.1 THE M&A MOTIVATION & TARGET SELECTION SCREEN

The set of companies is split into two parts, a small set of acquiring companies with an EBITDA of more than 8 million euros, and a large set with potential target companies. This division is made because it is easier to make a division between targets and acquirers. Benchmarking groups are better to configure for the user. The user can narrow down the potential target companies by setting a target EBITDA range and a target Gross Margin range. For both the margin and EBITDA the user selects an upper and lower bound, the target company and the

companies that are the benchmark group fall within these bounds. Parallel to the target selection, this is also the first planning step of the benchmarking process.

After selecting the target company, the benchmark group is selected. The user has the freedom to choose any of the companies between the bounds he or she sets. But the dashboard makes some recommendations for the selection of comparable companies. On the right side of the page there is an average shown of the gross margin, equity, EBITDA, liabilities, and result after tax. Furthermore, the current, debt-to-equity, and cash ratio and the return on equity, return on assets and the EBITDA as a percentage of the gross margin are shown in bar charts.

The bar charts give a visual representation of the benchmark group characteristics. The evaluation field on the page gives a verbal indication on the fit of the target group. The evaluation field gives an all clear once all criteria for a good comparable group are met. Loosely based on the criteria for comparable companies' valuation we select a group that has similar financial statements and is between five to thirteen companies. The evaluation field recommends adding or remove one company, or switch a company is the selected companies are not "centered" around the target company. Meaning there should be an even number of companies with an EBITDA higher than the target and an EBITDA lower than the target. We chose EBITDA because it is available from the dataset and because it limits the effect of
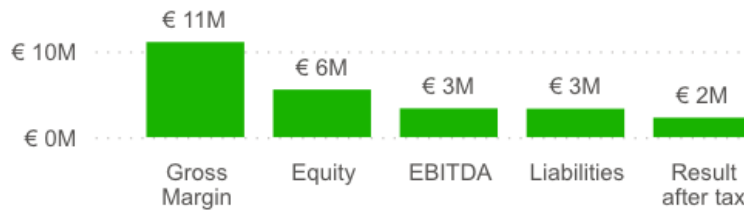
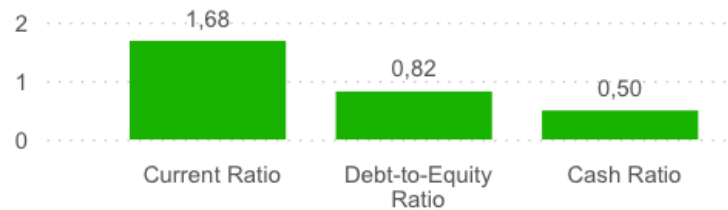Financing and accounting decisions and focusses on the core business of the company (Damodaran, 2007).

FIGURE 5.2, SELECTION CRITERIA FOR THE PEER GROUP

The criteria used to evaluate the fit of the target group are not solely based on EBITDA, the coefficient of variation in the averages on the bar charts is also represented. The coefficient of variation measurers the relative variability of a statistic. It is introduced because it gives a measure of comparability. A low value indicates a similarity between the companies. Because the target needs to be compared to a group of similar companies, a coefficient lower than one is desired. Adding this to the similarity in EBITDA, we have two dimensions that determine whether the benchmark group has enough similarity.

5.3 Due diligence
5.3.1 Commercial due diligence

FIGURE 5.3, COMMERCIAL DUE DILIGENCE PAGE

The due diligence is split into three parts. Commercial, evaluating the market. Financial, assessing the financial performance of the company, and finally operational. In the commercial due diligence, we first assess expectations for the gross domestic product and the unemployment rate in the target country, provided by Statista. A growth in GDP and steady unemployment rate indicate a good economic climate. Below the graphs reflecting on the economy, a field with "cards" is shown. These cards give the tax rate, equity risk premium, ten year bond rate and country risk premium, which are all inputs for the valuation model. These values are all derived from the data provided by Damodaran (2023).

In the two columns on the right side of the due diligence page, we give information about the

Economy

GDP of The Netherlands

Unemployment Rate of the Netherlands

Country related valuation inputs

Tax Rate	Equity Risk Premium
25,80%	5,00%

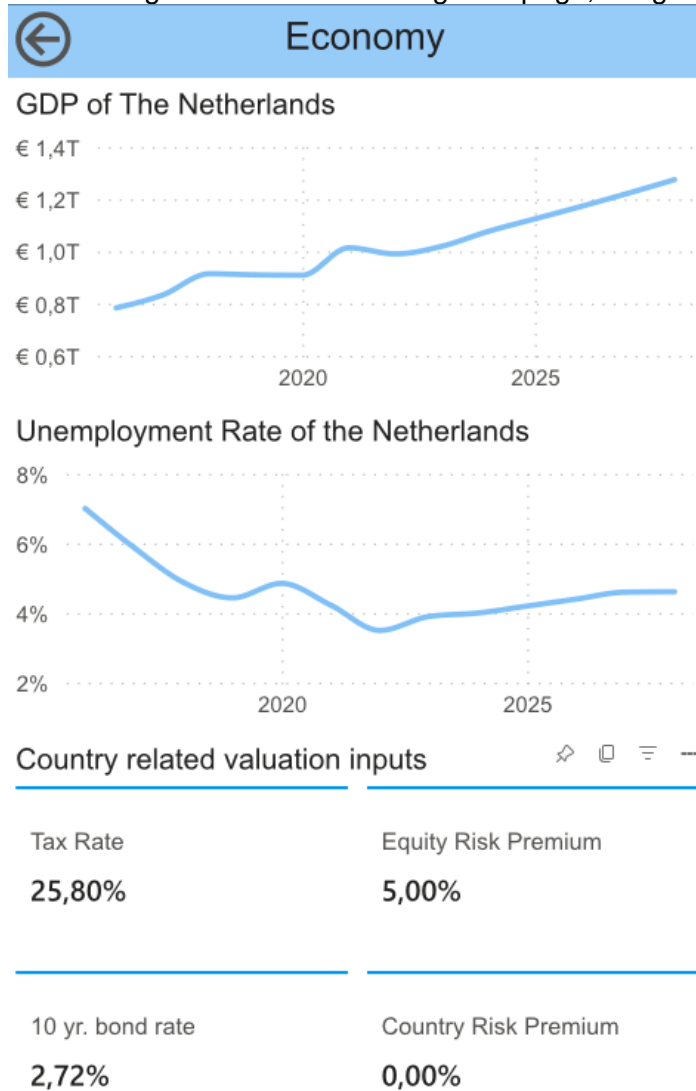| 10 yr. bond rate	Country Risk Premium
2,72%	0,00%

FIGURE 5.4, COMMERCIAL DUE DILIGENCE ON ECONOMIC CLIMATE

industry. The number of new companies started, of companies in the industry, of fast growers and of mergers and acquisitions in the industry is given. Alongside the projected revenue of the IT services industry in the Netherlands provided by Statista (Statista, 2023). Another field with information on the industry is provided. Giving insight into the industry related valuation inputs. We get the beta, cost of debt and cost of equity from Damodaran (Damodaran, 2023). And three EBITDA valuation multiples are obtained from the Brookz overnamebarometer (Brookz, 2023).
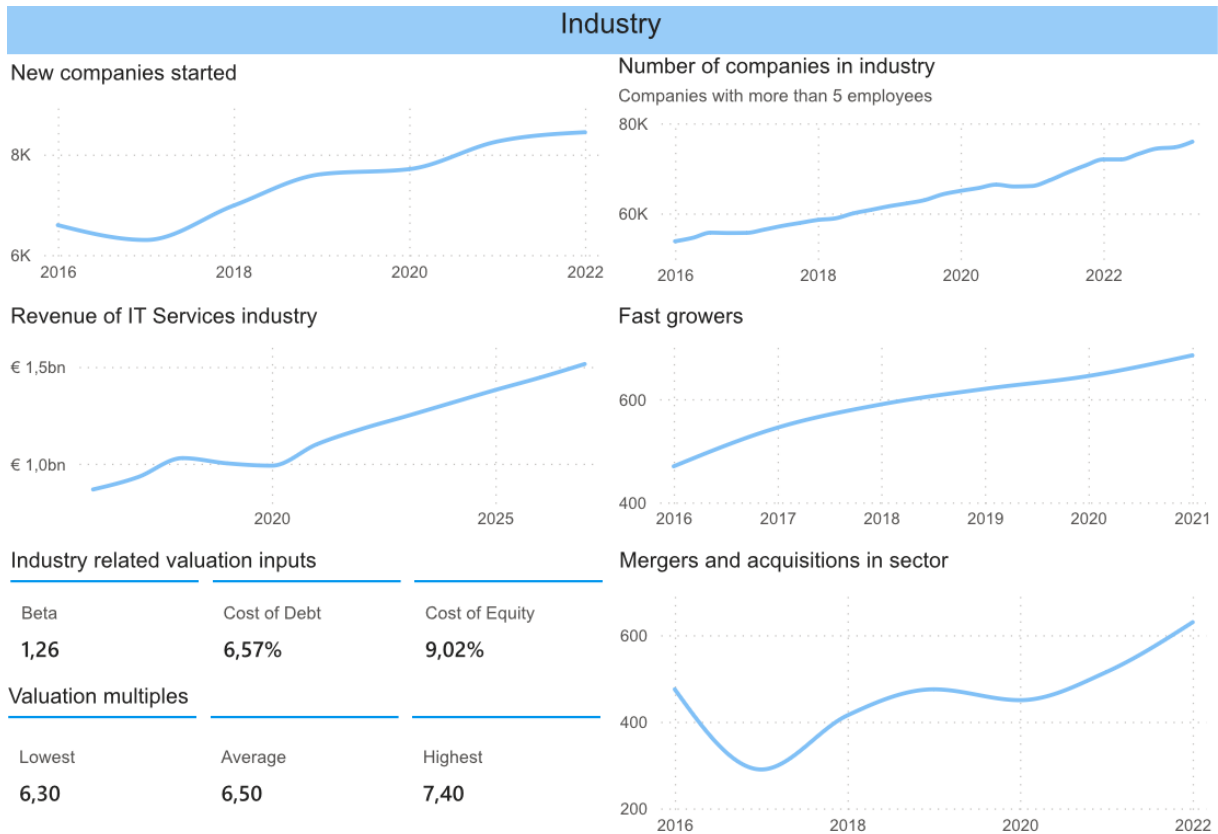
Industry

New companies started

Number of companies in industry
Companies with more than 5 employees

Revenue of IT Services industry

Fast growers

Industry related valuation inputs

Beta	Cost of Debt	Cost of Equity
1,26	6,57%	9,02%

Valuation multiples

Lowest	Average	Highest
6,30	6,50	7,40

Mergers and acquisitions in sector

FIGURE 5.5, COMMERCIAL DUE DILIGENCE ON INDUSTRY

5.3.2 Financial due diligence

The financial due diligence's purpose is to get a view of the financial performance of the target. It is in the financial due diligence that we start with benchmarking. We compare the target company based on two statistics: standard deviation and average. The standard deviation is used to assess whether the financials do not deviate too much from the average. If the targets

FIGURE 5.6, FINANCIAL DUE DILIGENCE PAGE

34

companies financials are within the standard deviation of the average, we can say it does not deviate from the benchmark group too much. This contributes to the quality of earnings investigation.

