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Business model evolution of Asset Management companies with a focus on the role of Artificial Intelligence in managing alternative investments

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Business model evolution of Asset Management companies with a focus on the role of Artificial Intelligence in managing alternative investments

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“Rem tene, verba sequentur”

“Possiedi l'argomento, le parole seguiranno”

Catone il Censore

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Introduction

Research Question

The primary goal of this thesis is to conduct an analysis of the asset management industry from a business model structure perspective, examining its development and the key factors that contribute to the value generation of the companies operating within it. The industry as a whole is currently experiencing a period of great sensitivity, influenced by unfavourable macroeconomic conditions following the COVID-19 epidemic and the global increase in interest rates. This has resulted in decreased profit margins and reduced profitability for businesses within the industry. The research question of this study is to examine the ideal integration of artificial intelligence within a given context, in order to maximize its potential benefits, if any, and to identify any current limitations or gaps in knowledge. The study aims to provide insights into the current state of AI implementation and explore its prospective applications. I am interested in directing my attention towards alternative investments, a subject that I believe has received less attention from the sector as a whole. In my perspective, there is significant potential for advancement in this area through the use of technical innovations. The study topic aims to investigate the potential impact of implementing artificial intelligence systems in asset management organizations. Specifically, it seeks to determine whether such implementation can lead to cost reduction and thus enhance profitability.

Personal Motivation

My thesis started during my semester abroad at Yonsei University in Seoul, South Korea. Here I got to know a high-tech company that had changed its business model over the years from a classic asset management company to a hybrid that bases its value proposition on the introduction of artificial intelligence in this sector. When I arrived in Asia, I had just finished a summer internship in a private equity fund after working part-time for almost a year and a half in a venture capital fund. I was therefore very interested and involved in the sector, so discovering this company was a perfect combination of these passions with the drive for innovation that I lacked. I then had the opportunity to discuss with employees of the company itself, attend conferences and also attend some seminars on the subject, increasing my curiosity and deciding to embark on a thesis path related to artificial intelligence, asset management from a business model and alternative investments.

Summary of the Literature Review

Most of the resources found on this subject focus on two aspects, the study of the evolution of the business model of asset management companies and the application of alternative technologies within it, very little therefore related to the purely artificial intelligence aspect. Through this phase, I studied

the historical trend of financial returns, analysing their decline and the main causes, both internal and external. I researched the impact of certain technologies within it and the changes they brought, positive and negative aspects.

Method

After the literature review, I developed my research through two main methodologies, quantitative research and a case study. I constructed a survey related to the topics mentioned above that I submitted to market participants, such as financial or investor analysts, with about 13 quick-answer questions. The case study, on the other hand, concerns Qraft, the Korean company I mentioned earlier, where I collected data during my semester outside through interviews and participation in seminars.

Thesis Structure

The thesis will be organised into five separate chapters. The first two will be inherent to the study of the relevant literature and an introduction to the selected topic, the third a detailed explanation of the methodology used for data collection. Subsequently, the fourth chapter (divided into two for each dataset collected) will be dedicated to the presentation of the data and its results and insights. I will close the thesis with a conclusion chapter where a summary of what has been written and the main insights derived from the study performed will follow.

Chapter 1: Business model evolution for Asset Management firms

1.1 Industry Overview

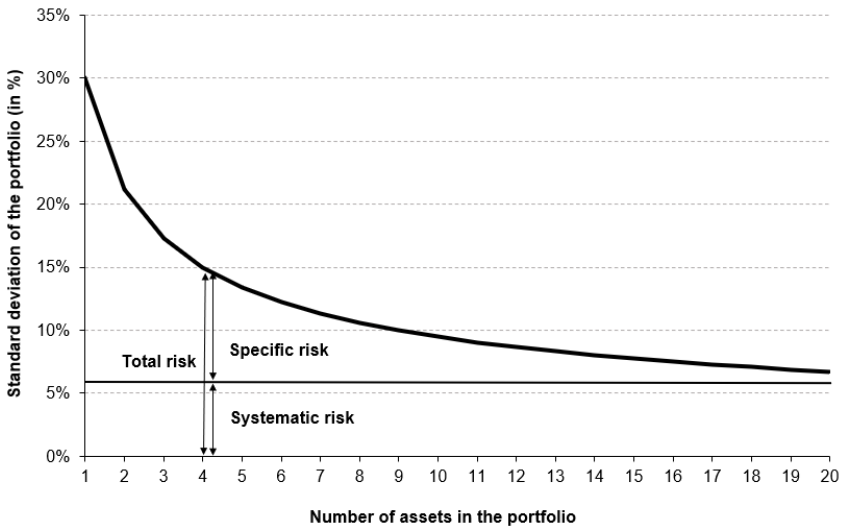
1..1.1 History of Asset Management

The collective financial administration has always been a fundamental aspect of all societies and historical civilizations. From the management of public funds derived from citizen taxes to the most cutting-edge supranational funds, everything falls under the general macro-category of the optimal allocation of limited resources collected from multiple institutional and private individuals. The origins of asset management can be traced back to ancient civilizations that managed their land and precious metals. These earliest forms of asset management emphasized resource allocation and wealth preservation and growth. As economies grew and financial systems emerged, asset management became a more formalized practice over time. Wealthy individuals entrusted their assets to custodians or advisors in Mesopotamia, Egypt, and ancient Greece. On behalf of their affluent patrons, these stewards were responsible for administering land, livestock, commodities, and other valuable assets. They would assure the appropriate upkeep, protection, and use of these assets, frequently generating income or returns for the owners. (Ashby, 2011). During the feudal era, nobles and landowners employed estate managers to administer their vast landholdings and associated assets. These estate administrators were in charge of managing agricultural production, organizing labor, maintaining infrastructure, and generating revenue for landowners, performing an essential role in maximizing the value and productivity of the estates. (Wood, 2002). Investment trusts arose as early examples of asset management structures in the 18th century. For instance, the Scottish Widows Fund was one of the first investment trusts when it was established in 1815. Individuals could pool their resources and entrust their capital to professional fund managers, who would employ it in a diversified portfolio of assets. This idea set the groundwork for contemporary investment funds and collective investment schemes. The globalization of economies has unquestionably increased the necessity and efficacy of a capital exchange system, both in terms of the diversity of investment opportunities and the profitability of those investments. Globalization has had a significant impact on asset management by increasing investment opportunities, market complexity, and new challenges. Currently, asset managers optimize investment strategies by navigating global markets, gaining access to diverse asset classes, and analysing geopolitical factors. The increase in collective wealth prompted an increasing number of investors to carefully manage their assets, and for the first time in human history, each citizen had the opportunity to invest his or her own capital, which was no longer used exclusively for the family's survival. In 1952, Harry Markowitz introduced the theory of portfolio diversification, which marked a significant formalization of these processes. According to this theory, diversification

of investments reduces the systemic risk associated with the potential loss of a particular asset (Markowitz, 1952). He established the groundwork for the optimization of investment portfolios using mathematics. His research demonstrated how combining assets with varying risk and return characteristics can reduce portfolio risk without compromising returns.

The seemingly highly abstract concept is straightforward to implement in any of the mentioned social contexts. The allocation of capital from public taxes to a singular investment can be extremely risky (specific risk), and the loss on that investment cannot be covered by other assets. The investor is exposed to two types of risk: the risk associated with the specific asset in which he has invested, and the risk associated with the financial and economic system in which the asset is embedded. Systemic risk refers to the risk of a widespread disruption or failure within a financial system or an entire economy, resulting from the interconnections and interdependencies among its various components. It arises when the failure of one institution or a series of interconnected events has the potential to trigger a domino effect, causing significant damage to the entire system. *"Systemic financial risk is the risk that an event (shock) will trigger a loss of economic value or confidence in, and attendant increases in uncertainty about, a substantial portion of the financial system that is large enough to, in all probability, have significant adverse effects on the real economy"* (Gianni De Nicolo, 2002). This factor is a non-diversifiable risk and affects the entire portfolio of investments. It is the component of risk that cannot be eliminated through diversification, as it is beyond the control of individual investors or specific investments. The part of the risk that can be eliminated by diversification is called diversifiable risk (or specific risk) and represents the risk peculiar to a specific company. Investors do not have to be remunerated for keeping this risk, as it can be avoided through diversification, and thus diversifiable risk does not influence expected returns.

Graph 1: Specific and Systematic Risk



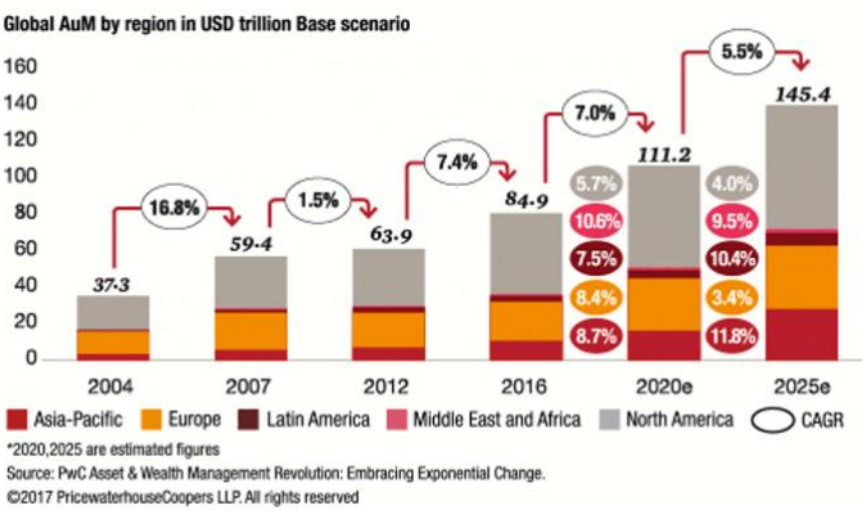
Source: Ebrary: The effect of diversification on risk

This concept is essential for comprehending the objective of accumulating and distributing funds in order to generate more investable capital or community wealth.

Over the past century, the knowledge gap between investors (those who hold and demand a return on capital) and those who invest and manage wealth has widened, increasing the need for entities capable of collective wealth management within the financial system. Understanding this concept is the basis for comprehending why collective asset management societies emerged. On the one hand, we have a middle class with rising discretionary income that lacks the financial knowledge to efficiently remunerate invested capital and maximize diversification. Asset management companies attract also significant investments from institutional investors such as pension funds, insurance companies, endowments, and foundations. These institutional investors allocate a portion of their portfolio to asset management firms to achieve their investment objectives.

There are companies, on the other hand, raise this money and decide on its appropriate allocation with the goal of remunerating previously obtained capital through portfolio diversification and risk reduction. The word asset management refers to the managed investment of securities and cash. An asset management firm is a financial entity that specializes in managing client investment portfolios. Its principal mission is to maximize returns on investments while avoiding risks based on their clients' individual investment goals and preferences. Large asset managers have traditionally sold their products through a Business-to-Business (B2B) partner network, which includes banks, insurance companies, and other capital providers. Asset management firms offer a variety of services, including investment advisory, portfolio management, and investment fund administration. They hire expert investment managers and analysts who are in charge of researching, analysing, and picking investments that correspond to the company's investment plans and customer objectives. These firms also manage the funds' investments, investing in a variety of investment alternatives such as stocks, real estate, securities, gold, bonds, and debt (conventional or alternative investment assets). These firms are regarded as fund managers in the industry because they determine where to invest the money that has been pooled. This is a massive sector in terms of both turnover and global distribution. According to a PWC study: "*If interest rates remain relatively low globally and economic growth is sustained, our projections foresee AuM growing from US$84.9 trillion in 2016 to US$111.2 trillion by 2020, and then again to US$145.4 trillion by 2025. Growth will be uneven; on a percentage basis, its slowest in developed markets and fastest in developing markets"* (PWC, 2022).

Graph 2: Global AuM by region in USD trillion Base Scenario



Source: PWC, Asset & Wealth Management Revolution

Instead, in the European market, there has been a robust growth tendency that has followed the worldwide trend, moving at a slower rate. The war in Ukraine, combined with the European Central Bank's increase in interest rates, has marginally hampered the sector's expansion, which is likely to recover to normal levels within a few months. The total assets under management (AuM) in Europe grew to EUR 32,2 trillion at the end of 2021, with a -11.8% due to the causes described above reaching a final value of EUR 28,4 trillion (EFAMA, 2022). Asset management in Europe is mainly concentrated in six countries, which are responsible for almost 85% of the asset management activity. The UK is the largest European asset management market, followed by France, Germany, Switzerland, the Netherlands and Italy. This concentration can be explained by the presence of large financial centres in those countries.

Even in the midst of the most severe financial crisis, the asset management business remains a rock of stability. The current rise in interest rates certainly makes borrowing money more expensive, making it more expensive for these businesses to operate. Despite this, the industry has always demonstrated exceptional resilience in the face of external disasters. According to the OECD: *"The global asset management industry was severely hit by the worldwide financial crisis in 2008, with all regions suffering a severe contraction in assets. According to EFAMA, the value of assets professionally managed in Europe suffered a fall of 21%, from EUR 13.6 trillion at end 2007 to EUR 10.8 trillion at end 2008. Thanks to the stock market rally and the recovery of net inflows into UCITS, the value of assets under management (AuM) bounced back in 2009 to an estimated EUR 12.8 trillion at end 2009."* (OECD Journal: Financial Markets Trends, 2011).

1..1.2 Business Model and value drivers

Capital management for the aim of investment and return necessitates a well-defined corporate structure and business strategy, which may vary depending on needs. Overall, an asset management business model seeks to provide value to clients' investments by successfully managing them, providing personalised investment solutions, and producing higher investment returns within risk constraints. However, before delving into the asset management firm model in depth, I believe it is necessary to provide an overview of it. The business model defines the set of elements by which an economic initiative develops, conveys to others, and collects for its own profit the value gained from transactions with third parties (Caroli, 2017). There are therefore several elements that need to be studied and analysed in order to run a business effectively and efficiently. The main ones are:

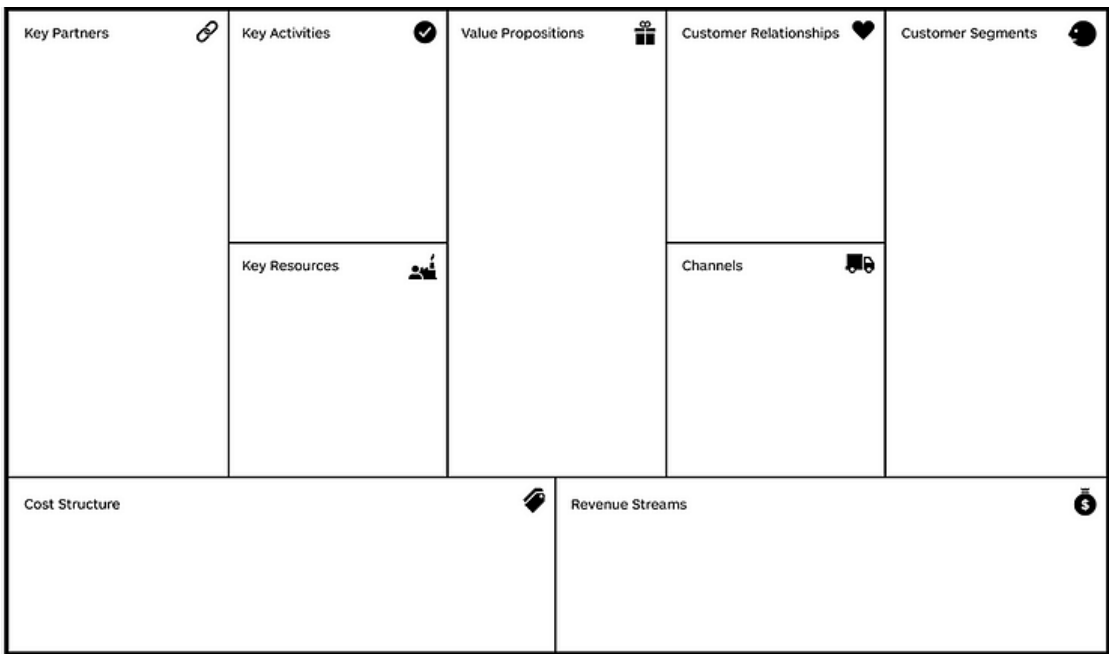
- Value Proposition
- Key Conditions
- Profit Proposition

Their harmonious coexistence in a society allows with high probability the attainment of goals (Michael Morris, 2005). However, it is not only a description of how the company operates. It also has in it a forecast of the future and what stakeholders may want from the company itself. According to Teece, a business model is the *"management's hypothesis about what customers want, how they want it, and how an enterprise can best meet those needs, and get paid for doing so* (Teece, 2010)*"*. This notion is critical since it is widespread in all types of industries and societies, and its study throughout time allows for an optimal understanding of the evolution of each sector, particularly in identifying which business models contribute to long-term success. Obviously, a business model changes dramatically over time, and its adaptation is critical to the company's survival in an ever-changing macro-environment. This is known as "business model innovation" and it occurs when a company adopts a new approach to commercializing its underlying assets or to addressing the potential for further growth into adjacent markets and industries, and it is at the centre of a significant set of entrepreneurial and industrial opportunities (Alfonso Gambardella, 2010). It entails rethinking and reinventing the basic components of how a company runs and provides value to its consumers. While product and service innovation focus on improving individual items, business model innovation examines innovative ways to structure and organize the entire firm. Changes in revenue streams, cost structures, client segmentation, distribution routes, collaborations, and value chain activities are all possible. Businesses must innovate their business models in order to remain competitive and adapt to changing market circumstances. It can result in disruptive breakthroughs, new revenue streams, increased consumer happiness, and long-term competitive advantages.

However, it necessitates a willingness to question established ideas, think creatively, and try out new approaches.

After this general description, it is appropriate to describe the various points at which a business model is composed using its most famous formulation, the Canvas business model. The business model Canvas, as described by Osterwalder in the original formulation, divide an organization's business model into nine interconnected components: customer value proposition, segments, customer relationships, channels, key resources, key activities, partners, costs and revenues (A Osterwalder, 2010). It is visually represented by a set of sections where each one succinctly lists the previously mentioned points. The Canvas is a strategic management tool that provides a visual representation of the key components and activities of a business. It allows entrepreneurs and managers to analyse and design the fundamental elements of their business model, allowing a general overview of the firm. The Business Model Canvas, by visualizing and analysing these nine building elements, assists entrepreneurs and managers in understanding the interdependence and alignment of their business components. It helps with strategic decision-making, innovation, and identifying potential gaps or opportunities for development in the business model.

Table 1: Business Model Canvas Representation



Source: Medium

The thorough examination of a business model over time is also useful for assessing the evolution of a company and its industry over time. One of the goals of this thesis is to comprehend, through the evolution of the business model, how asset management has changed over the past few years and how

new technologies will have the opportunity to enter this context and alter it in the future. As stated previously, asset management firms have a unique business model that extends beyond the simple raising and investment of capital. The business model of asset management firms revolves around managing investment portfolios and providing financial services to clients. Here are the key components represented with a Business Model Canvas:

Table 2 Asset Management Companies Business Model Canvas

Source: Own elaboration

The model described above is the most recent iteration of a process that has been ongoing for decades and will endure an even more rapid evolution in the coming years as a result of the new technologies and systems that will be analysed in this thesis. It is the traditional version of today's asset management firms, such that the organizational and financial structure of the industry in question can be comprehended and observed with a singular perspective.

In conclusion, asset management firms provide clients with value through investment management, portfolio construction, and risk management. They seek to produce attractive risk-adjusted returns, preserve capital, and assist clients in achieving their financial objectives. By aggregating the resources of numerous investors and assisting individuals in diversifying their financial holdings across a variety of assets, these firms can mitigate risk. Risks are evaluated and monitored by asset managers based on historical performance. This structure generates multiple revenue streams: Customers typically pay Asset Management companies (AMC) a fee calculated as a percentage of the entire AUM. Portfolio Management Services (PMS) revenue from AMCs. Individual securities are

purchased when investing in PMS. AMCs generate revenue from the PMS fees they levy, which fall into three categories: Entry Load, AMCs may assess a 3% entry load when the PMS is acquired. Administration Fees Each PMS plan also collects an administration fee or charge. It is assessed quarterly to the PMS account and can range from 1% to 3%. In addition to a fixed charge, a small number of PMS schemes also provide profit-sharing revenue, wherein the AMC provider retains a portion of the return garnered by the fund as a fee or profit (McKinsey&Company, 2013).

1..1.3 Categories of Asset Classes

Collective investment has a fundamentally different foundation than individual or corporate investment. As previously described, collective asset management firms employ a sophisticated system of diversification and return-to-risk balancing. Diversification centres on the various categories and investment opportunities available to these corporations with their available capital. There are two general macro-categories: conventional investments and alternative investments. "Traditional" investments are asset classifications that refer to categories of investments such as stock (Niels Bekkers, 2009). They are considered Traditional asset classes that refers to the main categories of investment assets that have been historically recognized and widely used by investors. These asset classes represent different types of investments that have distinct characteristics and risk profiles. The main traditional asset classes include stocks, bonds and cash and cash equivalents. In addition to this, the financial system has broadened its investment spectrum by adding further possibilities outside the financial markets. Asset classes such as corporate equity, commodities or real estate are becoming increasingly popular among investors because of higher returns and lower risk, although they usually have a longer time horizon (Hardeep Singh Mundi, 2023). Moreover, alternative investments often require a higher level of due diligence and may have limited liquidity compared to traditional investments. They are typically more suitable for sophisticated investors who can bear the associated risks and have a well-diversified investment portfolio. However, this topic will be detailly expanded in the following paragraphs and chapters. Here are some common types of alternative investments (Scharfman, 2020):

- **Hedge Funds**: Hedge funds pool funds from multiple investors using both long and short positions, leverage, derivatives, and other techniques;
- **Private Equity**: involves investing in privately held companies with growth potential, often aiming to buy a controlling stake and then selling it at a profit. In this case, the company practically intervenes in the management of the acquired company, not only as a passive investor of capital;

- **Venture Capital**: these funds invest in early-stage companies (so-called startup) with high growth potential providing financing in exchange for an ownership stake;
- **Real Estate**: purchasing properties for income generation or appreciation. This can include both residential, commercial, or industrial properties, as well as real estate investment trusts (REITs) (Allen, Madura, & Springer, 2000);
- **Commodities**: physical goods like gold, silver, oil, natural gas, agricultural products, and more. Investors can gain exposure to commodities through commodity futures contracts, commodity-based exchange-traded funds (ETFs), or direct ownership (Elie Bouri, 2020);
- **Art and Collectibles**: investing in art, rare collectibles, and antiques has gained popularity for the significant appreciation over time;
- **Cryptocurrencies**: decentralized digital currencies that use cryptography for security and operate on blockchain technology.

Despite this strictly academic and rigorous division, asset management companies of today have moved away from the traditional nature of investments and are seeking alternative return opportunities. Thus, the focus is determined solely by the requirements of the target investors in terms of time horizon, risk exposure, and specific sector preferences (such as investments in environmental and social sustainability or exclusion of certain industries, such as the military industry). Despite this, the current investment categories are extremely diverse and have the potential to generate significant growth in the real economy.

1.2 Business Model Evolution

In the first chapter, a standard academic structure of an asset management company was examined as an example. The actuality is manifestly different, consisting of adaptability based on market trends, macroeconomic conditions, and new investment opportunities. In addition to the various asset classes from which the fund can choose, there are also a variety of methods in which companies can operate, offering a variety of investment modes and innovative practical solutions.

The main processes of an AMC typically include (PwC, 2018):

1. **Client Onboarding**: acquiring new clients and gathering relevant information about their financial goals, risk tolerance, investment horizon. The company establishes a formal agreement detailing the scope of services to be provided.
2. **Investment Strategy Development**: Asset management companies work with their clients to develop personalized investment strategies tailored to their individual needs.

3. **Portfolio Construction**: Based on the agreed-upon investment strategy, the asset management company constructs portfolios by selecting a mix of assets, both traditional and alternative.
4. **Investment Research and Analysis**: Asset management firms conduct extensive research and analysis on various financial instruments and markets to make informed investment decisions.
5. **Risk Management**: practices to mitigate potential losses and ensure that portfolios align with the client's risk tolerance (diversification, hedging strategies, market risks).
6. **Trading and Execution**: Once investment decisions are made, AMCs execute trades on behalf of their clients.
7. **Portfolio Monitoring and Rebalancing**: Regular monitoring of the portfolio's performance, tracking the investments and compare their performance against relevant benchmarks. If necessary, they rebalance the portfolio by adjusting asset allocations to maintain the desired risk-return profile.
8. **Reporting and Communication**: regular reports to clients.

Classical asset management firms employ the "product provider" model, in which the client, of whatever form, provides capital and the company provides an investment product. The value proposition presented to the client is the optimisation of the selection of the product that best meets their requirements and is capable of delivering a return commensurate with their expectations. In this context, the product is understood to be an asset class to which the investor (the client) allocates capital through the fund's mediation. In this situation, there is a significant information asymmetry between the company and the client. The same is true of the "Solutions Provider" business model, in which a company offers comprehensive coverage of products and services through a singular point of contact (Julian Marius Müller, 2018). The consumer is provided with additional knowledge to enhance efficiency and performance. A solution provider's business model refers to a company that offers comprehensive solutions to address specific customer requirements or problems. Instead of focusing on the sale of individual products or services, solution providers offer end-to-end solutions that incorporate multiple components, technologies, and services to provide a comprehensive solution. Nonetheless, the two business models share two essential characteristics: scalability and expertise. Providers of solutions and products design their products to be scalable and adaptable to consumers of various sizes and industries. They are able to satisfy a variety of requirements and expand their product line to reach a larger market. Moreover, they have extensive domain knowledge and expertise in the industries in which they operate.

However, the industry has evolved over time to serve and provide clients with a variety of solutions. In accordance with the prevalent trend, numerous asset management companies have adopted a business system known as platform provider. The business model of a platform provider is a company that constructs and operates a platform where multiple users or participants can interact, trade goods and services, or conduct transactions. The platform itself functions as an intermediary, connecting and facilitating interactions between the various parties. With the emergence of digital platforms and the sharing economy, this model is becoming increasingly popular. The primary success factors in this case are technology, data administration, and distribution reach. In this solution, the client is afforded a greater degree of autonomy in decision-making and the administration of their investments in real time; as a result, the client is typically more competent. In terms of the structure of the business model, there is also a distinction between revenue streams. This business model can generate revenue in numerous ways (Giessmann & Stanoevska-Slabeva, 2012), these are the most common ones: transaction fees, charging a percentage or fixed fee on transactions conducted through the platform. Subscriptions or membership fees, charging users a regular fee for access to premium features, enhanced services, or exclusive content. licensing or partnerships, collaborating with other businesses or individuals and charging licensing fees for the use of the platform's technology, data, or brand.

An additional phase to observe is that of external data providers for investment firms, i.e., companies that provide valuable data and analysis to asset management firms. These businesses rely on precise and timely data to make intelligent investment decisions. Data providers compile information from a variety of relevant sources, including financial markets, stock exchanges, regulatory documents, and news reports. They aggregate and normalize the data into a structured format for analysis using sophisticated technologies and algorithms. As a result, they have become an indispensable instrument for all asset management firms, providing highly specialized and useful investment services for the underlying asset classes. Bloomberg, FactSet, Morningstar, and Refinitiv are examples of data suppliers in the asset management sector. These companies provide a vast array of financial and market data, analysis, and research to assist asset management firms in gaining knowledge, optimizing their investment strategies, and maintaining market competitiveness. In addition, there has been a growing integration of the two processes, that of data acquisition and analysis with investment companies' standard investment processes. New large corporations have emerged offering solutions that integrate their data with their clients' asset management systems or platforms. This integration enables asset managers to seamlessly access and utilize data within their existing workflows. Additionally, data providers offer customisation options, allowing asset managers to modify the data to their particular requirements and preferences. However, there is a significant issue: the organizational and cost structure. As one might expect, the administration of such a system

necessitates a sizeable workforce and infrastructure. In addition, the company's primary competencies would be diminished or confused by a more complex business system. This resulted in the emergence of asset management firms with a very specific business model, the 'Data and Infrastructure Providers'. Order Management System (OMS), also known as "Trade order management system", is a form of software used for the management and execution of trades between two parties. The trade of securities, bonds, currencies, stocks, and other assets is possible. The software is used to track the execution process of their order. Otherwise, there are the Portfolio Management Service (PMS), that is a professional financial service where portfolio managers and stock market professionals manage an equity portfolio with the assistance of a research team and strong analytical tools. It enables investors to make decisions that are supported by extensive research and factual data.

The so-called “capital provider” is the final component observed across the various business model configurations. The capital provider business model describes a company or entity that provides financial capital to individuals, businesses, and other entities in need of funds. A capital provider's primary function is to distribute capital in exchange for a monetary return, such as interest, equity participation, or other forms of return on investment. In this instance, the activity of asset management firms is not limited to raising and investing capital, but also occurs subsequently. Moreover, asset management funds provide capital to external entities, such as investment banks and other institutional investors.

