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AN EXPLORATION OF SYNERGY EVALUATION APPLICATION MODEL TO SUPPORT IMPLEMENTATION ON MERGER AND ACQUISITION

Jieping Mei

AN EXPLORATION OF SYNERGY EVALUATION APPLICATION MODEL TO SUPPORT IMPLEMENTATION ON MERGER AND ACQUISITION

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

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Master of Science

in

Information System and Technology

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ABSTRACT

The project focuses on a comprehensive system's analysis and design of the front-end of the Synergy Evaluation Application Model (SEAM) system for mergers and acquisitions (M&As). The research questions asked are: Q1. How did the SEAM system incorporate the system requirements and design that incorporated the strategic goals and priorities of both the acquirer and the acquiree? Q2. What data sources will the SEAM system rely on, and how does it overcome data integration, automation, visualization challenges? Q3. How will the model identify build in potential synergies, both quantitative and qualitative? The research questions were analyzed through the SEAM system analysis and design using Objective-Oriented Analysis Design (OOAD) approach. The findings and conclusions to the three questions respectively are: Q1.It is possible to design an ideal physical SEAM system that incorporates the strategic goals priorities of both the acquirer and acquiree. The SEAM system can guide executives to know which companies or businesses to merge or acquire with, and how much level they can move on. Q2, The SEAM system utilized the data from internal merger companies' datasets, external financial providers, and public data sources, and realized data integration, automation and visualization features by implementing ETL process, machine learning and interacting with external use interfaces. So long as the data is available, the SEAM system can realize data integration, automation, visualization features. Q3. This project categorized synergies into distinct types and designed a framework for identifying and

assessing synergies respectively by using scenario analysis to identify best-case, worst-case, and base-case scenarios, as well as sensitivity analysis to account for uncertainties. Areas for further study focus on implementing and testing the model in actual M&A scenarios, exploring advanced technologies on quantitative synergy analysis, the integration of AI algorithms on qualitative synergy analysis and expanding the model's features.

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CHAPTER ONE

INTRODUCTION

A Merger and Acquisition (M&A) transaction helps a firm move quickly into a new market, product space or pursue a strategy that would otherwise be too costly, risky, or technologically advanced to achieve on its own (Has-peslagh & Jamison, 1991). In 2020, Global M&As activities reached 44,416 deals worth $3.6 trillion dollar, highlighting the significant volume of strategic transactions occurring across industries worldwide (Smith & Parr, 2020). Despite a long-standing of M&As transactions and experience in evaluating and realizing synergies, the performance success rate of M&As remains persistently low and consistently reported to range between 40 and 60 percent (Homburg & Bucerius, 2005, 2006, in press). These disappointing performance rates are usually explained by little synergy potential and thus, a poor strategic fit (Larsson & Finkelstein, 1999), or by poor integration and thus, deprived synergy realization (Haspeslagh & Jemison, 1991). These arguments are underpinned by the implicit assumption that predicted synergies are objectively assessed and thus represent the true value potential of an acquisition that just needs to be realized during integration to deliver the desired outcome. Researchers have long been intrigued by the assessment of synergy value arising from M&A transactions for both the acquiring and target companies. One question that has interested researchers for

decades is to explore the synergistic potential in M&A by developing a process model (Gomes & Barnes, 2005).

Since the mid-20th century, the first concept of synergy in M&As has been focused and created, with early literature studying the potential benefits of combining resources, capabilities, and market positions: Strategy and Structure (Alfred, 1962) and Corporate Strategy (Igor, 1965), laid the robust groundwork for understanding the strategic rationale behind M&A transactions. In the 1970s and 1980s, scholars began to develop financial models which were used to quantify the value of synergies in M&As. These models often drew on principles from valuation theory, option pricing theory, and discounted cash flow analysis (Merton & Scholes, 1997). Notable contributions include the work "Theory of Rational Option Pricing" by Nobel laureate Robert Merton and the Black-Scholes model for valuing options (Merton & Scholes, 1997). Whilst, researchers in strategic management and organizational theory explored the strategic drivers of synergy in M&As. They developed models emphasizing the importance of strategic fit, organizational culture, and resource complementary in creating value from M&A transactions (Bower, 2001). Notable scholars such as “Competitive Strategy” written by Michael Porter and “Resource-Based Theory” written by Jay Barney were published at that period. Over time, scholars started to integrate financial and strategic perspectives to develop comprehensive synergy evaluation models which aimed to capture both the quantitative and qualitative aspects of synergy, incorporating factors such as market positioning, competitive

advantage, and organizational capabilities (King, Slotegraaf, Kesner, 2008). More important, researchers explored various methodologies, which laid the robust groundwork to build a physical synergy evaluation model, including real options analysis (Trigeorgis,1995), strategic fit assessments (Meglio & Risberg, 2010), and multi-criteria decision analysis (Chien & Tu, 2021). Empirical studies have tested and refined synergy evaluation models using data from real-world M&As (Poulsen & Stegemoller, 2008). Researchers have examined the determinants of synergy realization, the impact of synergy on post-merger performance, and the effectiveness of different evaluation methods (Haspeslagh & Jemison, 1991). Gregory Brown's empirical studies have delved into the determinants of synergy realization and the impact of synergy on post-merger performance. His research has shed light on the factors influencing the success of M&A transactions. Annette B. Poulsen's empirical research has focused on the determinants of synergy realization in M&A. Her work has been instrumental in identifying the factors that contribute to the successful integration of merged firms and the realization of synergies (Poulsen & Stegemoller, 2008). Mark L. Sirower's research has centered on studying the strengths and limitations of synergy evaluation models in practical applications. His work has helped in identifying the factors that contribute to the success or failure of synergy evaluation efforts in M&A (Sirower, 1997). This empirical research has provided invaluable insights into the strengths and limitations of synergy evaluation models in real-world scenarios.

After reviewing the previous literature on M&A and synergy evaluation models, this study will focus on developing a comprehensive Synergy Evaluation Application Model (SEAM) system. To achieve this goal, the project will employ a systematic approach, starting with a thorough systems analysis to understand the requirements and objectives of the system. Subsequently, the study will move into the design phase, where the structure and functionality of the system will be conceptualized and planned. These phases will be crucial in ensuring that the SEMA system is comprehensive, dynamic, and adaptable to the unique characteristics and objectives of each M&A transaction. By integrating financial, strategic, and organizational perspectives, such a system can help maximize the value creation potential of M&A transactions and increase the likelihood of long-term success.

Problem Statement

Literature gives us insights to these shortcomings existed in the previous Synergy Evaluation Models:

Overemphasis on Financial Metrics:

Many existing synergy evaluation models focus primarily on financial metrics. “Synergies in Mergers and Acquisitions: A Synthesis of the Theoretical and Empirical Literature", this article provides an overview of the limitations of

traditional financial-based synergy evaluation models and calls for a more holistic approach that integrates qualitative assessments. (Sudarsanam, 2003).

Inadequate Integration of Strategic Factors:

Existing models often fail to adequately integrate strategic factors such as market positioning, competitive advantage, and technological capabilities into the synergy evaluation process: "The Role of Synergy in Mergers and Acquisitions" (Palepu, 1985). This seminal article highlights the importance of strategic fit in M&A transactions and discusses the limitations of traditional synergy evaluation models in capturing strategic synergies.

Limited Consideration of Organizational Culture and Integration Challenges:

Existing models often fail to adequately integrate strategic factors. "Post-Merger Integration: How the Human Factor Can Make or Break the Deal" (Cartwright & Cooper, 1996). This article discusses the human factors involved in post-merger integration and emphasizes the importance of cultural alignment for synergy realization.

Lack of Flexibility and Adaptability:

Some models lack flexibility and adaptability. "The Creation and Realization of Synergy: Implications for Acquisitions and Alliances" (Capron & Mitchell, 2010). This article discusses the need for flexibility and adaptability in

synergy evaluation models and proposes a framework for assessing dynamic synergies in M&A transactions.

These sources provide insights into the shortcomings of existing synergy evaluation models and highlight the importance of developing more comprehensive, integrated, and flexible approaches to synergy assessment in M&As. This project conducts the area for further study of the SEAM system in M&A, focusing on data integration, automation, and visualization techniques into the front-end design. These technologies can enhance the user experience by providing users with insightful and interactive visualizations of M&A data, enabling them to explore, analyze and predict complex relationships and patterns more effectively. The project investigates how data integration, automation analytics and visualization techniques can be integrated into the front-end design to support various aspects of synergy evaluation, such as identifying potential synergies, assessing their impact on post-merger performance, and communicating findings to stakeholders. By developing innovative data visualization tools and techniques, researchers can improve the usability and effectiveness of synergy evaluation models in M&A transactions.

CHAPTER TWO

LITERATURE REVIEW

Mergers and acquisitions (M&A) transactions are intricate processes that demand a nuanced understanding of the potential synergies involved. Synergy, often defined as the additional value created through the combination of two companies, 2+2>5, stands as a cornerstone of M&A activity (Gaughan, 2010). Synergy evaluation models serve as indispensable tools in this realm, providing a structured framework for assessing the potential benefits and risks of a proposed transaction. This chapter undertakes a comprehensive review of the literature on synergy evaluation models, focusing on their theoretical underpinnings, historical evolution, and practical application in M&A transactions. By critically examining existing models and theories, this review seeks to illuminate the path for designing and developing a comprehensive SEAM system that effectively addresses the limitations of current approaches.