Secondly, the comparison by average is used to see whether a company performs better or worse than the benchmark group. A company that performs better, is obviously a better target, but will also have a higher value than a company with a lower performance. Keep in mind that having a higher value does not necessarily imply it is better, spending less on employees compared to the benchmark group is better better for instance.

To provide the insights we speak of above, the financial due diligence page consists of three columns. Each column is made up of an explanation, KPIs, a bar chart and a table. The bar chart gives a visual indication of the difference between the averages. Below, the table indicates whether the financials are inside or outside the standard deviation and whether the performance is better than average or worse. The choice for the words "better" and "worse" was explicitly made to indicate that higher is not always better. Whether the financial is in or out the range is used to determine if the annual accounts need to be investigated further or adjusted.

The three columns are divided into a column to investigate the direct annual accounts, so without any operations performed on the number. This gives an absolute comparison, and we refrain from giving an indication if something is better or worse for this column. For most companies with a higher gross margin, it is logical to have more assets and a higher EBITDA. It is not better or worse if a company has higher absolute financials. The financials shown in this chart are gross margin, assets, equity, EBITDA, liabilities, result after tax, and cash and cash equivalents. All of these financials, except one, are extracted from the annual accounts directly. The EBITDA is calculated by subtracting the depreciation and amortization costs from operating profit, which is the same as the EBIT.
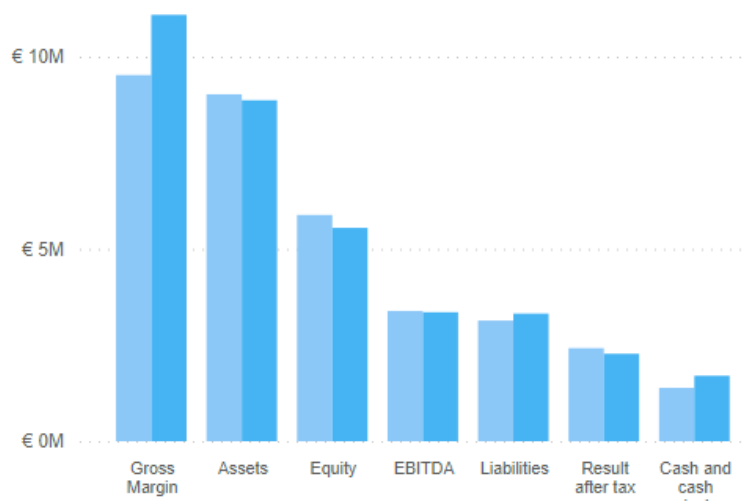

FIGURE 5.7, BENCHMARKING OF PEER FINANCIALS AGAINST TARGET COMPANY

The remaining two columns to the right display financial ratio's, returns, etc. Because these are relative measures we can say if something is better or worse. The financial ratio's we display are summarized below:

- Quick ratio: Measures a company's ability to cover its short-term liabilities. A higher quick ratio is better, a ratio higher than one means the company can pay off its liabilities without selling inventory.

$$Quick\ Ratio = \frac{Current\ assets}{Current\ liabilities}$$

- Debt ratio: Shows the part of a company's assets that are financed by debt. Lower is better, a lower ratio means there is less leverage and potentially less risk.

$$Debt\ Ratio = \frac{Total\ debt}{Total\ assets}$$

- Debt to equity ratio: Measures the amount of debt that is used to finance the company relative to the value that comes from shareholders equity. Lower is better.

$$Debt\ to\ equity\ ratio = \frac{Total\ debt}{Total\ equity}$$

- Equity ratio: Indicates the proportion of the company's assets that are financed by the shareholders. Higher is better because the company is less reliant on outside creditors.

$$Equity\ Ratio = \frac{Total\ equity}{Total\ assets}$$

- Operating cash flow ratio: This ratio reflects how well the current liabilities are covered by the cash flow that is generated from the company's operations. Higher is better, a better ability to cover current liabilities is desired.

$$Operating\ cash\ flow\ ratio = \frac{Cash\ flow\ from\ operations}{Current\ liabilities}$$

- Cash ratio: The cash ratio reflects the company's ability to cover its short term liabilities with only cash and cash equivalents. A ratio higher than one indicates the company can pay off its liabilities.

$$Cash\ ratio = \frac{Cash\ and\ cash\ equivalents}{Current\ liabilites}$$

- Quality of earnings: Is used to assess whether the origin of the income is from structural inflows or comes from one-time events. A higher quality of earnings is better because it there is more structural income.

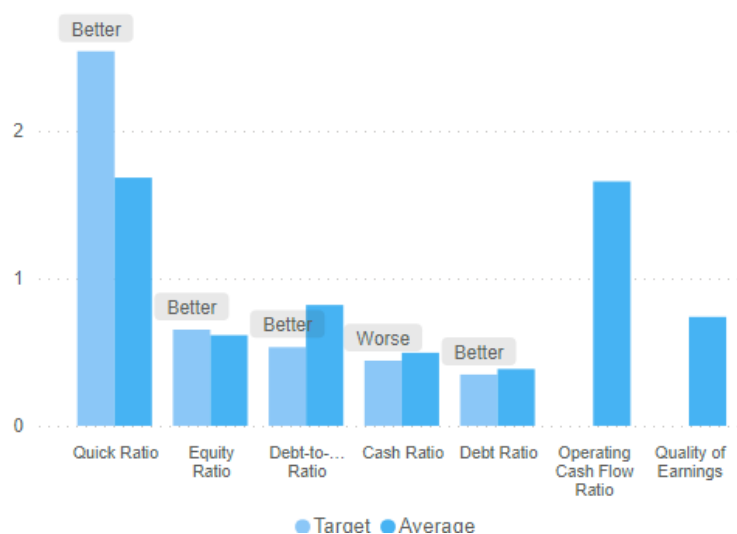$$Quality\ of\ earnings = \frac{Cash\ flow\ from\ operations}{Result\ after\ tax}$$

FIGURE 5.8, BENCHMARKING ON FINANCIAL RATIO'S

The bar chart in the rightest column reflects on the following numbers:

- EBITDA as a percentage of gross margin: Compares the earnings before interest, taxes, depreciation, and amortization to the gross margin. It assesses how much of the gross profit is retained after the operating costs are subtracted. A higher percentage is better because more of the gross margin is converted into EBITDA.

$$\frac{EBITDA}{Gross\ margin} \times 100\%$$

- Employee expenses as a percentage of gross margin: Determines how much of the company's gross margin goes towards covering employee-related expenses. Lower is better, a lower percentage indicates that the gross margin is used to cover its employee expenses, which suggests operational efficiency.

$$\frac{Employee\ expenses}{Gross\ margin} \times 100\%$$

- Receivables percentage as a percentage of assets: Shows how much money is owed to the company as a part of the total assets. It shows how much of the company's assets are tied up in money that it should receive. Lower is often better, a high percentage might indicate that there are liquidity problems.

$$\frac{Receivables}{Current\ assets} \times 100\%$$

- Result after tax as a percentage of gross margin: This compares the net profit to the gross margin. A higher percentage indicates that the company keeps more of the gross margin aster all expenses, which is a sign of profitability and efficiency.

$$\frac{Result\ after\ tax}{Gross\ margin} \times 100\%$$

- Return on assets: Measures the company's profitability with respect to its total assets. It reflects upon how effective a company uses its assets to generate earnings. A higher value is better because it indicates the assets are used effectively.

$$\frac{Result\ after\ tax}{Assets} \times 100\%$$

- Return on equity: Return on equity is an indicator of profitability with respect to the shareholders equity that is in the company. Same as return on assets but focused solely on the shareholders equity.

$$\frac{Result\ after\ tax}{Equity} \times 100\%$$

FIGURE 5.9, BENCHMARKING OF FINANCIAL PERCENTAGES

The KPI bar gives a conclusion of the page based on five key performance indicators. For the absolute financial numbers, the percentage of times the target financial falls into the standard deviation of the benchmark group average. If it falls outside this range, the financial should be researched further, to check whether it is correct. The same is calculated for the other two bar charts. Additionally, we calculate how often the target company outperforms the benchmark group.

Target Financial Standard Deviation Score, Target Metric Performance Score, Target Metric Standard Deviation Score, Target Rates and Return Per...