Chapter 2: AI for Asset Management firms with a focus alternative investments (Framework and topic details)

2.1 Alternative Investments

2..1.1 History and Asset Classes

What was said in the previous chapter about the various asset classes provided a general overview of the topic that will be discussed in this chapter in much greater depth. This chapter's other objective is to introduce the research topic and research query, as well as the first details on the topic and the results to be investigated. The importance of alternative investments in the portfolios of asset management firms and other institutional investors is growing. As described previously, an alternative investment is a financial asset that does not fit into a conventional investment category. Conventional asset classes include stocks, bonds, and cash. Private equity or venture capital, hedge funds, managed futures, art and antiquities, commodities, and derivative contracts are examples of alternative investments. Additionally, real estate is frequently categorized as an alternative investment. In addition to non-traditional approaches to investing in special vehicles, such as private equity funds and hedge funds, alternative investments also include non-traditional approaches to investing in non-traditional vehicles. These funds give the manager the freedom to employ derivatives and leverage, invest in illiquid assets, and take short positions. The assets in which these vehicles invest may include traditional assets (stocks, bonds and cash) and less traditional assets (Mehta, 2021). Management of alternative investments is typically active. To sum up, the main differences between traditional and alternative investments are:

- Underlying object of investment;
- High minimum investments and fee structures: Alternative assets may have high initial minimums and upfront investment fees; transaction costs are typically lower than those of conventional assets due to lower levels of turnover;
- Type of client and investment objective: as alternative asset investments are more expensive, only a small number of specialized funds (Private Equity or Venture Capital) or large institutional investors enter this sector;
- Time Horizon: alternative investments typically have a significantly longer time horizon and a strong illiquidity theme that prevents the investor from rapidly converting the investment into capital. Typically, these products offer higher returns but have a prolonged maturity;
- Investment strategy: this particular asset class rarely permits passive investments, such as ETFs or equity packages. The investor in question actively pursues alternative investments, non-traditional approaches to investing within special vehicles, such as private equity funds

and hedge funds. These vehicles provide the manager with the flexibility to employ derivatives, leverage, and short positions. In addition, a prior process of due diligence is required to establish the investment's validity and safety.

This division may appear artificial and solely academic, but there is a significant financial disparity that should not be overlooked. The asset classes described above have distinct correlations than other options. Asset correlation is a statistical measure of the relative movement of investments. This measurement ranges from -1 to +1, where -1 represents a perfect negative correlation and +1 represents a perfect positive correlation. A correlation of 0 in this range indicates that the performance of these assets is completely uncorrelated. This indicates that the price fluctuations of one asset have no effect on the prices of other assets. This concept fits flawlessly with the portfolio diversification theory described in the introductory pages of this thesis.

Table 3: Correlation matrix

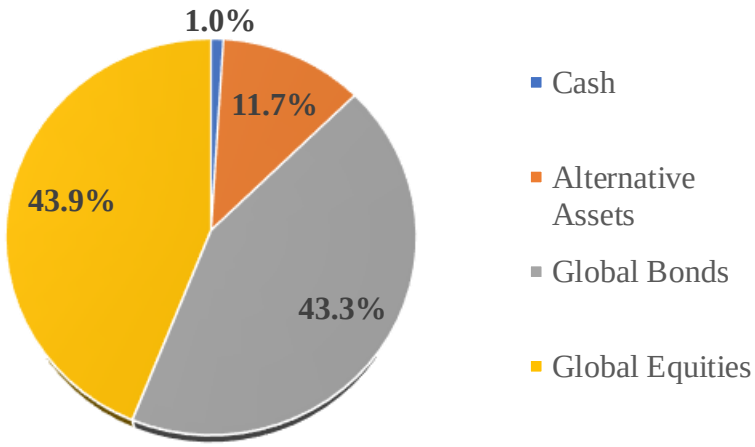
	Equus	S&P/ASX 200	REIT's	MSCI$A	Composite Bonds	Cash	S&P 500	Gold	AUDUSD
Equus	1.00								
S&P/ASX 200	0.09	1.00							
REIT's	0.11	0.62	1.00						
MSCI$A	-0.03	0.55	0.29	1.00					
Composite Bonds	0.16	-0.26	0.11	-0.25	1.00				
Cash	0.21	-0.09	-0.12	-0.14	0.14	1.00			
S&P 500	-0.06	0.72	0.44	0.72	-0.37	-0.15	1.00		
Gold	0.10	0.03	0.06	0.12	0.12	0.09	0.01	1.00	
AUDUSD	0.03	0.41	0.18	0.50	-0.30	0.00	0.55	0.40	1.00

Source: IRESS

As shown in the preceding graph, which explains the distinct correlations of various asset types, gold (a commodity included in alternative investments) has an almost zero correlation. All investment categories, particularly equities, are typically compared to the S&P 500, an index comprised of some of the 500 largest US companies by market capitalization. Gold has virtually no correlation with the S&P 500, so it is wholly unaffected by price fluctuations in this stock index. Similar circumstances exist when comparing securities with certain bonds or stock indices, although there are notable differences. According to Pimco Investment: *"In the short run, stocks and bonds tend to respond in opposite directions to fluctuations in investor risk appetite. During flight-to-safety episodes we observe the familiar negative correlation. However, in the long run, secular trends in growth, inflation and interest rates may have similar effects on stock and bond returns, inducing a positive correlation."* (Pimco, 2013).

This lack of correlation distinguishes alternative investments significantly from traditional investments. Incorporating such assets into the portfolio of these funds can significantly increase its diversification and prevent the portfolio as a whole from losing value during severe systemic financial crises. Obviously, not all asset classes fit under the umbrella term 'alternative investments,' and it is worthwhile to consider how investors and funds allocate capital within this category.

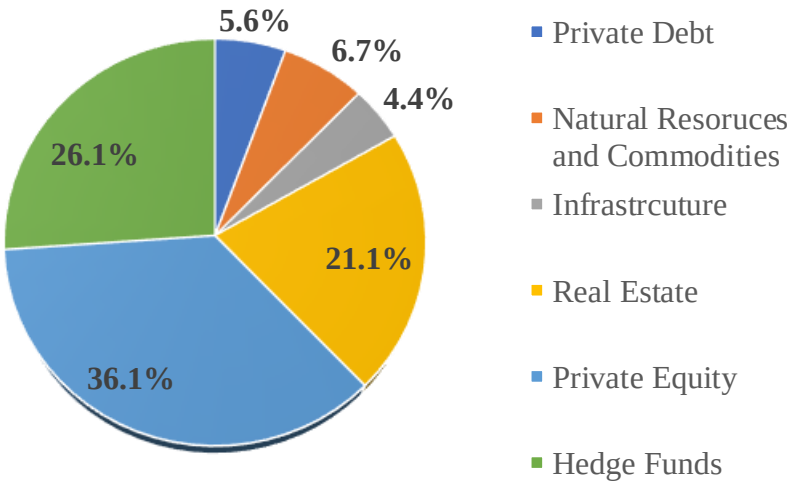
Graph 3: Global Assets allocation



Source: CAIA Association, The Portfolio for the Future

Approximately 11.7% of total assets are currently allocated to alternative investments. It is also a rapidly growing quantity, given the recent emergence of such assets and the reluctance of more conventional investment funds to include them in their portfolios.

Graph 4: Alternative Assets Composition



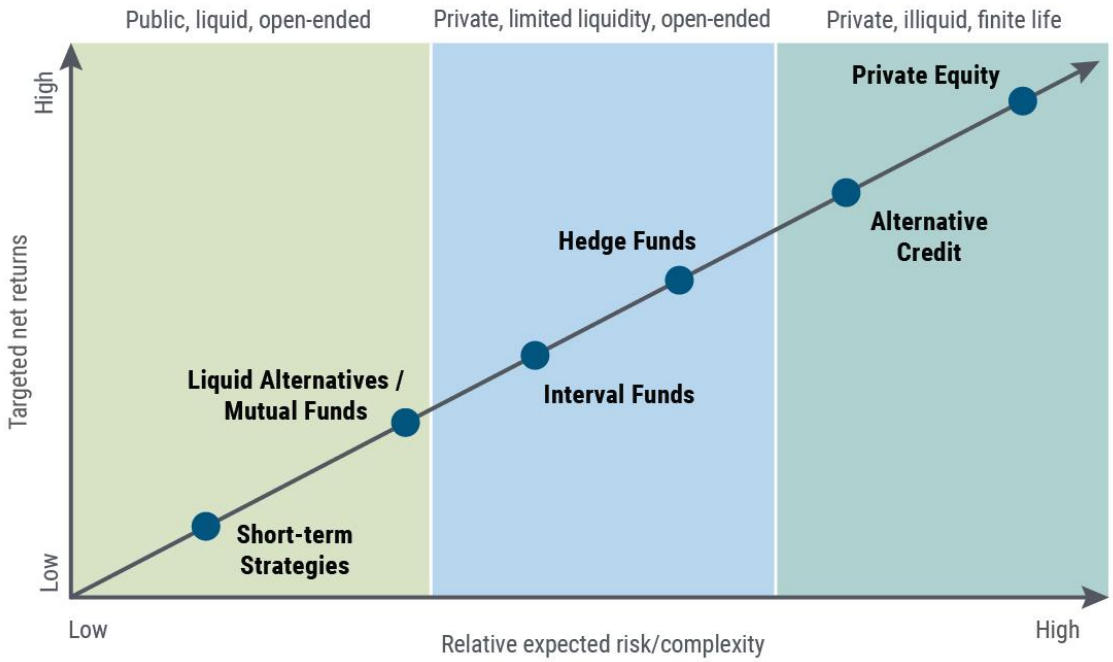
Source: CAIA Association, The Portfolio for the Future

The table below details the current composition of alternative investment assets. Due to its extended existence within the global financial landscape, private equity continues to hold the top position. Real estate, on the other hand, is declining as hedge funds and other financial entities such as cryptocurrencies gain market share.

2..1.2 Transaction Costs and returns

After explaining the various general differences between traditional and alternative investments, as well as the rationale behind investors' choice to allocate capital in the latter asset class, this section will discuss a detailed analysis of the financial returns on the assets in question.

Graph 5: Return targets and risk levels differ across alternative strategies and vehicle types.



Source: PIMCO as of 31 March 2021. Return reflects a 60/40 portfolio represented by 60% U.S. equities and 40% U.S. core fixed income.

The chart above clearly shows how different asset classes offer different risks and return expectations. The most interesting theme is certainly private equity, which has performed significantly better in recent years than, for example, investments in stocks. According to STRATA: *"In the 20-year period ending in 2022, average annual returns for private equity investments were around 14.75%, compared to 9.25% for the S&P 500 and 8.84% for the Dow Industrial Average"* (STRATA, 2023). One of the main reasons behind this strong growth of the sector stems from the high stability of the market and its strong resilience even in times of high market volatility. One of the most striking

examples is the financial crisis of 2007/2008, where the S&P 500 recorded a net loss in value of 55% until 2009. During this period, on the other hand, the private equity industry suffered a net loss in deal value of 28%; still a decrease, but significantly less than the stock market (CAIA, 2023). Even more significant is the gold price. As described in the preceding section, gold has no correlation with the stock market; therefore, a decline in the stock market should not affect the price of gold. However, during periods of severe economic and financial volatility, this alternative asset class has been observed to have a negative correlation with the stock market. Consequently, when demand and stock prices decline, the price of gold rises because investors demand for this precious asset is driven by its security. In fact, gold is referred to as a'safe haven asset,' which is an asset purchased by investors in times of financial market uncertainty because its price will never experience a precipitous decline. As stated by the U.S. Bureau of Labor: *"After rising 2.6 percent in 2008, the PPI for gold increased 12.8 percent in 2009 […]. The extraordinary moves by the U.S. Federal Reserve to inject liquidity into the economy helped lower the value of the dollar, often seen as one of the main alternatives to gold. As a result of the economic contraction and monetary easing, investors, searching for a vehicle that would maintain their total assets' value, poured money into gold, further enhancing its value in the weak economic environment"* (BLS, 2013).

A very similar episode also occurred with the COVID-19 pandemic crisis. In the March 2020 financial crash, global equities fell by at least 25% and 30% in most G20 countries. On 20 March, Goldman Sachs warned that by the end of the second quarter of 2020, US GDP would contract by 29% and unemployment could rise to at least 9% (Maretno Agus Harjoto, 2021). On 28 February 2020, stock markets in every country drastically decreased, the biggest crash since the 2008 financial crisis. Oil futures also fell sharply. During the days between 24 and 28 February 2020, therefore, all stock markets fell several percentage points globally, while the loss of indices on Wall Street was more than 10%. This pattern persisted throughout the year and nearly through the end of 2021. This event had a profound impact on the stock market in addition to several traditional asset classes. In the context of a global economic downturn, private equity initially bore the brunt of the financial crisis, but soon recovered and increased its investment volumes and activities. Based on the market value of transactions, the private equity market increased by 8% year-over-year despite the pandemic. The pandemic, which caused economic disruptions across all industries, had an effect on company valuations. Uncertainty regarding future earnings and cash flows increased investors' risk aversion, resulting in decreased valuations for companies pursuing private equity investments. This has enabled large funds with high liquidity to increase the number of transactions and investments, acquiring stakes and shares in companies at prices below pre-COVID-19 levels. Despite the difficulties, the pandemic has created new investment opportunities in certain industries. During the economic crisis,

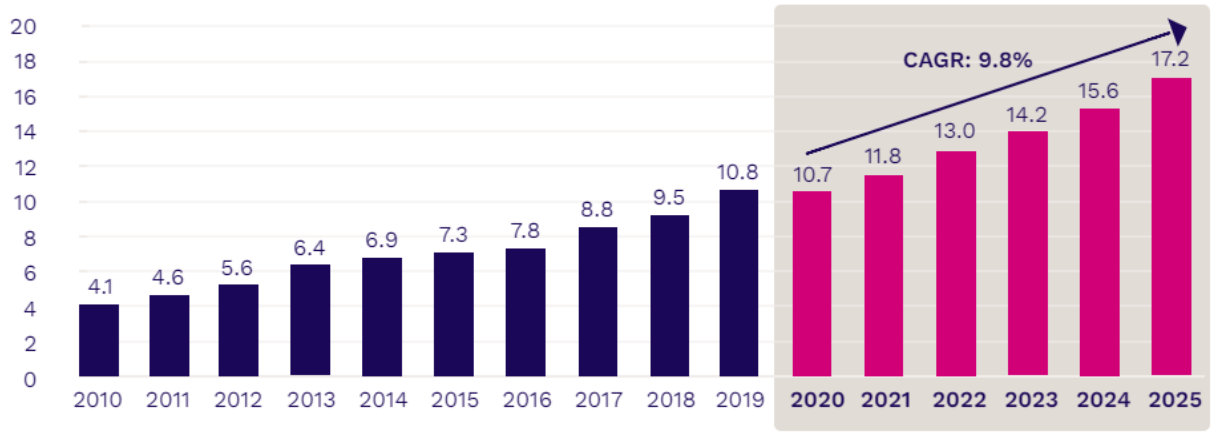
technology, healthcare, and e-commerce companies experienced increased demand and expansion. Private equity firms that were well-positioned and had expertise in these sectors were able to identify and capitalize on these opportunities (Deloitte, 2020).

In summary, the primary assets of alternative investment categories have historically generated higher returns because, unlike the stock market, they have rarely experienced extended periods of steep declines. However, the most important factor is the relationship between risk and return. Alternative investments offer the potential for significantly higher returns than comparable listed securities, but investors must engage in extensive due diligence and transaction-by-transaction analysis. Therefore, even for alternative investment categories, the risk-return ratio is heavily influenced by the investment's risk. This risk is greater because it is more difficult to reduce company-specific risk through diversification. Due to a nearly unique allocation to this type of investment, specialized funds (such as hedge funds, venture capital funds, and private equity funds) are simpler to diversify. For instance, a venture capital fund may decide to focus on specific industries or to invest proportionally in various startups. Typically, however, traditional asset management firms must employ a particular strategy. Alternative Investments ought to be made with an investor's discretionary finances, i.e., capital that an investor can lose without it having an impact on their major personal responsibilities and their capitals. Thus, alternative investments could result in an increase of the investment-specific fundamental risk as well as an increase of the cost structure (analysed from the perspective of the business model) due to high transaction costs.

2..1.3 Alternative assets under management and future trends

In addition to the strong diversification they bring to investment funds, alternative investments have been immensely successful over the years due to the historical returns observed over time. In order to conclude the discussion and prepare for more in-depth analyses of the topic, it is necessary to assess the current state of alternative investments and the prospects for the sector over the next few years. The market for alternative assets has grown consistently in recent years and is now an essential component of the current financial environment. The sector's AUM are at an all-time high, and investors and fund managers' interest in alternatives has consistently increased over time.

Graph 6: Alternative Assets under Management ($tn)



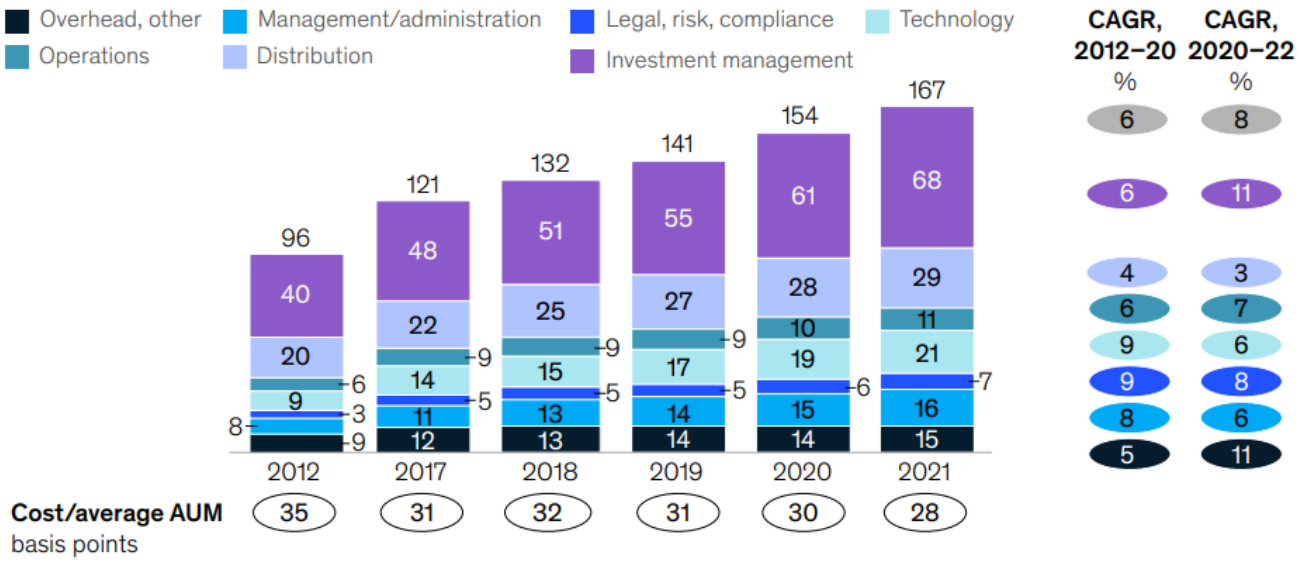
Source: Prequin, The Past, Present, and Future of the Industry

The preceding graph clearly illustrates two important points. The first relates to the year 2020 and plainly illustrates how the flexible reduction in investment due to the COVID-19 pandemic resulted in only a slight decrease in AUM. The industry then recovered promptly in 2021 and is anticipated to grow steadily over the subsequent years, with a CAGR of nearly 10% from 2021 to 2025 (Prequin, 2021). Investor demand expansion has been the industry's primary growth driver. Alternative assets have become a substantial portion of the portfolios of many institutional investors and are no longer the exclusive domain of a small number of savvy investors. In 2018, more than 11,000 investors invested in alternatives, compared to 3,500 in 2008. In the next five years, nearly 84% of investors plan to increase their capital commitment to alternative assets. It is possible for industry expansion to continue for a very long time (Cote, 2021). The growth of emerging markets will be another crucial factor. Southeast Asia, China, India, and Brazil in particular are playing an increasingly significant role as the focus of investment opportunities for fund managers looking to deploy capital as well as a source of capital from investors allocating to alternatives.

Despite the strong propensity to invest in the sector and the high expectations, there are impending negative factors to consider. The disruption of 2022 has had a significant impact on the financial performance of asset managers, although the sector has recovered very well over the past year. In addition, costs have increased due to inflation. Asset managers continued to invest in and enhance their expertise in areas such as private markets, ESG integration, and digital transformation. The foreseen consequence was significant pressure on average profit margins. Between Q4 2021 and Q3 2022, the 40 largest asset managers in the globe reported a 14.9% decline in AUM, a 22.9% decline in revenue, and a 12% decline in operating margin (Lee, 2023). According to EY modelling, the industry profitability outlook is clearly on the decline. The trends described at the beginning of this section were aimed at outlining how the industry is protecting itself from the most important issue of the coming years, cost growth with direct impact on the profitability of asset management companies.

According to Olwyn Alexander, PwC's global asset and wealth management leader: *"There's a lot of cost pressure in the industry now and margin pressure that's forcing managers to look at their critical mass, and particularly with these pressures from the very big managers in the industry, whether they can withstand that as well as maintain margin."* (Alim, 2023). Almost all of the managers predicted that environmental hazards and geopolitics will further harm their assets under management. They listed inflation, market volatility, and interest rates as the main causes of the decline. With a series of high-profile mergers and acquisitions, the global asset management business has been quickly entering into agreements to address these challenges and try to tap new clients or areas of growth. Consequently, the consolidation of the industry would seem to be the most direct consequence of this process, with the main aim of lowering structural and management costs. According to the survey, which gathered data from 70 companies in North America, Europe, and the Asia-Pacific area, the average cost of managing each dollar of assets under management has increased by 4% since 2014. Spending on compensation for people also increased at the same time (Segal, 2019). According to the analysis, pay and other benefits for employees outside of the top ranks increased by 5% in the previous year. Senior executives' expenses increased less, by 3%. According to Walters, these figures also reflect an increase in business recruiting. Another important factor to consider is the decline in management fees. Asset managers must adjust to a new reality in which costs are increasing and fees are decreasing. To remain competitive, businesses must make substantial investments in technology and innovation, and as managers deal with more stringent regulatory requirements and the effects of ever-more-complex products, legal and compliance costs have escalated.

Table 3: Total North American asset manager spend by function (estimate), 2012–21, $ billion



Source: McKinsey Performance Lens Global Asset Management Survey

The main takeaway from this discussion is the decreasing profitability of the entire industry, dictated by macroeconomic and structural factors that require innovative solutions to grow in the future.

The following chapters, as well as the research question itself, will explore specific systems of innovation (in terms of business models) to increase the profitability of the sector and, in particular, asset management firms investing in alternative assets, such as those described above. The technological aspect is unquestionably the most essential, and the greatest potential for cost reduction and efficiency can be realized through the introduction of significant innovations. The quantum leap has begun to be driven by innovations such as artificial intelligence, machine learning, data collection and processing, and mechanized process automation. These technologies have the potential to create efficiencies and reduce costs, particularly in the front office and sales and customer service. Managers who have not yet increased their investment in technologies and analytics that improve the investment process and distribution function will fall behind. There are four primary technological areas where asset managers can concentrate their efforts to increase profitability via technological advancements (Asset, 2022):

- Internet of Things (IoT): For asset management, the Internet of Things has become a trending phenomenon. As it is compatible with sensors and cloud platforms and provides valuable information. IoT is efficient and utilized across all industries.
- Data analytics: Data analytics is essential to asset management because it enables investment professionals to make informed decisions, optimize portfolio performance, manage risks, and increase overall efficiency. It is an integral component of contemporary asset management, enabling professionals to utilize data-driven insights to make better investment decisions, manage risks, and effectively meet client expectations. The asset management industry will increasingly rely on data analytics as technology and data processing capabilities continue to advance.
- Cloud Technology: Cloud infrastructure enables asset management companies to rapidly scale up or down their resources based on their requirements. This scalability enables them to manage large amounts of data, facilitate growth, and adapt to shifting market conditions without requiring substantial up-front hardware and infrastructure investments. Market data, portfolio information, and client data are just a few of the vast quantities of data that asset management firms manage. Cloud technology offers secure and cost-effective storage solutions, allowing businesses to centralize and organize their data storage and access.

- Artificial Intelligence (AI): Utilizing AI to facilitate analytics, businesses seek measurable bottom-line impacts. The flows of asset managers who have implemented distribution analytics models (e.g., propensity to buy and next best product) have increased by up to 20 percent annually, while redemptions have decreased by 5 to 8 percent (McKinsey, How asset managers can create strategic distance with technology, 2023). Early efforts to use generative AI in investment management have primarily centered on assisting advisors to respond to customer questions more swiftly and accurately, and to provide consistent advice based on the firm's own research. Because these analytics rely on timely, high-quality, and easily accessible data, prominent companies are also modernizing their data infrastructure.

Few asset managers have begun investing in technology to propel development thus far, presenting a significant opportunity for leaders in this field to expand their advantage. Those who have adopted this strategy have rejected the notion that technology is a facilitator of business strategy or, worse, a cost center. It should rather be viewed as a development accelerator. According to a McKinsey report, only a handful of the industry's leading asset managers have implemented these technologies and serve as prime examples of what is possible and how to gain a competitive advantage. On the basis of these analyses, they estimated that an average asset manager who makes comparable technology investments could increase efficiency and operational performance by up to 30%, while launching new products in as little as one-fifth of their previous time to market, or even faster (McKinsey, How asset managers can create strategic distance with technology, 2023).

Table 4: Top performers Asset Managers

Benchmarks of top-quartile and average firms[1]		Top quartile[2]	Survey average
	Assets under management (AUM), $ billion	1,859	1,073
Performance	Profit margin, %	**48**	**35**
	Long-term net asset flows, %	**2.7**	**3.8**
Technology	Technology costs/AUM, basis points	**2.3**	**2.6**
	Technology costs/revenue, %	**7.5**	**8.1**
	Application costs, % of total tech costs	**53**	**46**
	Growth in tech costs 2020–21, %	**15**	**6**
Operations	Operations costs/AUM, basis points	**1.2**	**1.4**
	Operations costs/revenue, %	**4.0**	**4.5**
	Outsourced operations costs, % of total operations costs	**26**	**23**
	Growth in operations costs 2020–21, %	**11**	**7**

Source: McKinsey Performance Lens Global Asset Management Survey 2022 (McKinsey, 2022)

The relevant data illustrates how top-performing asset managers have consistently invested in technology in recent years. The following paragraph will instead examine the introduction of AI to the asset management industry, with a focus on alternative investments and their implementation in terms of business models.

2.2 Artificial Intelligence in Asset Management

2..2.1 General Overview

AI is the simulation of human intelligence in machines that have been programmed to carry out duties that normally require human intelligence. It is a broad field of computer science that aims to construct intelligent agents capable of learning, reasoning, and decision-making in a manner similar to humans. AI systems are designed to perceive their environment, comprehend it, and act accordingly to achieve their goals. AI is based on the creation of algorithms and models that can process massive quantities of data, recognize patterns, and improve their performance through experience learning and pattern recognition over time (Fetzer, 1990). AI is utilized in numerous industries and fields, including finance, healthcare, transportation, manufacturing, customer service, and entertainment. Even if AI is a well-known topic since almost three decades, it has endured remarkable advancements in recent years, allowing it to become pervasively integrated into our daily lives. These advancements are a result of the exponential increase in computing power and massive amounts of data. AI's fundamental technologies can be divided into three different categories:

- Machine Learning: It focuses on the development of algorithms and statistical models that allow computers to learn and enhance their performance on a specific task without being explicitly programmed. The fundamental concept underlying machine learning is to enable machines to learn from data, recognize patterns, and make predictions or decisions based on this learning (Ashkan Fredström, 2022). This process can supervise or non-supervised.
- Natural Language Processing (NLP): it focuses on making it possible for computers to comprehend, interpret, and produce human language. NLP enables machines to interpret, analyze, and respond contextually to natural language data, such as text and speech. NLP's ultimate goal is to overcome the distance between human language and machine comprehension, allowing computers to interact with humans in a more natural and intuitive manner. Chatbox, language translators and sentiment analysis are just ones between a lot of different areas of application where NLP could bring serious advantages.
- Deep Learning: artificial neural networks with multiple layers (deep neural networks) are trained to process and learn from complex data. The term "deep" refers to the profundity of

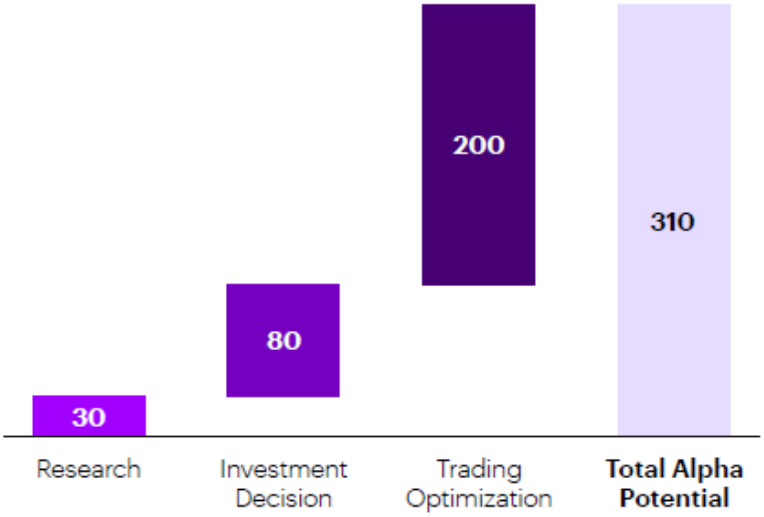
these neural networks, which comprise of multiple interconnected layers of nodes (neurons). Each network layer processes and transforms the data, extracting increasingly high-level characteristics as it proceeds deeper. Deep learning is widely used in image and speech recognition, recommendation suggestions and game playing (Shinde & Shah, 2018).

Powered by even other fundamental technologies such as computer vision, neural networks, and robotics, Artificial Intelligence is reshaping various industries and transforming the business world. As AI evolves, its potential for innovation and positive societal impact is limitless.