Synergy evaluation models are built on a diverse range of theoretical perspectives, each offering unique insights into M&A transactions. Among these, financial theories play a foundational role, with methods like the discounted cash flow (DCF) approach and the real options framework being pivotal in quantifying the financial advantages of synergy (Ross et al., 2016). The DCF method computes the present value of expected cash flows from the merger, incorporating synergies that lead to cost savings or revenue enhancements

(Damodaran, 2016). On the other hand, the real options approach expands on this concept by recognizing the inherent flexibility in many M&A decisions. This flexibility allows companies to postpone, expand, or even cancel projects based on uncertainties about the future (Trigeorgis, 1996). The literature review pertaining to the three research questions is outlined as follows:

Q1. Strategic Alignment: How will a SEAM system incorporate the system requirements and design that accommodate the strategic goals and priorities of both the acquirer and the acquiree?

First, from strategic theories aspect, resource-based theory and transaction cost economics, underscore the strategic motivations and competitive advantages drove M&A transactions (Barney, 1991; Williamson, 1985). Resource-based theory posits that firms acquire other companies to access valuable resources or capabilities that are challenging to replicate (Barney, 1991). Transaction cost economics, on the contrary, focuses on the costs linked with using the market to exchange goods and services, suggesting that firms engage in M&A to reduce transaction costs and enhance efficiency (Williamson, 1985).

From organizational theories aspect, cultural compatibility and integration perspective, delve into the organizational factors influencing post-merger integration and synergy realization (Schweiger & Very, 2003). Cultural compatibility refers to how closely aligned the cultures of acquiring and target firms are, which can have a profound effect on the success of the integration

process (Schweiger & Very, 2003). From an integration standpoint, the emphasis lies on merging the operations, systems, and processes of both entities to realize synergies (Schweiger & Very, 2003). By incorporating these theoretical viewpoints, synergy evaluation models can provide a thorough and all-encompassing evaluation of the potential value creation in M&A transactions.

The evolution of synergy evaluation models mirrors the progress in finance, strategy, and organizational behavior theories and practices over time. In their infancy, models like the synergy scorecard and the McKinsey 7-S framework primarily emphasized qualitative aspects such as culture, leadership, and organizational structure (Goold & Campbell, 2002; Waterman et al., 1980). These early models highlighted the importance of aligning these elements to realize synergies, setting the stage for the development of more advanced quantitative models.

In the 1990s, the balanced scorecard approach gained prominence for its integrated perspective on synergy evaluation (Kaplan & Norton, 1996). According to the balanced scorecard framework, companies should assess synergy from four different angles: financial, customer, internal processes, and learning and growth (Kaplan & Norton, 1996). This methodology offered a comprehensive perspective on synergy, considering both financial and non-financial dimensions. Nonetheless, challenges remained, such as the requirement for enhanced quantitative techniques and the inclusion of dynamic and uncertain variables.

Q2. Data Integration, Automation, and Visualization: What data sources will the SEAM system rely on, and how does it overcome data integration challenges ((Doan A, et al., 2003)?

Data integration, data automation, and data visualization are necessary for the SEAM System to effectively process and analyze data related to M&A transactions. This Chapter describes some literature reviews, these references provide insights into the importance and challenges of data integration (Doan A, et al., 2003), automation (Stonebraker M. et al., 2011), and visualization (Munzner T., 2014), which are relevant to the development of the SEAM System for M&A transactions.

Data integration stands as a pivotal aspect of the SEAM system, involving the amalgamation of data from various sources to create a unified view for analysis. This process can be intricate, requiring reconciliation of differences in data formats, structures, and semantics. To ensure effective data integration, the model will leverage tools and techniques such as ETL (Extract, Transform, Load) processes, data mapping, and data validation. By integrating data from diverse sources, the model will provide a comprehensive and accurate assessment of synergy in M&A transactions.

Automation is a fundamental element of the SEAM system, simplifying and accelerating the analysis process. Through automation tools, tasks like data collection, data cleaning, and report generation can be automated, freeing analysts to concentrate on the evaluation's strategic facets. This shift in focus

leads to more efficient and effective decision-making. Moreover, automation enhances consistency and accuracy in the evaluation, lowering the chance of errors and enhancing result reliability.

Visualization emerges as an essential component of the SEAM system, enabling analysts to explore and communicate complex data intuitively. Visualization tools such as charts, graphs, and dashboards can transform raw data into meaningful insights, allowing data analysts to identify trends, patterns, and outliers more effectively. By incorporating visualization capabilities into the model, users can interact with the data, gaining a deeper understanding of the underlying factors driving synergy in M&A transactions.

Q3. Synergy Identification: How will the model build potential synergies, both quantitative and qualitative?

Synergy Identification is a critical process in M&A transactions, seeking to reveal potential value creation opportunities when combining two or more merger companies. This process entails pinpointing synergies that can be achieved through cost reductions, revenue boosts, and other strategic advantages. This literature review explores existing frameworks and approaches for identifying synergies, focusing on both quantitative metrics and qualitative considerations.

Quantitative Synergy Identification

Quantitative methods focus on identifying synergies that can be measured in financial terms. These encompass cost synergies, like scale economies,

resource sharing, and operational streamlining, alongside revenue synergies, such as cross-selling potentials and enhanced market presence.The significance of employing financial modeling and valuation methods to precisely quantify these synergies was stressed (Weston et al., 2004). Similarly, the use of financial metrics and performance indicators to assess the potential impact of synergies on the combined entity's financial performance was highlighted (Hitt et al., 2001).

Qualitative Synergy Identification

Qualitative methods focus on identifying synergies that are more difficult to quantify but can still create significant value (Cartwright & Cooper, 1993). These include strategic synergies, such as enhanced market positioning, expanded product offerings, and improved competitive advantage. Identifying these synergies, along with cultural synergies such as shared values and culture of the organization is crucial. However, quantifying them can be challenging. Strategic analysis tools like SWOT analysis and scenario analysis are valuable for this purpose (Cartwright & Cooper, 1993).

Integrated Approach

An integrated approach that combines quantitative and qualitative methods is recommended for comprehensive synergy identification. Integrated approach enables companies to fully grasp both the measurable and intangible advantages of M&A transactions. For instance, a framework that merges

financial analysis with strategic assessment was proposed. By blending quantitative financial modeling with qualitative strategic evaluation, firms can gain a more complete understanding of the synergies present in an M&A deal (Shan et al., 2017).

In conclusion, synergy identification in M&A transactions requires a multi-faceted approach that considers both quantitative and qualitative aspects. By leveraging existing frameworks and approaches, firms can enhance their ability to identify and capture synergies, ultimately maximizing the value created through M&A transactions.

Challenges, Limitations, and Future Directions

Despite the potential benefits of synergy evaluation models, several challenges and limitations persist. Assessing potential synergies in M&A transactions is challenging due to their inherent uncertainty and complexity (Haspeslagh & Jemison, 1991). Issues related to data quality and availability can further affect the reliability of synergy evaluation models (Gaughan, 2010). Furthermore, proficiency in finance, strategy, and organizational behavior is essential for a thorough evaluation (Ross et al., 2016).

Looking ahead, there are promising opportunities for enhancing synergy evaluation models. The integration of advanced analytics and ML techniques holds the potential to improve the accuracy and reliability of these models (KPMG, 2020). Additionally, the development of dynamic and uncertain models

could provide a more sophisticated approach (Trigeorgis, 1996). Finally, the development of industry and context-specific models can enhance the relevance and reliability of synergy evaluation across different situations (Barney, 1991).

In conclusion, the SEAM system represents a significant advancement in the field of M&A transactions. By integrating advanced analytics, data integration, automation, and visualization, the model will provide a comprehensive and accurate assessment of synergy, ultimately leading to better decision-making and outcomes for all stakeholders involved in M&A transactions.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter describes the procedures and methods used for data collection and analysis for this culminating experience project. The data collecting and integrating function will be designed to integrate all different data sources, including financial reports, stock market, and third-party consult research conclusions from within the merger companies, external financial providers, and various public data sources. The datasets used were derived from outside or inside of the acquirer and target companies, is ensured to be accessible by the SEAM system. For this project's purposes, ETL process includes three-phase of processing data including extract, transfer, and load, and is used to consolidate data from multiple databases and other various sources into a single repository with data that has been properly formatted and qualified in preparation for storage, data analytics, and machine learning.

The rest of this chapter discusses the research analysis and design for the SEAM system. Developing the SEAM system for M&A transactions involves using a mixed-methods approach. Qualitative methods, like a thorough literature review, are used to grasp the theoretical underpinnings and real-world applications of existing synergy evaluation models.This includes studying relevant academic literature, industry reports, and case studies to gain insights into the key factors influencing synergy in M&A transactions, also can assist by

AI algorithms to leverage the priority of key factors. Quantitative methods are used for data collection and analysis, including surveys and interviews with industry experts to gather empirical data on synergy evaluation practices and challenges.

Using an Object-Oriented Analysis and Design Approach

This project explored a SEAM System to support the implementation on M&As, enabling internal or external individual users to input the data, analyze data, visualize data, draw reports as needed, get access to the trends, request suggestions, do comparison with data, draw strategic decision and realize the M&A results as expected.

The SEAM system design includes function and non-function requirements specifications which closely align with five main actors involved in the application. We conduct our project using OOAD approach, which helps us to design a class diagram to depict the structures and the relationships in a complex system used to visualize, specify, construct, and document the artifacts of the system.

As mentioned earlier in Chapter one , this chapter section will outline the methods used to address the following research questions:

Q1. Strategic Alignment: How will a SEAM system incorporate the system requirements and design that incorporate the strategic goals and priorities of both the acquirer and the acquiree?