Target Financial Standard Deviation Score	Target Metric Performance Score	Target Metric Standard Deviation...	Target Rates and Return Performance Score	Target Rates and Return Standard Deviation Score
100.00%	57.14%	71.43%	33.33%	100.00%

FIGURE 5.10, SCORES OF FINANCIAL DUE DILIGENCE
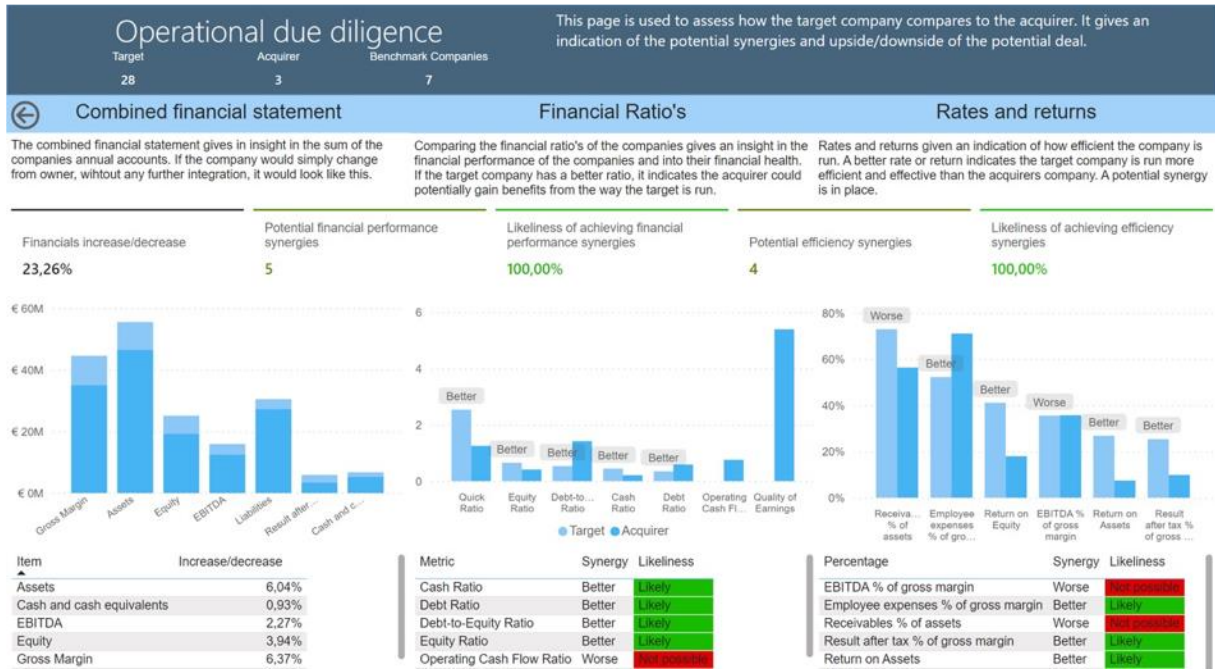
5.3.3 Operational due diligence

FIGURE 5.11, OPERATIONAL DUE DILIGENCE PAGE

The operational due diligence page has a large resemblance to its financial colleague. The difference between the pages is that in the latter, we compare the target against the acquirer. The acquirer forms as the functional baseline described in Section 4.1.3. If the target outperforms the acquirer, there is a potential synergy. However, it is not said whether it is likely a synergy can be achieved. Therefore, we use the "in" or "out" classification from the financial due diligence. If an item does not fall in the standard deviation, we deem a synergy unlikely because there is something going on with the financial metric. If a metric underperforms with respect to the acquirer, there is no synergy possible.
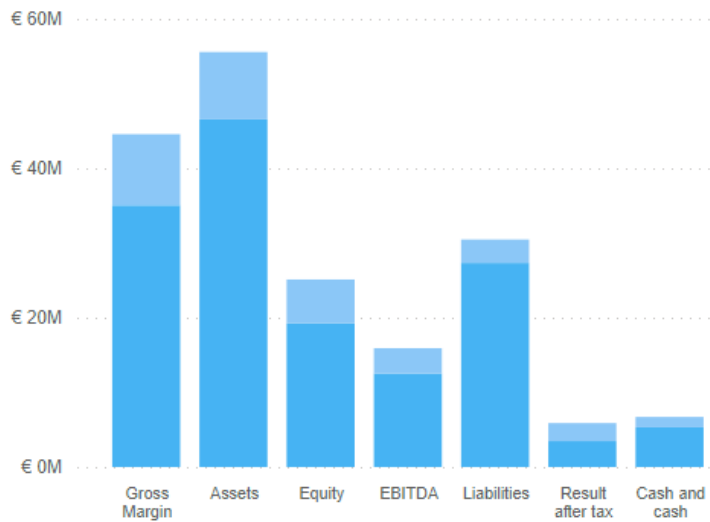

FIGURE 5.12, COMBINED FINANCIALS OF ACQUIRER AND ACQUIREE

Synergies are divided into two types. The middle bar chart shows financial performance synergies. A financial performance synergy indicates that the financial structure of the target is better, this can be for instance because the amount of equity is higher in comparison to the amount of debt, which means that the company is leveraged less and potentially carries lower risk. The same structure for the bar charts is used as for the financial due diligence.
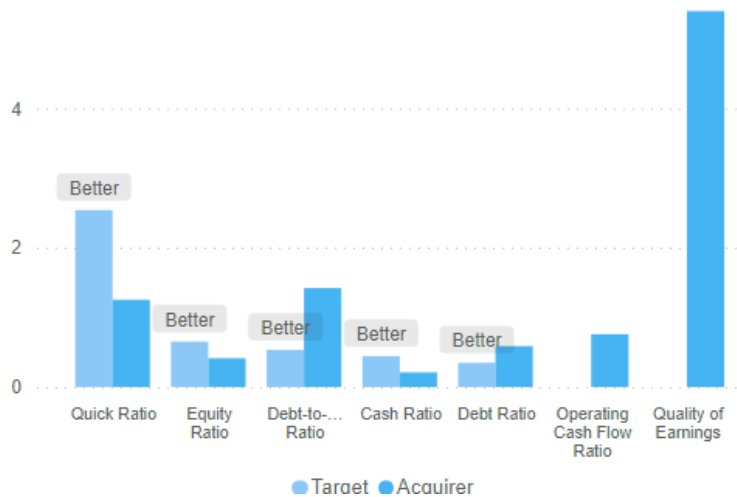
The second type of synergy, reflected upon in the rightest bar chart are efficiency synergies. An efficiency synergy shows that the company is doing something in a more effective way. Relative less employee expenses means that the way in which the company allocates its personnel is more efficient, and a higher result after tax percentage simply indicates that the company spends less of its income. On the left, the financial statement is reflected upon, which gives a visual indication of both companies and their absolute size differences.

FIGURE 5.14, COMAPARIS OF PERCENTAGES

5.4 Valuation

FIGURE 5.15, VALUATION PAGE

The valuation page calculates an average value for the company based on two methods. The first method is relatively simple, it is the EBITDA multiple method. The Brookz overnamebarometer provides a biennial report of the EBITDA multiples that are current in the IT services industry. They provide an average multiple, and a high and low multiple. This essentially gives a spread of three values.

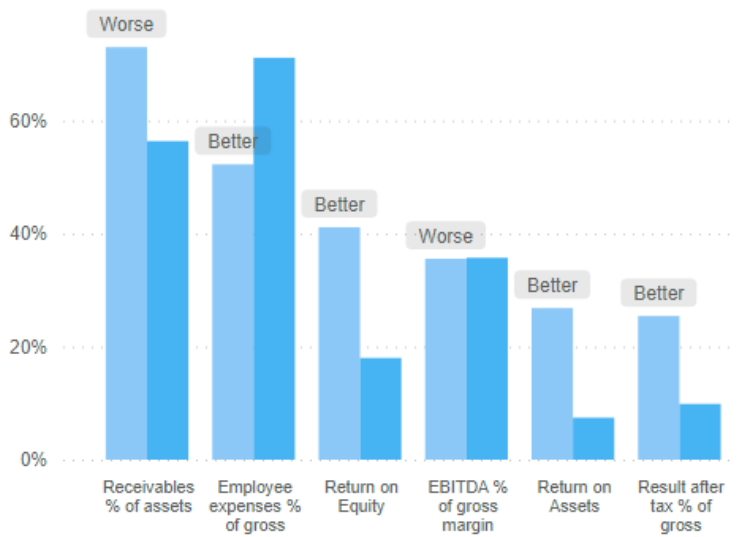Secondly, the discounted cashflow method is used. Here the present value of the company is calculated by discounting the expected future cash flows to the present using the weighted average cost of capital. For the calculation we use the free cash flow to the firm (FCFF). It is also possible to use the free cash flow to equity (FCFE). We opt for the use of FCFF for multiple reasons. Firstly, it is pre-debt, due to the limitations of the data it is not possible to calculate the exact debt. We assume that debt equals the total amount of liabilities, but whenever we can it is better to bypass such assumptions and use values we can calculate or derive with certainty. Secondly, FCFF is widely accepted for DCF calculations with private companies (Damodaran, 2021), and the FCFF method often gives a more conservative valuation, this can partly account for illiquidity of private companies and the fact that there are more unknowns in comparison to acquisitions with public companies.

The calculation starts with EBIT, which is the operating income from the company directly taken form the income statement. Then it is adjusted for taxes using the tax rate in the Netherlands, because money handed to the tax agency cannot be spent on other things. After adjusting for taxes, we add the depreciation and amortization back, they are non-cash expenses recorded on the income statement, however, we are only interested in real cash flows. Subsequentially, we account for the change in net working capital. An increase in working capital reflects that there is more money tied up in operations, which results in the fact that the company has a lower free cash flow. Finally, to obtain the FCFF we adjust for capital expenditures (CapEx). CapEx are the cash outflows that are used to maintain and grow the business, which is cash that is not available to the shareholders, or to spend on operations. The formula for the FCFF is given below and follows the same structure as Brealey and Myers (2023).

41

$$FCFF = EBIT(1 - tax) + Deprecation \,\&\, Amortization - Change\ in\ Net\ Working\ Capital$$
$$- CapEx$$

In the denominator we use the weighted average cost of capital (WACC), which considers the cost of capital from all sources, while taking in account the capital structure of the company. The WACC consist of multiple components. We start with the cost of equity (Re), this is the expected return that an investor should get when investing in a company. It is based on the risk free rate, the return an investor would get when investing in bonds or saving his money in a savings account. To the risk free we then add the market beta multiplied by the equity risk premium (Damodaran, 2021). However, we leave out the small cap premium and illiquidity premium, we do this to prevent double counting, since a small cap premium might also be implied in the illiquidity premium and vice versa. Furthermore, there is little data on these premiums for the market we are in.

$$Re = Risk - free\ rate + \beta \times Equity\ Risk\ Premium$$

The WACC also uses the cost of debt (Rd). The cost of debt and the cost of equity are then weighted for the capital structure of the target company. We explicitly calculate the WACC of the target since we want to carry the risk profile of the investment (the target) and not the risk profile of the investor.

$$WACC = \frac{E}{E + D} \times Re + \frac{D}{E + D} \times Rd(1 - Corporate\ tax\ rate)$$

The final part of the DCF valuation is the terminal value. The terminal value can be calculated in three ways. We choose to go for the exit multiple approach and use the discounted EBITDA and multiply it by the average EBITDA multiple. We choose this option because the other two options are disqualified. The constant growth model carries too many assumptions about the future growth of the company and the liquidation value is based on the idea that the company stops to exist (Lajoux, 2019). This in turn gives the following formula for the DCF-valuation, based on a time horizon of five years.

$$Valuation = Multiple \times \frac{EBITDA_6(1 + g)^6}{(1 + WACC)^6} + \sum_{t=1}^{5} \frac{FCFF \times (1 + g)^t}{(1 + WACC)^t}$$

The calculations are done in Power BI using calculated columns. Based on the two DCF valuations, using different growth rates, and on the three EBITDA multiples the results of the valuation are given on the valuation page. The middle column gives more detail about the calculation. The inputs are discussed in more detail in 5.6 Assumptions.