2..2.2 AI in Asset Management Industry

The asset management industry is on the verge of undergoing a transformative transformation fuelled by the growing potential of artificial intelligence. Due to its reliance on data-driven decision making, asset management is uniquely positioned to reap the benefits of AI's capabilities. The ability of artificial intelligence to process massive amounts of data, identify complex patterns, and adapt in real time is the key to releasing investment strategies with unprecedented efficiency, precision, and profitability. The incorporation of AI technologies into the asset management landscape promises to reshape the industry and equip investment professionals with an unprecedented capacity to navigate the complexities of today's global financial markets. In this era of abundant data, asset management firms that wish to remain competitive, enhance performance, and provide clients with superior value must adopt artificial intelligence. This paragraph explains how AI will usher in a new era of intelligent investment management in the asset management sector. As it pertains to more qualitative investment decisions, the adoption of AI in capital markets will increase. Existence of these prospective developments is already apparent. According to an Accenture research, mature firms that industrialized and scaled AI across the investment process reported up to 300 basis points (bps) of alpha (the return on investment that is incrementally greater than a benchmark index such as the S&P 500 or another suitable benchmark) collectively, which is the aggregate of alpha from the complete collection of use cases in research, analysis, portfolio management, and trading optimization (Accenture, 2020).

Table 5: Alpha potential (bps) for mature firms scaling AI



Source: Accenture Global Data Analytics / Artificial Intelligence Study 2020

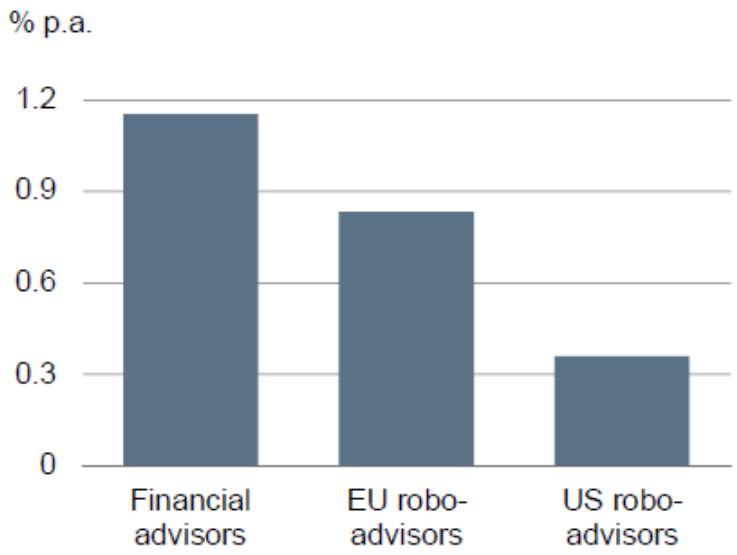
The graph shows three different application areas, which are also the processes with the greatest potential in terms of management efficiency and cost reduction.

- Research: AI can considerably improve a company's research capabilities by providing tools to process, analyze, and extract insights from immense quantities of financial data. AI can assess the aggregate sentiment of market news and social media posts pertaining to particular assets or industries. This assists asset managers in measuring market sentiment and identifying potential asset price impacts (so-called sentiment analysis). Using algorithms for machine learning, AI can construct predictive models that forecast market trends, asset prices, and macroeconomic indicators (Bartram, 2020). These models can aid in measuring investment decisions and risk management techniques. Moreover, it is capable of optimizing investment portfolios by taking into account multiple variables, risk factors, and constraints to achieve optimal asset allocation.
- Investment Decision: providing sophisticated tools and data-driven insights that enhance the accuracy, efficiency, and efficacy of the decision-making process. AI is vastly superior to humans in terms of efficacy and efficiency when it comes to recognizing patterns and making decisions in significant amounts of data.
- Trading Optimization: AI is extremely efficient in order execution (trading), where the optimal order execution strategy is deduced by learning transaction data and limit order book data of individual equities. The artificial neural network functions as a universal function approximator, capable of approximating any function given sufficient data, and demonstrates excellent performance with respect to problems of this nature. AI-based methods have assumed a more prominent role in technical analysis.

The greatest effect is observed in this final section, which focuses on trading optimization. It combines all the various factors (research and investment decision) into a single evaluation of the optimal portfolio balance and timing. Additionally, it plays a crucial function in reducing trading costs. An essential component of pre-trade analysis, transaction cost analysis determines whether trading costs are low enough for a trading signal to generate profits after deducting implementation costs. These transaction costs primarily consist of bid–ask spreads, market impact costs, and trading commissions. The only costs that cannot be observed prior to the initiation of a trade are market impact costs, which are defined as the negative impact of a trade on market prices (FSB, 2017). AI is also useful for estimating the market impact of transactions in assets that lack sufficient (or any) historical trading data, since it is nearly impossible to estimate the market impact costs using traditional approaches. About the machine learning aspect and in contrast to conventional methods of textual analysis, AI techniques enable the automated discovery of components that provide the greatest predictive capability for stock returns. These strategies leverage variables associated with the macroeconomic and corporate landscape. AI models have the potential to be effectively trained using both historical data and forward-looking data, including analysts' buy or sell recommendations and sale recommendations provided by analysts (Bew D., 2019).

The introduction and implementation of robo-advisors is one of the most prominent trends of AI in asset management. robo-advice refers to online investment guidance and portfolio management services based on algorithms and models. The guiding principle is to minimize or eliminate human intervention and identify optimal investment strategies for clients using only computer programs. Robo-advisors are fully automated online platforms that provide clients with digital financial advice and portfolio allocation (Kaya, 2017).

Table 6: Costs differences for advisors



Source: Deutsche Bank

A financial advisor's annual fees for administering a portfolio of up to USD 100,000 are typically around 1%. For comparable portfolios, US robo-advisors charge an average of 0.4%, with a range of 0.15% to 0.67%.

The deployment of AI systems can significantly enhance risk management, specifically in relation to market risk and credit risk. AI has the potential to enhance the assessment of market risk by incorporating qualitative data obtained from textual sources or imagery, such as satellite image for example. This integration enables more precise estimations of financial or economic variables at both the aggregate and firm level, surpassing the accuracy achieved through conventional data sources. In recent years, there has been a growing utilization of various AI techniques, which have been employed either in conjunction with or as substitutes for conventional methods. These techniques encompass multivariate discriminant analysis, as well as logit and probit models (Groth, 2011).

2..2.3 Alternative Investments and AI, potential and future developments

Diverse factors contribute to the exponential growth prospects of a comparable industry; in the concluding sections, general applications to the asset management industry are examined. Academic literature and practical implementations developed by investment funds over the past few years have demonstrated that alternative investments are one of the asset management industry's sectors most likely to benefit from the integration of AI efficiency systems. Their large-scale investment was constrained by high transaction costs, the impossibility of passive investing, and a significantly longer time horizon than conventional investments. If AI is able to surmount these limitations, the sector's invested capital and investment categories will likely increase. AI has also a wider range of applications. AI has both market and credit risk management applications. Credit risk is the risk of a

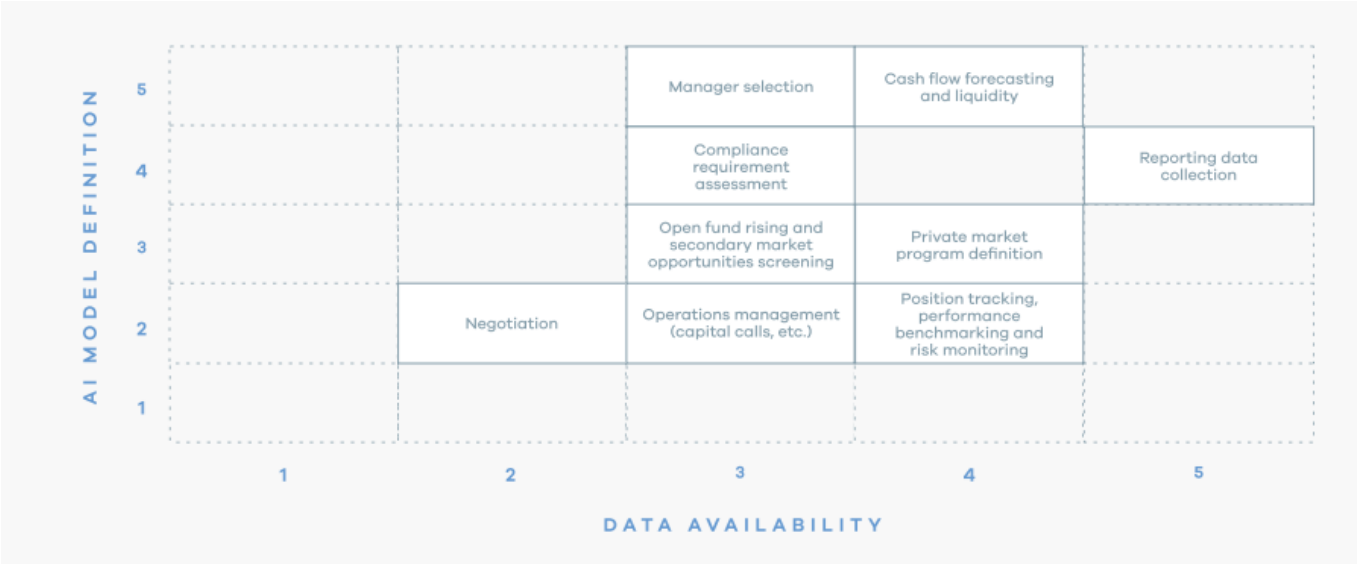
counterparty failing to fulfil contractual obligations, resulting in a loss of value. Market risk, again, refers to the probability of loss arising from aggregate market fluctuations. AI is useful to predicting financial or economic variables used in risk management (e.g., probability of bankruptcy, value at risk, interest rates, exchange rates). In the world of alternative investments, attaining long-term success requires an accurate assessment and management of risk. AI can assist investment administrators in identifying potential risks and developing mitigation strategies. For instance, machine learning algorithms can analyse historical data to identify patterns that may indicate a higher probability that a particular investment will fail. Investment managers can make more informed decisions about which investments to pursue and which to avoid by recognizing these patterns (BlackRock, 2021). Indeed, according to Accenture (Accenture, 2020), the AI application areas in the Asset Management industry can be mainly referred to alternative assets instead of the traditional ones:

- Private Equity: AI enables the construction of a "living" data mine to create a comprehensive view of targets and target industries to support the PE lifecycle and enable quicker and more efficient deal sourcing and pricing. Armed with these "intelligent signals," companies can collectively better their valuations and subsequent term sheets/deal arrangements to price their deals more competitively, with a potential alpha generation of 50 basis points or more.
- Real Estate: Using AI to forecast potential asset yields and lease retention rates can generate 30-70 basis points of alpha. For instance, asset managers can utilize alternative data (e.g., consumer and demographic data, retail and employment expenditure) to forecast the impact of various factors on global valuations and leases.
- Equities: Through sentiment analysis and predictive calculations, AI enables businesses to anticipate equity performance prior to quarterly reports and earnings announcements. This can produce 10 to 50 bps alpha. Predictions can also enhance investment decision conviction, thereby creating additional alpha.

Even though alternatives are not readily accessible to retail investors, investors and asset managers are pursuing new methods to increase returns and diversify assets. Moreover, as private markets continue to experience double-digit annual growth, investors will become increasingly intrigued by these asset classes. The full democratization of alternative investments may not be possible until AI become the norm in the investment industry. These processes may accelerate the adoption of alternatives, despite the fact that liquid alternatives continue to serve as the primary entry point to these investments. To evaluate the likelihood that AI will disrupt the process of investing in alternatives, activities have been classified as either Direct or Indirect (utilizing an intermediary to

invest money in a portfolio of bundled securities. Simply put, these are investments made by third parties through intermediaries) investment. For each private equity investment activity, two tables (Tables 7 and 8) assign a score ranging from 1 to 5 that measures the prospective use of artificial intelligence. The first dimension of artificial intelligence potential relates to the ability to reduce the complexity of a real-world task to a simplified model, as well as the extent to which human interaction may not be required to complete the same task. The second dimension pertains to the current availability and accessibility of information/data that informs the first-dimensional model.

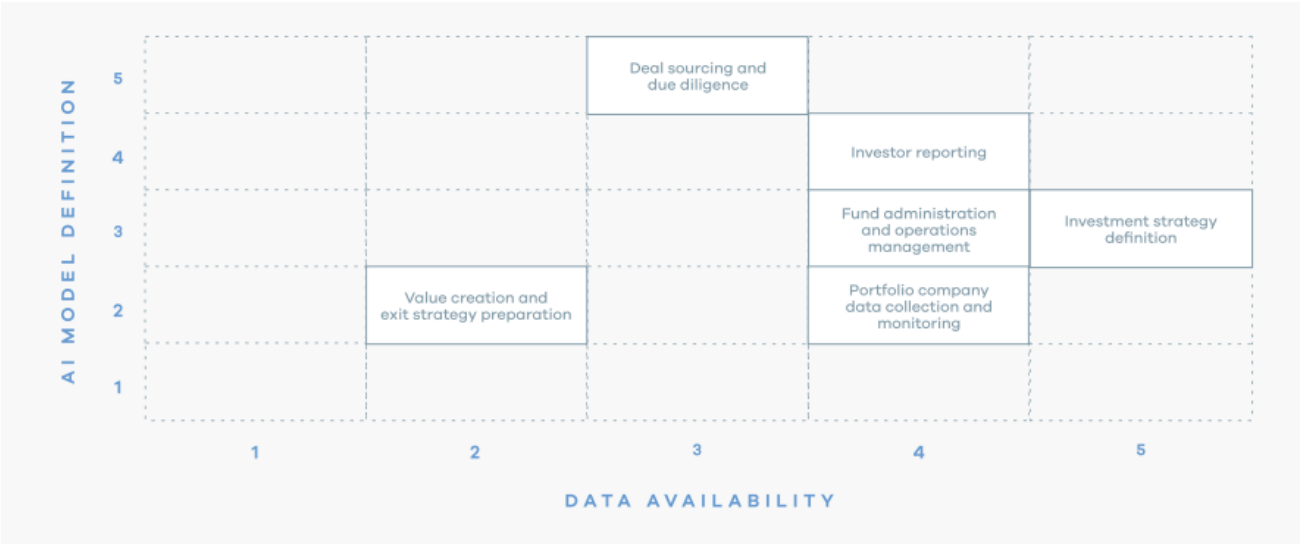
Table 7: The potential of the use of AI in different investment activities within the scope of indirect investing in alternatives.



Source: BlackRock, AI²: Alternative Investments Meet Artificial Intelligence

Starting from the analysis of the manager selection, a thorough examination of past performance identifies the proprietary acquisition as a deal source, the improvement of core business operations (expanding sales force, supporting product line development, etc.) as a value creation strategy, and selling to a strategic buyer as three drivers that maximize the performance of an acquisition in the biotech industry. For an investor who has predetermined in her private market portfolio program that additional exposure to the biotech industry is an upgrade to the existing risk-return profile of the overall portfolio, the best strategy is to seek out managers who have a track record of success in the proprietary sourcing of deals, the enhancement of the portfolio company's top line, and the arrangement of exits with strategic buyers. AI can be instrumental in automating all relevant data collection processes and determining the most accurate regression model for predicting future performance.

Table 8: The potential of the use of AI in different investment activities within the scope of direct investing in alternatives



Source: BlackRock, AI²: Alternative Investments Meet Artificial Intelligence

Similar to the information gathering and digitization processes, reporting data collection within the manager selection scope of operations utilizes artificial intelligence applications such as computer vision and natural language processing to convert the quarterly reporting documents from their various formats into machine-readable text. Automatic labelling of datapoints (on GP company, a specific fund, investment professional, and portfolio asset) can transform the tens of thousands of documents received each quarter into an organized data warehouse that is ready to be analysed and used to generate knowledge. Models based on machine learning can detect inconsistencies in data and identify the indicators that serve as early warnings of portfolio company and managed asset inflections, etc. Thus, position surveillance becomes more efficient, and the time saved can be spent on negotiations and analysing the portfolio asset's established governance. Another important element is linked to the due diligence phase. Platforms utilizing artificial intelligence can autonomously collect unstructured data from company websites, various open web sources, social media, and third-party intelligence providers. A company that manages alternative investments can increase the volume of transactions by employing Cognitive Search and ML technologies that transform unstructured data into organized knowledge (Nikolay Maksimov, 2020). Employing textual analysis algorithms permits fund managers to conduct sentiment analysis of the company's customer evaluations or various legal documents and client contracts. These are only a few of the general applications of AI systems for alternative investments. This chapter's goal was to provide an overview of the application possibilities, followed by practical examples of application in terms of increasing profitability from a business model perspective. In this historical era, where the increase in the cost

of money due to the increase in interest rates makes the entire industry less profitable, and where the years of the COVID-19 pandemic have significantly reduced valuations and investment opportunities, the study of the possible combinations between AI and asset management is crucial. Exploring new potential introductions could have a positive effect not only on the asset management industry or alternative investments, but also on the real and financial economy as a whole.

Chapter 3: Research Methodology

3.1 Introduction to research question and methodology

The term research methodology covers a well-organized and methodical framework consisting of many processes, strategies, instruments, and procedures that researchers utilize in order to carry out their investigations, collect data, analyse information, and formulate findings. This research methodology chapter serves as a framework for readers to make informed about the data collection method and the research question developed, the establishment of the study's boundaries, and the assurance of the findings' validity, reliability, and credibility. The objective of this study is to examine the impact of implementing artificial intelligence systems on business model transformation for asset management companies. Specifically, this research aims to explore how such systems might boost industry growth and address profitability challenges that are currently reshaping the whole sector. I believe that these benefits encompass risk reduction through portfolio diversification, decrease of cost structure and enhancement of operational efficiency within the organization. The final result will be a general improvement of the industry's profitability and their margins, currently decreasing. Over the years, the industry has undergone a radical transformation of processes and business model structure, both in terms of investment assets (e.g. alternative investments) and operations. My aim is to study the evolution of these changes with a business model perspective and thus study how the industry will change in the future.

To facilitate the examination of the subject matter pertaining to asset management profitability and alternative investments, I formulated a research question focused on the industry segment that exhibits the most substantial prospects for constant improvements and enhanced efficacy. The objective of this study is to establish the advantages that asset management firms can derive from the adoption of AI systems in their investment decision-making procedures pertaining to alternative assets. Specifically, these benefits encompass risk reduction through portfolio diversification, augmentation of investment returns, and enhancement of operational efficiency within the organization. I will develop this idea through an analysis of the evolution of the business model of asset management companies and their future change as a result of this introduction. It will be an empirical project with two different data collection methods, a quantitative investigation and a case study. The first one will be a survey to European asset management firms (specifically directed to fund managers or analysts). Then I will analyse in depth a specific case study to evaluate other aspects of this trend and practically described possible applications and prove the concrete potential of this subject. A clearly articulated research question functions as a guiding framework for the entirety of the study. This research framework offers a coherent and structured approach to conducting research,

covering several aspects of it. The formulation of this research question aids me in establishing the parameters and scope of my study.

3.2 Quantitative Analysis and survey structure

Quantitative research assumes a crucial role in offering rigorous and empirical insights into a diverse range of phenomena spanning multiple disciplines. The significance of this methodology resides in its methodical procedure for gathering and examining quantitative data, enabling researchers to measure associations, patterns, and tendencies. Statistical tools facilitate the derivation of objective and generalizable conclusions. Through the adoption of a survey, it highly valuable in the identification of causal links, prediction of outcomes, and validation of the hypotheses proposed. I will utilize this quantitative research as a robust basis for evidence-based decision-making and the progression of knowledge across several aspects of the industry and business model innovation. The primary aim of the coming questions in this chapter is to examine the fundamental aspects of AI implementation in alternative investments and ascertain whether there exists genuine industry interest or if comparable systems for introducing and modifying the business model have already been employed. The initial phase of developing this survey involved conducting a comprehensive literature review, analysing the industry, and drawing from personal experiences. The motivation behind my inquiry into this subject matter originates from a deep personal fascination. Over time, I have consistently monitored developments within the sector. Consequently, external influences have enabled me to identify specific areas that could benefit from these enhancements, which can be attributed to a convergence of several elements. The literature study played a crucial role in delineating the composition of the industry and identifying practical areas for change, thereby transcending mere conceptualization and facilitating actual implementation. Subsequent to this juncture, and in light of the examination of the initial findings procured, I started the process of devising questions to be posed to the designated sample.

The second step of this study is the sampling techniques. They refer to the methods used to select a subset of individuals or items from a larger population for the purpose of conducting research or gathering data (Flick, 2013). These techniques are crucial when the complete population is not feasible to study, like in the case of asset management industry. Researchers utilize sampling procedures to choose a representative subset for examination, and this is what i have done for my quantitative study. The careful selection of the sample for administering the prepared questionnaire was a pivotal factor in shaping the subsequent formulation of the questions. Indeed, I made the deliberate decision to exclusively go for industry professionals possessing an extensive understanding of investing dynamics and exhibiting expertise in several verticals pertaining to alternative

investments, among other qualifications. The primary objective of my study inquiry is not alone to establish the favourable effects of artificial AI on the financial performance of asset management firms, but also to elucidate the specific influence of AI implementation on a subset of alternative assets investments. The utilization of each of these factors in a dual capacity can yield significant benefits in relation to the company strategy. As professionals inside the industry rather than representatives of the mass market, the sample size obtained for this research will be rather small. However, it will be highly pertinent to the subject matter at hand. This sample will be utilized in conjunction with a case study to conduct a thorough examination of the business model's evolution in response to the suggested adjustments. Following this, I initiated the process of formulating the questions with the intention of attaining the predetermined goals. These questions are characterized by their high level of specificity, while also being arranged in a progressive manner that gradually delves deeper. This deliberate sequencing aims to ensure that the respondents feel at ease during the assessment and are not unduly strained. The process of sample selection was crucial in order to ensure that the test was designed in a manner that minimized the time commitment required from the selected sample. As experts in the respective domain, administering an extremely lengthy and intricate examination would have potentially deterred their willingness to participate. Hence, it was imperative to concentrate on a select number of core aspects and present them to a targeted audience including individuals whom I anticipated would possess the requisite expertise to assist me in the examination of the aforementioned subjects. The questionnaire is not remunerated in economic terms, it therefore stems from the free will of the sample to answer the proposed questions, with the personal guarantee of anonymity and with the aim of safeguarding the rights and welfare of participants, while upholding the integrity and respectfulness of the research process. The establishment of a meticulously designed research methodology is vital in order to generate research outcomes that are dependable, reputable, and significant. The study's aims are ensured to be realized, and its findings are ensured to contribute to the existing body of knowledge in a valid and rigorous manner. The survey was designed not only to gain insights about the present utilization of asset management businesses, but also to explore a more intricate framework. The empirical component of this study will encompass the identification of difficulties and key topics directly from practitioners, in addition to relying solely on reports or newspaper articles as observed in the literature review sections. This will serve as a means to validate or challenge the information presented in the earlier sections of this thesis. Furthermore, there will be a set of generic inquiries aimed at classifying the participants and subsequently identifying a subset of individuals for potential analysis or additional investigation. The complete questionnaire will be displayed in the subsequent section. Furthermore, it is imperative to do research on potential or existing applications in the industrial sector. This can be accomplished by direct inquiries or by

exploring hypothetical future situations based on subjective viewpoints. The conscious decision was made to refrain from include certain specific questions in order to mitigate the risk of obtaining insufficiently pertinent responses and potentially discouraging survey participants from completing the proposed inquiry. Due to the limited number of players within Italy, it became necessary to expand the scope of the research to a European level (although the case study will focus on a South Korean company for distinct reasons). This approach aims to alleviate potential respondent apprehension about the disclosure of crucial information pertaining to their investment management practices.

In order to enhance the precision of the feedback provided, the grading system spans from 1 to 5. In this context, the numerical value of 1 represents a response indicating a strong disagreement, whereas a value of 5 represents a response indicating a strong agreement. However, additional types of questions, such as multiple-choice or descriptive questions, will be included. The discerning evaluations will assist in understanding the diverse levels of interviewed perspectives. Below are the questions that make up the questionnaire submitted:

Q1: Which of the following definitions best defines the company you work in?

1. Traditional Asset Management firm
2. Software Company
3. Innovative Asset Management firm
4. Private Equity firm
5. Venture Capital Fund
6. Hedge Fund

Q2: When did you start working in asset management industry?

1. < 1 year
2. 1 to 3 years
3. 3 to 5 years
4. > 5 years

Q3: What do you believe your company's core value proposition is?

1. Offers the best return to our customers
2. Offers innovative products with high potential
3. High security on all the investments
4. Constant communication with the client
5. High protection against risks and market fluctuations
6. Exceptional strategic partners structure

Q4: What proportion of alternative assets should be included in a portfolio to guarantee sufficient diversification?

1. < 10%
2. Between 10% and 30%

3. Between 30% and 50%
4. Between 50% and 75%
5. > 75%

Q5: Why don't you increase the percentage of alternative investments?

1. Our customers do not find it convenient
2. Investment management is overly complicated
3. Too expensive
4. Too much time to select the right investment
5. Only alternative investments

Q6: What do you believe will be the most significant trend in the asset management business in the future years?

1. Interest rate fluctuation
2. Industry consolidation
3. Decreasing profitability
4. Clients searching for different investing solutions

Q7: Do you already employ an artificial intelligence system in your business?

1. Yes
2. No
3. Prefer not to say

Q8: What do you think would be the phase with the greatest potential improvement following the introduction of AI?

1. Investment Research
2. Investment Decision
3. Trading Optimization

Q9: How do you manage the due diligence stage before making an investment?

1. We do the full process in-house
2. We use third-party platforms to help us
3. Only the research is handled by a third-party player

Q10: How often are your portfolios updated?

1. Weekly
2. Monthly
3. Quarterly
4. Annually

Q11: How do you select the right assets and proportion of investments?

1. Automatic Management
2. External Software

3. Human intuition with the help of external data

Q12: What do you believe is the primary benefit of incorporating artificial intelligence into asset management?

4. Keep up with technological developments
5. Increase profitability
6. Improve the performance of the investment process
7. Maintain competitive position
8. Develop innovative management strategies

Q13: In what areas would you most likely use/currently use AI?

1. Investment process
2. Operative efficient
3. Data collection and analysis
4. Marketing and customer engagement
5. Infrastructure management
6. Target market definition

Q14: Do you believe your organization will be able to develop AI systems for internal use?

- (from 1) Strongly disagree
- (to 5) Strongly agree

Q15: Do you agree that utilizing external services with a strong technology character can assist small businesses in increasing their profitability by lowering costs?

- (from 1) Strongly disagree
- (to 5) Strongly agree

A more comprehensive examination of the obtained results will be undertaken in the subsequent chapter, wherein a thorough analysis of the acquired responses and their potential interpretations will be provided.

3.3 Case study and practical exploration: Qraft Technologies case

The genealogy of this thesis is initially embodied inside the topic of this specific paragraph. The subject matter of my master's thesis was conceived during my academic term spent at Yonsei University in Seoul, South Korea. Within the academic setting of this university, I had the privilege of engaging with numerous students and professors who possessed a deep understanding and involvement in the Korean financial system. Consequently, I was exposed to a multitude of insights and experiences. Qraft Technologies, an asset management company, has garnered attention for its

sustained emphasis on utilizing AI technologies and procedures to inform investment decision-making. Consequently, my curiosity in the subject matter was piqued, prompting me to formulate a research question and devise a suitable framework for data collecting aligned with the desired answer. Given that this served as the genesis of my chosen research topic, I made the deliberate choice to incorporate this organization into a comprehensive case study. The objective of this study is to examine their business model, trace their progress throughout the years, analyse their investment process management, and explore the practical implementation of alternative investments. I maintained contact over the months with a number of students who then started internships in Qraft, thus having access to clear and direct information. I think that the inclusion of a case study is of the highest priority in the context of a master's thesis, as it serves as a fundamental element for rigorous research and thorough analysis. By conducting a case study, I can thoroughly investigate a practical situation, scrutinizing intricate particulars and complex dynamics that may not be fully comprehended by purely theoretical examination or with a quantitative or qualitative analysis. Through a thorough examination of the case, utilizing diverse data sources, and employing rigorous procedures, I will be able to extract invaluable insights that make significant contributions to academic debate as well as practical problem-solving in the real world. The case study plays a significant role in illustrating, contextualizing, and validating theoretical concepts, hence enhancing the quality and credibility of the master thesis.

However, the definition of a case study necessarily passes through a few key moments (Gerring, 2004), described as follow:

- The process of identifying and comprehending the problem: The current state of asset management businesses on a worldwide scale is characterized by a lack of immediate danger. However, there exists the potential for several risks to arise if the matter of profitability remains unaddressed, particularly in relation to the business model employed at the corporate level. The initial chapters were designed to ascertain the primary themes, which continue to be prominently featured and utilized for the goals of the case study.
- Identify and delineate the essential inquiries that need to be addressed: the right questions should be thought in order to advance the understanding of the subject matter. The primary inquiry pertains to the potential implementation of artificial intelligence systems and procedures into asset management firms, examined from a business model perspective. Specifically, this inquiry will focus on examining the extent to which alternative investments can potentially yield advantages.