This question is related to the project objectives, which is the big picture of the organizations, explaining the primary objective and what both organizations aim to achieve through M&A. The project is designed solidly supported by researching scholarly articles and large amount of empirical M&A successful or failed cases. We built an ideal physical SEAM system to give a better understanding of the architecture which can realize the identification of synergies, describe the criteria and methodologies used in the model to access strategic alignment. The SEAM system aligns with the strategic goals and objectives of M&A transactions by incorporating a strategic alignment matrix that ensures both companies' strategic priorities are considered in the model design. This matrix is developed through extensive research and analysis, including interviews with key stakeholders from both merger companies to understand their strategic objectives. By mapping each company's strategic goals to potential synergies, the SEAM system ensures that the evaluation process is aligned with the overarching goals of the M&A transaction. This alignment is crucial for identifying synergies that are relevant and impact, as it ensures that the model focuses on areas that will drive value creation for the merged entity.

Moreover, the SEAM system's strategic alignment approach enables a comprehensive assessment of potential synergies by considering both companies' strategic priorities. This ensures that the model identifies synergies that align with the merged entity's long-term strategic vision, rather than concentrating solely on immediate benefits. By aligning with the strategic

priorities of M&A transactions, the SEAM system improves decision-making by offering a framework that aids in achieving the companies' strategic aims and objectives. Table 1 is a strategic Alignment Matrix, defines the level of strategic alignment between merger and acquirer companies (Company A and B). For example, for Market Expansion, the column Alignment is High, which means both companies prioritize market expansion, indicating the strong alignment, Potential synergies can be realized through market share growth, new market penetration, and geographical expansion. Designing the Strategic Alignment Matrix within the SEAM system can enhance the effectiveness and success of M&A transactions by facilitating synergy identification, prioritization of goals, decision-making support, enhanced communication, risk mitigation, and performance monitoring.

Table 1: Strategic Alignment Matrix

Strategic Goals/Objectives	Company A Priority (1-5)	Company B Priority (1-5)	Potential Synergies	Alignment (High/Medium/Low)
Market Expansion	5	4	Market share growth, new market penetration, geographical expansion	High
Cost Savings	3	5	Operational efficiency, economies of scale, procurement synergies, supply chain optimization	Medium
Product Innovation	4	2	New product development, R&D collaboration, cross-selling opportunities, enhanced product offerings	Medium
Customer Experience Improvement	5	3	Enhanced service offerings, improved customer satisfaction, personalized customer experiences, loyalty program alignment	High
Technology Integration	4	5	IT systems integration, shared technology platforms, data management synergies, digital transformation alignment	High
Talent Development	3	4	Skills enhancement, knowledge sharing, talent retention, career development alignment	Medium

Q2. Data Integration, Automation and Visualization: What data sources will the SEAM system rely on, and how does it overcome data integration challenges (Shan et al., 2017)?

To answer this question, first, the SEAM system realizes the seamless data integration is essential for accurate analysis and decision-making. In this project, the various data sources that will be used in the SEAM system include internal financial data, operational data, employee information, customer data and any other relevant sources, which could be cited from public data sources or inside the companies, or archive library and ScholarWorks. We should make sure data quality and data consistency is comparable across the merging entities, and make sure data cleaning, duplication, and reconciliation processes are facilitated to eliminate errors and discrepancies. Second, the SEAM system utilizes a combination of ETL (Extract, Transform, Load) processes and data integration tools such as Apache NiFi and Talend to integrate data from various sources. These tools help the system gather the right data, make sure it's in a format the system understands, and put it into the model for analysis. SEAM also uses techniques to match up data from different places, dealing with differences in how the data is set up. It checks the data to make sure it's correct and makes sense, using tools like Apache Nutch and Trifacta to make sure the data used for analysis is good quality. Three, SEAM leverages automation tools such as Apache Airflow and Jenkins to automate data collection, cleaning, and analysis processes. These tools enable the system to streamline workflows, reducing

manual effort and increasing efficiency. For example, the SEAM system automates the collection of financial statements, operational data, and market research reports, ensuring that the data is up-to-date and readily available for analysis. The system also automates data cleaning processes, identifying and correcting errors in the data to improve its quality and reliability. Furthermore, the SEAM system automates the generation of reports and dashboards, enabling users to visualize the data and identify trends and patterns easily.

Last, the SEAM system employs advanced visualization techniques to present the data in an intuitive and accessible manner. The system uses tools such as Tableau and Power BI to create interactive dashboards and reports, allowing users to explore the data and gain insights into potential synergies These visualization tools help users see trends, patterns, and unusual data points, which helps them make better decisions during M&A deals. SEAM also uses geospatial visualization to show geographical data, giving insights into where the company might expand and finding synergies based on location. Overall, the SEAM system's approach to data integration, automation, and visualization ensures that the data used for synergy evaluation in M&A transactions is accurate, reliable, and easily accessible. By leveraging advanced tools and techniques, the SEAM system enables users to efficiently analyze data and identify potential synergies, ultimately leading to more successful M&A transactions.

Q3. Synergy Identification: How will the SEAM system build in potential synergies, both quantitative and qualitative?

In the realm of M&A, identifying potential synergies is crucial for maximizing the benefits of the transaction. The SEAM system employs a systematic structured approach to synergy identification, which includes categorizing synergies into distinct types and designing a framework for identifying and evaluating them.

The SEAM system begins by integrating data from various sources, including financial statements and market research reports, into a centralized database using a data warehouse architecture. Machine learning algorithms are then utilized to analyze this integrated data, identifying patterns and relationships that may indicate synergistic opportunities. Visualization tools, such as Tableau and Power BI, are employed to create interactive dashboards and reports, enabling users to visually explore the data and identify potential synergies more effectively. The SEAM system's design, with its scalability and flexibility, allows it to handle large volumes of data and adapt to changing business needs. This comprehensive approach enables the SEAM system to effectively identify potential synergies in M&A transactions, ultimately leading to more successful outcomes. Below displays Synergy Identification Matrix in Table 2. These formulas are sourced from scholarly articles such as Dikova et al. (2010), Pablo & Javidan (2004), and Cartwright & Cooper (1996), providing a solid academic foundation for synergy identification in M&A transactions.

Table 2: Synergy Identification Matrix

Potential Synergy	Description	Data Sources	Tools/ Techniques	Criteria	Synergy Identification Formula
Cost Savings	Identify and quantify potential cost-saving opportunities, such as economies of scale	Financial statements, operational data	Financial analysis, benchmark	Cost reduction, efficiency improvement (Dikova et al., 2010)	Cost Savings = (Cost Before Merger) - (Cost After Merger)
Revenue Enhancement	Identify and quantify potential revenue growth opportunities, such as expanded market reach	Market research reports, sales data	Market analysis, customer segmentation	Market share growth, new market penetration (Dikova et al., 2010)	Revenue Enhancement = (Revenue After Merger) - (Revenue Before Merger)
Operational Efficiency	Identify and quantify potential efficiency improvements, such as -streamlined processes	Operational data, process documentation	Process optimization, lean six sigma	Operational performance improvement (Pablo & Javidan, 2004)	Operational Efficiency = (Operational Costs Before Merger) - (Operational Costs After Merger)
Cultural Alignment	Assess cultural compatibility between merging companies	Employee surveys, cultural assessments	Cultural analysis tools, interviews	Cultural fit, shared values (Cartwright & Cooper, 1996)	Cultural Alignment = (Cultural Compatibility Score)
Talent Retention	Identify strategies to retain key talent from both companies	Employee data, talent management reports	Retention analysis, talent development programs	Employee retention, skill retention (Pablo & Javidan, 2004)	Talent Retention = (Number of Key Employees Retained) / (Total Number of Key Employees)
Technology Integration	Identify opportunities to integrate technology systems and infrastructure	IT infrastructure reports, technology assessments	Integration analysis, compatibility assessments	IT system integration, shared technology platforms (Dikova et al., 2010)	Technology Integration = (Technology Integration Score)
Brand Synergy	Identify opportunities to leverage and enhance brand equity	Brand equity reports, customer feedback	Brand analysis, brand development strategies	Brand value, customer perception (Cartwright & Cooper, 1996)	Brand Synergy = (Brand Compatibility Score)

CHAPTER FOUR

SEAM SYSTEM ANALYSIS AND DESIGN

SEAM System Analysis

Through viewing a great number of scholarly articles and ScholarWorks, the discuss on the previous chapters helped clearly to understand which elements would need to be incorporated to build the SEAM system using an OOAD approach, which is pivotal in constructing the SEAM system, providing a systematic method to identify, define, and organize the building blocks of the system. Drawing from scholarly works such as "Object-Oriented Analysis and Design" by Grady Booch and "Applying UML and Patterns" by Craig Larman, the SEAM system leverages OOAD principles to ensure a robust and scalable design, guiding the development of the SEAM system to meet the complex requirements of synergy evaluation in M&A transactions. To better address three research questions, an Object-Oriented Analysis and Design approach (Arlow, 2004) was utilized in this paper, to construct the building blocks for the SEAM system.

The contributes brought from the SEAM system design to the research questions are:

Q1. Strategic Alignment: How will a SEAM system incorporate the system requirements and design that accommodate the strategic goals and priorities of both the acquirer and the acquiree?

The SEAM system's Functional Requirement Specification includes providing a user-friendly interface for the users to input data related to merging companies, such as organizational culture, business processes, and technology infrastructure to align with the strategic goals and priorities of both merger companies, and the system processes this information to assess the compatibility and strategic fit between the entities. Non-functional Requirements Specification includes being scalable to ensure the system handles large datasets from within the merger entities, third-party data providers, and various public data sources, and prioritizes security to protect sensitive information throughout the evaluation process. A use case diagram illustrates how the SEAM system supports activities such as compatibility assessment, strategic fit analysis, and synergy identification.