Forecasted Free Cash Flow
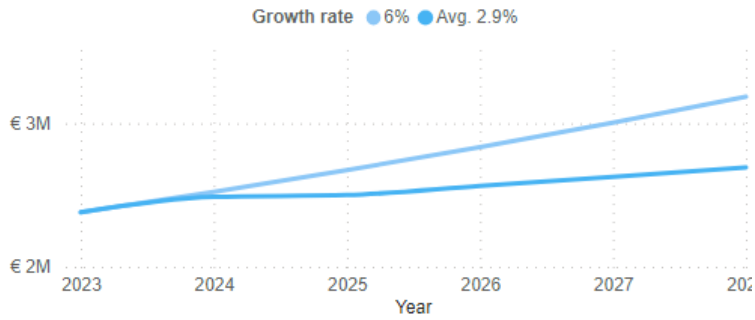
Discounted Free Cash Flow
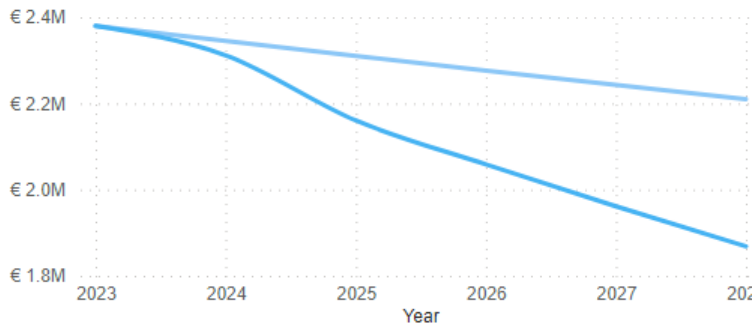
FIGURE 5.16, CASH FLOW FORECASTS

After performing all calculations displayed on the dashboard, we can perform data analysis. First, we take a look at the valuation methods. In 75 of the 85 cases the Discounted Cash Flow method results in a higher valuation. Furthermore, the results differ greatly if we take a look at the relative standard deviation. The average relative standard deviation is 67%, which is the average of the relative standard deviations of the valuation of one company. A number that seems high, if we remove the outliers however, we get a lower standard deviation that is more sensible. If we remove the highest and lowest two (-262%, -195%, 1335%, 2355%) the standard deviation becomes 28%. This means that a large part of the variation comes from the
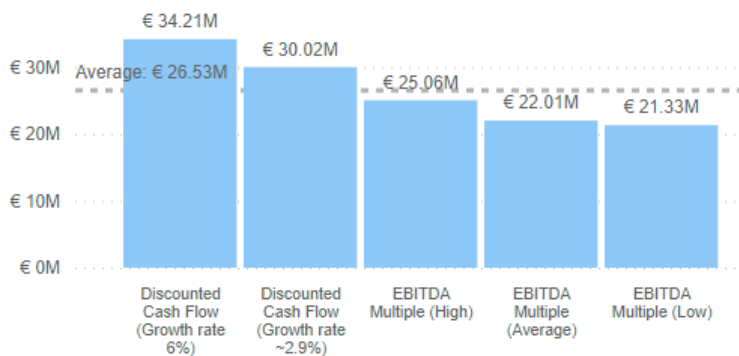
FIGURE 5.17, VALUATION RESULTS FROM DIFFERENT METHODS

outliers, and that when these outliers are removed the valuations are stable enough for our intentions. It is not our goal to provide an absolute valuation, we simply want to give the user an idea as to what the company might cost.

It is also important to note that the companies are in the same industry but are not all similar. A different company size can mean a different cost structure.
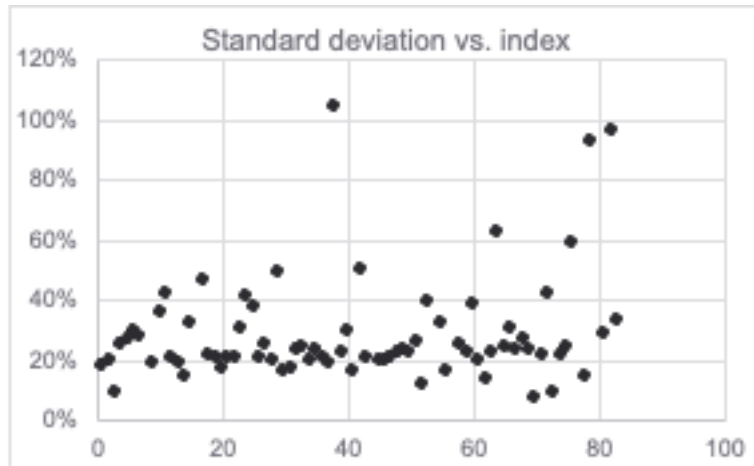
5.5 Cockpit

The cockpit is the page that eventually helps the user conclude. In the left column, the due diligence is summarized with a review of the key operational and financial metrics and with the graph that shows the development of the revenue in the chosen industry. The center column sums up the valuation results. The right column gives advice on the potential takeover.
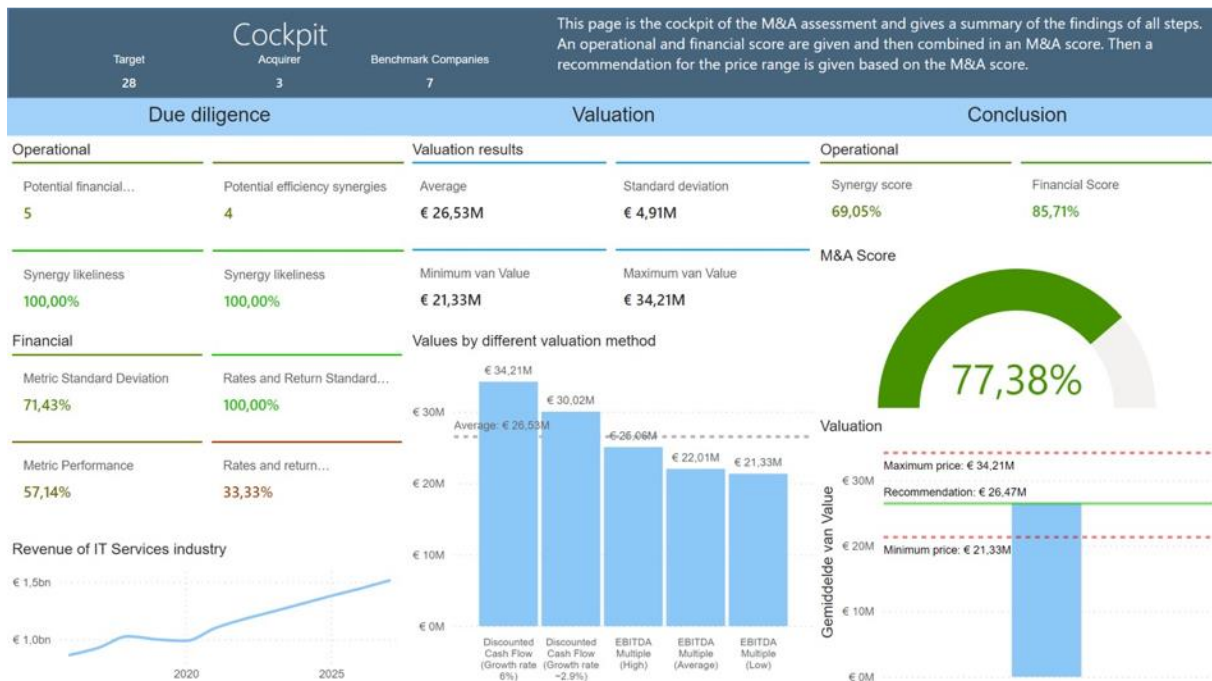
FIGURE 5.19, THE COCKPIT PAGE

The advice starts with a synergy score and a financial score. The synergy score gives a score based on the number of likely synergies over the total number of possible synergies. The financial score gives the percentage of scores that fall within the standard deviations. We do not consider whether the target outperforms the benchmark group, because we already consider when the target outperforms the acquirer in the synergy. The financial score focuses on whether the targets financial seem normal.

The average of the synergy and financial score is given in the M&A score. A higher M&A score
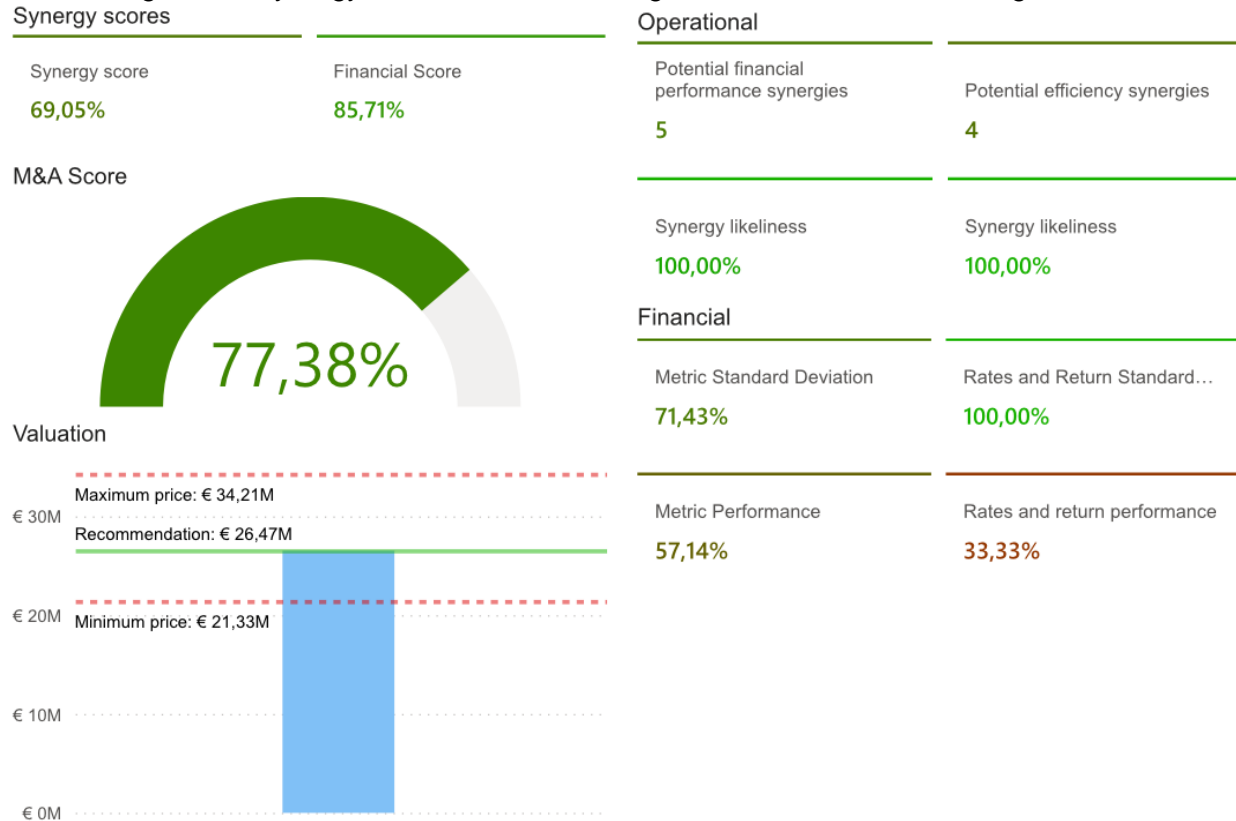
FIGURE 5.20, METRICS ON THE COCKPIT PAGE

means that the target is a more suitable target and gives a green light to pursue the merger or acquisition further. It is in no way a sign that the acquirer should immediately start negotiations, it is a sign that the acquisition might be worthwhile. It indicates that an account or M&A expert is the next step.