- Identifying the system under investigation: It is essential to determine the boundaries of the case and identifying its component units. Defining the inner circle of stakeholders is one of the key points in the study of any business system, and so here too.
- The development of the data gathering and analysis protocol: Three distinct methodologies were employed in order to acquire the pertinent data and information. Initially, the data was acquired during the stay in South Korea through participation in conferences and direct engagements, facilitating a first acquaintance with the subject matter and enabling interactions with pivotal individuals inside the organization. Subsequently, I established contact with several employees and successfully conducted an in-depth interview with an analyst affiliated with Qraft Technologies. This interview provided me with more perspectives on the firm, a comprehensive comprehension of their business model, as well as insights into their primary asset classes and customer base. For the purpose of this study, publicly accessible data was utilized as the ultimate source, which was obtained from the organization's official website, as well as other reputable financial information platforms and investment paperwork.
- Examining and interpreting data: After the first data collection and in order to uncover patterns, relationships and insights, I studied the overall situation and adapt it with the previous data obtained. This is why I decided to include this section as the last research part of my thesis and immediately preceding that of the conclusions. I want to use this case study as an overall example of each aspect studied so far and to demonstrate (or reject) my assumptions and research question.
- Creating and presenting a research report: the last part would then be the final presentation of the data obtained. This section is intricately connected to the preceding chapter in the concluding section. Nevertheless, it is important to clarify that the information provided does not intend to make sweeping generalizations about all asset management or software companies involved in investment systems. Rather, it focuses on a specific business model that leverages artificial intelligence systems to enhance company profitability and provides a viable and sustainable alternative within the industry.

The combination of all these elements, coupled with the three data collection methods developed over the course of these months, allowed for an in-depth analysis in terms of the business model, offering a highly pragmatic approach to the discussion by selecting areas of improvement and areas of interest within the company's management.

3.4 Conclusion chapter and further discussions

The final chapter of my master's thesis provides a detailed synthesis of the research process, summarizing the main discoveries, insights, and contributions that have arisen from both studies. The chapter functions as a reflective conclusion, wherein the research objectives are revisited, and the central research issue is addressed in consideration of the empirical analysis and theoretical inquiry undertaken throughout the thesis. In addition, the chapter will provide a thorough evaluation of the limitations in the research and the methodological difficulties faced, emphasizing areas for further investigation and possible improvements to the research methodology. The concluding chapter will serve to highlight the importance of the study's findings within the wider academic and practical framework, stressing their potential consequences for the field and providing a reflective conclusion to the academic undertaking presented in this thesis. Some results will, of course, also be shared in the next chapter, the one describing the insights derived from the two research methods employed, but the final chapter of which this paragraph is the description will be relevant as a summary of what has been achieved and correlation between the results.

One issue that arises when endorsing two distinct research methodologies is the subsequent integration of the acquired findings. The primary focus of my analysis was to identify generalizations or inferences. To achieve this, I employed two distinct ways of data gathering. However, the intention was not solely to augment the quantity of data, but rather to enhance the richness of the research by incorporating two distinct perspectives. In my personal opinion, I contend that a survey, despite its notable benefits and seemingly straightforward design, lacks adequacy for the objectives of the research I am pursuing. The research question is developed with the primary purpose of examining a study from a business model perspective, while excluding business generalizations or technology processes that are not relevant to the topic of inquiry. The present discourse delineates the sequential stages involved in elucidating the composition of a company model, as well as the salient aspects of the contemporary asset management sector, commencing with the cost structure and pivotal alliances. Subsequently, I proceeded to examine the diverse processes or services that artificial intelligence may potentially fulfil within organizations operating in the industry. This examination proved valuable in formulating the questionnaire and conducting research on the specific factors to be assessed within the case study. What is lacking in the current discussion is a comprehensive synthesis of all the research findings that have been substantiated, a concise overview that will serve as a focal point in the last chapter pertaining to the conclusions.

Chapter 4: Findings and Research Results

4.2 Survey's results: quantitative approach

4.1.1 Respondents' answers and general overview

In the preceding section, an explanation was provided about the methodology employed for data gathering, encompassing the utilization of a survey instrument, the deliberate selection of the target sample, and the formulation of the proposed inquiries. The survey was distributed to a sample of 50 participants, resulting in a response rate of 46% (23 total responses). The survey was sent using direct messages on the professional networking platform, LinkedIn, as well as through personal contacts. The statistical significance of this result is attributed to the robust concentration on industry professionals operating within the European context, resulting in very few players compared to other industries. The large disparity in player density between the United States and other countries contributes to the optimal and meaningful interpretation of the data. The subsequent paragraphs will present a comprehensive examination of the observed phenomena, along with pertinent insights derived from the collected responses. The purpose of this opening paragraph is to provide a summary of the elements seen during the data collection process and offer a general overview. During the process of managing the survey, I noticed a distinct hesitancy among participants. This was evident through their many inquiries about the inclusion of preliminary questions, despite the explicit assurance of complete anonymity in the collected findings. Additionally, some participants asked clarifications regarding specific sections of the survey. There appears to be a prevalent sentiment of secrecy and reluctance to provide information, which serves to reinforce the significance of the subject under investigation and its potential implications. Nevertheless, it is worth noting that there was a strong inclination to assist in the completion of this thesis. Additionally, I was provided with a substantial amount of guidance pertaining to overlooked issues, which I subsequently incorporated into the initial chapters of the research. Furthermore, suggestions were made regarding potential applications in specific domains.

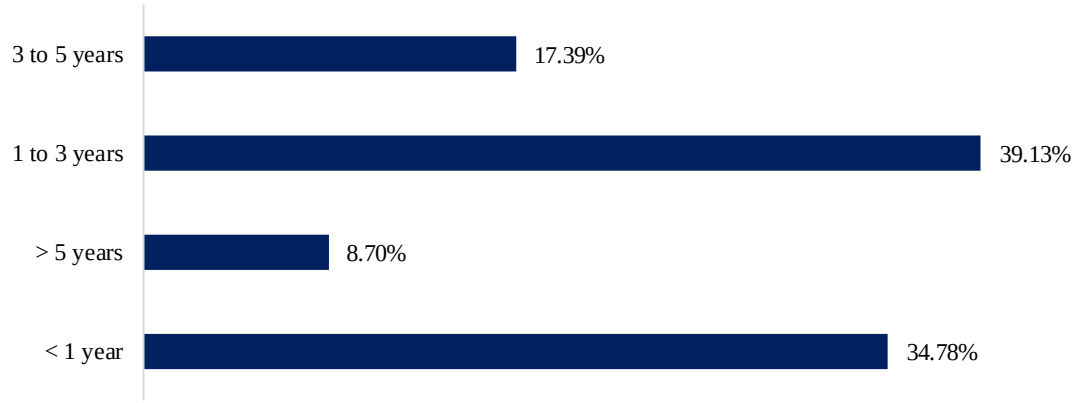
The findings of the study offer a complete analysis of the insights obtained from the respondents. By conducting a meticulous examination of the data, I have successfully revealed significant trends, patterns, and feelings pertaining the new trends of the Asset Management industry and the AI applications. A notable proportion of participants conveyed about the increasing importance of these essential aspects, even if they are not applying any AI processes yet inside their organization, so providing insight into a crucial component of the subject. Furthermore, an additional percentage of participants emphasized the parallel growing importance of alternative investments in the industry's

overview. In summary, the survey findings provide a comprehensive understanding of the predominant attitudes and perceptions pertaining to the subject matter of the survey. The data obtained from our survey participants not only validate the research question analysed in the previous chapters, but also provide novel perspectives that could influence forthcoming activities and the case study presented in the following pages of this thesis. This extensive analysis is a great tool for the final comprehension of the company chosen for the case study and to elaborate decisions and further investigating about implementation of AI systems in the company's business model.

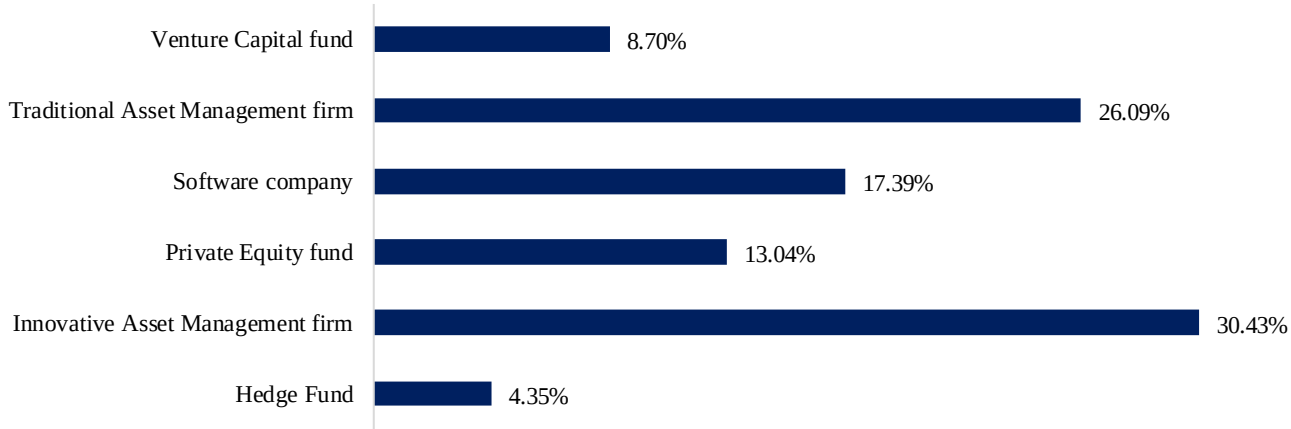
4.1.2 First Section: growing problems and industry overview

This first section is dedicated to the current analysis of the industry, in which the entirety of the observed sample is a part. This is the composition of the sample examined, so as to give the reader a reference quantity and a description of the sample examined.

Graph 7: **When did you start working in asset management?**



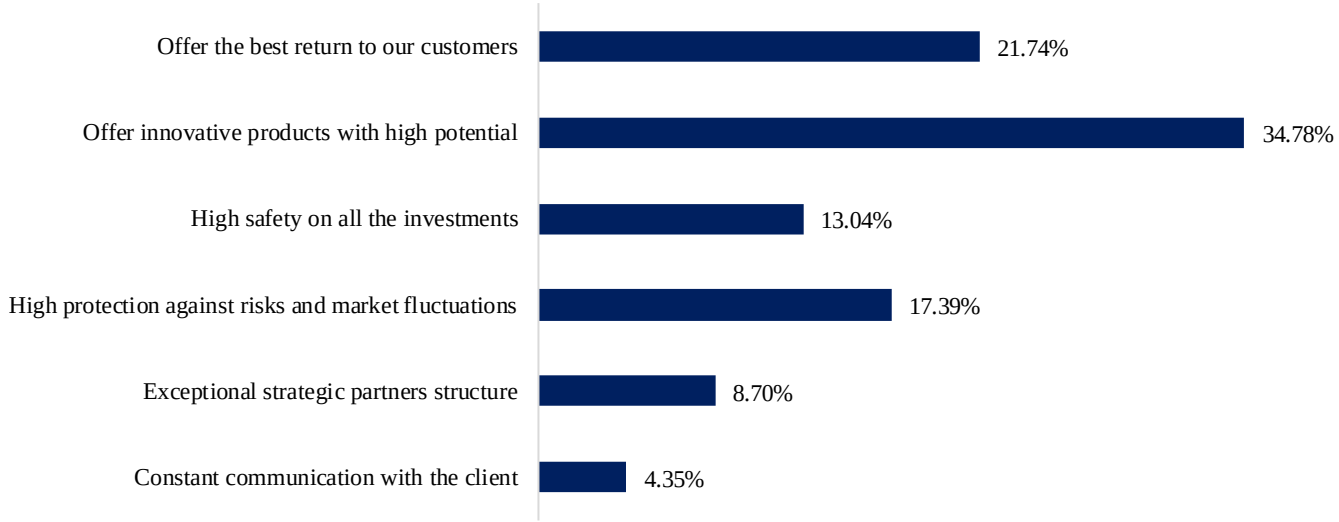
Graph 8: **Which of the following definitions best defines the company you work in?**



The two graphs depict the distribution of the analysed sample, revealing a notable clustering towards individuals in the younger age group or those who are relatively new to the sector. This concentration is attributed to the greater ease of accessibility for the specific survey being conducted. On the other hand, there is a notable disparity when it comes to the inquiry regarding the reference company. It should be noted that the primary aim of the inquiry is not to establish a precise standardization of corporate categories, but rather to gauge the subjective perception of the respondent in relation to their workplace. The differentiation between 'traditional' and 'innovative' holds significance; nonetheless, it is reiterated that this distinction solely pertains to the subjective perception of the individual being surveyed.

After this information, I also wanted to assess a further aspect of workers' perceptions of society. It was essential for me from the outset to categorise the results obtained, so as to make statistically relevant inferences in the remainder of this chapter. In fact, below I have reported the opinion on the value proposition of the companies examined.

Graph 9: **What do you believe your company's value proposition is?**

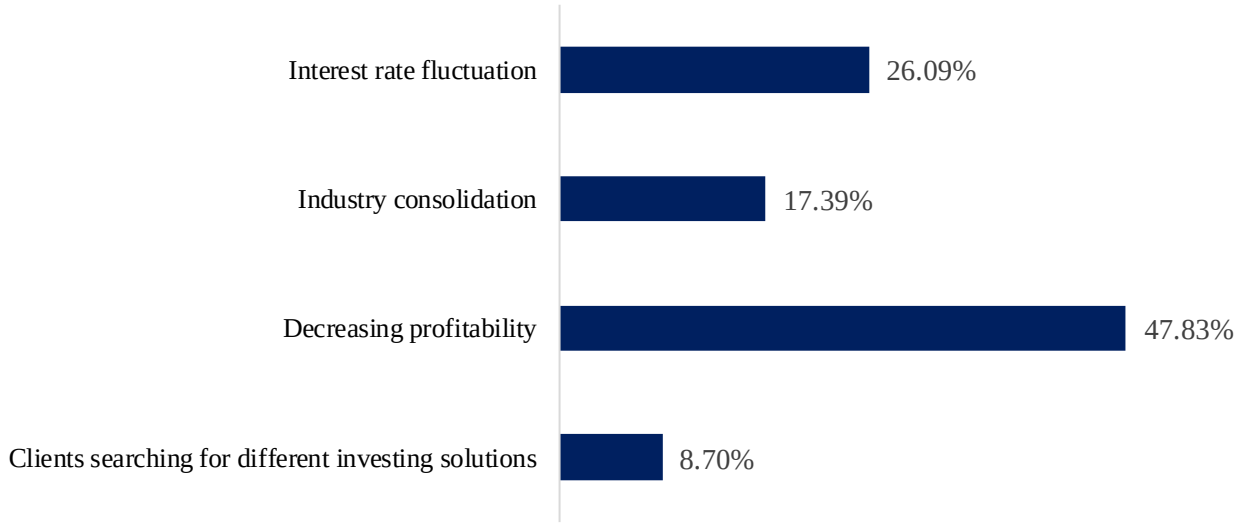


This argument will hold significant importance in the subsequent paragraphs, as we delve into the crucial considerations for organizations regarding their resource constraints and their ability to meet the demands of the end consumer. The organizations demonstrate a notable inclination towards pursuing investment opportunities that provide promising future potential, rather than solely focusing on yield. Undoubtedly, the primary focus of any asset management company, regardless of its kind, is to engage in core business activities. However, the value proposition of such companies rests in their inclination to distinguish themselves from competitors and strategically position themselves to

achieve optimal future growth. Hence, there exists a heightened emphasis on the strategic value of long-term prospects, particularly within the framework of individual client portfolios.

Following a process of internal visualization, I endeavoured to examine the external reality that defines this sector in order to presently ascertain the primary concerns that instil fear in the market. Subsequently, I sought to understand how the industry participants will strategically navigate these challenges to ensure unhindered progress and growth.

Graph 10: **What do you believe will be the most significant trend in the asset management business in the future years?**



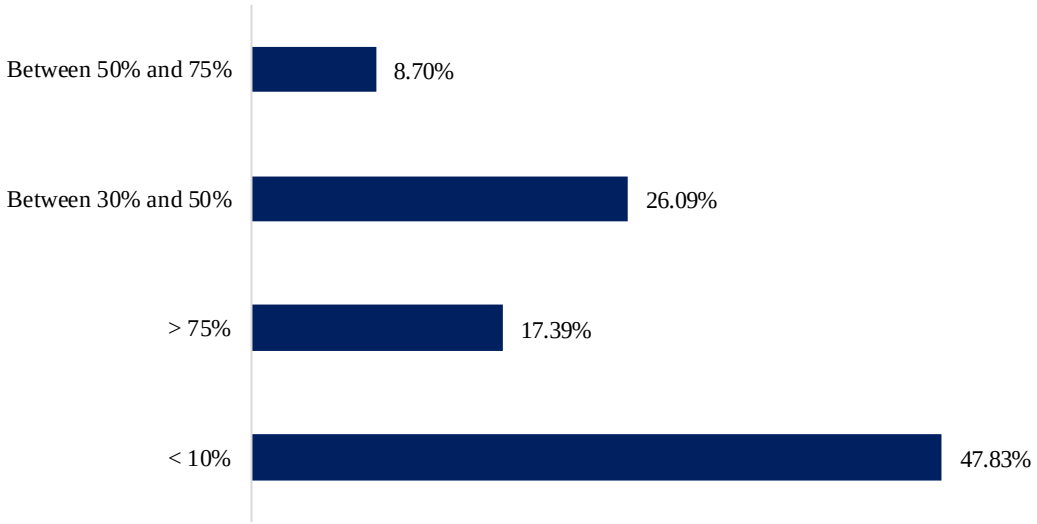
The survey results indicate a conspicuous pattern regarding the predominant factor that stakeholders in the European collective asset management setting are concerned about. The questions exhibit a definite tendency to be important and intricately linked, hence posing a possible challenge in discerning the accurate question. Nevertheless, the inquiry should be construed as a subjective apprehension and sentiment derived from the awareness and information garnered in recent months. The cause-effect link is an inherent component of the inquiry. The predominant concern continues to revolve around the potential decrease in profit margins resulting from capital management within the financial markets. This apprehension, as previously elucidated in preceding chapters, arises from a confluence of various causes. One notable factor is the escalation in management expenses and financial burdens, primarily attributed to the upward trajectory of central bank interest rates. Consequently, this phenomenon renders specific undertakings more financially burdensome. The rising cost of debt, which is a significant tool employed in leveraged buyouts to enhance for example the equity returns of private equity investors, has posed challenges to the investment rationale on the

buy-side. The current situation has not only caused investors to exhibit increased hesitancy towards engaging in transactions, but it has also exerted a negative influence on prices, which has proven to be unattractive for several sellers, thereby leading to a deceleration in economic activity. There was further pressure on technological advancement, which was hardly accompanied by adequate investment in the sector, which could lead to a probable backwardness of the entire sector in the medium to long term. All this combined with the stock market downturn observed in 2022 and also following the COVID-19 pandemic, which has led, given the significant exposure of these companies in the stock markets, to very low if not negative returns.

4.1.3 Second Section: industry's problems and analysis

The problem delineation plays a pivotal role in providing a comprehensive overview of the present state of this specific subject matter or concern. The aforementioned statement offers a thorough examination of the results acquired from the survey conducted to the selected sample, with the aim of illuminating current patterns, issues, or obstacles within a specific field. This section provides and outlines the precise challenges or concerns that have emerged from the findings of the survey, including areas that necessitate focus, examination, or possible remedies. It is so an essential tool for decision-making and solution-providers, enabling me to make informed solutions and conduct further investigations. The first element I want to focus on is the issues surrounding alternative investments, and why there is still a particular reluctance to their mass application.

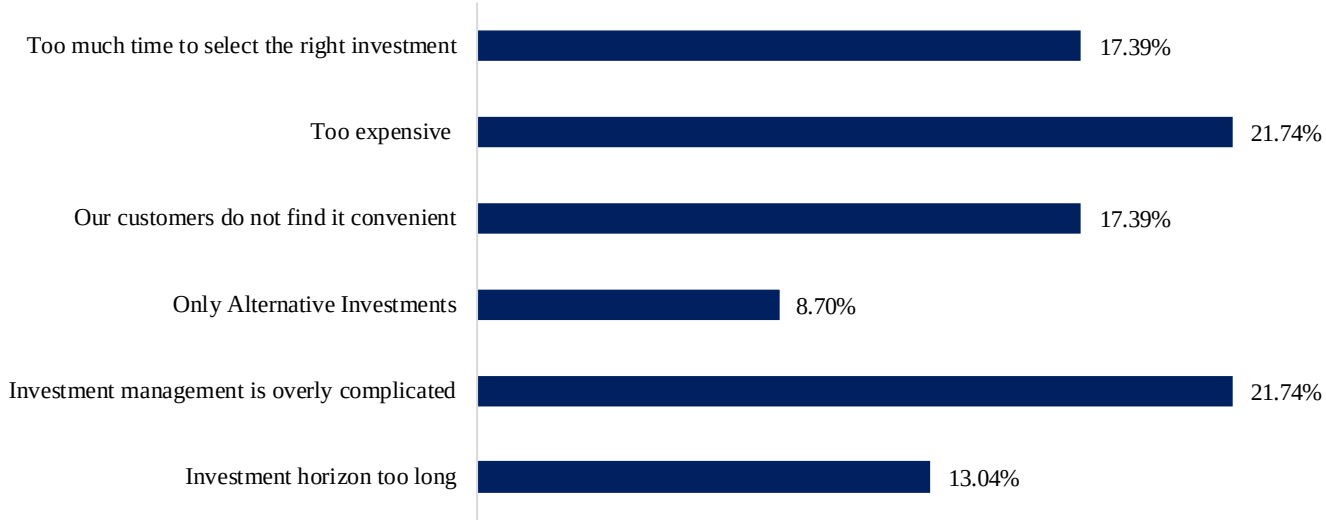
Graph 11: **What proportion of alternative assets should be included in a portfolio to guarantee sufficient diversification?**



This figure clearly includes some private equity and venture capital funds that I decided to include when selecting the sample of respondents, as well as hedge funds. In general, however, most of the

public seems to tend towards a more conservative stance by including fewer alternative investments within their asset classes.

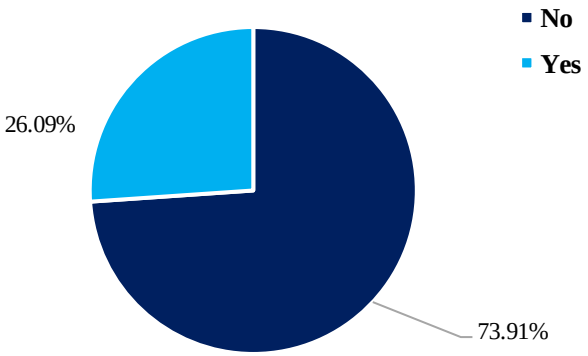
Graph 12: **Why don't you increase the percentage of alternative investments?**



This is a graph that I found very interesting, as it does not offer a single view of the problem inherent in alternative investments. At the moment, this type of asset suffers from being overpriced due to the cost overhead involved in such an investment study and the due diligence required for optimal investment. But the reasons are almost the same for everyone, including a very long investment period and excessive difficulty in maintaining control of the investment over the years (especially when we are talking about private equity, startups, and real estate).

Following the mentioned research, my intention was to examine the present state of organizations with respect to the integration of artificial intelligence into their operations. Specifically, this pertains to the inquiry of the implementation of automated systems for investment processes, encompassing both internal and external aspects. Hence, my reference was not directed towards a comprehensive automated investing system. Nevertheless, it is noteworthy that a majority of investors presently exhibit limited consideration or

Graph 13: **Do you already employ any kind of AI system in your business?**



utilization of AI systems in their operations. I have endeavoured to provide a concise summary of the rationale for this matter. Subsequently, I solicited the participants' rationales for their behaviour and concurrently requested a subjective impetus to reflect upon this concept, so facilitating the seamless progression of the conducted survey. In the following analysis, I have shown two descriptive statistics pertaining to a set of questions designed with a 5-point Likert scale. This scale ranges from 1 to 5, where a lower value signifies a lesser degree of agreement with the given topic, while a higher number implies a greater level of agreement. These are two questions relating both to whether the current companies might have the resources and capabilities to build such a system internally and then explore the possibility of using external companies to help in this regard.

Table 8: Do you believe your organization will be able to internally develop an AI to help the business in any way?

Mean	2.136363636
Standard Error	0.211113873
Median	2
Mode	2
Standard Deviation	0.990211836
Sample Variance	0.980519481
Range	3
Minimum	1
Maximum	4
Largest(1)	4
Smallest(1)	1

Table 9: Do you agree that utilizing external services with a strong technology track record can assist asset management businesses in increasing their profitability by lowering costs or increasing efficiency?

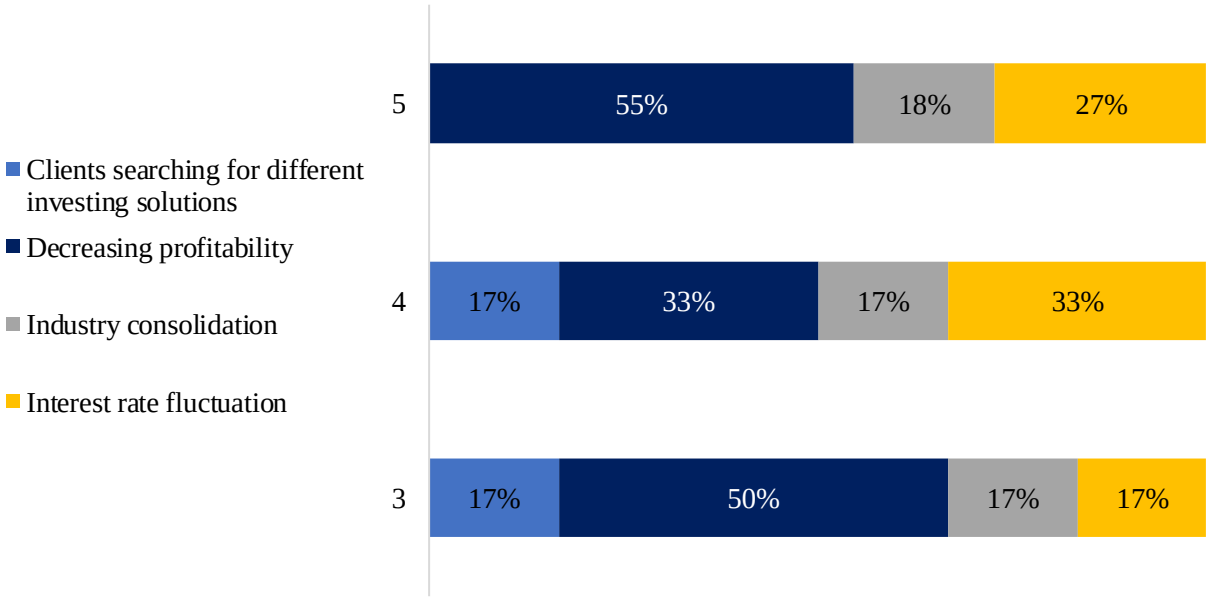
Mean	4.217391304
Standard Error	0.17733782
Median	4
Mode	5
Standard Deviation	0.850482309
Sample Variance	0.723320158
Range	2
Minimum	3
Maximum	5
Largest(1)	5
Smallest(1)	3

Regarding table number xxx, the values assigned to the categories indicate the likelihood of implementing ad hoc in-house systems. A value of 1 indicates a low potential, while an average value of 2 is seen with a standard deviation of no greater than 1. The data suggests that asset management companies lack the necessary capabilities and resources to internally develop this particular technology. However, it is not entirely implausible for market participants to develop such resources, as it aligns with the underlying business model logic of these companies. The analysis I have provided suggests that there exists a deficiency in internal capabilities or essential strategic alliances to effectively manage a comprehensive transformative process. Additionally, there has been an ongoing discussion regarding the necessity for technological advancement and innovation, which the industry

has consistently neglected to prioritize. The subsequent discussion expands to explore the potential efficacy of AI in enhancing industry profitability. Notably, an average rating exceeding 4, with 5 being the highest benchmark, is observed. This means a strong conviction within the industry regarding the advantages of AI in terms of cost reduction and incremented returns. These returns are derived from larger AuM, leading to increased revenue streams and consequently greater capital available for management fees.

After the analysis of this question, I also thought it appropriate to examine in terms of inference some of the questions previously posed in order to seek appropriate insights from the research in question. In the field of logic, inference refers to the cognitive process through which a claim is deduced or derived from a set of premises. It is so common practice to assume the truth of statements and derive the truth of another proposition based on their content.