In addition, the project glossary defines key terms related to strategic alignment, such as "compatibility assessment" and "strategic fit analysis," ensuring a common understanding among the users. The context diagram shows how the SEAM system interacts with external systems, such as users and data sources, emphasizing its role in supporting strategic alignment in M&A transactions. The class diagram identifies key classes within the SEAM system, such as "merging entity," "compatibility assessment," and "strategic fit analysis,"

illustrating how the system facilitates strategic alignment. The class diagram identifies various classes representing merging organizations, synergy types, and evaluation criteria etc., showcasing how the SEAM system facilitates strategic alignment.

Q2. Data integration, automation, visualization: What data sources will the SEAM rely on, and how does it plan to overcome data integration challenges?

The SEAM system's Functional Requirements Specification entails the integration of data from diverse sources, the automation of data processing, and the utilization of advanced visualization techniques to offer a comprehensive perspective of the merging entities. The system integrates data from within the merger entities, third-party data providers, and various public data sources by using ETL process to extra, transfer and load the data into a centralized database. The automation of data processing can be realized through the following steps: data collection, data transformation, data analysis, visualization, feedback loop. Collecting data involves implementing mechanisms using APIs, web scraping tools, or manual data entry interfaces to automatically collect data from various sources. The SEAM system designed processes to transform raw data into a standardized format easier analyzable. The system developed algorithms and models to identify potential synergies between merging companies using statistical analysis, AI algorithms or machine learning techniques, or business rules. The system implemented automation tools or

scripts to execute the data processing and analysis automatically to reduce manual effort and ensure consistency in the processing of large datasets. The system utilized advanced visualization techniques to help users identify patterns, trends, and potential synergies more effectively. Establishing a feedback loop is necessary to continuously improve the automation processes by refining algorithms, new data sources updates, or enhancing visualization feature. The non-functional requirement specification is designed to be highly performant, ensuring that data integration and analysis processes are completed in a timely manner. It also prioritizes usability, providing users with intuitive visualization tools to interpret the analysis results. Use cases demonstrate how the SEAM system integrates data, automates processes, and presents visualization results to users. The project glossary defines terms related to data integration, automation, and visualization, such as "data integration," "automated analysis," and "visualization tools".

The context diagram illustrates the data flow between SEAM and external data sources, highlighting the system's integration and automation features.The class diagram identifies classes related to data integration, automation, and visualization components within SEAM, showcasing how the system supports effective data management and analysis.

Q3. Synergy Identification: How will the model build potential synergies, both quantitative and qualitative?

The SEAM system's Functional Requirements Specification involves using advanced algorithms and models to analyze integrated data and identify potential synergies between merging entities. The system provides users with detailed

reports outlining these synergies and their potential impact on the M&A transaction. Non-functional Requirements Specification specifies that the system is designed to be accurate and efficient in identifying synergies, ensuring that decision-makers have reliable information to support their M&A decisions. Use cases demonstrate how SEAM identifies synergies in areas such as cost savings, revenue enhancement, and operational efficiency. For example, a use case might involve a user reviewing a synergy analysis report and identifying potential cost-saving opportunities. The SEAM system developed a framework for identifying and assessing synergies, categorizes them into distinct types and employs scenario analysis and sensitivity analysis. This framework categorizes synergies based on their nature and impact, such as cost, revenue, and operational synergies. Scenario analysis involves defining best-case, worst-case, and base-case scenarios to evaluate synergies under different conditions. Best-case scenarios assume maximum synergy benefits, worst-case scenarios consider minimal benefits or negative impacts, and base-case scenarios provide a realistic expectation of synergies. Sensitivity analysis assesses the impact of uncertainties by varying key parameters related to synergies. Table 3 below depicts an example of scenario analysis.

Table 3. Scenario Analysis For M&A Synergy Identification

Scenario	Assumption 1	Assumption 2	Assumption 3	Synergy Estimate
Base Case	$10 million	$5 million	$15 million	$30 million
Scenario A	$ million	$ million	$ million	$ million
Scenario B	$ million	$ million	$ million	$ million
Scenario C	$ million	$ million	$ million	$ million

Note: In this example, the table presents different scenarios for synergy estimation in an M&A transaction. Each scenario varies the assumptions regarding the potential cost savings, revenue enhancements, and other synergies expected from the merger or acquisition. The synergy estimate column shows the total estimated synergies for each scenario based on the given assumptions. This allows decision-makers to compare the potential outcomes under different scenarios and assess the range of possible synergies.

This analysis helps identify the most likely occurring synergies, their potential impact, and associated risks. The framework generates detailed reports and visualizations to communicate synergy assessments, aiding decision-makers in understanding potential benefits and risks in M&A transactions. Statistical software like R, Python, or MATLAB can be used for more complex scenario and sensitivity analysis. Simulation software such as Monte Carlo simulation tools (e.g., @RISK, Crystal Ball) can be used for scenario and sensitivity analysis. Business Intelligence Tools like Tableau, Power BI, or QlikView can be used for

visualizing scenario and sensitivity analysis results. Financial Modeling Software like dedicated financial modeling software or specialized software for M&A analysis can also be used for scenario and sensitivity analysis. Decision tree software and sensitivity chart tools can help visualize the impact of different scenarios and parameter changes on outcomes, aiding in decision-making processes.

In addition, the project glossary defines terms related to synergy identification, such as "synergy analysis" and "synergy impact assessment," ensuring clarity in communication. The context diagram highlights the SEAM system's role in identifying synergies and its interactions with data sources and analytical tools, showcasing their importance in the M&A process.

The class diagram identifies classes related to synergy identification, such as "synergy type," "evaluation criteria," and "analytical model," demonstrating how the SEAM system facilitates synergy identification in M&A transactions.

SEAM System Design

The SEAM system architecture, depicted in Figure 1 below, illustrates the various components and their interactions within the system. This architecture serves as the foundation for the analysis and design phases, providing a clear blueprint for the development of the system.

System analysis and design are crucial phases in the development of any software system, including the SEAM system. During the analysis phase, the focus is on understanding the requirements of the system, including functional and non-functional requirements, as well as the needs of the users. This phase involves gathering and analyzing information about the system's objectives, functionalities, and constraints. The design phase, on the other hand, focuses on creating a blueprint for the system based on the requirements identified during the analysis phase. This includes designing the system's architecture, database schema, user interface, and other components to meet the specified requirements. Throughout these phases, it is essential to consider factors such as scalability, security, and usability to ensure the effectiveness and efficiency of the SEAM system.

To establish a solid foundation for building the SEAM system, this chapter develops comprehensive requirements documentation. This documentation includes detailed functional and non-functional requirements, elaborate use cases, use case diagrams, a project glossary, a context diagram, and a class diagram (OpenAI, 2023). The purpose of constructing these requirements is to provide future system developers with a clear understanding of how the SEAM system should function and the constraints it must adhere to. These requirements form the groundwork for developing a robust SEAM system for M&A transactions, enabling organizations to make well-informed decisions regarding merger and acquisition opportunities. These requirements can be

tailored to align with the specific needs and objectives of our organization, as illustrated in Table 4, which presents the Functional and Non-Functional Requirements Specification. As outlined in Chapter Three's Methodology, data for the SEAM system is collected from various sources, including financial statements from within companies and public sources, along with bibliometric methods citing data from existing literature and scholarly articles.