The M&A Score is also used in the price recommendation. It shows the maximum price as a bound and the minimum price. If the M&A Score is 100%, the recommendation is to pay up to the maximum price. Otherwise, the recommendation is to pay the percentage of the maximum price, so the highest price calculated. If the maximum price is 35 million, and the M&A score is 75%, the recommendation is to pay 26 million euros.

All visuals in the cockpit have a drill through page assigned. This means that the user is only right mouse click away from accessing the respective pages of the topic. If the user wants to know what averages are higher than the benchmark group, the user can simply click and go the financial due diligence page. Using the "go back to last page" button the user can navigate back to the cockpit with ease.

5.6 Assumptions

To perform the calculations, we need to make some assumptions. Most of the assumptions are needed for the DCF valuation. One is not, however. The chamber of commerce annual

records to not specify what part of the liabilities is debt. Liabilities represent the total amount of money owed to a business by another partners, this can be current liabilities, which have to be paid within one year, or non-current liabilities, which are carried over multiple years. Debt falls into the non-current liabilities and is only money that is borrowed. Without a better alternative we have to assume all liabilities are debt. This does not mean we have a problem, because we do this for all financial statements that are entered, which ensures that we keep a uniformity in the dataset.

For the risk free rate, it is normal to take the return on the country's ten year bond. This number is widely available and is 2.8% in July 2023 (Trading Economics, 2023). For the growth rates we use two alternatives. The first one is based on the growth rate of the revenue in the IT-services sector, which is 6% (Statista, 2023), the second one is based on the prediction of the statistics office, which is 4.5% for the first year and 2.5% for the later years (Stadig, 2023).

For the beta, tax rate, cost of debt and cost of equity we use the data provided by Damodaran (Damodaran, 2023). For the tax-rate we use the country specific rate of 25.8%. For the unweighted cost of debt and cost of equity we use 6.57% and 9.02% respectively, these are all industry specific and based on European IT-services. The same goes for the equity risk premium, 5%, and the beta, which is 1.26.

5.7 The development of the dashboard: Conclusion

Looking back at the intended goals of the dashboard (Section 1.3) and the conceptual design of the dashboard (Section 4.2) we can ascertain the dashboard meets the goals but deviates from the conceptual design. The goals of the dashboard were to give:

- Higher information availability.
- Higher level of insight.

All goals seem to have been met. With a straightforward way of selecting a target and peer group, the time to completion has been lowered from the first step. After selecting the target and peer group they are evaluated to see whether they are suitable. If all bars are green the dashboard gives you an indication to continue, simultaneously all calculations are made.

The most information is given in the "Cockpit", which is a summary of all information. Depending on the information demand of the user, there is a drillthrough option, which gives the user more information on the topic. For instance, if the user desires to know more about the operational due diligence, a right-click on the visual gives the possibility to go to the due diligence page. Thus, the "Cockpit" provides a high level of insight, whereas the pages about the specific subject give a more in-depth view. This reflects a higher information ability we aim to provide.

If we reflect on RQ 9: *To what extent does the dashboard perform the way it was intended to?* We have to admit that there are some limitations. One of our goals was to reflect the M&A motives throughout the dashboard and based on that choose a valuation method that is most appropriate. Due to the broad nature of both M&A motives and valuation motives, this functionality proved to be out of scope. The broad nature results in a lot of possible options and combinations, especially when the type of M&A is also considered. Therefore, we chose to only reflect the DCF valuation and multiples valuation.

In the target selection the rule based is used to select the right rules for the coming steps. This is centered around picking the right inputs from the case base. Additionally, by selecting the group of peer companies based on the bar charts, the user also fills the rule base with additional rules. This action is aligned with the planning step of the benchmarking process.

The due diligence steps, synergy assessment, and valuation step all function in the way we intended. Except for the operational due diligence, here it was too difficult to assess the size, timing and complexity of the synergies we expect to occur. What we instead assess is the number of possible synergies and whether they are likely or not likely to occur based on the financials of the companies.

Concluding, the dashboard largely reflects the intended design we outlined in Chapter 4. With some restrictions with respect to the motivation and operational due diligence. The desired outcomes of the dashboard are met, and we can say the dashboard supports pre-deal M&A decision making.

6 Conclusion

This conclusion represents the finale of an investigation into the combination of Business Intelligence with mergers and acquisitions (M&A). The thesis shows how the usage of a decision support system (DSS) aids the pre-deal phase of M&A. It bridges the gap between these fields, introducing a new way to make the evaluation of M&A targets in the early stages of the process data-driven.

The M&A process is known for its complex nature. Investigating the current dashboards in the pre-deal phase, we detect the need for innovation. The thesis addresses this by researching the question:

How to design a business intelligence dashboard to support decision-making in pre-deal mergers & acquisition processes?

The dashboard supports a more structured, efficient, and insightful way to start the M&A process and target company evaluation.

Central to the thesis is the development of a conceptual framework. It aligns the steps of the pre-deal M&A phase with those of the benchmarking process. Benchmarking is used for the comparison of the target company against its peers. Furthermore, the benchmarking and M&A steps are aligned with the key components of a DSS. This alignment provide a structured framework for the usage of the DSS and ensures that each stage of the pre-deal M&A process is supported by data-driven insights. The model points out the limitations of the current practices. The new approach leverages the latest technologies that transforms data into comprehensible and actionable data.

The conceptual of the framework addresses the core problem identified in the beginning of the thesis:

The limited use of data-driven decision-making in M&A processes.

The thesis demonstrates how a dashboard can transform data into a strategic asset. The tool helps decision-makers to steer through the pre-deal M&A phase faster and easier. It provides a comprehensive yet concise summary of the relevant data.

In practice, our dashboard has potential in numerous use cases. It can be used by a range of stakeholders. Think of accountants, or potential acquirers and acquirees. For an accountant, the tool generates a shortlist of targets to be screened. The acquirer can do the same. An acquiree could use the benchmarking capabilities of our dashboard to compare itself to its peers and potential acquirer. The streamlining of this process leads to lower cost in this phase, this is done by reducing the time that is needed to complete the phase and by increasing the amount of information. The potential of the dashboard also extends beyond the M&A process. It allows companies to compare their performance against a selection of its peers.

One of the most notable functions of this dashboards is its ability to provide a snapshot of a company at a single point in time. Another function is that dashboard helps in the due diligence steps of the pre-deal M&A phase. The dashboard offers insights into the market of the target, its financial performance respective to its peers, and offers insight into potential synergies.

Besides the practical application, the thesis also makes a contribution to the theoretical landscape of M&A. It combines the fields of decision support systems, benchmarking and M&A. Doing so, it presents a multidisciplinary approach and gives an new perspective on the way M&A processes can be viewed. The development of the conceptual framework is translated into a practical dashboard, which indicats that theory and practice have been successfully bridged.

In conclusion, the thesis is a step forward in the integration of data-driven decision-making in the M&A process. It proposes a way to use BI in the pre-deal M&A phase. It is a testament to the power of modern technology and its ability to transform traditional ways of working. The theoretical and practical contributions allow for future innovations within this field, and inspires further exploration into the world of BI and decision-making.

7 Discussion

The thesis has some inherent limitations and constraints that are caused by the data . The primary limitation being that the dataset is relatively small, and only consists of around 80 suitable companies. This limitation has an impact on the way the dashboard can be used in other sectors or countries. Markets dynamic can vary greatly across different scales or industries. The small scope of the dataset influences the effectiveness and accuracy of the tool. Hence, while the dashboard has potential within the context of the dataset, it remains to be seen whether it has the same potential within other settings.

Another limitation can be found within the dataset, which consists of anonymous data of one year. It is a constraint on the ability to analyze the performance of a company over multiple years, which should be an important part of M&A analysis. Data over multiple years could provide insights into, trends, stability, growth, etc. of target companies.

These limitations open up several options for future research and development:

- Expanding the scope of the dataset.
- Longitudinal analysis.
- Expand the dataset to other sectors.

Future research could aim to use a larger dataset, with more diverse IT companies. For instance, companies from other countries, public companies, or smaller and larger companies. It would also be interesting to see whether the dashboard functions outside of the IT industry, thus the dataset could be expanded in additional research. A longitudinal analysis could also help in improving the dashboard, allowing for a view over multiple years.

A validation of the assumptions and outcomes of the dashboard would improve the credibility of the end product. This could be done by an analysis of past mergers and acquisitions, which would require access to these types of data, this might be expensive. Quantitative validation would provide empirical evidence for the effectiveness of the dashboard, and increase the credibility and reliability in the eyes of the user.

Furthermore, it is also interesting to see what the merging trends of advanced analytics techniques, such as artificial intelligence (AI) and machine learning (ML) could do to improve the models and information generated.

Finally, the dashboard could be improved by researching the best way to represent the information. Currently, we have opted to build a "Dashboard" page and an "Analysis" page following the dashboard, analysis, report. Structure, however, due to the limited dataset it is not possible to create a "report" page, which enables the user to explore the data on a "row" level. The report part, on some row level is depicted on the bottom of the analysis pages, which leads to a somewhat information heavy screen. Once more data is added to the model, the dashboard should be redesigned, with the conceptual framework in mind.