Graph 14: **Inferences between profitability and AI**



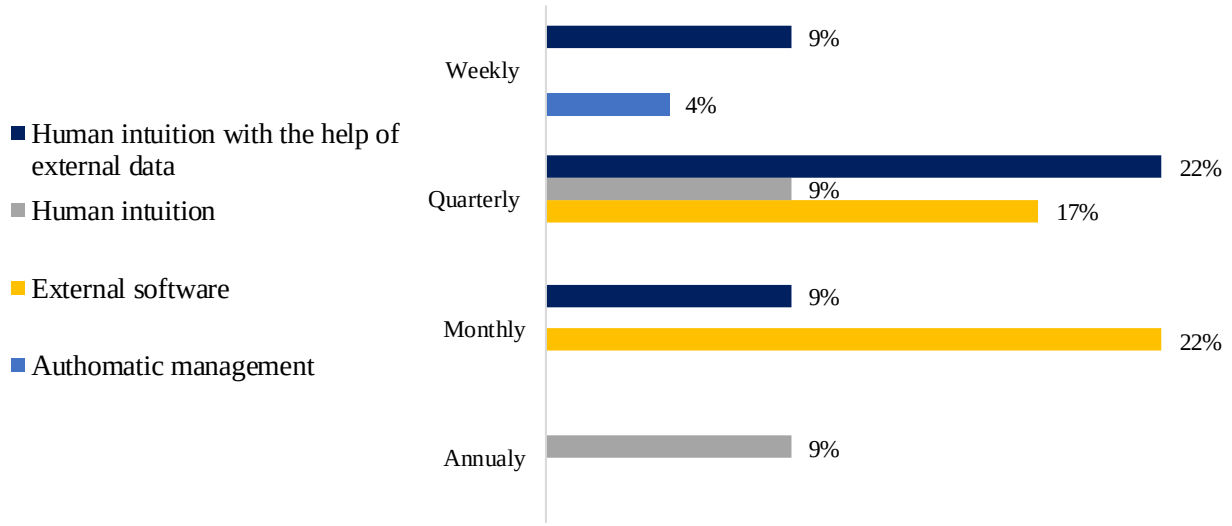
The provided graph illustrates the inference of responses from the preceding question concerning the utilization of external partners possessing substantial expertise in technology activities, in order to enhance the margin aspect of asset management firms. This combination is juxtaposed with the response pertaining to the primary medium- to long-term challenge faced by the entire industry. An intriguing observation is that a significant majority of respondents who assigned the highest rating (5) to the initial question expressed a considerable level of importance towards both the matter of profitability and the issue of fluctuating (rising) interest rates. This correlation suggests that the latter factor may have a consequential effect on the profit margins of companies operating within the

industry. It is noteworthy that a significant proportion of respondents who expressed a strong preference for the incorporation of external technology businesses did not perceive the adoption of alternative solutions by customers as a fundamental issue for the sector. The primary conclusion drawn from this analysis pertains to the recognition that the industry is progressively embracing a higher degree of transparency compared to previous periods. This acknowledgment is rooted in the understanding of the significant role that specific external firms can play in the operational aspects of the asset management sector.

4.2.1 Third Section: AI and asset management, opportunities and future developments

The objective of this part is to provide more perspectives on the viewpoints of asset management organizations regarding prospective enhancements in investment management and the overall resolution of issues over an extended period of time. In the initial sections of this study, an examination was conducted to identify potential areas for enhancement utilizing AI. Subsequently, specific inquiries were raised regarding the existing procedure of asset selection for investment and the frequency of modifications required to achieve portfolio diversification and capitalize on emerging market opportunities.

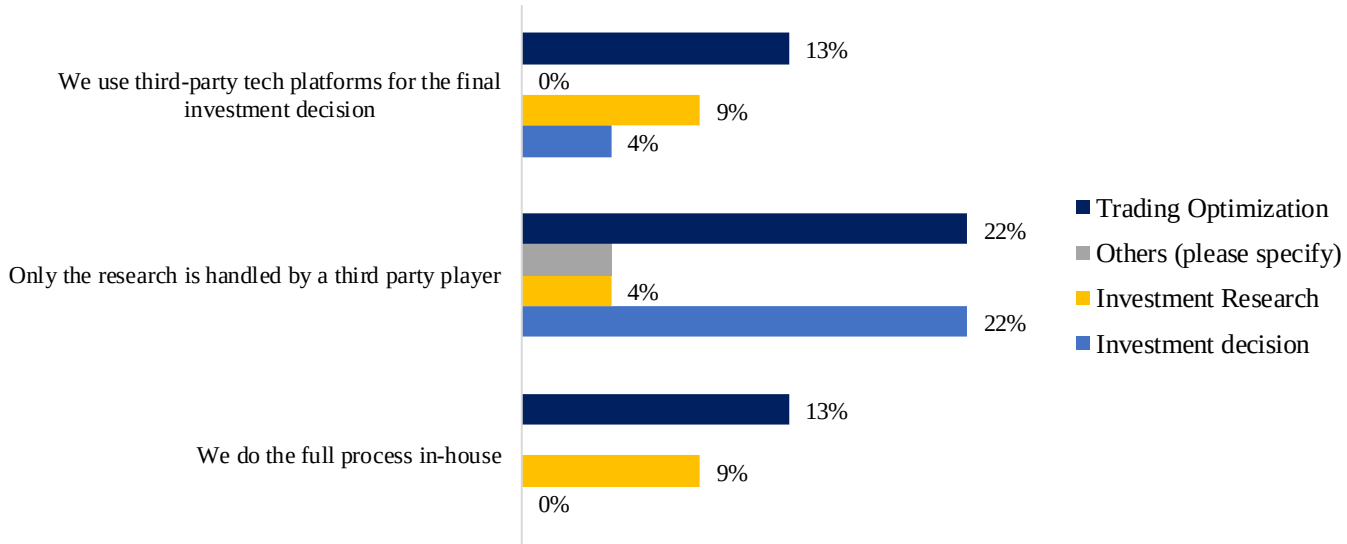
Graph 15: **Portfolio update frequency and methodology of selection**



The graph presented provides a concise visual representation of investment management, specifically highlighting the selection of assets for investment and their subsequent adjustments throughout time. In the subsequent chapter, specifically pertaining to the case study, can be observed that the incorporation of artificial intelligence systems capable of facilitating portfolio management might significantly affect the process of portfolio update. It is evident that the management of this process is predominantly facilitated through the utilization of automated internal systems or external software.

The primary element, nevertheless, remains closely associated with the combination of personal intuition, which is informed by years of experience in the field and knowledge specific to the relevant sector, and the acquisition of external data from specialized agencies or industry experts, either through tailored arrangements or regular updates. Nevertheless, it is important to note that these external data should not necessarily be interpreted solely as traditional datasets or market research specifically associated with the relevant industry. There is an emerging phenomenon in the world of alternative investments, wherein investors increasingly rely on industry-specific guidance pertaining exclusively to private money. If a fund is considering dedicating a portion of its resources towards acquiring a minority ownership in a luxury jewellery manufacturing company, it would aim to gather primary data by conducting interviews with industry professionals. This approach is intended to obtain valuable insights. Hence, this utilization does not encompass any technological data processing system, however it is nonetheless integral to the rationale of circumventing a comprehensive in-house system that oversees each stage of the investment process. The subsequent diagram serves as a demonstrative instance and will initiate the discourse pertaining to the outsourcing of investment activities as a means of advancement, ingenuity, and addressing the deficiency in necessary knowledge.

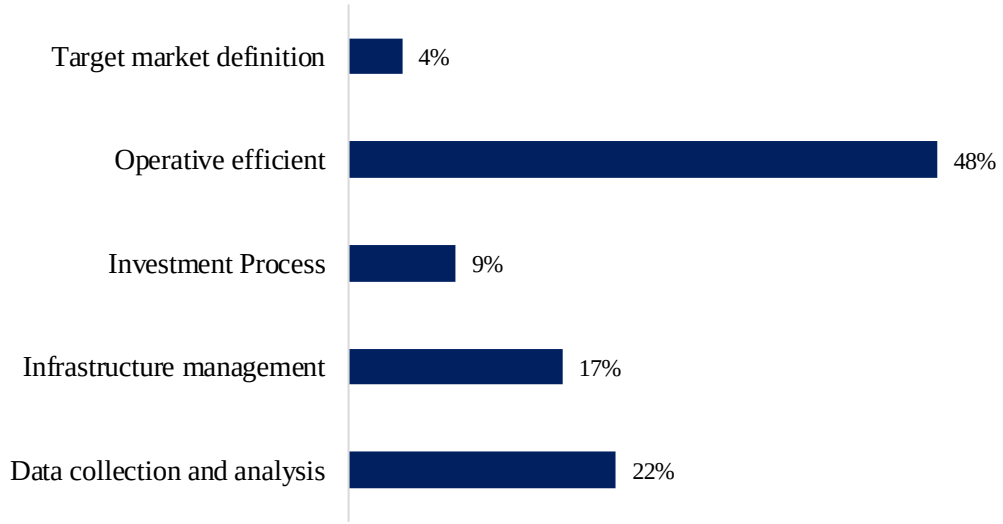
Graph 16: **What do you think would be the phase with the greatest potential improvement following the introduction of AI? Depending on level of vertical integration**



The utilization of the correlation between the two inquiries is deemed crucial in order to propose a pertinent area for future investigation in the field. Specifically, this pertains to the issue of addressing the complete absence of key resources and capabilities in technological matters, particularly in the

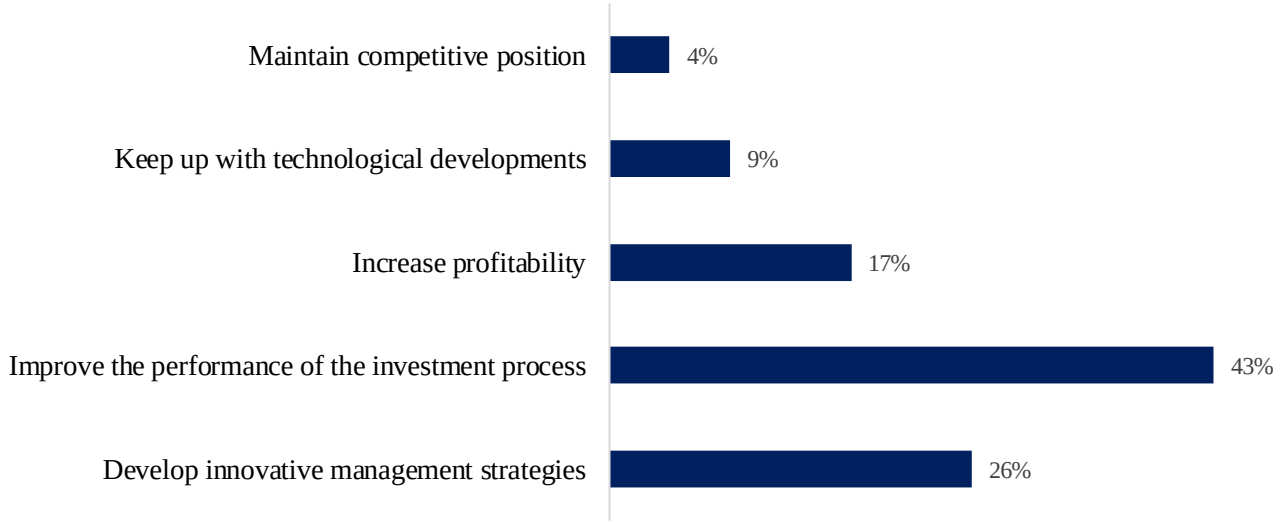
world of artificial intelligence, through the practice of outsourcing specific processes. In this study, I have outlined the fundamental phases involved in every investment, specifically focusing on the assessment of vertical integration inside the asset management firm. Subsequently, I have identified the three primary stages of capital management. The aforementioned inquiry was afterwards associated with the initial aspect of my study pertaining to artificial intelligence. I inquired about their perspective on the primary domain of interest and potential stemming from the implementation of artificial intelligence methodologies within asset management firms. At a fundamental level, it is evident that a significant number of organizations are presently engaging external corporations to assist with various stages of investment management, as opposed to exclusively doing all aspects internally. As a result, given the considerable prevalence of organizations that presently depend on external entities for initial investment research and decision-making, the discussions pertaining to the potential of AI primarily revolve around the phase that these companies tend to outsource to a lesser extent, namely trade management. It is imperative to regularly update one's portfolio to account for emerging market possibilities and optimal timing. This principle holds true across all asset classes, including those that are comparatively less liquid, such as alternative investments as opposed to corporate equities. The determination of the optimal timing for executing an exit strategy following a private equity purchase in a firm has the potential to generate substantial money. Presently, this process is predominantly conducted internally and exhibits limited inclination towards technological integration. Numerous interviewees thus perceived this stage of the investment as holding significant potential, particularly for companies that already delegate certain aspects of their operations, such as initial research and ultimate investment decision-making, to external entities. The segment holds promise in terms of the asset management company's ability to strategically outsource the investment process stage that is least aligned with their core resources and competencies. The practice of total outsourcing has the benefit of eliminating the need for investments in infrastructure and knowledge. However, it also comes with the drawback of lacking exclusivity in the analyses and projects obtained. On the other hand, the process of total internalisation enables the collection, storage, and analysis of unprocessed data in a manner that aligns with its specific requirements, necessitating significant investments in research, as well as the procurement of suitable technology and human resources. The user's text is appropriate. The implementation of partial outsourcing strategies offers a viable approach to achieving a middle ground by effectively integrating the procurement of data (whether raw, processed, or semi-processed) with internal data analysis capabilities. The following questions will therefore investigate further areas of AI expansion from the perspective of the market players themselves.

Graph 17: **In what areas would you most likely use/currently use AI?**



This graph elucidates two significant concepts. Firstly, it highlights the preferred investment areas for present industry participants, wherever the introduction of artificial intelligence yields tangible advantages. Secondly, it serves the purpose of identifying issues and inefficiencies within the business model. The findings indicate that there is a significant demand for AI primarily in the context of enhancing operative efficiency. This refers to the phase of effectively and efficiently managing AI as a form of capital, with the goal of minimizing disruptions or inefficiencies. The respondents appear to have less interest in the remaining stages. This could be attributed, in part, to the fact that external players already offer these services for specific aspects of business management, as mentioned in the prior responses. Hence, it is observed that there exists a prevailing necessity within the sector to enhance the management procedures encompassing the entirety of the organizational phase, rather than focusing solely on a singular facet.

Graph 18: **What do you believe is the primary benefit of incorporating artificial intelligence into asset management?**



This graph shows similar responses to the previous survey, although based on questions more related to the operational aspects of asset management. Here again, a particular need for improvement in operational processes is evident, more than any other need. A particular problem of compliance with certain KPIs arising from the management of many phases of the investment is therefore noted, this aspect could therefore be combined with the offer of an innovative system of management strategies, the second response in terms of votes.

4.2 Qraft Technologies Case Study: Transforming investing with Artificial Intelligence

4.2.1 Preliminary Company Overview

The extensive data gathered during the research process may provide an adequate basis for an early assessment of the concerns, areas of contemplation, and present practical considerations regarding the utilization of artificial intelligence in the asset management sector. The important juncture subsequently leads to the shift from the theoretical world to the applied domain, which is the fundamental aspect for me in the course of writing this master's thesis. Throughout my years of observation, I have encountered numerous concepts that have exhibited a high degree of interest and potential for stimulation. However, these ideas have often fallen short in terms of practicality and feasibility. The progression from conceptualization to realization has significant importance within a start-up context. Consequently, I approach my research with a keen awareness of the perceived proximity (which may occasionally be misleading) between these two distinct phases. The motivation for my decision to examine the business model of these organizations in the initial sections of this thesis stems from the fact that it serves as a practical tool and the most accurate depiction of a company's available resources. The inclusion of a case study after doing a quantitative research necessitates a modification in the objectives of the study, as well as a revaluation of the timeline for

obtaining various desired outcomes. Hence, the intention was to conclude the research process by conducting an in-depth case study to comprehend the potential implications of integrating AI systems into a company's business model. Additionally, the study aimed to explore the asset management industry and specifically the alternative investments sector, which is often perceived as highly conventional and dominated by a small number of powerful market participants. However, it is crucial to recognize that this industry is highly adaptable and characterized by various subtleties that can foster competition, prevent excessive consolidation, and address the numerous challenges outlined in preceding chapters.

As already stated in the previous chapter, the company described below was the initial point in my process of formulating my master's thesis topic. Qraft Technologies, established in 2016, is dedicated to revolutionizing the asset management processes. Their mission is to utilize AI in several aspects such as AI-powered exchange-traded funds (ETFs) and AI trade execution, in order to enhance the ability to identify alpha (excess returns) without incurring disproportionately high costs. According to the company itself, the term "Qraft" is derived from the combination of the terms "Quant" and "Craft," which effectively communicates the objective of the company in developing quantitative solutions for clients through the utilization of our exclusive artificial intelligence technology. Qraft's internally developed, vertically integrated artificial intelligence suite provides the company with the capacity to adjust to the dynamic demands and circumstances of the market swiftly and continuously. Qraft's objective is to persistently enhance and furnish an extensive array of AI-driven facilitative services for financial institutions. These services encompass the construction of portfolios through security selection and asset allocation, data management via the Kirin API, identification of alpha through the Alpha Factory, and provision of trading signals via AXE. Their overarching aim is to leverage technology in order to enhance the availability of financial products to individuals across the globe. It is a company that, from the first moment I came into contact with it, aroused strong interest in its innovative drive, as it has modelled its business model to offer alternative solutions to traditional asset management companies, as the perfect combination of internalisation of processes and a very strong value proposition capable of differentiating the company and establishing itself internationally. According to Marcus Kim, CEO of QRAFT Technologies (Technologies, 2017): *"The asset management industry has been finding ways to reduce costs and increase productivity by combining and applying the strengths of both AI and humans into financial systems, and we're headed towards a 'hybrid model' where AI and humans would focus on where they would each perform best in".*

As can be deduced from an initial brief description, Qraft Technologies is not just a traditional asset management company, but a software firm that helps strategic partners such as institutional funds, asset raising companies or companies looking for an optimal allocation of capital, and to do so in an alternative way. Qraft Technologies is a firm that leverages AI technology to address the inefficiencies prevalent in the asset management sector, hence fostering innovation. Doing this, they aim to avoid inefficiencies within the asset management business through the utilization of AI including several stages such as data processing, alpha research, and portfolio order execution. Although the use of such research and analysis systems is not new to the financial world and especially to the world of investment, and the positive development, to some extent, for human managers lies in the fact that index funds continue to remain the predominant challenge, given that the present AI-operated funds have had difficulties in outperforming their respective benchmarks. Among the several options available, it is worth noting that the Qraft AI-Enhanced US Large Cap stands out in terms of its performance (Braham, 2023). However, it is expected that this situation will evolve over time, as additional funds are introduced, and artificial intelligence systems continue to improve through learning processes.

The focal point of this discussion lies in the inherent characteristics of the company, established merely seven years ago as a start-up, boasting a remarkable capacity for technological innovation. This serves as a testament to the potential for generating value within an industry that is deeply entrenched and characterized by formidable barriers to entry, by leveraging emerging trends and offering a unique value proposition. In order to elucidate the means by which a robust differentiation of the firm can be achieved within the global market, the subsequent presentation entails a concise depiction of the CANVAS business model, which offers a more lucid perspective of the previously mentioned corporation.

Fig. 4: Qraft Business Model CANVAS

<table>
<tr>
<td rowspan="2">Key Partner

- Strategic alliances between non-competitor companies, especially with important investiment banks or tech firms

- Joint Venture for the creation of personalized and specific products</td>
<td>Key Activities

- Creation and improvement of AI processes

- ETF issuance in financial markets</td>
<td rowspan="2">Value Proposition

- Offer of innovative solutions in the financial markets utilizing AI systems

- Quantitative investing strategies

- Tailored solutions for strategic partners

- Continuous improvement and machine learning system for investing solution</td>
<td>Customer Relationship

- Automatic services and online touchpoints

- Co-creation sharing the value creation process</td>
<td rowspan="2">Customer Segments

- B2B clients on a segments market

- Financial Institutions, such as investment banks or any kind of asset management firms

- Tech Corporates searching for innovative investing solutions

- Public institutions</td>
</tr>
<tr>
<td>Key Resources

- Patents on AI systems and processes

- highly skilled employees with different backgrounds</td>
<td>Channels

- Indirect online channels

- Personal communication within companies' top management</td>
</tr>
<tr>
<td colspan="3">Cost Structure

- Personnel costs

- Maintenance of IT systems

- ETF issuance costs</td>
<td colspan="2">Revenue Streams

- Management Fee (0.75%)

- Tailored contracts with strategic partners

- Other fees from AuM</td>
</tr>
</table>

Source: Own production

The business model CANVAS functions as a broad visualization tool for the organization, while it is limited in scope and does not encompass all the changes and advancements that have occurred during the years. The following chapter will delve into the evolution of the business model. However, it is imperative to note that Qraft's key competency, which persists throughout the years, is the use of artificial intelligence in the field of finance. This paper will examine the various ways in which this concept has been adapted to generate diverse sources of revenue and optimized for future scalability across multiple industries.

4.2.2 Financing History and Business model evolution

Qraft has a history strongly linked to the highly innovative and technological character of East Asia and South Korea in particular, but it is not only this. According to the company statement: *"Qraft was started by a group of people passionate about quantitative investing. While trading with their own money in their spare time, they found great success. However, over time, they became frustrated with the amount of work and short life span of the strategies they were using. That frustration drove them to find a new solution to this problem: Artificial Intelligence"*. Since its inception, it has received numerous awards and, more importantly, international credibility recognised by the major players in the industry, historically highly reluctant towards this type of alternative instrument. Below is a

milestone of the company's key moments from its foundation to the present day, with the relevant funds received and awards:

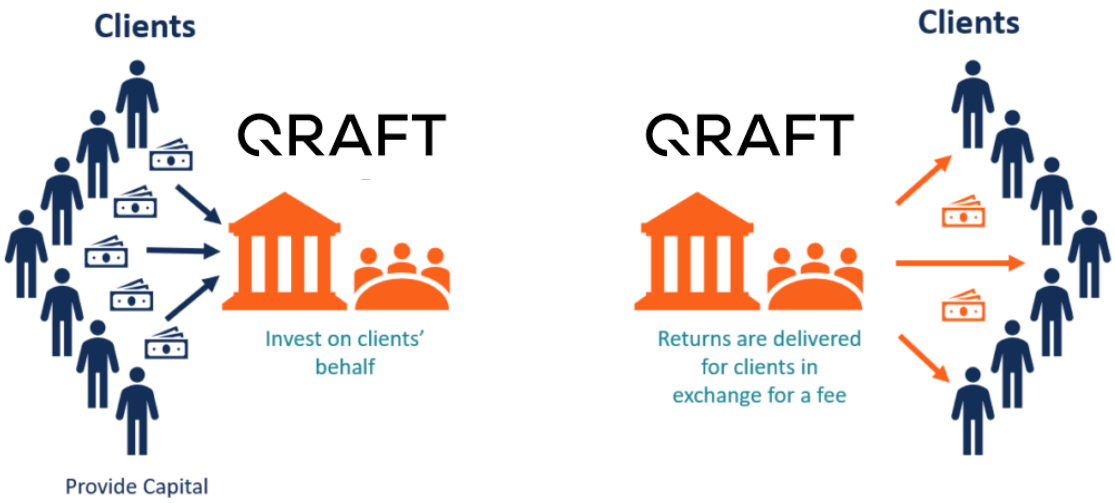
- 2016: QRAFT Technologies foundation
- 2017: Listed world's first AI fund, integrally generated by automatic systems
- 2018: Entered the B2B AI robo-advisor market, where Qraft Technologies has designed products in collaboration with Mirae Asset Global Investments.
- 2019: Half of Korea's megabanks adopt the QRAFT AI Robo engine, tailored solutions for B2B clients. The AI asset allocation engine developed by Qraft Technologies has been used by several banks. Robo service users now have access to advanced asset allocation algorithms, which were previously exclusive to prominent asset management firms and hedge funds.
- 2020: launch of AI Powered Electronic Trading (AXE), pioneering example of a commercialized AI Trading system that utilizes deep reinforcement learning techniques. The primary objective is to mitigate the adverse effects on the market resulting from the execution of substantial orders, while simultaneously decreasing the expenses associated with transactions. More details will be described in the following paragraphs.
- 2020: launch AI ETF in the New York Stock Exchange (NYSE), automated ETF that combines human intuition oversight with the superior processing and analytical depth delivered by AI.
- 2021: reached $ 30m AuM, cited in the most important financial newspapers like The Wall Street Journal and The Financial Times.
- 2022: funding by SoftBank Group, successfully secured 170 billion won ($142 million) in Series C funding from SoftBank Group, the biggest in company history. This investment is the greatest amount of cash from Japanese capital in a Korean enterprise, surpassing the previous record set by the ecommerce behemoth Coupang.
- 2022: first launch of QRAFT-Powered Global AI Equity Fund ranked for Hana Bank. Listed as first Global among AI funds in AUM growth and second Global among AI funds in AUM size.

Qraft thus started out as the classic technology-driven start-up, following several pre-seed and seed rounds that allowed it a rapid international consolidation. In fact, as can be seen from the business model reported in the previous chapter, scalability has always been its crucial point, making it a business with high potential and very appealing to almost all investors looking for this type of company.

Due to the influx of investments, Qraft has experienced growth in its workforce, currently employing over 80 specialized individuals who perform a wide range of duties. The primary areas of expertise inside the organization are upheld by a significant portion of software developers, quantitative researchers, and financial analysts who possess a specialized knowledge in artificial intelligence and automated trading. The organization has achieved a notable degree of nationwide prominence, particularly in terms of its ability to attract young professionals in the financial or research sectors. It is noteworthy that a majority of the present workforce, including the Founder and CEO, originate from the prestigious SKY Universities, which is an abbreviation for Seoul National University, Korea University, and Yonsei University - the three prominent educational institutions in South Korea. Every year, the most educated students in the country endeavour to secure admission into one of these prestigious universities. One of these internationally acclaimed colleges, known for attracting the most exceptional intellects in the nation. The status of being a catchment location for these students cannot be assumed, as prominent Asian or international investment banks as well as Asian technology firms like Samsung or LG also draw a significant number of these students. Establishing confidence with these students necessitates possessing a prominent national standing and a strong ambition to rival prominent international entities.

The company's notable adaptability and proactive approach towards change have facilitated its evolution across various dimensions, encompassing the expansion of its service portfolio and the fundamental transformation of its business model. According to the creator, Qraft was established based on the founders' initial enthusiasm to oversee their personal finances through ETF investments and trading activities. The establishment of the company was therefore based on the value proposition of generating capital by offering investors the assurance of a favourable return. The underlying assets of the investments were exclusively intrinsic to the technology sector and, notably, also to the realm of artificial intelligence, encompassing conventional assets like ETFs or equities. Hence, traditional asset management organizations embraced a conventional service provider business model, which is considered a classic approach where, in order to provide services of superior quality, it is imperative to possess the requisite expertise, skills, and knowledge. This entails the recruitment of individuals possessing particular expertise or qualifications, like financial analyst and quant engineer. The main source of income for the firm derived from the fees or charges associated with the services they deliver. With this business model structure, exploration of diversification of revenue streams can be undertaken by considering the integration of additional services or goods.

Fig. 5: First Qraft Technologies Business model structure



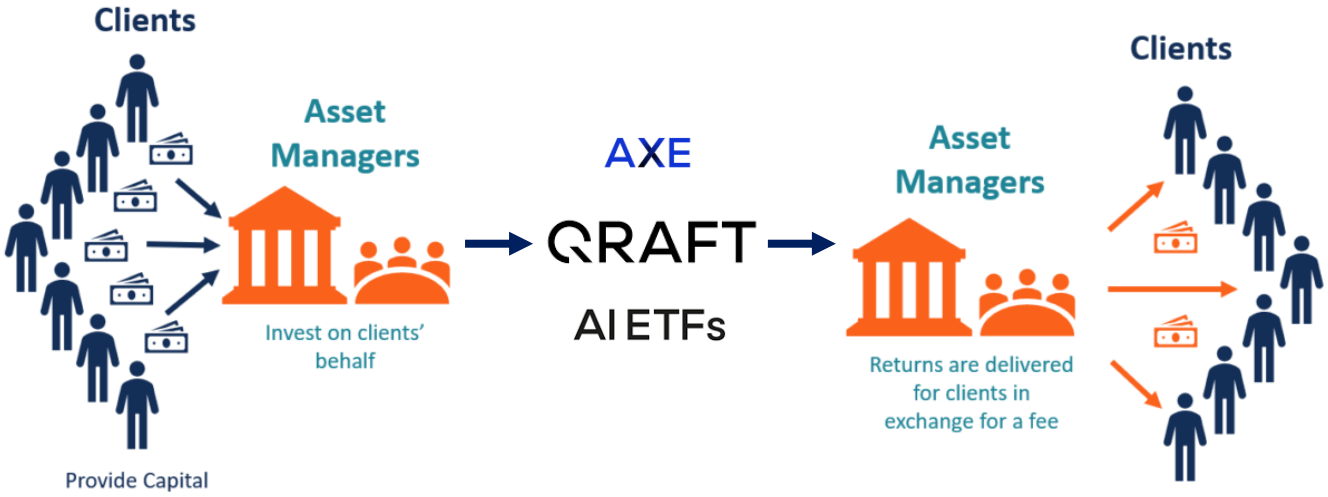
Source: own production

The main client in these cases were initially private contributors, the founders themselves, and some strategic partners linked to the corporate world, as stated by current employees. The reality then expanded as also observed by the milestones highlighted earlier, reaching banks and institutional investors, as well as other asset management companies. What changed, however, was not the value proposition or the integrity of the business model, but other aspects of the company itself:

- Channels: One of the first evolutions of Qraft was the different way of searching for target customers, expanding from private acquaintances to a more extensive strategic network. The mode of customer acquisition moves towards advertisements in trade newspapers, high media exposure (e.g., the well-known 'ringing of the bell' for the closing of the New York Stock Exchange);
- Customer Segments: there has been a substantial evolution in this respect, moving towards exclusively seeking institutional clients such as banks, insurance companies or asset management companies themselves. Recently, there has also been a move towards large high-tech companies seeking an alternative allocation of their capital;
- Revenue streams: there are no longer only asset management fees, but rather ad hoc payments for the creation of certain portfolios (this aspect will be explored in more detail in the following sections on the solutions offered by the company), remunerated partnerships with partner companies and ETFs issued by AI.

The subsequent content is a concise overview of Qraft Technologies' novel business concept.