Figure 1. SEAM System Architecture Diagram

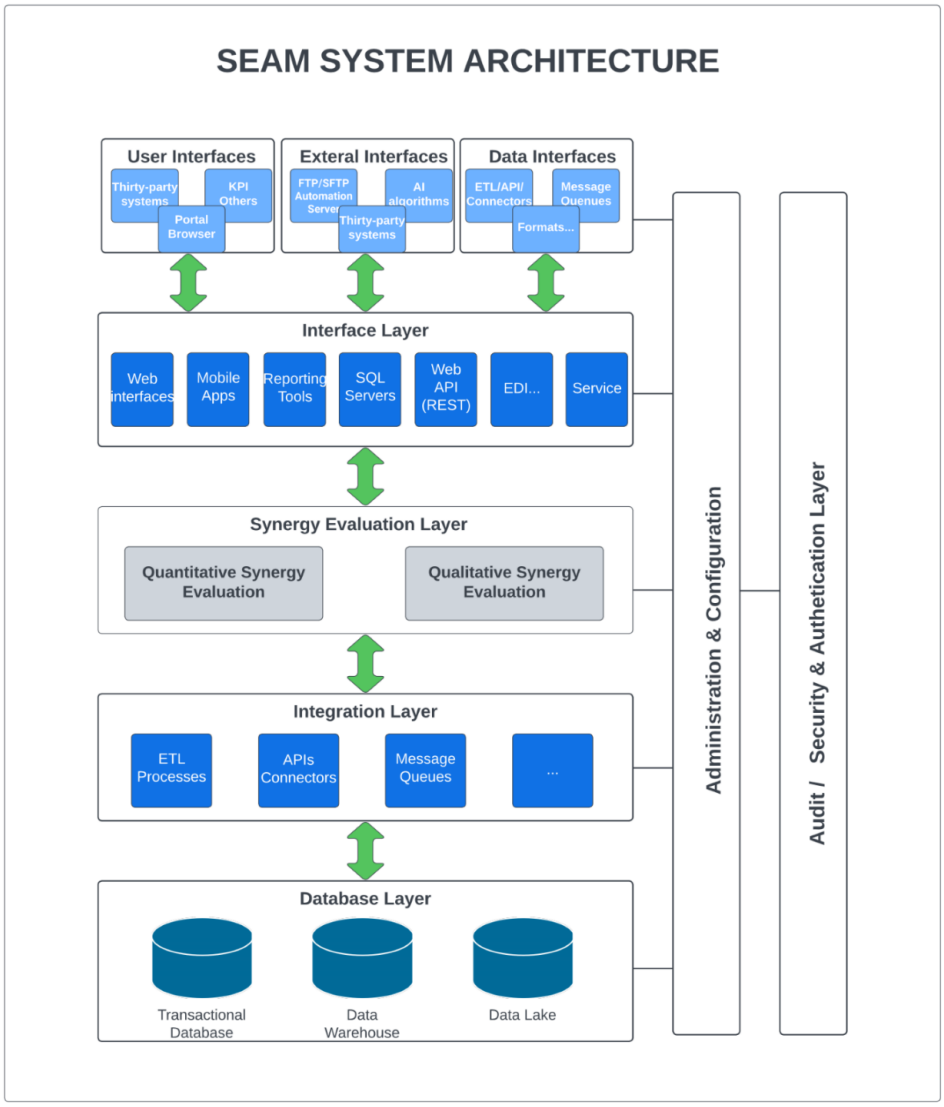


Table 4. SEAM Functional And Non-Functional Requirements Specification

ID	Details	Type	Priority
R1	The SEAM system shall include logging to retrieve, transform, load and integrate financial data with tools such as ETL systems	Functional Data input processing	Must Have
R2	The SEAM system shall perform financial analysis, including ratio analysis, profitability assessment, and valuation calculation (e.g., DCF, CCA, PTA)	Functional Financial analysis	Must Have
R3	The SEAM system shall conduct potential synergy evaluation with external tools KPIs analysis, assumption analysis, and Scenarios analysis, cost-related, revenue-related, and quantify their impact on financial performance	Functional Synergy Evaluation	Must Have
R4	The SEAM system shall automatically identify, access, predict, alert risks associated with the M&As and Provide tools or alternative for resolution	Functional Risk assessment	Must Have
R5	The SEAM system shall apply a comprehensive integration plan with details on the organizational structure, IT system integration and workforce transition	Functional Integration plan	Must Have
R6	The SEAM system shall enable the users to create and evaluate different M&A scenarios, considering various parameters like cost savings, market share growth, revenue enhancements	Functional Scenarios analysis	Must Have
R7	The SEAM system shall allow the users to conduct stakeholder impact analysis the impact of the M&A on various stakeholders, including employees, shareholders, customers, and suppliers	Functional Stakeholder impact analysis	Could Have
R8	The SEAM system shall generate reports summarizing the synergy evaluation results and recommendation	Functional Generate Reports	Must Have
R9	The SEAM system shall provide a user-friendly interface with tools for data input, scenario modeling, and reporting	Functional Interact with various systems	Must Have
R10	The SEAM system shall perform complex financial calculations efficiently and provide results in a reasonable time frame	Non-Functional Increasing performance	Must Have

R11	The SEAM system shall be scalable to accommodate larger M&A deals with significant amount of data	Non-Functional Scalability	Could Have
R12	The SEAM system shall ensure high system reliability and minimal downtime during critical evaluation processes.	Non-Functional Reliability	Could Have
R13	The SEAM system shall ensure data security is paramount, with encryption and access controls to protect sensitive financial information	Non-Functional Data Security	Must Have
R14	The SEAM system shall ensure the user interface to be intuitive and user-friendly to facilitate ease of use by financial analysts and decision-makers	Non-Functional Usability to the users	Must Have
R15	The SEAM system shall interact with various data sources and formats to accommodate different M&A scenarios	Non-Functional Compatibility	Must Have
R16	The SEAM system shall comply with relevant financial regulations and standards, such as GAAP	Non-Functional Compliance	Must Have
R17	The SEAM system shall maintain comprehensive documentation	Non-Functional Documentation	Must Have
R18	The SEAM system shall seamlessly integrate with other financial system tools use in the M&A process	Non-Functional Integration	Must Have
R19	The SEAM system shall automatically audit, and track changes made within the model for transparency and accountability	Non-Functional Audibility	Could Have
R20	The SEAM system shall enable users to utilize training resources and support	Non- Functional Training and Support	Should Have
R21	The SEAM system shall automatically implement data backup and recovery processes	Non- Functional Data backup and recovery	Must Have

Note: Must Have: Past unreal assumption; Should Have: Past unreal recommendation; Could Have: Past unreal ability.

Next the purpose of designing the detailed use cases was to show a step-by-step sequence of events for important system functions with important users,actor semantics are developed to define the users in the requirements documentation. They define the five main types of users for the SEAM system to give the builders an understanding of what their role in the application system is. The typical roles in the SEAM system might will include data analysts, system administrators, auditors, and stakeholders showcasing an overview of what their roles are in the SEAM system and how the system operates at a high-level, and external interaction system, defining new use cases or interactions between the SEAM system and the Outside Application or AI System to illustrate how data is exchanged or how predictions are made. These interactions can include data sharing, API calls, or other communication methods, such as KPIs system and Financial Data Provider system or AI system. Detailed use cases for each actor are defined which were as shown in Table 7-14, which declare detailed action steps respectively. Continuing, the project glossary was constructed to help future builders understand the technical language in SEAM systems which can be found in Appendix A. Table 5 contains brief semantics for the actors in the M&A SEAM system. The Table 6 below contains brief semantics for the use cases in M&A SEAM system. These brief semantics provide a quick overview of the key use cases, their purposes and the main activities involved in each use case with the M&A SEAM system.

Table 5. Actor Semantics For The M&A SEAM System

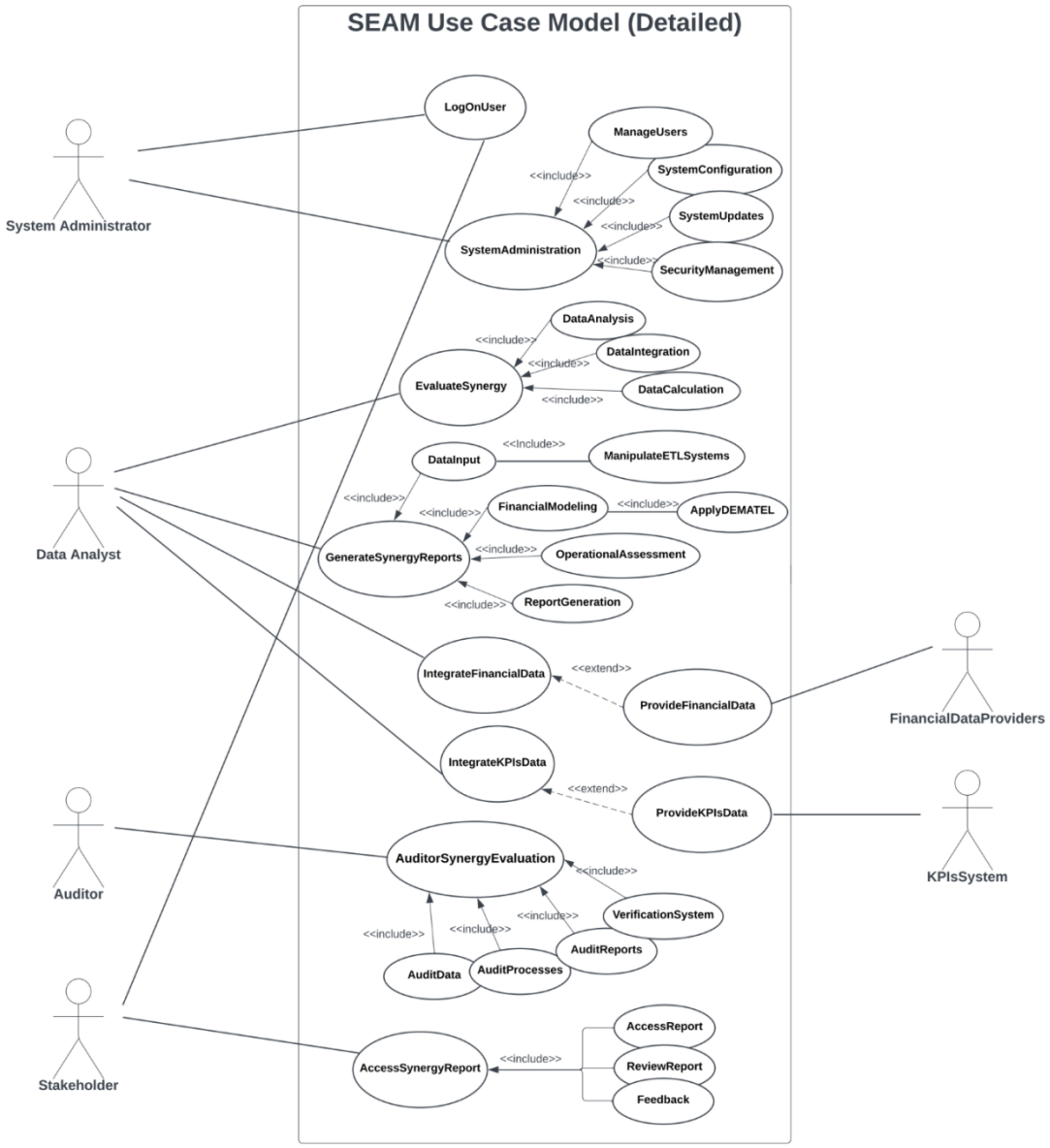
Actor Semantics	
Actor	Semantics
DataAnalyst	Someone who can input and manipulate data, perform financial modeling, assess operational metrics, and generate detailed synergy reports. They ensure data accuracy and quality.
SystemAdministrator	A special user of the system who can set up access rights for other users, implement the application configuration, perform updates, ensure data security, and address technical issues or system failures.
Auditor	The auditors are external and internal entities who perform audits of the synergy evaluation process, data integrity, and report quality. They provide an independent assessment of the evaluation's validity.
Stakeholder	Accesses generated reports and insights for decision-making regarding M&A opportunity, including executives, board members and decision makers.
KPIsSystem	An external KPIs System example that supplies data that is integrated into the synergy evaluation process, allowing for additional insights and assessments.
FinancialDataProviders	Serve as external sources of critical financial data that is integrated into the evaluation process to assess financial aspects and empower the M&A SEAM system to make informed and data-driven assessments, aiding in the successful execution of M&As.