8 References

Battagello, F. M., Cricelli, L., & Grimaldi, M. (2016). Benchmarking strategic resources and business performance via an open framework. *International Journal of Productivity and Performance Management*, *65*(3), 324–350. https://doi.org/10.1108/IJPPM-08-2014-0129

Brealey, R. A., Myers, S. C., Allen, F., & Edmans, A. (2023). *Principles of Corporate Finance*. New York: McGraw Hill.

Brookz. (2023). Brookz Overname Barometer onderzoek. Retrieved October 5, 2023, from https://www.brookz.nl/barometer

Centraal Bureau voor de Statistiek. (2022). Bedrijven__fusies_en_overnames_13022023_114131. Retrieved February 13, 2023, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/83147NED/table?dl=786D0

Centraal bureau voor de Statistiek. (2023a). StatLine - Bedrijven; bedrijfstak. Retrieved May 10, 2023, from https://opendata.cbs.nl/#/CBS/nl/dataset/81589NED/table

Centraal bureau voor de Statistiek. (2023b). StatLine - Bedrijven; snelle groeiers, bedrijfsgrootte, rechtsvorm, bedrijfstak. Retrieved October 5, 2023, from https://opendata.cbs.nl/statline#/CBS/nl/dataset/83328NED/table?ts=1696491861608

Damodaran, A. (2007). *Valuation Approaches and Metrics: A Survey of the Theory and Evidence*. Boston: Now Publishing.

Damodaran, A. (2021). *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset*. Hoboken: John Wiley & Sons Inc. Retrieved from www.WileyFinance.com.

Damodaran, A. (2023). Damodaran Online. Retrieved October 5, 2023, from https://pages.stern.nyu.edu/~adamodar/

Fernández, P. (2007). *Company valuation methods. The most common errors in valuations*.

Garzella, S., & Fiorentino, R. (2014). A synergy measurement model to support the pre-deal decision making in mergers and acquisitions. *Management Decision*, *52*(6), 1194–1216. https://doi.org/10.1108/MD-10-2013-0516

Hamzah, M., Sobey, A., & Koronios, A. (2010). Supporting decision making process with information visualisation: A theoretical framework. *ICIME 2010 - 2010 2nd IEEE International Conference on Information Management and Engineering*, *3*, 267–271. https://doi.org/10.1109/ICIME.2010.5477827

Hassan, I., Chidlow, A., & Romero-Martínez, A. M. (2016). Selection, valuation and performance assessment: Are these truly inter-linked within the M&A transactions? *International Business Review*, *25*(1), 255–266. https://doi.org/10.1016/j.ibusrev.2015.05.004

Heerkens, H., Winden, A. van, & Tjooitink, J.-W. (2017). *Solving Managerial Problems Systematically*. Groningen/Houten: Noordhoff Uitgevers BV.

Kamer van Koophandel. (2022). Standard Business Classification 2008 - update 2022. Retrieved May 10, 2023, from

https://www.kvk.nl/download/Standaard_Bedrijfsindeling_2008_ENG_tcm109-510163.pdf

Kamer van Koophandel. (2023). Waaruit bestaat de jaarrekening? Retrieved May 8, 2023, from https://www.kvk.nl/inschrijven-en-wijzigen/deponeren/jaarrekening-deponeren/waaruit-bestaat-de-jaarrekening/#

Kinnunen, J. (2010). *Valuing M&A Synergies as (Fuzzy) Real Options Some of the authors of this publication are also working on these related projects: M&A and real options View project Multivariate statistical modelling View project Valuing M&A Synergies as (Fuzzy) Real Options*. Retrieved from https://www.researchgate.net/publication/228239769

Kinnunen, J., & Georgescu, I. (2023). Credibilistic Valuation of Merger and Acquisition Targets with Fuzzy Real Options. In *Smart Innovation, Systems and Technologies* (Vol. 321, pp. 353–365). https://doi.org/10.1007/978-981-19-6755-9_28

Koi-Akrofi, G. (2016). Mergers and Acquisitions failure rates and perspectives on why they fail. *International Journal of Innovation and Applied Studies*, *17*, 150–158. Retrieved from http://www.ijias.issr-journals.org/

Lajoux, A. R. (2019). *The Art of M&A, Fifth Edition: A Merger, Acquisition, and Buyout Guide* (Fifth Edition). New York: McGraw-Hill.

Microsoft. (2023). Microsoft Power BI. Retrieved February 13, 2023, from https://powerbi.microsoft.com/nl-nl/

Mueller, C. (2019). *Usage of Business Intelligence Solutions within the Mergers and Acquisitions process*.

Nissim, D. (2022). Big data, accounting information, and valuation. *Journal of Finance and Data Science*, *8*, 69–85. https://doi.org/10.1016/j.jfds.2022.04.003

Paul, S., Janecek, A., Neto, F. B. D. L., & Marwala, T. (2013). Applying the Negative Selection Algorithm for Merger and Acquisition Target Identification Theory and Case Study. *2013 BRICS Congress on Computational Intelligence and 11th Brazilian Congress on Computational Intelligence*, 609–616. IEEE. https://doi.org/10.1109/BRICS-CCI-CBIC.2013.107

Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A design science research methodology for information systems research. *Journal of Management Information Systems*, *24*(3), 45–77. https://doi.org/10.2753/MIS0742-1222240302

Pipino, L. L., Lee, Y. W., & Wang, R. Y. (2002). Data quality assessment. *Communications of the ACM*, *45*(4), 211–218. https://doi.org/10.1145/505248.506010

Rabier, M. R. (2017). Acquisition Motives and the Distribution of Acquisition Performance. *Strategic Management Journal*, *38*(13), 2666–2681. https://doi.org/10.1002/smj.2686

Sirower, M. L., & Weirens, J. M. (2022). *The synergy solution : how companies win the mergers and acquisitions game*. Boston: Harvard Business Review Press.

Stadig, D. (2023, July 4). IT-dienstensector blijft ook de komende jaren doorgroeien. Retrieved October 5, 2023, from https://www.ing.nl/zakelijk/sector/tmt-ict/outlook

Statista. (2023). IT services - Statistics & Facts | Statista. Retrieved October 5, 2023, from https://www-statista-com.ezproxy2.utwente.nl/topics/3917/it-services/#topicOverview

St-Pierre, J., & Delisle, S. (2006). An expert diagnosis system for the benchmarking of SMEs' performance. *Benchmarking: An International Journal*, *13*(1/2), 106–119. https://doi.org/10.1108/14635770610644619

Trading Economics. (2023). Netherlands 10-Year Government Bond Yield - 2023 Data - 1988-2022 Historical. Retrieved July 5, 2023, from https://tradingeconomics.com/netherlands/government-bond-yield

Victa. (2023). Victa Business Intelligence. Retrieved February 13, 2023, from https://victa.nl

Wangerin, D. (2019). M&A Due Diligence, Post-Acquisition Performance, and Financial Reporting for Business Combinations. *Contemporary Accounting Research*, *36*(4), 2344–2378. https://doi.org/10.1111/1911-3846.12520

Welch, X., Pavićević, S., Keil, T., & Laamanen, T. (2020). The Pre-Deal Phase of Mergers and Acquisitions: A Review and Research Agenda. *Journal of Management*, *46*(6), 843–878. https://doi.org/10.1177/0149206319886908

Wen, W., Wang, W. K., & Wang, T. H. (2005). A hybrid knowledge-based decision support system for enterprise mergers and acquisitions. *Expert Systems with Applications*, *28*(3), 569–582. https://doi.org/10.1016/j.eswa.2004.12.018

9 Appendix

9.1 Systematic Literature Review Protocol RQ1

Knowledge/RQ

The first SLR revolves around the question: *What concepts, key constructs, variables, and theoretical perspectives apply in data-driven decision-making and M&A?* We are looking for concepts, constructs, variables, and theoretical perspectives and apply them to the context of M&A and (data-driven) decision making with the goal of developing a conceptual/theoretical framework for M&A decision making.

Selection Criteria

Included	Excluded
Keywords: Concepts, Constructs, Variables, Theoretical Perspectives	Non-English literature; ease of reading and reproduction of research
Title: Mergers and Acquisitions, Decision Making, Data Driven	
Related keywords: Conceptual Framework, Theoretical Framework; all synonyms of terms in the original question	Sources focusing on emerging markets
Subjects: Decision Sciences, Economics, Econometrics, and Finance, Business, Management, and Accounting	Articles before 2010, reduce the scope of the research
	Books and Book Chapters

Sources

Database	Origin
Scopus	Multidisciplinary, peer-reviewed
Web of Science	Multidisciplinary, peer-reviewed

Search Strings

In Scopus, this string yielded more than 46 thousand results. Therefore, it needs to be refined more:

```
( TITLE-ABS-KEY ( concepts, OR constructs, OR variables, OR
theoretical, OR perspectiv*, OR framework*, OR conceptual ) AND
TITLE-ABS-KEY ( merger*, OR acquisition*, OR takeover*, OR "decision-
making" , OR "data-driven" ) ) AND PUBYEAR > 2009 AND ( LIMIT-
TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "DECI" ) OR LIMIT-
TO ( SUBJAREA , "ECON" ) )
```

Refining it to the following yields 18000 results:

```
( TITLE-ABS-KEY ( concepts, OR constructs, OR variables, OR
"theoretical perspective" , OR "theoretical framework" , OR
"conceptual framework" ) AND TITLE-ABS-KEY ( "Mergers and Acquisitions"
```

```
, OR "decision-making" , OR "data-driven" ) ) AND PUBYEAR > 2009
AND ( LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA , "DECI"
) OR LIMIT-TO ( SUBJAREA , "ECON" ) )
```

After excluding books and book chapters there remain 17000 results. Further limiting to restricting the Title to contain "decision-making", "data-driven" and "mergers and acquisitions" reduces the number of results to 2933. Also demanding the concepts, constructs string to be in the title yields 146 results. Adding Computer Science as an accepted field we obtain 427 results. The query below is the final query we obtain:

```
( TITLE ( concepts, OR constructs, OR variables, OR "theoretical
perspective" , OR "theoretical framework" , OR "conceptual framework"
) AND TITLE ( "Mergers and Acquisitions" , OR "decision-making" ,
OR "data-driven" ) ) AND PUBYEAR > 2009 AND ( LIMIT-TO ( SUBJAREA
, "COMP" ) OR LIMIT-TO ( SUBJAREA , "BUSI" ) OR LIMIT-TO ( SUBJAREA
, "DECI" ) OR LIMIT-TO ( SUBJAREA , "ECON" ) )
```

We export this to a RIS file and import it into Covidence.