Fig. 6: New Qraft Technologies Business model structure



Source: own production

Qraft still maintains a structure as a traditional asset management company, with about $30 AuM, but also offers customised investment solutions to investment banks or corporations, all with a high technological impact related to artificial intelligence. Qraft holds the belief that investment outcomes can be enhanced by the utilization of AI, hence yielding superior results in the long run. The organization specializes in the development and oversight of investment products that leverage artificial intelligence technology. Additionally, Qraft offer investment services to asset and wealth managers on a global scale, utilizing an exclusive AI technology. The remarkable adaptability of the business model has facilitated swift client transitions and expanded the company's exposure to market opportunities. The beginning of this endeavour can be traced back to a meticulous evaluation of the company's primary resources and competencies. These were discerned through the examination of legally protected rights and licenses pertaining to artificial intelligence systems, which were subsequently utilized to develop alternative investment alternatives. Qraft demonstrated a pronounced inclination towards leveraging artificial intelligence in the world of financial investments. Recognizing their distinctive skill in this domain, Qraft made a strategic decision to fortify their primary operations accordingly.

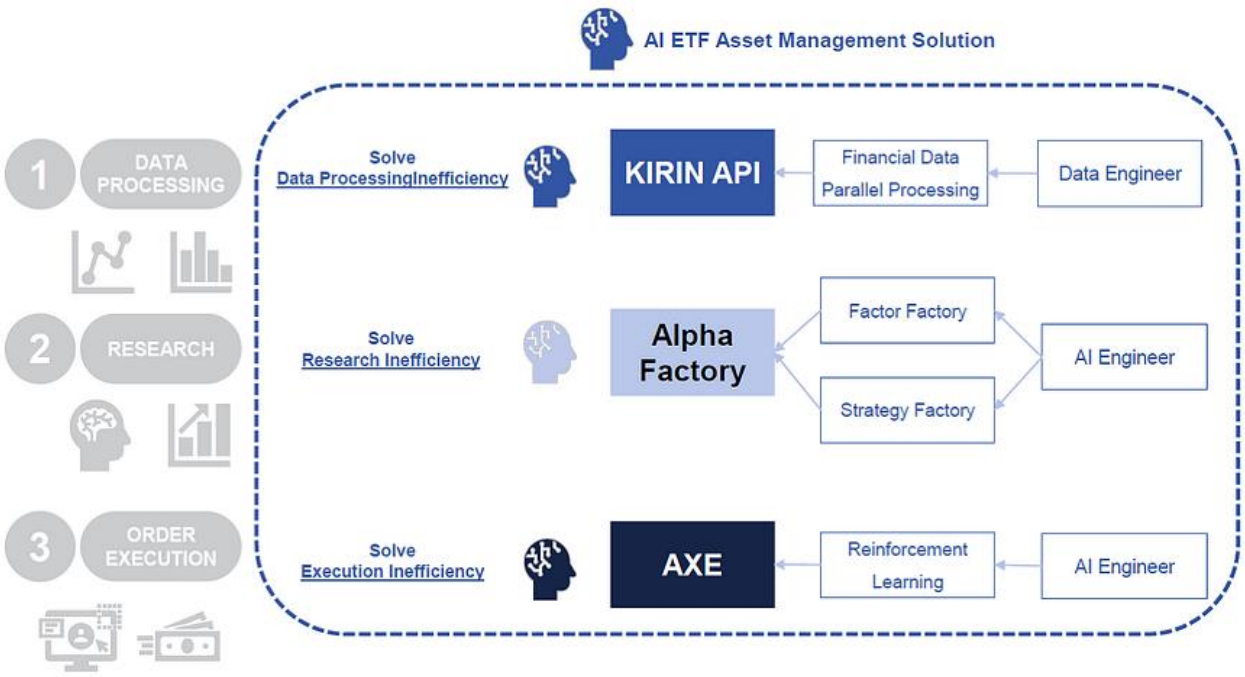
There are so two distinct perspective on portfolio management as well as a separate perspective on trading, namely order execution. The trading system employed in their study partitions tactics into around 700 to 800 segments on a daily basis, afterwards identifying the most effective approach by means of reinforcement learning techniques, and this is about their personal AuM allocation. The aforementioned method is presently used in several securities' brokerage firms, Qraft's main clients. The execution of stock orders and existing exchange deals are conducted by direct involvement of traders or brokers. From a portfolio management standpoint, AI is utilized to identify recurring

patterns that consistently impact the performance of stocks. This is achieved by analysing many types of data, including financial, macroeconomic, and alternative data, and subsequently incorporating these patterns into investing strategies. So far, Qraft has only employed outsourced solutions to respond to its clients' requirements for money funds or trading system implementation. A very illustrative example is the partnership with Hana Bank, one of the largest banks in South Korea and the whole of Asia. Qraft Technologies has entered into a partnership with Hana Bank with the aim of collaboratively developing novel business models that leverage the capabilities of artificial intelligence technology. Their agreement seeks to enhance the development and progression of Qraft's Robo-advisors and the customized construction of model portfolios. Moreover, Hana Bank plans to introduce a new financial business model that incorporates AI technology with the utilization of MyData (widely utilized financial management service in Korea that facilitates asset and credit management through the collection of personal financial information. This service leverages big data analysis to examine asset and consumption habits) (Ji-young, 2022).

4.2.3 AI-powered services to financial firms

As stated before, Qraft holds the belief that investment outcomes can be enhanced by the utilization of artificial intelligence, hence yielding superior results over an extended period. The firm is specialized in the development and oversight of investment products that leverage AI technology. Artificial intelligence technology is utilized in the process of investment decision-making to discern patterns and signals from a vast array of real-time data sources. The distinguishing factor between AI and quant strategies is in AI's capacity to autonomously adjust to dynamic circumstances and unforeseen occurrences, enabling it to generate investment forecasts. This sets AI apart from quant strategies, which solely rely on conventional statistical methods. In practical terms, Qraft Technologies' offering is unique compared to its competitors in the financial services market, offering its partners a process for formulating the sought-after product that can be summarised in the chart below:

Fig. 7: Qraft AI-powered services



Source: Company's website

1. Security selection & Portfolio Construction is the section of Qraft's services – it is the first part of the service offered to institutional funds, banks or major high-tech companies that need customized portfolios for their capital allocation. In order to realize this service, Qraft has effectively utilized AI to optimize data processing, investment research, and portfolio design. This investment strategy aligns with the conventional practices of fundamental asset managers, but distinguishes itself through its enhanced magnitude, breadth, and velocity. The AI engine developed by the firm is referred to as Alpha Factory. This advanced system specializes in generating personalized investment portfolios that are actively maintained, consisting of distinct equities securities. Qraft's AI-based exchange-traded funds (ETFs) undergo regular systematic updates in order to accurately capture and adapt to the dynamic nature of market conditions.

Fig. 8: Qraft Deep Learning Engine

Source: Company's website

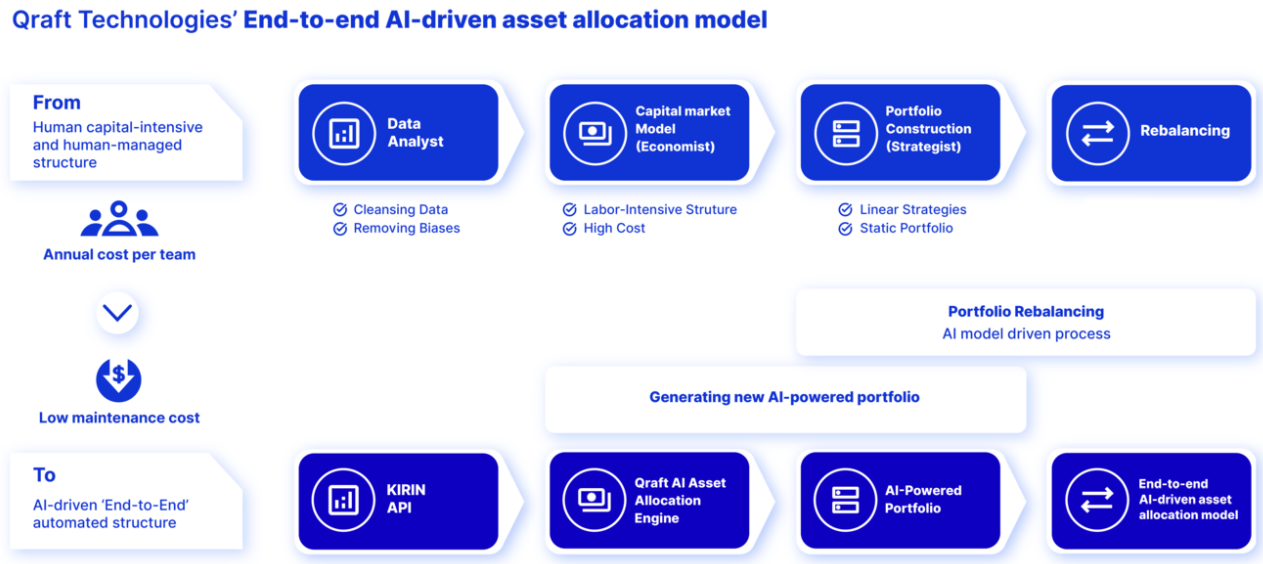
This allows an approach totally free of “human” bias resulting from the free choice of financial traders. Not only in the choice of which assets to invest, but also their weight within the portfolio, which clearly changes over time depending on market conditions. This is 'supervised learning' for which Qraft holds all the patents globally, the initial input is defined by the needs of the clients in question. Moreover, machine learning and deep learning techniques enable the evaluation of extensive datasets that surpass the replicability capabilities of people. The two factors that might significantly impact a process or system are speed and scalability, as well as the capability to improve over time thanks to automatic learning process.

At its essence, Qraft machine learning is a computational procedure via which computer systems can acquire knowledge from data in order to generate predictions, make decisions, or carry out tasks without the need for explicit programming. The initial stage involves the collection of pertinent data. The data should accurately depict the problem that the machine learning model aims to address (in this case, the problem is the proper selection of the best securities for the partner). Then, the data can be categorized into structured data, such as tables, unstructured data, such as text or photos, or a combination of both. Data preprocessing is an essential step into this data analysis process, as raw data is frequently unstructured and may exhibit various imperfections such as missing values, outliers, or extraneous information. The process of data preparation encompasses the tasks of cleansing and manipulating the data in order to render it appropriate for analytical purposes. This stage includes activities such as data normalization, addressing missing values, and doing feature engineering. Then, Qraft’s algorithm partitions the data into multiple sets, namely the training set, validation set, and test set. The training set is employed for the purpose of training the machine learning model, while the validation set is utilized for hyperparameter tuning and model selection. Lastly, the test set is employed to assess the performance of the model on previously unseen data. Model training is the stage in machine learning where the model acquires knowledge and improves its performance by analyzing and processing the training data, especially historical financial data, market insights from newspaper or specialized articles, as well as any other useful data to make a correct decision. The model endeavors to identify patterns, correlations, or decision boundaries within the dataset, enabling it to generate predictions or classifications. The evaluation of the model entails the utilization of task-specific evaluation measures to determine its performance. Common metrics for classification include accuracy, precision, recall, and F1-score. In the context of regression analysis, the algorithm utilizes measurements such as mean squared error (MSE) or root mean squared error (RMSE). Then, after achieving satisfactory performance, the model can be implemented in a production setting to generate predictions about financial markets with unobserved data. Monitoring and maintenance are essential aspects of machine learning models, as periodic retraining may be necessary to ensure their accuracy,

particularly when there are changes in the underlying data distribution over time. The process of continuously monitoring and updating the model in response to potential model drift is of utmost importance, the feedback loop in machine learning involves an iterative process. The utilization of feedback obtained from the performance of a model in real-world scenarios can be employed to enhance the model's accuracy, enhance the quality of the data used, or adjust the model to accommodate evolving needs. Consequently, if the predictive model takes into account certain assets that do not perform optimally and the system obtains new information about certain security, it will not make the same mistake in the future. The success of a machine learning project is contingent upon several crucial variables, namely the quality of the data, the selection of an appropriate algorithm, and meticulous evaluation.

2. Asset Allocation & Model Portfolios is the second step on the formulation of the optimal tailored portfolio for the client. We previously described the machine learning system in order to detect and select the right securities for the partner's needs. Qraft claims that investment solutions driven by artificial intelligence possess the potential to provide superior outcomes over an extended period. Consequently, they undertake the development and oversight of AI-driven model portfolios, with the aim of aiding asset and wealth managers worldwide in delivering innovative investment solutions to their strategic partners.

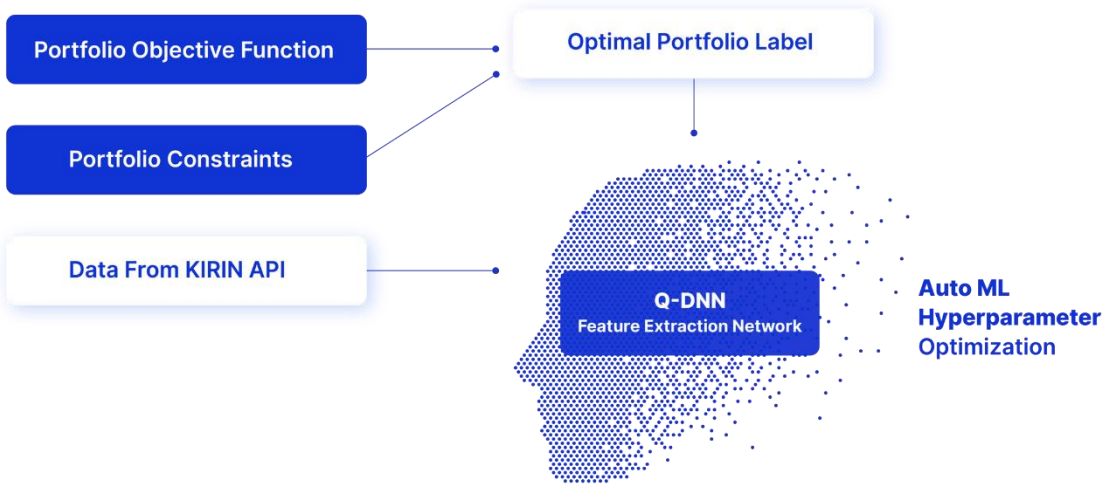
Fig. 9: Qraft End-to-end AI-driven asset allocation model



Source: Company's investor deck

The above table clearly shows both the problems encountered by the company in the course of its work as well as the potential of an automated system capable of avoiding human interaction in the processes of creating a suitable portfolio. The concept of an end-to-end AI-driven framework entails the use of AI systems that are specifically developed and utilized to autonomously manage and execute a whole process or activity, without the need for human involvement, from its initiation to its completion (Francisco M. Castro, 2018). The objective of this method is to automate and enhance asset allocation processes by utilizing no human interaction at all. The process of data ingestion involves the intake and subsequent processing of unprocessed data obtained from many sources. The data under consideration can be categorized into three types: structured, semi-structured, or unstructured, this kind of data plays a fundamental role in facilitating AI analysis and informing decision-making processes. Data preprocessing involves the utilization of a system to effectively cleanse, preprocess, and convert data into a format that is conducive for analysis using artificial intelligence techniques. This may encompass several tasks such as data cleansing, standardization, feature engineering, and processing of textual or visual information. End-to-end artificial intelligence systems frequently integrate machine learning or deep learning models. The AI models undergo a process of training and optimization, wherein previous data is utilized to enhance their accuracy and performance. The system has the capability to work either in real-time, where choices are made instantaneously, or in batch mode, where data is processed in bigger batches at regular intervals, depending on the specific use case. The architecture of the system is designed to accommodate the growing data quantities and computing needs by scaling either horizontally or vertically as required.

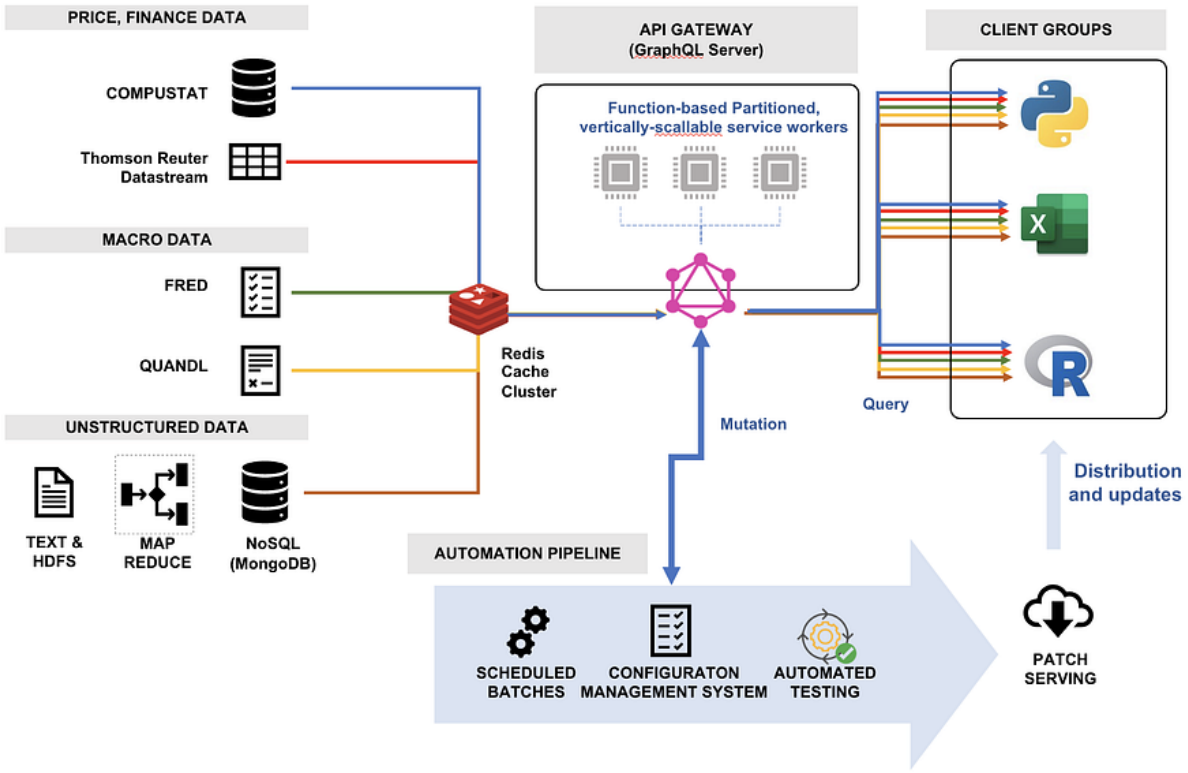
Fig. 10: QRAFT Technologies' Asset Allocation Engine



Source: Company's investor deck

As the chart above shows, KIRIN API ® is Qrfat Technologies' registered system for collecting data and formulating the best allocation in each asset type. Qraft Technologies has undertaken the process of restructuring its data-driven application programming interface (API) service, known as Kirin API. The Kirin API was originally created by the AI Research team to offer a diverse range of financial data integrated with various widely utilized databases. This includes corporate market data from sources such as S&P Global's Compustat database and Thomson Reuters' Datastream, as well as economic macro data from APIs like FRED or Quandl. All of these datasets are accessible through a single endpoint. As the project experiences increasing demands both internally and internationally, it has transitioned from an internal pilot project overseen by my team, the Research Platform, into a commercially oriented endeavor. This transformation aims to create a highly scalable and available service capable of accommodating higher volumes of traffic and serving a larger client base. In general, an API is a collection of regulations, protocols, and instruments that facilitate intercommunication between diverse software programs. These APIs facilitate the exchange of information and the execution of particular actions across applications (Robillard, et al., 2012).

Fig. 11: Kirin API® service architecture using GraphQL



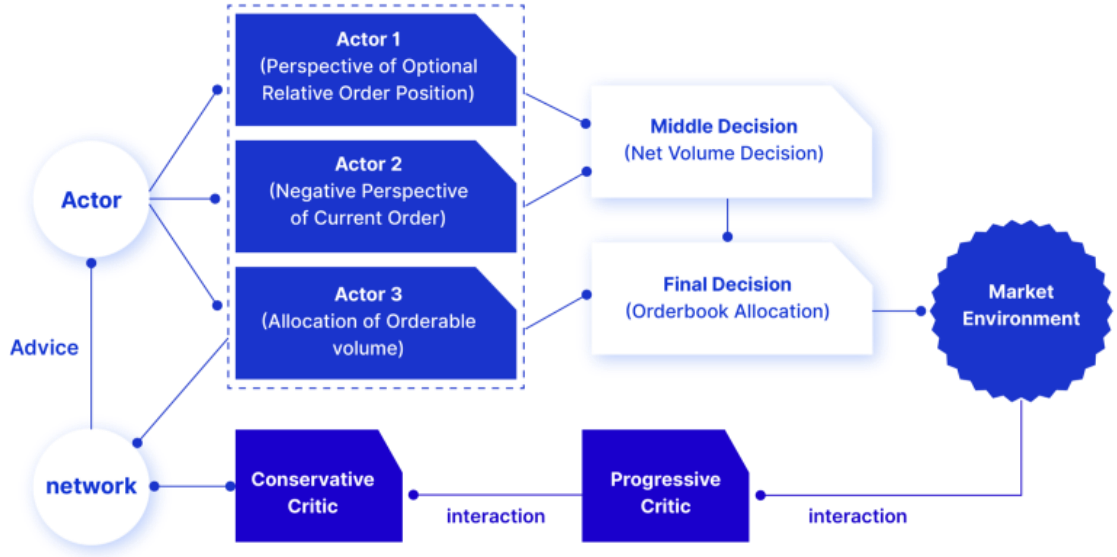
Source: Medium.com

Each client group submits requests for data to the API gateway, which is a GraphQL server. The associated resolvers then retrieve the requested data from the original data source. Upon retrieval of

data, the asynchronous service workers are responsible for executing postprocessing tasks and subsequently delivering the outcome to the customers. The Continuous Integration and Continuous Deployment (CICD) system in place utilizes an automated pipeline that executes scheduled batches. These batches are responsible for monitoring updates on the data sources, verifying the integrity of the data, and ensuring that each group of client versions is utilizing the most recent updates.

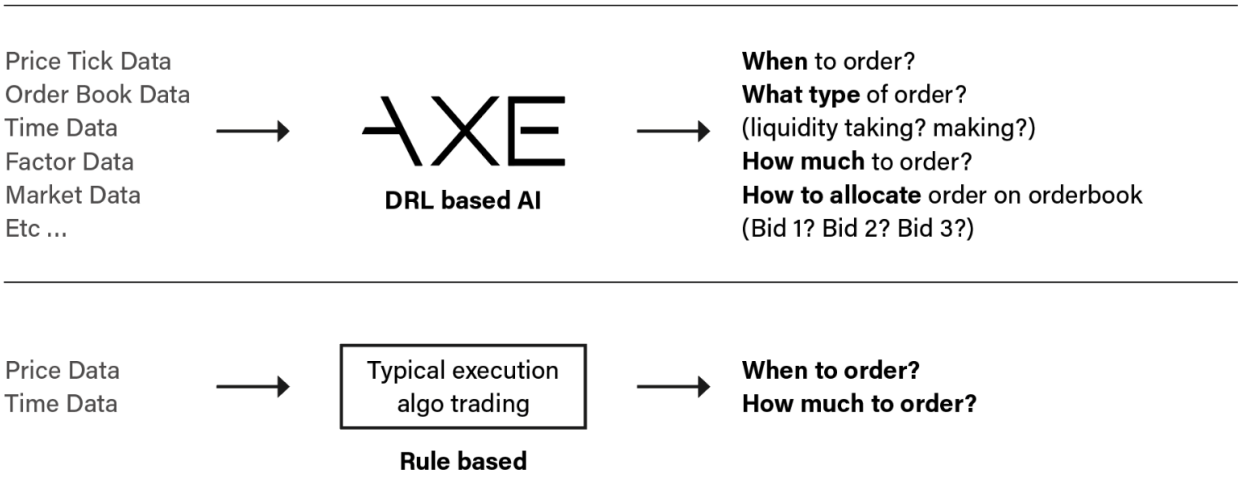
3. Another way in which AI is used is in the management of trading (initial and over time), the fundamental element with the highest alpha among all the various moments of portfolio and investment management. To trade at its best, Qraft has created AXE®. AXE (AI eXEcution) is a trading insights platform that utilizes deep reinforcement learning. It is recognized as one of the pioneering commercialized AI trading systems driven by this kind of technology. The primary objective of AXE is to mitigate the adverse effects on the market resulting from the execution of substantial orders, while concurrently diminishing the expenses associated with transactions. This is achieved by the identification and implementation of optimal trading techniques, as well as the abil ity to swiftly adjust to dynamic market conditions. Qraft offers trading signals to clients via its AXE platform, which may be included into their trade execution procedures. Durante il mio processo di interviste e raccolta dati, ho osservato particolare entusiasmo verso questo metodo di investimento e strategia di trading, un forte orgoglio da parte di tutta la società per aver perfezionato un metodo di investimento attualmente funzionante e in grado di garantire quasi sempre un ritorno maggiore rispetto a quello del mercato. The AXE system employs a method of learning analysis to determine the most effective strategy. This analysis involves examining market micro-structure using historical tick data, which includes information such as price and transaction volume, as well as data from the limit order book. Subsequently, the system provides trading signals, insights, and guidance in order to effectively minimize transaction costs and mitigate market impact. By utilizing such a system, investors have the ability to optimize their returns through the reduction of transaction costs associated with the large-scale trading of financial products. The potential benefit and cost reductions from AXE's technology are greater when there is a higher volume of trade and l ower natural liquidity, such as in the case of smaller cap companies. Below is a visualisation of how this trading system works in practice.

Fig. 12: AXE Agent Mechanism



Source: Company's investor deck

As can be seen from the figure, there is no end point in this execution system, but rather a continuous circle of improvement and refinement in trading in equity and other types of stocks. The system takes into account two fundamental elements, order execution and market impact. Order execution refers to the procedural steps involved in the purchase or sale of a predetermined quantity of specific securities. The inherent nature of managing a substantial quantity of shares will inevitably exert influence on the market, resulting in changes in prices (StreamNative, 2021). As an example, in the event that a significant investor, such as a major investment bank, intends to purchase stocks valued at one million dollars, the execution of this transaction is highly likely to exert an influence on the market, hence resulting in substantial transaction costs. The optimal approach, inherently, involves dividing substantial orders into multiple smaller ones. This is the point at which AXE contributes. The order execution system acquires knowledge of tick data patterns specific to individual stocks and endeavours to identify an effective approach for placing orders at varying bid/ask prices.



The different investment strategy between a traditional method of execution and AXE is outlined above, as well as the factors taken into account for an optimal choice. The model developed by Qraft has the characteristic of execution and is classified as an event streaming model. As a consequence, the primary criteria for event streaming technologies are outlined as follows:

1- The concept of high throughput refers to the ability to process a large volume of data or perform a large number of tasks within a given time frame. The system should possess the capability to effectively process substantial volumes of tick data generated within exchanges, while also demonstrating scalability to execute multiple orders concurrently in real-time, all while maintaining a high level of resilience.

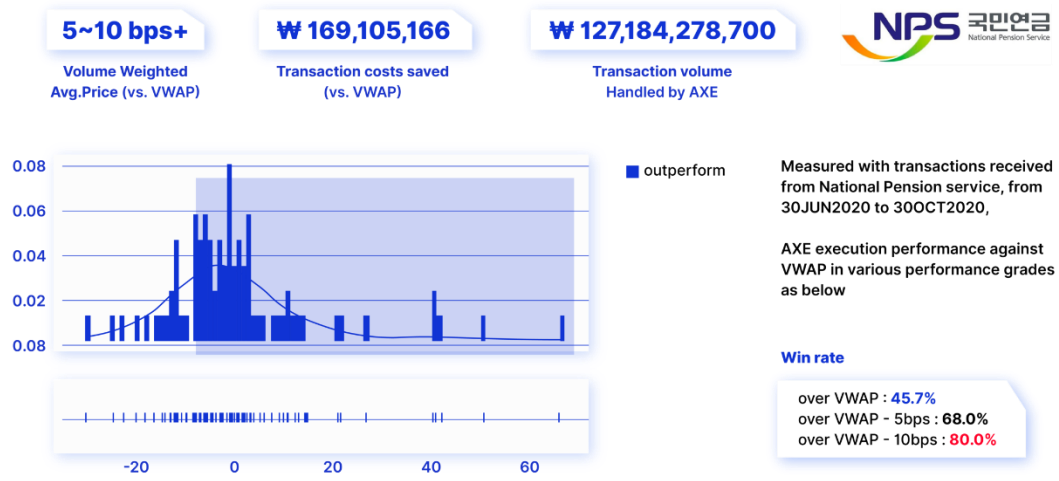
2- Then there is the level of latency, or delay, in a system. In the pursuit of identifying an effective approach to minimize transaction costs, it is imperative for the system to demonstrate adaptability in response to the rapidly evolving market dynamics. Additionally, the system has been specifically developed with the intention of minimizing the frequency of network communications that occur between microservices.

3- Ultimately, the concept of high availability refers to the ability of a system or service to remain operational and accessible for extended periods of time, with minimal downtime or interruptions. The management of failover circumstances is of utmost importance for the order execution system. The decreased capacity to recover after certain failures has the potential to result in significant revenue loss.

I mentioned earlier the enthusiasm I encountered when discussing the AXE® system with various employees, as it was seen as the flagship product of the entire company and still recognised externally as the company's characterising added value. Moreover, in the year 2018, a financial competition was held, supported by prominent entities such as NVIDIA, Shinhan Bank, KOSCOM, and PwC. This

competition saw seasoned traders from reputable securities firms engaging in a contest against AXE®, with the objective of acquiring stocks at a more favourable price. The duration of the competition spanned a period of five days. Ultimately, AXE® demonstrated superior performance in comparison to the human traders, securing a substantial victory and claiming the prestigious $100,000 top prize (Hyeong, 2018). Following this international recognition, many banks and financial institutions used Qraft's trading system for their investment management and capital allocation of their customers. The trade execution systems of prominent financial groups in Korea are integrated with AXE. Currently, AXE® conducts financial transactions amounting to 127 billion Korean won on a monthly basis, which is equivalent to over 100 million US dollars. It has consistently outperformed the conventional execution model by a margin of 5-10 basis points or more, thereby generating additional returns, commonly referred to as alpha.