Table 6. Use Case Brief Semantics for the SEAM System

Use Case	Brief Semantics
GenerateSynergyReport	Data Analyst may create detailed synergy reports that outline the potential benefits and drawbacks of a M&A. Main activities: Data input, financial modeling, explore data, perform analysis, operational assessment, report generation and collaborate with other stakeholders
EvaluateSynergy	Data Analysts may access the synergy potential of a M&A based on financial, operational, and strategic criteria. Main activities: Data analysis, integration, and calculation.
AccessSynergyReport	Stakeholders may access synergy reports to make informed choices regarding M&A opportunities. Main activities: Report access and review
SystemAdministration	System Administrators may manage and maintain the M&A SEMA system, ensuring its proper functioning and security. Main activies: Configuration, updates, security management.
IntegrateKPIsData	Data analyst may integrate KPIs data from the external KPIs system into the synergy evaluation process. Main activities: Data integration and analysis
IntegrateFinancialData	Data Analyst may integrate financial data from external Financial Data Providers into the synergy evaluation process. Main Activites: Data Integration, financial modeling.
AuditSynergyEvaluation	Auditors may review and verify the synergy evaluation processes, data, and reports, and may perform audits of the entire synergy evaluation process, ensuring that it aligns with regulatory requirements and standards. Main activities: comprehensive audit and verification.
LogOnUser	All actors must log on to the system before they can use it.

Figure 2: SEAM System Use Case Diagram (Outlined) Platform

Figure 3. SEAM System Use Case Model (Detailed)



Detailed Use Case

The Evaluate Synergy Use Case is a critical step in the M&A decision-making process, providing insights into the potential benefits and risks associated with the M&A. The evaluation considers various factors to ensure a comprehensive analysis. As shown in Table 7.

Table 7. EvaluateSynergy Use Case

Use Case: EvaluateSynergy
Use Case ID: 1
Primary Actor: Data Analyst | Stakeholder
Preconditions: 1. Data Analyst is logged on to the M&A SEAM system. 2. The system displays the relevant financial data.
Primary Scenario: 1. The Data Analyst accesses the SEAM system. 2. The Data Analyst selects the options to generate a synergy report. 3. The system prompts the Data Analyst to input parameters for the report, such as the companies involved, financial metrics, operational criteria. 4. The Data Analyst inputs the required parameters based on the specifics of the M&A under evaluation. 5. The system processes the input data, performs the necessary calculations and generates a detailed synergy report. 6. The Data Analyst reviews reports to ensure accuracy and completeness. 7. The Data Analyst can further customize reports or add additional insights. 8. The finalized synergy report is saved or exported for users
Alternate Scenario: If the input parameters are incomplete or contain errors, the system provides appropriate error messages, and the Data Analyst corrects the input.
Postconditions: 1. The synergy evaluation is successfully generated. 2. The results of the evaluation are stored within the system. 3. The data Analyst may proceed to generate a detailed synergy report based on the evaluation.
Exceptional Scenarios: When technical issues happen, the system logs the error, and the data analyst may need to retry the evaluation after resolving the issue or contracting further system support.

The Generate Synergy Report use case as shown in Table 8 involves the Data Analyst generating a detailed synergy report within the SEAM system. This report provides a comprehensive analysis of potential synergies, risks and benefits associated with a merger or acquisition.

Table 8. GenerateSynergyReport Use Case

Use Case: GenerateSynergyReport
Use Case ID: 2
Primary Actor: Data Analyst
Preconditions: 1. Data Analyst is logged on to the SEAM system with credentials. 2. The system is available to use, relevant data must be available and integrated into the system.
Primary Scenario: 1. The Data Analyst accesses the SEAM system. 2. The Data Analyst selects the options to generate a synergy report. 3. The system prompts the Data Analyst to input parameters for the report, such as the companies involved, financial metrics, and operational criteria. 4. The Data Analyst inputs the required parameters based on the specifics of the M&A under evaluation. 5. The system processes the input data, performs the necessary calculations and generates a detailed synergy report. 6. The Data Analyst reviews the generated report to ensure accuracy and completeness. 7. The Data Analyst can customize the report or add additional insights.
Alternate Scenario: If the input parameters are incomplete or contain errors, system provides appropriate error messages,Data Analyst corrects the input.
Postconditions: 1. The detailed synergy report is successfully generated. 2. The report is stored within the system for future reference. 3. Stakeholders, including executives and decision-makers, can access and review the generated synergy reports.
Exceptional Scenario: If there are technical issues during the report generation process, the system logs the error, and the data analyst may need to retry the report generation after the issue or contacting system support.

The Integration Financial Data Use Case involves the Data Analyst integrating financial data from external Financial Data Providers and various sources into the M&A SEAM system

Table 9. IntegrationFinancialData Use Case

Use Case: IntegrationFinancialData
Use Case ID: 3
Primary Actor: Data Analyst
Preconditions: 1. The data analyst is logged on to the SEAM system with credentials. 2. ExternalFinancialDataProviders must have a secure and reliable method for a data transmission.
Primary Scenario: 1. The Data Analyst selects the options to integrate financial data. 2. The system provides options for connecting to external FinancialDataProviders. 3. The Data Analyst selects the appropriate FinancialDataProviders and inputs necessary credentials or parameters for data retrieval. 4. The system establishes a secure connection with the selected FinancialDataProvider and retrieves the relevant financial data. 5. The retrieved financial data is integrated into the SEAM system. 6. The Data Analyst reviews the integrated financial data to ensure accuracy and completeness. 7. The system updates its database with the newly integrated financial data.
Postconditions: 1. Financial data from external providers is successfully integrated into SEAM. 2. The system database is updated with the latest financial information.
Exceptional Scenarios: If the retrieved financial data is incomplete or contains errors, the system provides alerts, and the Data Analyst may need to verify the data sources or make corrections.

The Integrate KPIs Data use case as shown in Table 10 ensures that the SEAM is enriched with relevant performance metrics, enhancing the overall evaluation process with additional insights from Key Performance Indicators.

Table 10. IntegrateKPIsData Use Case

Use Case: IntegrateKPIsData
Use Case ID: 4
Primary Actor: Data Analyst
Preconditions: 1. The Data Analyst is logged on to the SEAM system with the credentials. 2. The SEMA system is secure and reliable for connecting to the external KPIs system.
Primary Scenario: 1. The Data Analyst selects the option to integrate KPIs data or other criteria. 2. The system provides options for connecting to the external KPIs system. 3. The Data Analyst selects the appropriate KPIs system and inputs necessary credentials or parameters for data retrieval. 4. The system establishes a secure connection with the KPIs system and retrieves the relevant KPIs data. 5. The retrieved KPIs data is integrated into the SEAM system. 6. Data Analyst reviews the integrated KPIs data to ensure accuracy and completeness. 7. The system updates its database with the newly integrated KPIs data.
Postconditions: 1. KPIs data from the external KPIs system is successfully integrated into the M&A SEAM system. 2. The system database is updated with the latest KPIs information.
Exceptional Scenarios: If the retrieved KPIs data is incomplete or contains errors, the system provides alerts, and the Data Analyst may need to verify the data sources or make corrections.

This Auditor Synergy Evaluation Use Case which depicts in Table 11 allows auditors to assess the synergy potential among merger companies, ensuring that the integration process is aligned with the strategic goals of both parties. By conducting thorough evaluations and providing insights into potential synergies, and plays a vital role in enhancing decision-making processes and maximizing the value of M&A transactions.

Table 11. AuditorSynergyEvaluation Use Case

Use Case: AuditorSynergyEvaluation
Use Case ID: 5
Primary Actor: Auditor
Preconditions: 1. The auditor is logged on to the SEAM system with credentials. 2. Synergy evaluations shall have been previously conducted and stored in the system.
Primary Scenario: 1. The auditor selects the option to audit synergy evaluations. 2. The system presents a list of available synergy evaluations for auditing. 3. The auditor selects a specific synergy evaluation to review. 4. The auditor examines the input parameters used in the evaluation process, ensuring they align with regulatory requirements and standards. 5. The Auditor verifies the integrity of the data used in the evaluation, checking for accuracy and completeness. 6. The Auditor examines the calculations and methodologies applied in the synergy evaluation. 7. The Auditor reviews the generated synergy report to ensure it accurately reflects the evaluation results. 8. If discrepancies or issues are identified, the Auditor may request additional information or clarification from the Data Analyst. 9. The Auditor provides feedback or approval based on the audit results.
Alternate Scenarios: If the synergy evaluation being audited is found to be inconsistent with regulatory requirements or contains errors, the Auditor may request a reevaluation or corrections.
Postconditions: 1. The synergy evaluation audit is completed, and results are documented. 2. The synergy evaluation is marked as audited in the system.

The Access Synergy Report Use Case ensures that stakeholders have timely and secure access to detailed synergy reports, enabling them to make well-informed decisions in the context of mergers and acquisitions.