Entering the same query without subject areas gives 763 results in Web of Science. Refining by the web of science categories: CS Artificial Intelligence, Information Systems, Interdisciplinary Applications, Theory methods, and Management and Economy give 239 results. This too we import into Covidence. Both files are loaded into the Covidence tool. Additionally, 92 sources from unsystematic sources that were found earlier in the process are added to the screening process. In total, 201 duplicates were removed and 557 were screened. Of those studies, 440 were deemed irrelevant and 117 progressed to full-text screening. The main reason for excluding papers was their focus on post-merger situations and a too specific focus on a certain sector or market. Eventually, 34 studies were included.

758 Studies
imported

557 Studies Screened

117 studies assessed
for elegibility

34 studies includes
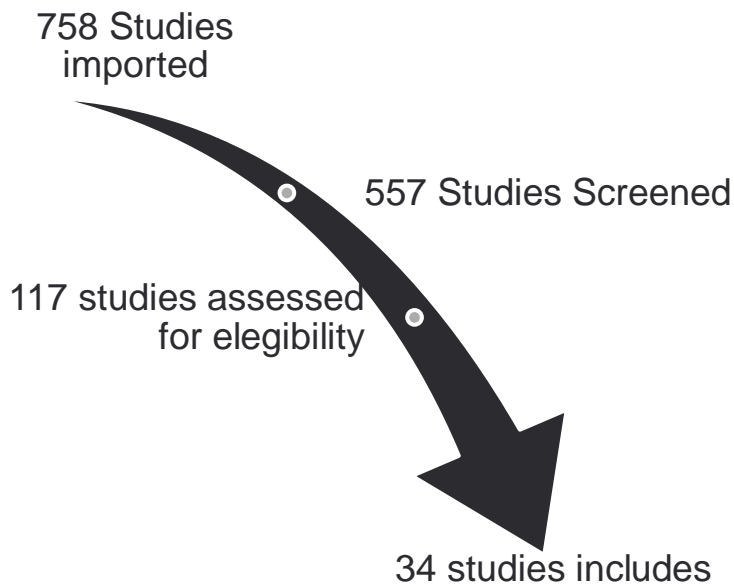
Findings
The findings are summarized in a conceptual matrix. (Included as an excel file too). And summarized in Chapter 2.1.

Author/Year	Title	Objective	Relevance	Category	Concepts / Keywords	Findings	Insight
Damodaran 2006	Valuation Approaches and Metrics: A Survey of the Theory and Evidence	To better understand what determines the value of a firm and how to estimate the value.	M&A	Valuation Types Valuation Types Valuation Types	Intrinsic Valuation Relative Valuation Contingent Claim Valuation Liquidation and Accounting Valuation Option Pricing	Discounted Cash Flow, Assets in Place, Cash Flows, Growth Assets, Debt, Equity, Discount Rate, Cash Flows, Present Value, Financial Ratios (i.e. PE ratio), EBITDA, Tobins Q, Earnings,..., Book Value, Book Value + Earnings, Fair Value, Liquidation Value	There are three main approaches to valuation: Intrinsic, Relative, ... Liquidation	More insight into valuation
Vidal-Garcia 2019	Terminal value in SMEs. Testing the multiple EV/EBITDA approach	The objective of this paper is to determine whether listed stock multiples, specifically EV/EBITDA can be used as a way to quantify the terminal value for SMEs.	M&A	Valuation Types Valuation Types	Cash Flow Valuation (Gordon-Shapiro) EV/EBITDA Terminal Value Estimation	Terminal Value, Free Cash Flows, EBITDA, Tax Rate, CAPEX, WACC, EV/EBITDA	The results show that EV/EBITDA valuation is not fit for use in the valuation of unquoted firm companies. It can be used but does not yield similar results for other, more accepted, Terminal Value Calculations	Do not use EV/EBITDA to estimate TV
Fernández 2002	COMPANY VALUATION METHODS. THE MOST COMMON ERRORS IN VALUATIONS	To describe the four main groups, comprising the most common valuation errors.	M&A	Valuation Methods Valuation Methods Valuation Methods Valuation Methods	Balance Sheet Based Methods Income Statement Based Methods Goodwill Based Methods (Accounting) Cash Flow Discounting Based Methods Key Factors Affecting Value	Book Value, Liquidation Value, Substantial Value, Value of Earnings, Value of Dividends, Valuation Multiples, Net Asset Value, Net Income, Sales Revenue, Turnover, Free Cash Flow, Equity Cash Flow, Debt Cash Flow, Weighted Average Cost of Capital, Growth, Return, Risk, Interest Rates	The best method for valuation, or at least the conceptually right method, is cash flow discounting based.	There are some good errors to take into account. For instance, confusing the value with price.
Olbrich 2015	Business Valuation inspired by the Austrian School	To identify weaknesses in common valuation methods that play a key role in transaction practice.	M&A	Valuation Methods Valuation Methods	NPV/DCF Valuation Subjective Valuation	Value to the owner, Market Value Value for the investor, Future Earnings Method (FEM)	The paper firstly reflects why DCF and other NPV based valuation methods are not fit for company valuation. The paper argues that there are a point of views for valuation: namely the valuation object or valuation subject.	The paper propose ten theses for valuation of which we could apply some to the theoretical framework.
Aadering 2019	Recommending untapped M&A opportunities: A combined approach using principal component analysis and collaborative filtering	Propose a new way to value	M&A	Valuation Valuation Valuation Valuation Valuation	Balance Sheet Valuation Income Statement Valuation Goodwill Based Valuation Cash Flow Discounting Valuation Value Creation Valuation Options Valuation Key Factors Affecting Value	Assets, Liabilities, Book Value, Market Value, Earnings, Valuation Multiple, Goodwill, Cash Flow, Residual Value, Discount Rate, Free Cash Flow, Equity Cash Flow, Debt Cash Flow, Weighted Average Cost of Capital, Economic Value Added, CFROI, Economic Profit, Cash Value Added, Black and Scholes, Investment option, Growth, Return, Risk, Interest Rates	Cash Flow discounting is the only conceptually correct way to determine the value of a company.	There are a lot of ways the value of a company can be determined. Some are conceptually right, but some aren't. All are widely used depending on the sector.
Toll 2019	A nonlinear state marginal price vector model for the task of business valuation: extension of the state marginal price vector model of Toll (2010). A case study: The dimensioning of T service companies under nonlinear synergy effects	To present a reasonable nonlinear extension of the state marginal price vector model of Toll (2010).	M&A	Valuation Valuation	Market Oriented Investment-Oriented		The paper proposes a way to perform the investment-oriented valuation. The method stipulates that the internet purpose should determine a proper valuation method.	The method stipulates that the internet purpose should determine investment value.
Hanifzadeh 2015	Financial valuation of a business model as an intangible asset	The Financial Valuation of a business model as an intangible asset	M&A	Valuation Valuation	Valuation Methods Valuation of Intangible Assets	Discounted Cash Flow Business Model, CAV-method, FIMMM-method	A valuation model for Business Models is given by combining FIMMM and CAV methods	Use this in Sum of the Parts valuation and to determine investment value.

Reference	Title	Objective	Type	Category	Concept	Description	Relevance
Russo 2006	The real cost of M&A advice	To investigate how M&A advice impacts the cost and price of M&A, as well as the value generated by advisors.	M&A	Valuation	Deal Value	At different levels of complexity there is a different likelihood that external advisors will be hired. If hired they can increase the acquisition cost and the acquisition premium	Removing the need for advisors might lead to lower acquisition premiums.
Kinnunen 2023	Credibilistic Valuation of Merger and Acquisition Targets with Fuzzy Real Options		M&A	Valuation	Fuzzy Real Options Valuation	Trapezoidal Fuzzy Numbers	
Pospíšil 2015	Valuation Date in the Process of M&A	To present valuation date is an important factor in valuation.	M&A	Valuation	Value Drivers	Valuation Date	The date of valuation determines the value drivers and fixes the premises and circumstances. Regardless of the used valuation method.	Valuation Date is an important determinant for value drivers.
Kinnunen 2010	Valuing M&A Synergies as (Fuzzy) Real Options Some of the authors of this publication are also working on these related projects: M&A and real options View project Multivariate statistical modelling View project Valuing M&A Synergies as (Fuzzy) Real Optio	To show the win with M&A valuation can be done using the real options method	M&A	Valuation	Real Options Valuation	Synergy Potential, Divestitures	The paper presents a decision support tool that supports the ex-ante pre-deal screening stage to determine a first approximate valuation of the synergy potential of a target.	Ex-ante pre-deal screening is what the thesis is about and what is the main topic of this paper. So for this seems a good way to determine value.
Kang 2018	Constructing M&A valuation: how do merger evaluation methods differ as uncertainty and controversy vary?	Investigate the idea of the effect of uncertainty and controversy on M&A valuation.	M&A	Valuation	Valuation Type	Uncertainty, Controversy	When uncertainty is high, design methods attempt to come to grips with a simpler distribution of potential outcomes. When controversy is high, issue list methods are used to resolve differences. When both are high, storytelling is used.	Methods to deal with uncertainty and controversy.
Hassan 2016	Selection, valuation and performance assessment: Are these truly inter-linked within the M&A transactions?	Investigate how the components involved in the business evaluation process influence the outcomes of M&A.	M&A	Target Selection / Target Selection / Valuation / Performance Assessment	Acquiring Firm's Characteristics / Target Firm's Characteristics / M&A Layout / Valuation Process / Assessment Process	Objectives, Management Structure, Viability Assessment Potential Assessment, Impact Assessment Selection Parameters, Shareholding Structure, Mode of Settlement, Approval Parameters, Determination, Implementation, Approval Parameters, Process, Approval	The findings reflect that strictly controlled and interlinked components relating to the evaluation process have impact on the outcome of transactions.	More variables to take into account.
Paul 2013	Applying the Negative Selection Algorithm for Merger and Acquisition Target Identification Theory and Case Study	To apply the negative selection algorithm to identify takeover targets.	M&A	Target Selection	Feature Selection (Features)	Number of offices, number of employees, financial relations, etc.	The paper presents a way to predict a way to predict m&a targets. The method looks promising. The feature selection and matching procedure might help determine whether a company is a match.