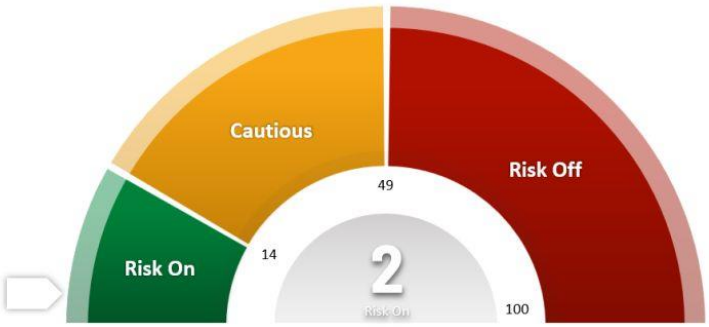
Fig. 13: AXE Performance over time



Source: Korean National Pension service

This massive use by financial institutions has made the company aware of the potential to go beyond the exclusive partnership with its customers, seeking consensus with the mass market and international respectability. The answer is a free risk communication service on financial markets developed with the AI systems described so far. Using the same systems of optimal capital allocation, trading execution and selection of the best securities in the market, Qraft has created a risk detection system with which it is able to assign an optimal risk assessment of a given asset (specifically the US stock market). Below an example of the visualization of the market risk indicator.

Fig. 14: Qraft AI Market Risk Indicator



Source: Qraft LinkedIn profile

The AI Risk Indicator utilizes their exclusive AI models to predict the level of risk in the U.S. equities market for the upcoming week. This enables investors to strategically allocate their equity portfolio based on the straightforward scoring approach. The provided actionable insight offers an evaluation of the current market risk conditions, accompanied by explicit recommendations for entry and exit locations that are in line with a suggested allocation between equities and cash. Specifically, It aids in navigating markets characterized by high levels of instability and unpredictability. Although numerous indicators and indexes exist for assessing market sentiment and risk, only a limited number offer precise and practical insights that are in line with equity/cash allocations. The AI Risk Indicator utilized is driven by a machine learning model that effectively assimilates, evaluates, and processes more than 70 macro and market data inputs in real-time. Through this process, the AI is able to forecast the risk landscape promptly, automatically, and in a manner that can be readily acted upon. The model places emphasis on contemporary measures of momentum, volatility, and correlation, and has undergone training and learning processes using historical data dating back to 1999. Extensive back testing has provided empirical evidence of the model's capacity to effectively navigate financial markets in situations where the risks are inherently unpredictable.

The term "indicator" pertains to the percentage of assets within a U.S. equity allocation that is advised to be maintained in the form of cash. A signal value of zero indicates an asset allocation consisting of zero percent cash and one hundred percent shares. A signal value of 100 indicates a portfolio allocation consisting entirely of cash (100%) and no allocation to stocks (0%).

The indication is partitioned into three distinct sections:

1) Risk On: Qraft's AI model predicts a low level of risk in the U.S. equities market for the upcoming week when the indicator ranges from 0 to 14. In the context of a U.S. stock allocation, the current

circumstances present a potentially favourable moment to primarily invest in shares while maintaining a limited cash position.

2) The cautious stance is indicated when the range of the indicator falls between 15 and 49, signalling Qraft's AI model's prediction of a moderate level of risk in the U.S. equity market for the upcoming week. In the context of a U.S. stock allocation, it is advisable to consider maintaining a moderate cash position as a strategic approach to exercising caution during periods of market uncertainty.

3) Risk Off: The AI model developed by Qraft predicts an elevated level of risk in the U.S. equities market for the upcoming week when the indicator value ranges from 50 to 100. In the context of a U.S. stock allocation, it may be advantageous to consider increasing the allocation of cash holdings as a means of safeguarding against potential losses during periods of anticipated market volatility.

4.2.4 Qraft AI ETFs

In addition to offering the customised services described in the previous chapter, Qraft manages AuM capital like a traditional asset management fund. It has then refined this process with the application of AI systems that have made the company internationally known. Indeed, the company has issued a number of ETFs on the NYSE from 2018 onwards that have attracted considerable interest from investors from the outset, both for their uniqueness and for their positive returns. But let's start with the basics - what is an ETF and how is it issued? An Exchange Traded Fund (ETF) represents a unit of ownership in an index fund that is traded on an exchange. Index funds are a type of mutual fund that is open-ended and tied to a certain index. In essence, these investment vehicles accurately reproduce the returns of a given stock or bond index, a real estate market index, sector indexes, or collections of stocks and bonds. Index funds are characterized by their passive management approach. In other words, the fund managers do not acquire assets based solely on personal preferences. However, the fund's portfolio consists of the identical securities that comprise the reference index (also known as the benchmark), with the same proportional weightage (Gastineau, 2004). The creation process invariably starts with the conceptualization of an asset management firm, which will be responsible for addressing and overseeing the issue at hand. After conducting a thorough analysis to determine the underlying index that will be replicated, the latter party will proceed with a feasibility study. It is important to note that not all world indexes can be easily replicated due to various issues, such as challenges related to negotiating the underlying securities. Subsequently, the party will initiate the process of obtaining the necessary authorizations from the relevant regulatory bodies, including the Stock Exchange and its corresponding control authority. After successfully overcoming this initial obstacle, the company proceed to acquire the stocks or bonds of the desired index on the market. This

is done in a manner that replicates the proportional and weighted distribution of these securities inside the respective index.

Given these final indications, we can now talk about how Qraft Technologies was one of the first, and certainly the best, to launch an ETF entirely set up through artificial intelligence choices with their predictive and choice algorithm. As stated by Francis Geeseok Oh, APAC CEO of Qraft Technologies: "*Unlocking the power of AI to surpass the limitations of human investing has been our goal since 2016, and we're so proud to deliver this new ETF at a time when we believe investors are seeking a new way to manage risk. Qraft has been providing AI-powered dynamic beta risk management solutions to institutional investors in South Korea since 2019, with its proven reputation and record of helping investors navigate the market more smoothly by managing downside risk with our AI model's prediction power. AI's speed and prediction capabilities will help investors uncover greater opportunities, and we look forward to continuing to apply AI to help investors achieve their goals."* (Lord, 2023). The goal of Qraft ETF strategy is seeking an advantage with AI in Active Management. Qraft employs AI-driven strategies that leverage machine learning techniques to select stocks inside the investment universe, as defined by human experts. The primary objective is still to uncover equities that exhibit the highest potential for generating alpha. The AI models developed by the organization have been specifically built and trained to forecast the relative strength of individual securities within the investable universe for the upcoming month. In isolation, the AI algorithms for portfolio formation consider both the current market conditions and predefined criteria established by humans. These parameters are specifically meant to mitigate risk in the portfolio, including restrictions on the size of individual positions and the maximum allowable weights for certain sectors. Subsequently, an artificial intelligence algorithm proceeds to curate a selection of stocks that exhibit the highest likelihood of achieving superior performance, taking into account the aforementioned factors. The Qraft AI-Enhanced ETFs employ an active management approach, wherein the portfolio holdings are adjusted on a monthly basis to incorporate the most recent stock and market-level forecasts given by Qraft's AI. That's why the company introduced a monthly updating of the portfolio that aim to achieve a harmonious equilibrium between the long-term performance and profitability of the strategy, while taking into consideration transaction costs and turnover. The availability of data is an additional factor to consider, as numerous financial data points are updated solely on a monthly basis. The active management and regular updating of portfolio holdings offer a distinct advantage in comparison to passive techniques that engage in less frequent rebalancing. However, Qraft's actively managed portfolio possesses a dynamic nature, enabling it to exhibit greater flexibility in adjusting to evolving market conditions. Until mid-2023, Qraft Technologies has issued four ETFs at the NYSE, all with the active strategy described so far and with the creation mode via artificial

intelligence.

QRFT ETF · QRAFT AI-Enhanced U.S. Large Cap ETF: The management of this fund is characterized by active decision-making and does not involve the monitoring or tracking of any specific index. The present unit class provides a revenue stream by means of dividend distribution. The Qraft AI Enhanced U.S. Large-Cap ETF utilizes AI technology to optimize and actively manage its investment strategy. Its primary objective is to achieve long-term capital growth through the dynamic allocation of assets across five established factors: quality, size, value, momentum, and low volatility. The automated framework they have developed integrates human intuition and oversight with the advanced processing capabilities and analytical depth provided by artificial intelligence. The current expense ratio is 0.75% on capital invested, with more than 125k shares outstanding and more than $5m of net assets.

Fig. 15: QRFT current asset composition (08/2023)

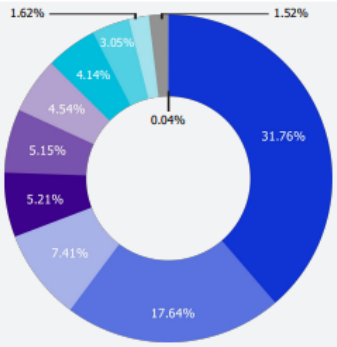
Top 10 Holdings

Veeva Systems Inc	2.13%
Qualcomm Inc	1.71%
Applied Materials Inc	1.52%
Qorvo Inc	1.45%
Lam Research Corp	1.34%
Idexx Laboratories Inc	1.28%
Amdocs	1.24%
Manhattan Associates	1.19%
Cummins Inc	1.08%
Humana Inc	1.08%

Holdings subject to change.

Sector Weightings

Technology	31.76%
Healthcare	17.64%
Industrials	7.41%
Financials	5.21%
Consumer Non-Cyclicals	5.15%
Consumer Cyclicals	4.54%
Basic Materials	4.14%
Energy	3.05%
Real Estate	1.62%
Utilities	1.52%
Other	0.04%



Source: Yahoo Finance

QRFT can be utilized as a constituent of the large cap equity allocation within a client portfolio, hence increasing equity exposure. It could perhaps be suitable for investors who are in search of dynamic factor exposure and for an alternative's allocation due to its investment approach that is centred around cutting-edge technology.

Fig. 16: QRFT current NAV history

Source: Track Insight

The ETF price also reflects investors' confidence in the underlying assets and the overall integrity of the benchmark index. The graph above shows the Net Asset Value (NAV) of the ETF over these three years. To initially explain what the value of an ETF is, therefore, it is useful to explain what these benchmarks are. The valuation of an ETF often aligns with its NAV. The NAV of an ETF is determined by subtracting the total liabilities from the total value of securities and other assets held by the ETF. This resulting value is then divided by the number of units in the ETF. This value is computed on a daily basis by an impartial custodian of the ETF. In the event that the value of the underlying assets experiences an increase, while the quantity of units remains constant, the value of each individual unit will correspondingly increase (JustETF). In the event of an increase in demand for ETF shares, the issuance of fresh shares will be initiated. An augmentation in the supply of units leads to the preservation of the unit's worth in accordance with the NAV of the ETF. The performance of an ETF is determined by the value of its underlying index, rather than the supply and demand dynamics of its units. The creation and redemption mechanism are designed to minimize deviations between the market price of the ETF and the underlying index it tracks. It is quite probable that competing funds that replicate the same index would exhibit a nearly equal percentage fluctuation in their respective prices. The degree of alignment between these modifications and the index's actual performance directly correlates with the ETF's level of success. The current QRFT return is exhibited as follow:

Fig. 17: QRFT Historical performance and flows

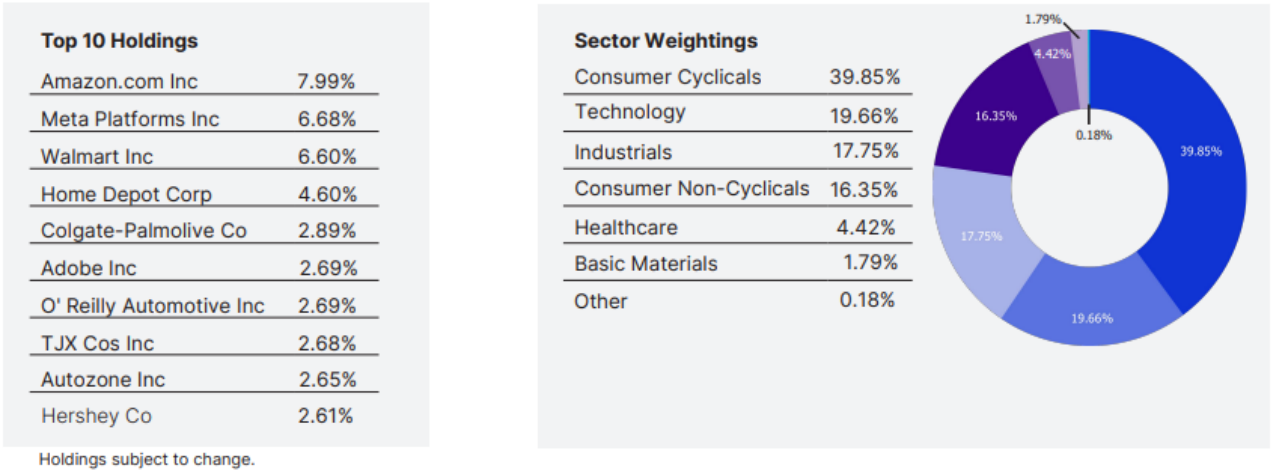
	1 month	3 months	1 years	3 years	year to date
Perf.	-0.44%	+4.24%	+13.59%	+28.55%	+15.31%

Source: Track Insight

AMOM ETF: This fund is subject to active management and does not aim to replicate the performance of any certain index. This particular category of shares delivers a consistent flow of

revenue through the distribution of dividends. The Qraft AI-Enhanced U.S. Large Cap Momentum ETF utilizes AI technology to optimize and actively manage its investment strategy. Its primary objective is to achieve capital appreciation by selecting stocks that demonstrate a greater degree of market momentum. The phenomenon of stocks that have exhibited superior performance in the recent past tending to sustain their positive performance in the immediate future is commonly referred to as momentum factor investing in academic literature. AI systems possess the capability to detect and analyse data patterns on a level, magnitude, and velocity that surpasses the capabilities of people in isolation. Furthermore, these systems have the ability to constantly acquire knowledge from growing data sets. The combination of momentum factor exposure and investment possibilities uncovered using artificial intelligence has the potential to generate superior performance throughout a complete market cycle. The current expense ratio is 0.75% on capital invested, with more than 425k shares outstanding and more than $13m of net assets.

Fig. 18: AMOM current asset composition (08/2023)



Top 10 Holdings

Amazon.com Inc	7.99%
Meta Platforms Inc	6.68%
Walmart Inc	6.60%
Home Depot Corp	4.60%
Colgate-Palmolive Co	2.89%
Adobe Inc	2.69%
O' Reilly Automotive Inc	2.69%
TJX Cos Inc	2.68%
Autozone Inc	2.65%
Hershey Co	2.61%

Holdings subject to change.

Sector Weightings

Consumer Cyclicals	39.85%
Technology	19.66%
Industrials	17.75%
Consumer Non-Cyclicals	16.35%
Healthcare	4.42%
Basic Materials	1.79%
Other	0.18%

Source: Yahoo Finance

As QRFT, also this ETF can be widely used by investors searching for equity and factor exposure, as well as alternative investments and the so called "consumer cyclicals". Moreover, consumer cyclicals refer to a classification of equities that exhibit a significant dependence on the fluctuations of the business cycle and prevailing economic conditions. Consumer cyclicals includes various industries, including automobile, housing, entertainment, and retail. The category can be further subdivided into two groups, namely durable and non-durable. Durable cyclicals encompass tangible commodities such as hardware or cars, whereas non-durables pertain to items that are rapidly used by individuals, such as cleaning supplies, clothing, or food. More in details, consumer cyclicals refer to firms that

engage in the sale of discretionary or non-essential products. The nomenclature is derived from the observation that these goods are predominantly acquired by individual consumers rather than companies, and the recognition that the sales of such products (together with their corresponding stock prices) exhibit cyclical patterns. Consumer cyclicals typically exhibit a positive correlation with the overall market, experiencing upward movements during periods of bullish market conditions and downward movements during bearish market conditions. Consumer staples are considered defensive companies due to their focus on selling essential products. These stocks have the potential to provide a hedge against consumer cyclicals within a portfolio, since they tend to have consistent demand even during periods of economic downturn.

Fig. 19: AMOM current NAV history

Source: Track Insight

AMOM's NAV has always been highly positive, generating attractive returns (as we will see below) and maintaining a more than positive valuation throughout its issuance history. However, the chart shows a period of significant decline during 2022. As we noted earlier when describing the ETF's composition, about 40 per cent of its stocks relate to consumer cyclicals, non-core consumer goods related to retail, automotive or entertainment. These particular stocks strongly follow the trend of the market, which in its entirety has been declining and generally losing value. At the end of 2022, the Dow Jones index had a decline of 9.2% on Wall Street, while the Nasdaq Composite technology index witnessed a significant drop of 33.8%. The Milan stock exchange in Italy has experienced a decline of 12.5% since the beginning of the year 2022 (MilanoFinanza, 2022). In addition, Greece exhibited the poorest performance in the government bond market, with a negative return of -14.35%. The Netherlands and Italy closely followed with returns of -13.69%. Comparatively, Spain, France, Portugal, and Germany demonstrated relatively stronger performance, albeit with double-digit negative returns. Among these countries, Germany emerged as the most favorable market within the euro area for European government bond portfolios. At the commencement of the year, Bitcoin had a decline in its value over 60%, while Ethereum suffered an even greater decrease of almost 66%. This then is the reason behind the decline in AMOM's NAV.

Fig. 20: AMOM Historical performance and flows

	1m	3m	1y	3y	YTD
Perf.	-0.89%	+5.28%	+21.90%	+13.74%	+18.60%

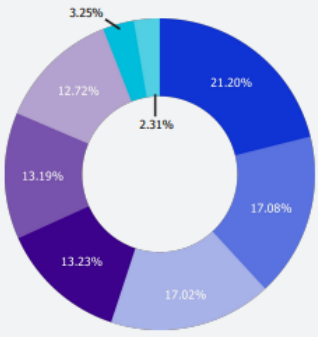
Source: Track Insight

NVQ ETF: Even this fund is subject to active management and does not adhere to the tracking of any certain index. The primary objective of this unit class is to provide a consistent revenue stream by means of dividend distribution. The Qraft AI Enhanced U.S. Next Level ETF utilizes AI technology to optimize and actively manage its investment strategy. The primary objective of this ETF is to achieve capital appreciation by investing in value companies that have been adjusted for intangible assets. These intangible assets can often constitute a substantial amount of a company's overall net worth. Even this ETF, such as AMOM, is searching for the factor exposure (stocks that exhibit favourable pricing in relation to their underlying fundamentals have demonstrated a tendency to outperform the broader market over whole market cycles) and capital appreciation (combination of value factor exposure and investment possibilities uncovered using artificial intelligence has the potential to generate superior performance throughout a complete market cycle). The current expense ratio is 0.75% on capital invested, with 150k shares outstanding and more than $4,6m of net assets currently under management.

Fig. 21: NVQ current asset composition (08/2023)

Top 10 Holdings	
Intel Corp	7.78%
ExxonMobil Corp	7.68%
CVS Health Corp	4.74%
Cigna Corp	4.30%
DuPont De Nemours Inc	2.78%
Arrow Electronics	2.67%
Zimmer Biomet Holdings	2.41%
EOG Resources Inc	2.21%
TD Synnex Corp	1.96%
M/I Homes Inc	1.81%

Sector Weightings	
Technology	21.20%
Consumer Cyclicals	17.08%
Healthcare	17.02%
Basic Materials	13.23%
Energy	13.19%
Industrials	12.72%
Consumer Non-Cyclicals	3.25%
Financials	2.31%

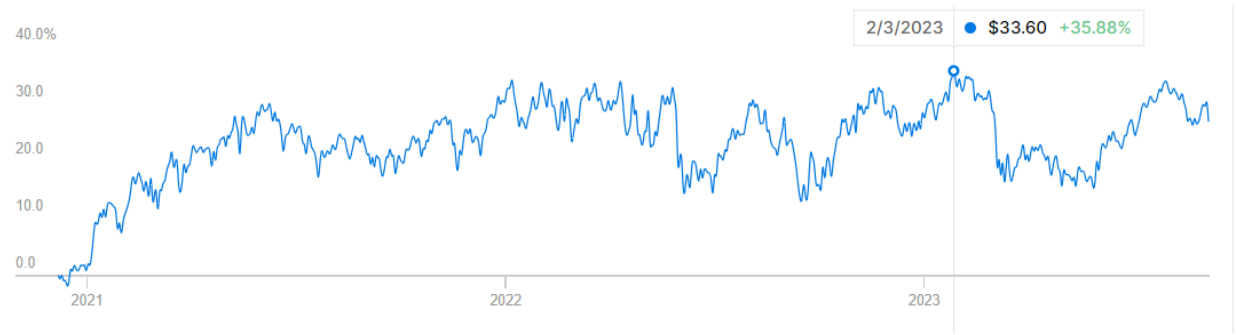


Source: Yahoo Finance

Here we observe a slightly different asset allocation than in previous funds. The share of consumer cyclicals is halved, in favour of the technology and basic materials sectors. Basic materials companies play a vital role in the initial phase of the supply chain by engaging in the exploration

and extraction of natural resources, which serve as the foundation for a wide range of goods. Hence, it should be noted that not all enterprises engaged in the processing of raw materials may be classified as basic materials companies. As an illustration, although a packaging business may engage in the utilization of raw lumber for the production of cardboard boxes, it does not fall under the classification of a basic materials company. The entities operating within this particular industry are primarily responsible for the provision of the majority of construction materials. This characteristic renders companies and their stocks susceptible to fluctuations in the business cycle. They exhibit a tendency to flourish in periods of economic strength. The predominant materials in this industry consist of extracted resources, including metallic elements and minerals, as well as timber-based products, commonly known as lumber. The basic materials sector encompasses the stocks of specific chemical companies and energy sources as well.

Fig. 22: NVQ current NAV history



Source: Track Insight

The ETF is presently being traded at NAV of approximately $31.1, indicating a lower value compared to the funds previously discussed by Qraft. This can be attributed to the inherent structure of the fund, characterized by its stability and notable correlation with the market. The fund comprises goods that do not exactly adhere to market trends, so exhibiting relatively low risks and subsequently yielding relatively modest returns.

Fig. 23: NVQ Historical performance and flows

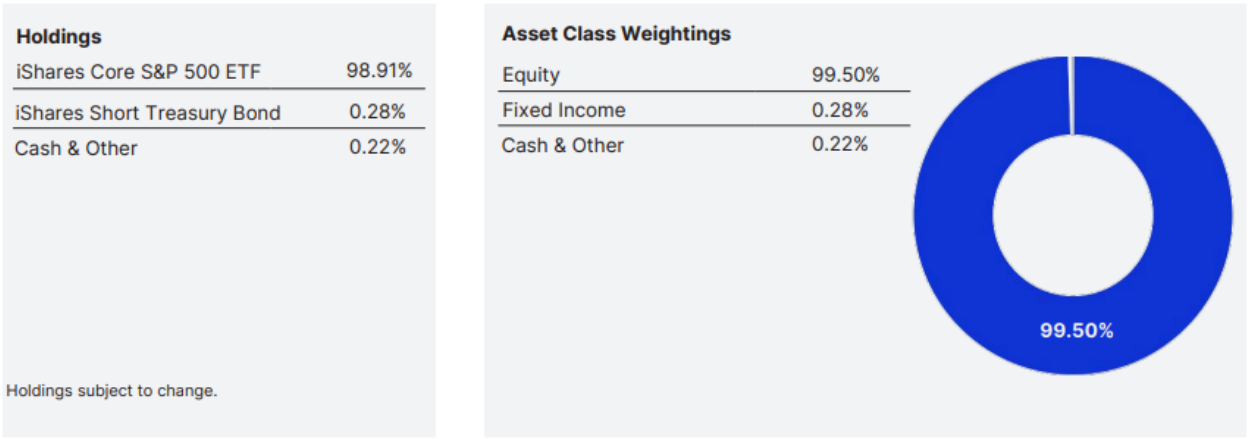
	1m	3m	1y	3y	YTD
Perf.	-3.89%	+7.10%	+3.94%		+0.69%

Source: Track Insight

In fact, as you can also see from the table below, the YTD and YTD returns are slightly lower than the previous ETFs described, but still positive and with limited risk exposure.

AIDB ETF: The primary objective of the QRAFT AI-Pilot U.S. Large Cap Dynamic Beta and Income ETF (referred to as the "Fund") is to achieve sustained growth in capital over an extended period, sharing dividend from the underlying assets. The strategy of this ETF is based on dynamic beta exposure, that involves utilizing more than 70 macro and market data sets to leverage artificial intelligence signals. These signals are used to dynamically modify the level of exposure to U.S. large-cap equities. The adjustments are made based on the real-time estimation of market risk. The fund aims to reduce the volatility experienced by investors by utilizing AI to dynamically allocate exposure from cash to stocks, resulting in a smoother ride. The actively managed portfolio aims to strategically optimize equity exposure in order to minimize drawdowns and achieve superior risk-adjusted returns in the long run. The current expense ratio is 0.75% on capital invested, with more than 120k shares outstanding and more than $3m of net assets currently under management.

Fig. 24: AIDB current asset composition (08/2023)



Source: Yahoo Finance

The current exchange-traded fund (ETF) has a distinct composition in comparison to its prior iterations, owing to its utilization of a divergent diversification methodology. Artificial intelligence (AI) is employed in this particular scenario to dynamically determine the optimal selection of stocks from the S&P 500 index. The S&P 500 index comprises the 500 largest technology companies in terms of market capitalization that are listed in the United States. Its primary objective is so to achieve superior performance compared to the S&P 500 Index. The SPY ETF serves as the primary vehicle for monitoring the S&P500 Index, resulting in a significant degree of shared security exposure with the AIDB ETF.

Fig. 25: AIDB current NAV history

Source: Track Insight

As can be seen from this chart, the ETF was launched in the market only 3 months ago, with an immediate response from the markets and $3m AuM. The NAV has risen relatively over these months, reflecting investor confidence.

Fig. 26: AIDB Historical performance and flows

	1m	3m	1y	3y	YTD
Perf.	-0.15%	+4.69%			

Source: Track Insight

4.2.5 Conclusions and Solutions

In the previous chapters the study described the entire company in detail from many points of view, both the general business model and then the offer available according to the client partner. Throughout the duration of this case study, we have undertaken a comprehensive investigation and examination, thoroughly examining the numerous nuances and multidimensional dimensions of the subject matter at hand. As the study nears its conclusion, it is imperative to engage in a reflective analysis of the significant discoveries, ideas, and implications that have arisen from our extensive research endeavour. In this concluding section, I shall provide a summary of the key points, emphasize the importance of our findings, and explore their wider implications and prospective directions for further research and practical implementation. By synthesizing the findings and engaging in thoughtful contemplation, the objective is to offer a comprehensive and balanced viewpoint on the subject matter. This will enable the reader to get a more profound comprehension of the topics under consideration and their wider ramifications. In order to do that, I firstly will describe again and discuss the points that emerged during the methodology definition about the case study structure.

- Problem definition: The survey utilized to begin the fourth chapter of this thesis effectively elucidates significant concerns pertaining to the integration of AI within the asset management sector. The primary focus pertains to expenses, wherein the initial expenditure on research and development undertaken by the company in question might be exceedingly high, particularly within a broader backdrop of declining margins and profitability observed throughout the majority of companies in the industry. Major asset management organizations lack abilities in technology development and programming, which are not considered their key competencies. Hence, the implementation of such advancements incurs additional expenses in the form of time and the acquisition of suitable staff to facilitate its introduction. Given the historical backdrop of increasing interest rates and declining investment in specific assets, it may not be prudent to endorse such a demanding investment at present. This might potentially lead to a missed opportunity to enhance the industry and the risk of failing to capitalize on considerable prospects. Consequently, the ability to engage in such investments is limited to only the major financial conglomerates, who are actively pursuing this course of action. This trend contributes to the growing concentration within the industry and the diminishing number of market participants. This development has significant implications, including the erosion of competition, the proliferation of monopolistic and oligopolistic entities, and the resulting negative consequences.
- Inquiries: the questions posed for this case study were precise and allowed me for a coherent conduct of the analysis process and drafting of the results obtained. These queries constitute the basis of the research process and provided me the direction to the investigation in collecting information, data, and insights. In this case study, I came across many types of enquiries, such as descriptive enquiries that aimed to offer a full depiction of the subject matter under investigation. There were questions about the evolution of Qraft business model, in terms of change in the value proposition or target clients, as well as their offer to the public. I then utilized comparative inquiries involving the practice of comparing the subject studied with other examples or situations that share similarities, with the aim of drawing meaningful parallels and contrasts. I compared the Qraft organizational structure with similar asset management companies, underlying the differences and the touchpoints, or the comparison between product of the same kind of company. The last method used was the evaluative inquiries, involving the assessment of the impact, success, or efficacy of initiatives, policies, or activities pertaining the Qraft business strategy. The evaluation has been based on historic data, financial returns and costs reduction.