Table 12. AccessSynergyReport Use Case

Use Case: AccessSynergyReport
Use Case ID: 6
Primary Actor: Stakeholder
Preconditions: 1. The Stakeholder is logged on to the SEAM system with credentials. 2. Synergy reports must have been previously generated and stored in the system.
Primary Scenario: 1. The Stakeholder navigates to the section for accessing synergy reports. 2. The system presents a list of available synergy reports based on the evaluations conducted. 3. The Stakeholder selects a specific synergy report for review. 4. The System displays the selected synergy report, presenting detailed information on synergy potential, risks, and benefits. 5. The Stakeholder thoroughly reviews the synergy report, considering financial, operational, and strategic aspects. 6. If needed, the Stakeholder may download or export the synergy report for further analysis or presentation. 7. The stakeholder uses the insights from the synergy report to make informed decisions regarding the M&A.
Alternate Scenarios: If the selected synergy report is not available or contains errors, the system provides appropriate error messages, and the Stakeholder may contact support for assistance.
Postconditions: 1. The Stakeholder successfully accesses,reviews the selected synergy report. 2. The Stakeholder may take further actions based on the information provided in the synergy report.
Exceptional Scenarios: In the event of system issues or data discrepancies, stakeholders may report concerns to the IT and data analysis teams for resolution.
Notes: The Access Synergy Report use case ensures that stakeholders have timely and secure access to detailed synergy reports, enabling them to make well-informed decisions in the context of mergers and acquisitions.

The System Administration Use Case as shown in table 13 describes the steps involved in performing system administration tasks in the SEAM system.

Table 13. SystemAdministration Use Case

Use Case: SystemAdministration
Use Case ID: 7
Primary Actor: System Administrator
Preconditions: The system is running and accessible.
Primary Scenario: 1. The system administrator logs into the SEAM system using their credentials. 2. The system administrator views the status of the SEAM system. 3. The system administrator monitors system performance metrics. 4. Manage User Accounts: create, update or delete user accounts. 5. Configure system settings: update system configuration, backup data. 6. Configure access control settings to monitor security logs. 7. The system administrator checks for system available updates and applies updates to the SEAM system. 8. The system administrator shuts down the SEAM system.
Alternate Scenarios: If the system administrator fails to log in, they can reset the password or contact the higher-level administrator for assistance or they can request additional privileges.
Postconditions: The system configuration is updated according to the administrator's actions.
Notes: The system administration tasks are specific to the SEAM System and may vary depending on the specific requirements of the system.

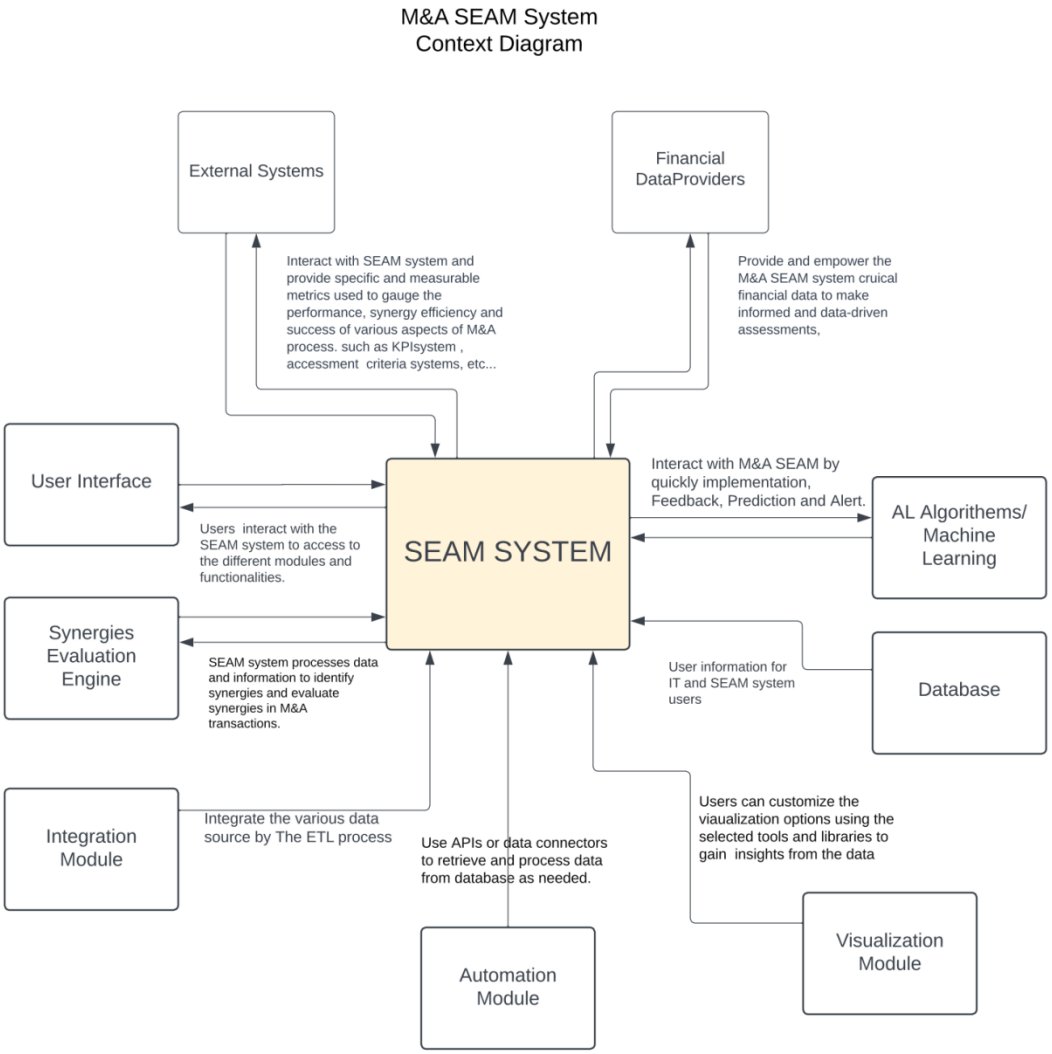
The Logon User detail use case as shown in Table 14 outlines the steps involved when a user logs on to the SEAM system and ensures that the process is secure and user-friendly.

Table 14. LogOn User Use Case

Use Case: LogOnUser
Use Case ID: 8
Primary Actor: user
Preconditions: The SEAM system is running, and the user has a valid account.
Primary Scenario: 1. User accesses Logon Pages of the SEAM system. 2. Enter credentials using their username and password. 3. The system validates the user's credentials. If valid, continue to the next step, otherwise, show an error message. 4. The system redirects the user to the SEAM main page.
Alternate Scenarios: When the user enters an invalid credentials, show an error message and allow the user to retry.
Postconditions: The user is successfully logged on to the SEAM system.
Exceptional Scenarios: The SEAM system must have a secure logon mechanism to protect user credentials.
Notes: The Logon process should also include security measures or two-factor authentication for enhanced security.

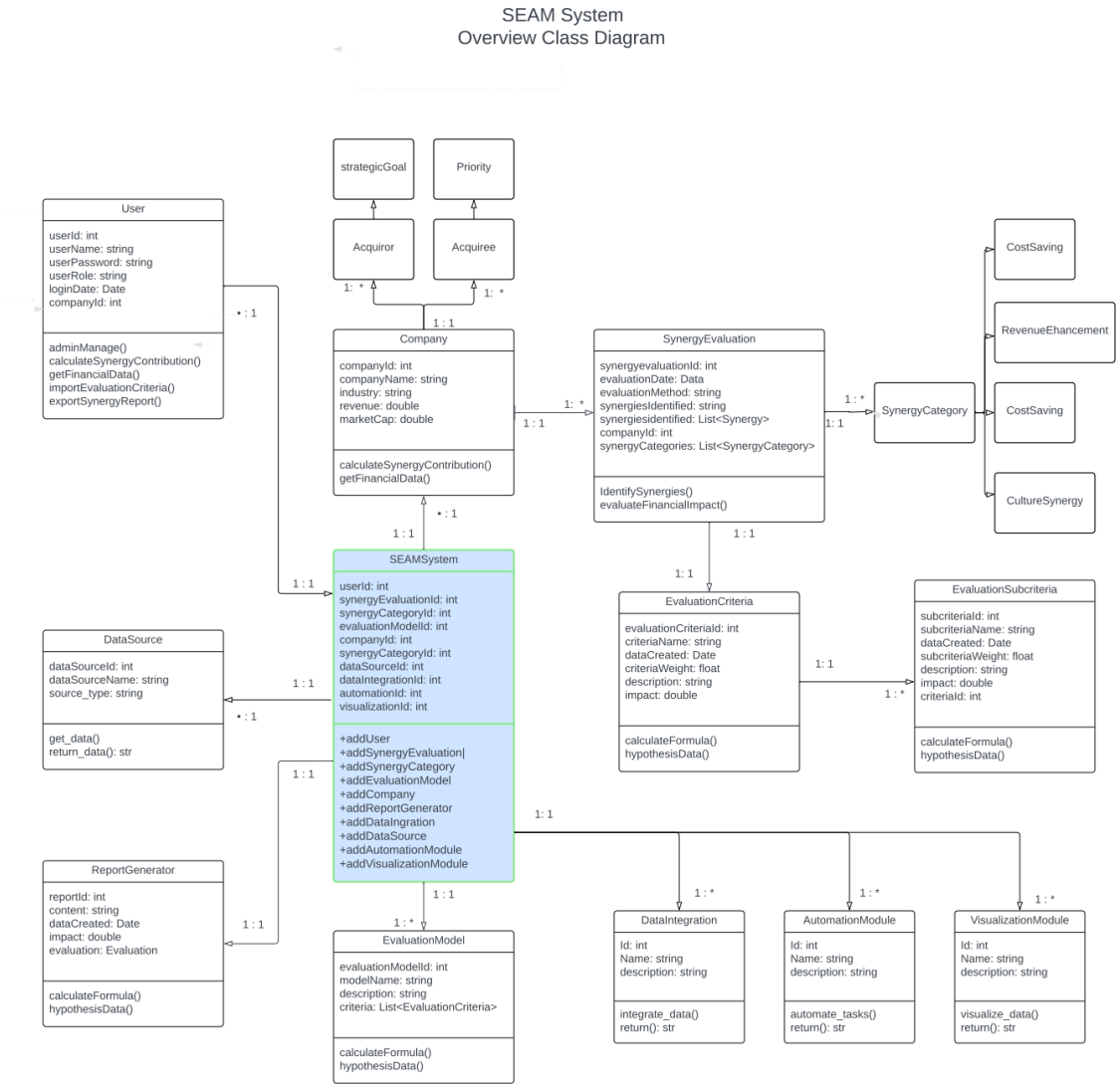
The Context Diagram for the M&A SEAM System as depicts in Figure 4 provides a clear and concise overview of the system's scope, boundaries, stakeholders, and interfaces. It highlights the interactions between the system and its external environment, laying the foundation for further analysis and design.