Source	Title	Objective	Field	Theme	Focus	Details / Variables	Findings	Contribution
Garulla 2014	A synergy measurement model to support the pre-deal decision making in mergers and acquisitions	To develop a synergy measurement model to support decision-making processes in M&A	M&A	Synergy / Synergy	Synergy Value / Synergy Types	Expected form of Synergy, Expected size of synergy, timing of the synergy, likelihood of achievement, Synergistic Flows, Discount Rate. Operational, Financial, Tax, etc.	Synergy value is often created in the operational business. Financial and tax synergies may occur, but are less substantial than synergy value from operational synergies.	This is useful for identifying types of synergies.
Bauer 2018	Examining Links between Pre and Post M&A Value Creation Mechanisms — Exploitation, Exploration and Ambidexterity in Central European SMEs	To link the pre- and post-phases of M&A and investigate when firms can benefit from past acquisition experiences.	M&A	Synergy	Post-merger integration	Synergy potential and realisation. Fit	N/A	Pre-Merger Exploitation and Exploration have a positive effect on PMI
Ozdağlu 2017	Leading the strategic decision-making process: Conceptual Frameworks	To propose an analysis framework for research in order to improve control of the DM process	Decision-Making	Strategic Decision-Making Process	Critical Factors of Leading the Strategic Decision-Making Process	Firm, Entrepreneur, Behavioral, Environmental, Cultural, Top management team factors.	The paper reflects the leading factors in the strategic decision-making process.	Variables that affect the decision are identified.
Yang 2016	Entrepreneurial Motivations and Risk Decision Making: A Theoretical Framework	To see if there is a relationship between entrepreneurial motivations and risk decision-making.	Decision-Making	Risk Decision Making	Risk Decision Making Process	Motivation, Risk Perception, Risk Decision, Self-efficacy		
Welch 2020	The Pre-Deal Phase of Mergers and Acquisitions: A Review and Research Agenda	To further develop our understanding of the pre-deal phase of the M&A process.	M&A	Pre-Deal M&A Process Pre-Deal M&A Process Pre-Deal M&A Process Pre-Deal M&A Process Pre-Deal M&A Process	Initiation, Target Selection, Bidding and negotiation, Valuation, financial terms and financing, Announcement, Closure	M&A motives, Ownership, Imitation, Executive characteristics. Target attraction, information symmetries, contextual influences. Competition in bidding, deal commitment, tactics, trust. Valuation process, antecedents to the M&A premium, acquired stake, method of payment, deal financing. Impression management, Information Leakage. Reducing uncertainty, institutional theory, agency theory, and learning theory.	The future research agenda encourages researchers to investigate the processes, actions, and the predominant variance-based theorizing with process theories to advance the frontiers of pre-deal M&A research.	The paper also includes relevant theories or fields in pre-deal research that are of relevance.
Vrontis 2012	Mergers and acquisitions process: The use of corporate culture analysis	advance cross-cultural management in M&A.	M&A	Organizational Culture	Approach to innovation and activity, Approach to risk, Horizontal, Relationship, Vertical hierarchical contact, Autonomy and decision making, approach to performance, approach to rewards		To achieve better success in M&A consultants will need to measure cultural differences.	Take organizational culture into account.
Garcia-Cascales 2010	ADAPTATION OF TOPSIS DECISION MAKING APPROACH FOR LINGUISTIC VARIABLES	To propose a model for Linguistic TOPSIS	Decision-Making	Multiple Criteria Decision Making	TOPSIS, LTOPSIS	Criteria, Weights, Linguistic Variables	A way for Linguistic TOPSIS evaluation is proposed. It works.	Yet another way to try and evaluate Linguistic variables in an MCDM problem using LTOPSIS

Reference	Title	Aim	Category	Subcategory	Concept	Variables	Findings	Relevance
Cabin 2012	The LTOPSIS: An alternative to TOPSIS decision-making approach for linguistic variables	Obtain not only a ranking but obtain a linguistic output using the TOPSIS method as a classifier.	Decision-Making	Multiple Criteria Decision Making / Multiple Criteria Decision Making	Technique for Order Performance by Similarity to Ideal Solution (TOPSIS)	Linguistic Value, Term Set	The LTOPSIS method is transformed to be able to use linguistic variables such as "Good" or "Bad".	This could be used for manual evaluation and decision input. It could be possible that we are not able to obtain some data points. This could be handled by letting the user give manual input with linguistic variables.
Basin 2020	Explaining multicriteria decision-making with formal concept analysis	Further helping decision-makers by adding to a set of solutions proposed by a multicriteria decision method	Decision-Making	Multicriteria Decision Making / Formal Concept Analysis	Criteria, Decisions Lattice Theory	Binary Datasets	Using background knowledge of criteria, we can rank elements and make decisions.	Usage of a decision-making concept could prove useful in decision-making for M&A.
Liu 2011	Method for multi attribute decision-making under risk with the uncertain linguistic variables based on prospect theory	To propose a risk MADM method with prospect theory, based on the risk MADM problems in which attribute values take the form of uncertain linguistic variables.	Decision-Making	MADM	Uncertain Linguistic Variables		The risk MADM model works and is easy to use.	Gives a way to implement ordinal variables (Good, bad, very good) into an MADM model.
Gomes 2013	Critical Success Factors through the Mergers and Acquisitions Process: Revealing Pre- and Post-M&A Connections for Improved Performance	Find out what the key success factors in the M&A process needs to consider.	M&A	Pre-Deal M&A Process / Post-Deal M&A Process	Premerger Critical Success Factors / Postmerger Critical Success Factors	Choice of Strategic Partner, Pay The Right Price, Size Mismatches, Strategy and Accumulated Experience on M&A, Courtship Period, Premerger communication, future compensation policy Integration Strategy, Leadership, Speed of Implementation, Integration Team, Regard of Day-to-Day Business Activities, Communication During Implementation, Managing Differences, Human Resource Management	It is important to pay attention to the potential linkages between success factors "within" and "across" factors.	There are a lot of Premerger CSFs
Koi-Akrofi 2016	Mergers and Acquisitions failure rates and perspectives on why they fail Value creation beyond IT investments View project IMPLEMENTING SUCCESSFUL IT PROJECTS View project	To investigate from literature what the perspectives on M&A failure are.	M&A	M&A Failure	Quantitative Failure (Shareholders Suffer because worse worse results), Qualitative Failure (M&A objectives were not met)	M&A Failure Rate, M&A Failure Reasons	There are a lot of factors contributing to M&A failure.	There are a lot of factors contributing to M&A failure.
Tortoriello 2018	The Art of the (no) Deal	To identify the drivers of cancelled M&A deals.	M&A	M&A Cancellation / M&A Cancellation	Cancellation Predictors	Size, deal proportionality, perceived price discount, CEO age, regulatory risk Cancellation Risk	The research shows factors that increase the probability of deal cancellation.	Researched a lot of variables that can predict M&A cancel rate. A lot of characteristics that we could also potentially apply to the cancellation rate were successfully identified and the hit-rate is twice that of a random chance.

Author	Title	Purpose	Category	Keywords	Framework	Components	Conclusion	Relevance
Li 2017	Big Data-driven Technology Innovation: Concept and Key Problems	To develop some dynamic decision-making models to deal with multi-period and multi-attribute decision-making problems.	Decision-Making	Dynamic Multi-Attribute Decision-Making	Triangular Intuitionistic Fuzzy Numbers		A DMADM-model is presented to deal with vagueness and uncertain information.	Could prove useful in the Real Options Valuation.
Caiaza 2015	M&A process. A literature review and research agenda	Present new insights on cross-border M&A.	M&A	Due Diligence; Integration; Integration; Performance; Performance	Multilevel (National) Due Diligence; Organizational Integration; Cultural Integration; Atmosphere; Distinctive competences	Foreign Policy, Cross-National Differences, Legal Systems, Financial, Investment Rules; Strategic interdependence, autonomy (Values: Symbiosis, Preservation, Absorption, Holding); Preservation of acquired culture, perception of the attractiveness of the acquirer (Values: Integration, Assimilation, Separation, Deculturation); Structural compatibility, Motivation to collaborate (Values:	There are a lot of questions and possible shifts in the world of Cross-Border M&A. Some of the constructs for cross-border M&A can be transformed to be used for regular M&A	
Bhagwan 2018	A systematic review of the due diligence stage of mergers and acquisitions. Towards a conceptual framework	Identify the research gap for the process that should be filled for the Due Diligence stage	M&A	Due Diligence; Due Diligence; Due Diligence; Due Diligence	Areas of due diligence; Process Factors; Best practices; Strategies; Success Factors; Risk Factors	Financial, Legal, Tax, Environmental, Operational, Market, Human Resources, Cultural, Strategic, Marketing, IP, Technology, R&D; Success Factors, Planning, Tools, Risk Factors, Steps; N/A; M&A motivation, amount and depth of DD, Intangible assets, Selling Motive, Synergies, Risk, Price, Revenue Enhancement; Opportunities; Critical Success Factors	Due Diligence is a critical component of the M&A process. Due Diligence is more than just identifying a reviewing a candidate.	Lot of constructs that have impact on DD.
Wen 2005	A hybrid knowledge-based decision support system for enterprise mergers and acquisitions	To present a hybrid knowledge-based decision support system for enterprise mergers and acquisitions.	M&A, Decision-Making	Decision Support System; Decision Support System; Decision Support System	Case Base; Rule Base; Model Base	Cases; Rules; Models	The HKDSS provides not only formal M&A procedures but also gives actions and feasible solution by using the knowledge base.	This paper proposes the way in which a DSS should work for the purpose of M&A.
Hannah 2010	Supporting decision making process with information visualisation. A theoretical framework	Establish a visualisation framework to support decision-making processes.	Decision-Making	Data-Driven Decision Making	Preliminary Theoretical Framework for DSS		The framework gives direction to the research for further frameworks.	A framework to support building a DSS
Battagello 2016	Benchmarking strategic resources and business performance via an open framework	The purpose is to test a way to benchmark strategic resources against each other.	M&A	Benchmarking	75 Framework to Assess Strategic Resources	Deliverable Value, Value Domains, Value Components (Level 1 and 2), Value Objects, KPIs, Categories, Performance	Benchmarking is fundamental for business. Once can measure and compare the performance of companies using the 75 Framework.	With this we can localise performance gaps and compare companies to each other and the market.
St-Pierre 2006	An expert diagnosis system for the benchmarking of SMEs performance	To allow SMEs to use benchmarking to improve their operational performance.	M&A	Benchmarking	Performance, Development, Growth System	Practices, Results/Performance, Vulnerability (Future), Effectivity (Past)	The paper proposes a fully implemented expert diagnostic system which evaluates the performance of SMEs. Benchmarking can be used to improve operational and financial performance.	Though there is no direct application to M&A discussed in the paper, the Benchmarking method could be applied in the M&A process.