Figure 4. Context Diagram of M&A SEAM System



To design an overview class diagram for the SEAM System, which is depicted as figure 5. We need to consider the key components and relationships involved in addressing the three research questions.

Figure 5. Overview Class Diagram of M&A SEAM System



CHAPTER FIVE

CONCLUSION AND AREAS FOR FUTURE STUDIES

This last Chapter will discuss the findings of Chapter Four, and provide a conclusion, and areas for further study for each of the three research questions.

Q1: Strategic Alignment: How will a SEAM system incorporate the system requirements and design that incorporate the strategic goals and priorities of both the acquirer and the acquiree?

Strategic alignment is crucial in M&A transactions, as it ensures that the objectives of the transaction are in line with the overall strategy of the organizations involved. The SEAM system addresses this by facilitating the alignment of M&A objectives with organizational strategies through a structured analysis of strategic goals and alignment criteria. The SEAM system makes it possible to incorporate the system requirements and design that incorporate strategic goals and priorities of both the acquirer and the target company which ensure that the SEAM system can guide executives to know which companies or businesses to merger or acquire with, how far they can move on, and how much the M&A transaction contributed to the long-term strategic goals of the organizations involved, enhancing the likelihood of success. The limitations of these findings are: (i) The strategic goals and priorities of organizations can change over time, which may require the SEAM system to be continually updated

to remain aligned. (ii) There may be instances where the strategic goals and priorities of the acquirer and acquiree are not fully aligned, making it challenging to incorporate them into the SEAM system.

There are two key areas for further study in this subject. First, we can conduct comparison analysis on the performance before and after executing. Second, we can learn from the successful and failed cases to gain effective models and plans.

Q2: Data Integration, Automation, and Visualization: What data sources will the SEAM system rely on, and how does it overcome data integration challenges?

Data integration, automation, and visualization are key components of the SEAM system, as they enable efficient processing and analysis of data related to M&A transactions. The SEAM system utilized data from internal merger companies' datasets, external financial providers, and public data sources, and realized the data integration, automation and visualization features by implementing ETL process, automated the analysis process by embedding AI algorithm, and visualized the results in a user-friendly format by customizing user interface. This enhances the efficiency and accuracy of the synergy evaluation process, enabling stakeholders to make informed decisions based on reliable data. The Limitation of the project could be highly complex due to the need to integrate disparate systems and data sources.

Further research may explore ways to optimize the data integration process to reduce the complexity and investigate the integration of data integration, automation, and visualization with AI and advanced analytics to streamline the integration process and improve scalability.

Q3: Synergy Identification: How will the model build potential synergies, both quantitative and qualitative?

Synergy identification is a critical aspect of M&A transactions, as it determines the potential value that can be created through the transaction. For quantitative synergies, the SEAM system will utilize financial data and financial models to estimate cost savings, revenue enhancements, and other financial benefits that may result from the merger. For qualitative analysis, the SEAM system facilitates synergy identification by providing a structured framework for evaluating synergies across various dimensions, such as operational, financial, and strategic synergy types using scenario analysis which can see table 3. and sensitivities analysis. Scenario analysis was used to identify potential synergies under different conditions. This involved developing best-case, worst-case, and base-case scenarios to understand the range of possible outcomes. Sensitivity analysis was conducted to assess the impact of uncertainties on synergy estimates. This analysis helped in understanding how changes in key variables, such as culture, market conditions or different premiums paid, could affect the overall synergy potential. This enables stakeholders to identify and prioritize synergies that are most likely to create value, enhancing the success of the M&A

transaction. The limitation of these findings mainly lies on subjectivity and bias, especially on the qualitative assessment on potential synergies may lead to inconsistencies and inaccuracy in the analysis. Further study may investigate advanced modeling techniques, such as simulation modeling, and machine learning and AI, for capturing the complex inter-dependencies and dynamics of synergies in M&A transactions, uncover hidden patterns and insights that can inform synergy identification.

In summary, the project leveraged an Object-Oriented Analysis and Design (OOAD) approach for the front-end system analysis and design process. Key functional and non-functional requirements were identified and prioritized, laying the foundation for the system's design. The system design phase focused on addressing these requirements through strategic architectural decisions, including the choice of technologies, database design, and user interface considerations. The use of use case diagrams, a project glossary, context diagram, and class diagram further elucidated the system's functionalities, interactions, and structure. Overall, the meticulous analysis and design processes outlined in the previous Chapters are pivotal in shaping the SEAM system to be an effective tool for synergy evaluation in M&A transactions. Areas for further study focus on implementing and testing the model in actual M&A scenarios, exploring advanced technologies on quantitative synergy analysis, the integration of AI algorithms on qualitative synergy analysis and expanding the model's features.

APPENDIX A

SEAM PROJECT GLOSSARY

SEAM PROJECT GLOSSARY

Term	Definition
SEAM (Synergy Evaluation Application Model)	The software application is designed to facilitate the management, analysis, and synergy evaluation of mergers and acquisitions.
M&A (Merger and Acquisition)	The process of combining two or more companies through various financial transactions, including mergers, acquisitions, consolidations, or other forms of corporate restructuring.
Synergy	The additional value generated by the combination of two companies that greater than the sum of the individual values.
Synergy Evaluation	The assessment of potential synergies that can be achieved through a merger or acquisition, including financial, operational, and strategic benefits.
Front-end System Design	The design of the user interface and user experience of the SEAM application.
Back-end System Design	The design of the underlying systems and processes that support the functionality of the SEAM system.
Functional Requirements	The specific features & functionality that the SEAM system must have to meet its objectives.
Non-functional Requirements	The requirements related to performance, security, scalability, and other aspects of the SEAM system that are not directly related to its functionality.
Scenario Analysis	A technique used to analyze the potential outcomes of different scenarios or situations.
Sensitivity Analysis	A technique used to assess the sensitivity of a system or model to changes in input variables.
Use Case	A description of how users will interact with the SEAM application system to achieve specific goals, typically represented as a sequence of steps or actions.
Class Diagram	A visual representation of the classes, relationships, and attributes in the SEAM application system, showing how different parts of the system are related to each other.
Context Diagram	A high-level diagram that shows the interactions between the SEAM system and external entities, such as users, other systems, and data sources.
Evaluation	The process of analyzing and assessing the performance, potential, and compatibility of a company in the context of a merger or acquisition.

Company/Entity	An organization or business entity considered for involvement in a merger or acquisition.
Evaluation Method	The approach or methodology used to assess the various aspects of a company during the evaluation process.
Financial Impact	The effect of a merger or acquisition on the financial performance and results of the companies involved.
Data Integration	The process of combining data from different sources into a single, unified view.
Automation	The use of technology to automate tasks and processes, reducing the need for manual intervention.
Visualization Techniques	Methods used to represent data visually, such as charts, graphs, and diagrams.
Synergy Identification	The process of identifying and assessing potential synergies between two or more entities considering an M&A transaction, involving analyzing various aspects to identify areas where combining forces could lead to strategic advantages.
Revenue	The total income generated by a company from its primary business activities.
Market Capitalization (Cap)	The total market value of a company's outstanding shares of stock, calculated by multiplying the share price by the number of outstanding shares.
Stakeholder	An individual or group with an interest or concern in the outcome of a merger or acquisition, including shareholders, employees, customers, and regulatory bodies.
Operational Synergy	The potential efficiency and effectiveness gains that can be achieved by combining the operational processes of two companies.
Financial Synergy	The potential financial benefits, such as cost savings or revenue enhancements, resulting from a merger or acquisition.
Report	A document generated by the system that summarizes the results, findings, and recommendation of the synergy evaluation.
Cultural Synergy	The alignment of organizational cultures between merging companies to facilitate smoother integration and collaboration.
Administrator	An authorized user responsible for managing and configuring the SEAM System.
External System	A third-party software or database that the SEAM System interacts with for data exchange or analysis.
Pre-M&A	This is a phase of an M&A process when the deal is conceived and negotiated by executives and then legally approved by shareholders and regulators.

Post-M&A	This is a process after the merger or acquisition, required to maximize the value of people and technology for an organization.
OOAD (Object-Oriented Analysis and Design)	OOAD is a technical approach for analyzing and designing an application, system, or business by applying Object-Oriented programming, as well as using visual modeling throughout the software development process to guide stakeholder communication and product quality.
Merging entity	Refers to both the acquiring and target companies involved in the transaction.
Compatibility assessment	Refers to the process of evaluating the degree of alignment or fitness between companies that considering or undergoing M&As. The assessment often includes qualitative and quantitative analyses, interviews with key stakeholders, and assessments of organizational structures and processes.
Strategic fit analysis	It is a process to assess the compatibility and alignment between organizations' strategic goals, objectives, and capabilities. The analysis aims to determine the extent to which the merging companies' strategies, resources, and competitive advantages complement each other and can be effectively integrated to achieve mutual benefits.

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