- Research boundaries: it served to delineate the extent and concentration of the inquiry. The establishment of well-defined boundaries is essential in order to maintain the manageability, relevance, and value of the study, while also preventing it from becoming excessively broad or unmanageable. I did not use any temporal, geographical or population boundaries, because the goal of my research was to study the company itself without any further implications. I used exclusion criteria due to the nature of the sector, where there are a lot of private and restricted data, especially about financial metrics and clients return. This is why I entirely decided to avoid this kind of research.
- Data collection method: this element remained unchanged from what was stated in chapter three. For the data collection of the study method, I used material gathered during lectures or company's presentations I attended during my semester at Yonsei University in Seoul, South Korea, interviews with some of the company's employees, and publicly available material on Qraft's website, as well as in industry newspapers or market data available on trading platforms.
- Data interpretation and solutions: this section will be answered within this section, where I have attempted to summarise what I have discovered, steer the discussion towards solutions applicable to the asset management context and hypothesise future developments based on what I have learned with a view to the research question of this thesis.

In the next sections, a methodical exposition of the findings will be provided, aiming to present a cohesive and all-encompassing portrayal of each significant discovery. Moreover, an examination of the implications of these findings and their relationship to the larger theoretical framework within which the case study is placed will be conducted. In a more specific manner, the examination of Qraft Technologies as a case study has facilitated the identification of a scalable and replicable instance that can serve as a paradigm for genuine innovation within the industry. This case study addresses some of the crucial aspects discussed earlier and presents a feasible alternative to the current model. Qraft offers an additional service to many asset management companies at a competitive price, almost always linked to the financial return it generates. This overcomes the problem of setting up an AI system in-house, as it is complicated to create and in the absence of specific knowledge usually different from that of traditional asset management companies. The advantage for these companies to adopt Qraft AI systems is that they are created by professionals that possess extensive knowledge in the field and their practical implementations (solving the lack of key resources). Utilizing their specialized knowledge and skills, organizations can effectively optimize their time and resources by leveraging existing expertise, as opposed to undertaking the arduous task of constructing AI solutions from the ground up. The process of AI creation might need significant amounts of time and resources.

The ability to swiftly respond to market demands or adapt to dynamic situations is of utmost importance in industries where being quick to market or rapidly adjusting to changes provides a competitive edge. AI systems provided by Qraft have the potential to provide cost-effective solutions, particularly for smaller firms or those lacking in-depth AI knowledge, fixing the consolidation process of this industry and trying to make it more democratic. For these firms, AI serves as a tool to achieve their goals rather than being a fundamental area of expertise. By delegating the development of AI to external experts, these firms may focus on their core business objectives, thereby entrusting the intricacies associated with AI to specialized professionals.

A direct advantage of using Qraft AI system is the reduction of the cost structure of the firm partner, especially about transaction costs. Reduced transaction costs have a direct impact on increasing profits for investors. Investors can enhance their net returns on assets by minimizing trading fees, spreads, and other transaction-related expenditures, as this allows them to retain a larger portion of their earnings. The decreased transaction costs contribute to the enhanced accessibility of financial markets for a wider spectrum of investors. The democratization of access enables regular investors and smaller institutions to engage in markets that may have been financially impractical in previous times. Traders, particularly those engaged in high-frequency trading and algorithmic trading, primarily depend on transaction cost analysis as a means to optimize their methods. The reduction of transaction costs can provide a competitive advantage onto these traders, facilitating the more profitable execution of their tactics. The reduction of transaction costs in trading is crucial for the optimization of returns, the facilitation of market liquidity, the improvement of market access, and the promotion of effective capital allocation. The ongoing advancements in technology and intensifying competition have resulted in a reduction in transaction costs, leading to increased inclusivity, efficiency, and responsiveness of financial markets to cater to the diverse requirements of stakeholders.

4.2.6 Future developments and new possibilities

The distinctive nature of Qraft's analysis system has facilitated a singular transformation in the company's business model. Indeed, business model innovation played a pivotal role in the success of financial institutions, the first one is about maintaining the competitive advantage, which in the case of Qraft is the use of AI systems to monitor and choose financial investments. This enables a financial institution to provide a distinct and potentially more appealing offering to customers, hence potentially resulting in augmented market share and profitability. The process of adapting to changing markets is a necessary response to the dynamic nature of financial markets, which undergo continuous

transformation as a result of technical improvements, regulatory modifications, and alterations in customer preferences. In details, Qraft changed its business model in these peculiar aspects:

- **Customer Segments**: there have been several transitions, starting with private clients entrusting their capital to the company attracted by innovative investment methods, then moving on to strategic partners of economic significance (such as investment banks or large technology companies) and then moving to the mass market with the issuance of ETFs and communication to the global financial landscape.
- **Value Proposition**: this too has changed over the years, while remaining firmly anchored to the founders' initial intentions. Qraft's value proposition remains that of offering customised investment methods through the use of artificial intelligence systems capable of managing the capital entrusted according to the client's needs. Innovation, in this case, lies in the ability to maintain the value proposition, which in a highly dynamic industry such as this means only continuous improvement.
- **Key Resources**: Undoubtedly Qraft's primary asset comprises the patents submitted for artificial intelligence procedures, which have undergone progressive development to address emerging industry demands and advancements in technology.
- **Cost Structure:** The asset manager model driven by AI requires a team of data engineers to identify and handle fresh data, as well as a team of AI engineers to develop deep learning models that facilitate the extraction of highly efficient strategies. The expenses are restricted to the subscription fees for data sources and tick data sources for the purpose of order execution. Regardless of the magnitude of money allocated for development and operation, no supplementary expenses are incurred except from the extension of server capacity.

After the evolution in terms of the business model, there are two major themes related to the offering that are essential to talk about. As we have said, the technologies that Qraft possesses are highly flexible depending on the client and the needs, but as they are all machine learning systems, it is also possible to change the underlying assets of the investment processes. Firstly, the paradigm needs to change. The ability to uncover intricate patterns from a particular data set that have not been previously observed by others enhances one's likelihood of achieving alpha. The issue at hand pertains to the inherent limitations of human cognitive capacity in effectively perceiving and comprehending nonlinear patterns. A linear pattern, such as the correlation between investing in low price-to-book ratio stocks and their potential future growth, or the relationship between investing in underperforming stocks and the likelihood of higher returns, aligns more effectively with the cognitive structure of individuals.

I now discuss the possible implications in terms of improving the proposed offer and having completed my study of the company in question and the literature present, I have identified two areas of possible positioning of the company in the medium to long term. Furthermore, reading interviews and other online documents, I also noticed a potential openness of Qraft's management towards the following:

1- Qraft should leverage its algorithms and AI systems to effectively oversee, investigate, and engage in the realm of alternative investments, with a particular focus on two specific alternatives. Commodities may serve as an initial reference point, given that their trading, namely in terms of futures contracts, exhibits similarities to the trading of corporate shares. The organization would expand its value proposition to potential new assets and alternative solutions, while also considering the potential for industry-wide transformation. This is particularly relevant in an industry that exhibits resistance to innovation and lacks the requisite expertise to successfully implement such advancements. However, the primary domain in which Qraft's solutions potentially exhibit the most significant potential for enhancement is to hedge funds. Hedge funds are characterized by their distinct attributes of managerial autonomy and a speculative orientation, setting them apart from mutual funds. The pursuit of attaining elevated returns is accomplished through the acquisition of shares that are perceived to be undervalued or expected to appreciate, while simultaneously engaging in short selling of assets that possess contrasting attributes, such as being overpriced or anticipated to depreciate. By adopting this approach, the portfolio's exposure was effectively protected from the impact of market changes. Qraft’s algorithms provide the capability to effectively analyse financial data derived from both conventional and non-traditional sources, enabling them to generate forecasts regarding the potential increase or decrease in value of specific equities. Moreover, AI can be employed to discern significant trends across diverse markets, enabling investors to anticipate forthcoming market changes and capitalize on opportune trade agreements. AI contributes to enhancing operational efficiency within financial institutions through assuming responsibility for some routine managerial decisions. Qraft’s AI has the capability to assist employees in several aspects of their daily company operations, such as conducting market research and communicating with potential clients. Automated scoring models are employed to assess personnel and deliver feedback, thereby enabling them to identify areas of weakness and monitor their individual progress. The prompt highlights that the speed of execution is a fundamental aspect of hedge fund management procedures. It suggests that an automated and enhanced system would be highly advantageous for this particular activity.

2- ESG certification: The current discussion surrounding sustainability and ESG reveals a growing concern among customers over environmental, social, and governance aspects. An innovative business model has the potential to integrate Environmental, Social, and Governance (ESG) concepts, hence appealing to socially conscious investors and customers. Currently, Qraft's algorithm does not incorporate environmental or social factors in its asset selection process. Instead, it solely relies on historical returns, financial insights, and macroeconomic market data. If the company were to choose for internal development of a system that can incorporate these variables into the investment decision-making process, it would likely enhance its attractiveness to both investors and institutional clients. The company's offer would encompass both the advanced technological utilization of AI systems and the ESG aspect (currently traded with B or C grade depending on the ETF), acknowledged by prominent rating firms and agencies in the industry.

Chapter 5: Discussion and conclusions on research question

As expressed at the beginning of chapter three, the chapter on methodology, I wanted to investigate the asset management industry from the point of view of the business model of the companies that make up this sector, both to investigate its evolution over the years and to analyse the structural problems that have been encountered. Macroeconomic factors are highly relevant in the current geopolitical context, and have significantly impacted the industry's profitability, both on the side of increasing costs and decreasing revenues. According to Amand Walters, senior manager at Casey Quirk: *"Two things are happening. Until the past few years, the asset management industry has not invested in tech in the same way as other industries have. That includes data infrastructure, investing in distribution technology, and artificial intelligence. One of the biggest drivers is all of the retooling of the technology platform and infrastructure that is needed."* (Segal, The Rising Expense That's Pressuring Asset Managers, 2019). Also from the same study, it can be seen that the cost of AuM has grown by about 4% per year from 2014 until now, and the same cannot be said of revenues. The objective of this study was to examine the impact of implementing AI systems on business model transformation for asset management companies. More specifically, I wanted to explore how such systems might boost industry growth and address profitability challenges that are currently reshaping the whole sector. In the course of the literature review, quantitative research and case study, I explored several hypotheses for the application of AI in the management systems of asset management companies, which I have summarised below:

- AI for alternative investments: Alternative investments are one of the asset management industry's sectors most likely to benefit from the incorporation of AI efficiency systems, according to academic literature and practical implementations developed by investment funds over the past few years. Their massive investment was limited by high transaction costs, the impossibility of passive investing, and a considerably longer time horizon than conventional investments. If AI can overcome these barriers, the sector's invested capital and investment categories will likely increase. This technology also has a greater variety of applications. It has applications in both market and credit risk management. Credit risk is the possibility that a counterparty will fail to meet contractual obligations, resulting in a loss of value. Again, market risk refers to the likelihood of loss resulting from aggregate market fluctuations. AI is beneficial for predicting financial or economic variables used in risk management, such as the probability of insolvency, value at risk, interest rates, and exchange rates. In the world of alternative investments, attaining long-term success requires an accurate assessment and management of risk. Artificial intelligence can aid investment administrators in identifying potential risks and devising mitigation strategies.

- Processes externalization: there are three main phases of the investment process, research, investment decisions and trading optimization. All of these can be improved by the implementation of more efficient technology such as the ones described above. About the research, AI can provide tools to process, analyze, and extract insights from vast amounts of financial data. AI can analyze the sentiment of market news articles and social media posts pertaining to specific assets or industries and assess a better sentiment analysis. It can construct predictive models that forecast market trends, asset prices, and macroeconomic indicators using algorithms for machine learning. About the investment decisions moment, it can recognize patterns and making decisions based on massive quantities of data, AI is significantly more effective and efficient than humans. But the section than can receive the best improvement is for sure the trading optimization, that is extraordinarily effective in order execution (trading), where the optimal order execution strategy is deduced by learning transaction data and limit order book data of individual equities. The artificial neural network functions as a universal function approximator, capable of approximating any function given sufficient data, and exhibits outstanding performance with regard to problems of this nature. Each company can therefore freely decide to outsource one of these steps according to its needs, core competencies and cost structure.
- Industry democratization and less consolidation: as an industry with decreasing profitability, high barriers to entry and departure, and rising cost of capital, it is becoming increasingly difficult for smaller or boutique companies to arise in this global environment. The study has demonstrated that the reduction in transaction costs brought about by AI would have a direct effect on cost reduction and, consequently, margin expansion. Everything would be possible if there were freer access (also through increased supply) and external resources to provide these services, avoiding internal development that would only result in a significant initial cost increase without the capital required to optimally manage this investment. The implementation of such technologies would result in the "democratization" of the industry, as large investment banks and financial institutions would no longer be the only ones able to make such investments on a large scale and obtain the previously mentioned benefits.
- Lack of key resources: In analysing the business models of companies in the industry and the responses to my survey of industry professionals, I discovered that the largest disparity exists in the area of key resources, which is the factor that most inhibits these technologies from obtaining a foothold in the industry. Many of these companies, particularly the smaller ones, suffer from a severe dearth of technological expertise, with almost all employees having a financial or economic background.

In conclusion, I would state that the research query can be partially confirmed. The initial assumption was that the introduction of AI processes in the asset management industry would provide decisive benefits in terms of cost reduction and revenue growth, thereby enhancing the margins and profitability of these companies. Having demonstrated the practical benefits during the literature review, we then provided a concrete illustration (Qraft) of the use of external platforms for the practical and rapid application of the in-question processes. The aspect that has evolved the most is the manner in which these systems will be implemented. This is perhaps the most significant theme of my thesis, as it emerged during the research and writing process, rather than from initial assumptions or preconceptions. At the outset of data and material accumulation, I was completely unfamiliar with outsourcing and the lack of key resources in the asset management sector, and even more so with the capillary division of the investment management and execution processes. The trading and monitoring phase of an investment is the phase where, on average, the greatest advantage could be obtained. Both because it is more readily monitored by such technologies and because there are no alternatives to in-house management at the present time. The global development of these technologies will permit ever-increasing application and further cost reduction, democratizing the sector and preventing its sudden consolidation, thereby preventing the formation of monopolies or oligopolies.

Limitations

However, the research conducted for this thesis has limitations, some of which were discussed in the third chapter concerning the proposed methodology. The apparent difficulty in locating confidential financial information, such as economic returns, cost structure, and revenue structure, is the first issue. As a result, I had to rely on public data (or data collected on paid industry platforms), which limited the study due to a dearth of essential information. Another factor is the number of samples obtained. Obviously, my intention was not to target a mass market with a lot of responses, as the composition of the European asset management market is very limited and, as a result, identifying the appropriate interlocutors may not be as simple as it appears.

Future research

I believe that future research should concentrate on two primary aspects. The first is unquestionably the sustainability of companies that can provide AI systems on a global scale, i.e., how they can maintain a high level of competitiveness while satisfying as many customers as possible. I am also of

the opinion that it is necessary to investigate all potential avenues for technological expansion and how to best adapt the numerous artificial intelligence systems to the world of asset management.

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Abstract

Introduction

Simply put, an asset manager monitors and maintains valuable business assets. By devising an efficient asset management plan, they can develop, operate, maintain, upgrade, and dispose of assets in a cost-effective manner. To accomplish this, they assist with all administrative, financial, capital, and operational aspects of the assets in their portfolio. Asset management incorporates a holistic perspective of an asset's entire life cycle. So, in terms of a piece of apparatus, this is its' life cycle from procurement and implementation through to renewal and disposal. Although asset management can be implemented using the most efficient appropriate software, but this is currently not happening. This technology can efficiently capture and analyze data, allowing for crucial asset management decisions to be made. Monitoring the effects of each activity on an asset enables a revaluation of the cost-benefit analysis. From the other point of view, an explanation about artificial intelligence is necessary for the overall comprehension of the topic proposed. Artificial intelligence is a collection of technologies that enable machines to perceive, comprehend, act, and learn with human-like intelligence. Therefore, it appears that the definitions of artificial intelligence vary. AI incorporates technologies like artificial intelligence and natural language processing. Each is evolving in its own way and, when combined with data, analytics, and automation, can assist businesses in achieving their objectives, such as enhancing customer service or optimizing the supply chain. More in details, AI possesses tremendous transformative power and has profound implications for the world's societies and economies. AI plays an increasingly significant role in defining economic and financial sector developments and is viewed as a driver of productivity and economic growth through increased efficiency, enhanced decision-making processes, and the creation of new products and industries.1 AI is also rapidly transforming the financial sector landscape by reshaping the nature of financial intermediation, risk management, compliance, and prudential supervision. This technology can help several aspects of the financial services and especially the asset management world, as I will describe in the next sections. Investment decisions on the private market can definitely benefit from alternative data sources. Choosing a manager of private market funds and locating an investment opportunity to deploy capital are data-intensive endeavours. IA can assist the alternative investments sector in adapting to a shifting business environment by fostering growth, diversification, enhancing the investor experience, and fostering agility. To thrive in the ever-changing business environment, businesses need dynamic systems and a solid governance model. While automation can provide the requisite flexibility, it should be strategically implemented with automated processes that extend beyond trading and foreign exchange.

Chapter 1: Business model evolution for Asset Management firms

Financial administration has always been a fundamental aspect of all societies and civilizations throughout history. From the management of public funds derived from citizen taxes to the most innovative supranational funds, everything falls under the general macro category of the optimal allocation of limited resources collected from a variety of institutions and private individuals. Ancient civilizations managed their land and precious metals, marking the beginnings of asset management. This sector has a way of existing because of a very important concept, diversification. too much exposure by investing in only one asset would bring certain risks that would be difficult to eliminate otherwise. The investor is exposed to two categories of risk: the risk associated with the specific asset in which he has invested, and the risk associated with the underlying financial and economic system. Systemic risk is the risk of a widespread disruption or failure within a financial system or an entire economy, as a consequence of the interconnections and interdependencies between its numerous components. It occurs when the failure of a single institution or a series of interconnected events has the potential to initiate a domino effect, causing severe harm to the entire system. Talking about numbers and capital allocation, the total assets under management (AuM) in Europe grew to EUR 32,2 trillion at the end of 2021, with a -11.8% due to the causes described above reaching a final value of EUR 28,4 trillion. Asset management in Europe is mainly concentrated in six countries, which are responsible for almost 85% of the asset management activity. The UK is the largest European asset management market, followed by France, Germany, Switzerland, the Netherlands and Italy. This concentration can be explained by the presence of large financial centres in those countries. The chapter then examines the business model value drivers of a typical company operating in the industry.

The above model is the perfect summary and visual representation of the business model of traditional asset management companies, representing the main drivers and structures of revenues and costs. These companies invest through specific vehicles created specifically to collect all capital and invest it, the object of the investment is called asset class. There are two broad macro-categories of investments: conventional and alternative. Traditional investments refer to categories of investments such as stocks. They are regarded as Traditional asset classes, which refer to the principal categories of investment assets that have been historically recognized and extensively utilized by investors. These asset classifications represent investments with distinct characteristics and risk profiles. The primary traditional asset classifications consist of equities, bonds, cash and cash equivalents. In addition, the financial system has broadened its investment options by introducing new opportunities outside the financial markets. Due to their higher returns and reduced risk, asset classes such as corporate equity, commodities, and real estate are gaining popularity among investors, despite their typically lengthier time horizons. On the other hand, at the level of activity and process management, these companies carry out a number of key steps, as follows:

1- Client Onboarding
2- Investments Strategy development
3- Portfolio Construction
4- Investment research and analysis
5- Risk Management
6- Trading and Execution
7- Portfolio monitoring and rebalancing
8- Reporting and communication

These are therefore the processes that all these companies follow, with different timing and importance. however, there are different business models that have been created and evolved over the years. Traditional asset management firms employ the "**Product Provider**" paradigm, in which the

client provides capital, and the firm provides an investment product. The value proposition communicated to the client involves optimising the selection of the product that best suits their needs and is able to deliver a return commensurate with their expectations. A slightly different companies are the "**Solutions Provider**" business model, in which a company offers comprehensive product and service coverage through a single point of contact. The consumer is given additional information to improve their efficacy and performance. solution providers offer end-to-end solutions that incorporate multiple components, technologies, and services to provide a comprehensive solution. Then, a "**Platform Provider**" is a company that constructs and operates a platform where multiple users or participants can interact, barter products and services, or conduct transactions. The platform acts as an intermediary, connecting and facilitating interactions between all stakeholders. This model is growing in popularity as a result of the emergence of digital platforms and the sharing economy. Another model is the external "**Data Providers**" for investment firms, i.e., the companies that provide asset management firms with valuable data and analysis. These companies rely on accurate and timely information to make prudent investment decisions. Information is compiled by data providers from a variety of sources, such as financial markets, stock exchanges, regulatory documents, and news reports. Using advanced technologies and algorithms, they aggregate and standardize the data into a structured format for analysis. However, there is a significant problem: the cost and organizational structure. As expected, the administration of such a system requires a substantial personnel and infrastructure. In addition, a more complex business system would diminish or confound the company's core competencies. This led to the emergence of asset management firms with a highly specialized business model, the **"Data and Infrastructure Providers"**, that is the mix of both previous models. The term "**Capital Provider**" is the last component observed across all business model configurations. The business model of a capital provider characterizes a company or entity that provides financial capital to individuals, businesses, and other entities in need of funds. The primary function of a capital provider is to provide capital in exchange for a monetary return, such as interest, equity participation, or other forms of return on investment.

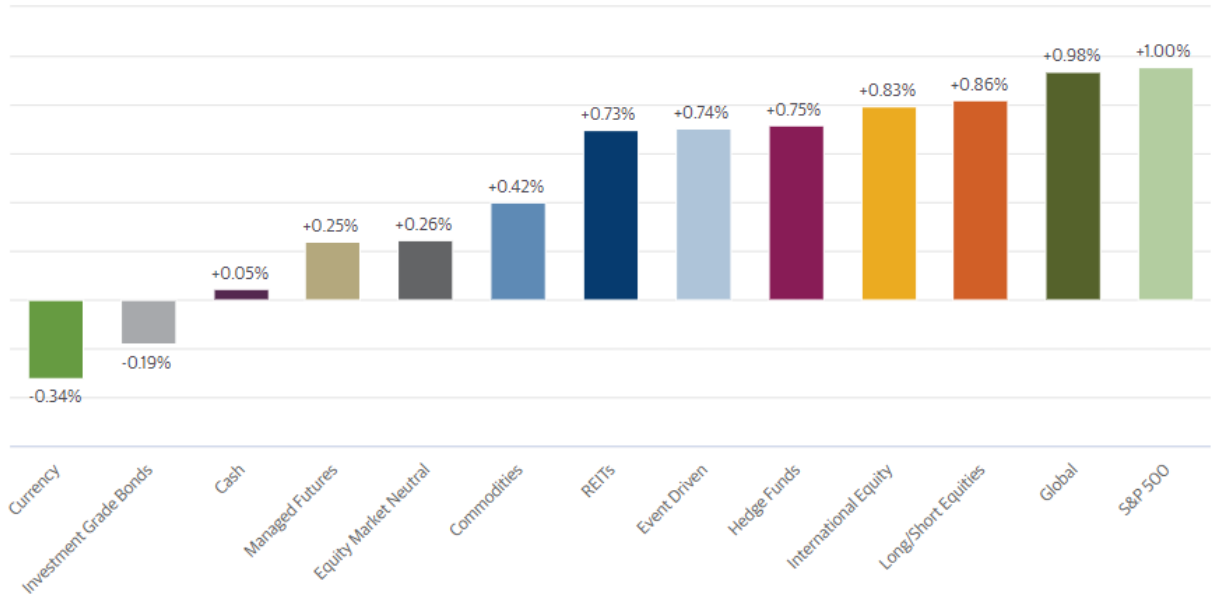
Chapter 2: AI for Asset Management firms, focus alternative investments

This chapter is divided into three sections. The first section provides a comprehensive explanation of alternative investments in the context of asset management and the financial world in general. I then examined what artificial intelligence is, its current financial applications, and its limitations. I then integrated the two aspects by researching potential joint applications in contemporary literature. Alternative investments are financial assets that do not fall into one of the conventional investment categories. Typical asset classes consist of equities, bonds, and currency. Alternative investments include private equity or venture capital, hedge funds, managed futures, art and antiquities,

commodities, and derivative contracts. Moreover, real estate is frequently considered an alternative investment. Alternative investments also include non-traditional approaches to investing in non-traditional vehicles, such as private equity funds and hedge funds. These funds permit the manager to utilize derivatives and leverage, invest in illiquid assets, and assume short positions. Despite which assets can be categorized as alternative investments, here a brief description of the key characteristics of these investments:

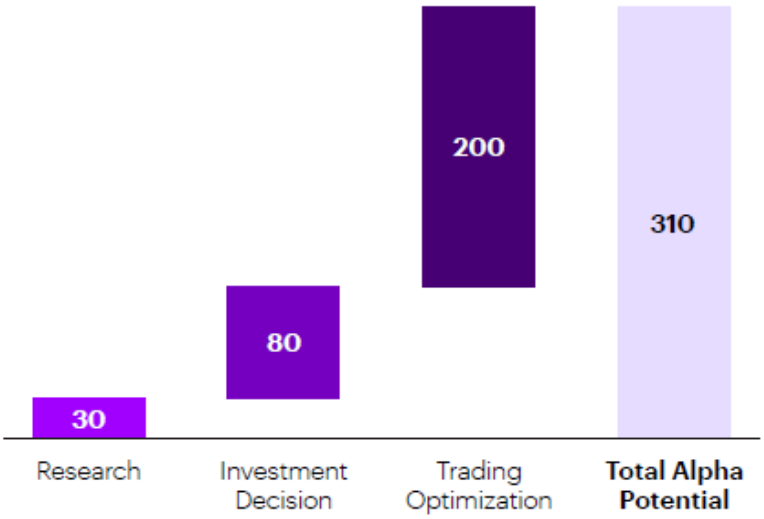
- High minimum investments and fee structures
- Type of client and investment objective
- Time Horizon
- Investment strategy

Another key element of distinction between traditional and alternative investment is the correlation with the financial markets. Asset correlation is a statistical measure of the movement of investments relative to one another. This measurement ranges from -1 to +1, with -1 indicating a perfect negative correlation and +1 a perfect positive correlation. In this range, a correlation of 0 indicates that the performance of these assets is wholly uncorrelated. This means that the price fluctuations of one asset have no impact on the prices of other assets.



As shown in the graph, some asset demonstrates a very low correlation with the S&P 500 (classic benchmark of financial markets trends). This lack of correlation significantly differentiates alternative investments from conventional investments. Incorporating such assets into the portfolios of these funds can considerably increase diversification and protect against portfolio losses during severe systemic financial crises. In addition to the important diversification they bring to investment funds,

alternative investments have been enormously successful over the years due to the long-term returns that have been observed. After this first introduction, an explanation about the main concepts of artificial intelligence is needed. AI is the emulation of human intelligence in machines that have been programmed to perform tasks that ordinarily demand human intelligence. It is a broad discipline of computer science that seeks to create intelligent agents capable of similar learning, reasoning, and decision-making as humans. AI systems are designed to perceive their surroundings, comprehend them, and act accordingly to achieve their objectives. AI is based on the development of algorithms and models that can process vast amounts of data, identify patterns, and enhance their performance through experience learning and pattern recognition over time. It has a wider range of applications, especially in the financial systems. According to an Accenture research, mature firms that industrialized and scaled AI across the investment process reported up to 300 basis points (bps) of alpha (the return on investment that is incrementally greater than a benchmark index such as the S&P 500 or another suitable benchmark) collectively, which is the aggregate of alpha from the complete collection of use cases in research, analysis, portfolio management, and trading optimization.



- Research: Enhance the company's research capabilities by supplying instruments to process, analyse, and extract insights from vast amounts of financial data. Using algorithms for machine learning, AI can construct predictive models that forecast market trends, asset prices, and macroeconomic indicators. In addition, it is able to optimize investment portfolios by considering multiple variables, risk factors, and constraints into consideration to achieve optimal asset allocation.
- Investment Decision: providing sophisticated tools and data-driven insights that improve the precision, efficiency, and effectiveness of decision-making. When it comes to recognizing

patterns and making decisions based on massive quantities of data, AI is significantly more effective and efficient than humans.

- Trading Optimization: efficacy in order execution (trading), where the optimal order execution strategy is deduced from transaction data and limit order book data of individual equities. The artificial neural network functions as a universal function approximator, capable of approximating any function given sufficient data, and exhibits outstanding performance with regard to problems of this nature.

Trading optimization (as shown in the graph), is potentially the most important section. It integrates the various factors (investment decision and research) into a single assessment of the optimal portfolio balance and timing. In addition, it serves an essential role in reducing trading costs. An essential element of pre-trade analysis, transaction cost analysis determines whether trading costs are low enough for a trading signal to generate profits after implementation costs are deducted. These transaction expenses comprise predominantly of bid–ask spreads, market impact fees, and trading commissions. Alternative investments can receive an important boost with the right adaptation and investments. AI has applications in both market and credit risk management, one of the crucial point when investing in private markets (especially private equity, venture capital and hedge funds). AI is beneficial for predicting financial or economic variables used in risk management, such as the probability of insolvency, value at risk, interest rates, and exchange rates. Long-term success in the field of alternative investments requires an accurate assessment and management of risk. Artificial intelligence can aid investment administrators in identifying potential risks and devising mitigation strategies. Another essential element is associated with the phase of due diligence. Using artificial intelligence, platforms can autonomously aggregate unstructured data from company websites, open web sources, social media, and third-party intelligence providers. Utilizing Cognitive Search and ML technologies that transform unstructured data into organized knowledge, a company that manages alternative investments can increase the volume of transactions.

Chapter 3: Research Methodology

In the course of the third chapter, I explained two main concepts. I initially formulated my research question on the basis of what I learned in the literature review and as initial assumptions when deciding on the topic of my dissertation. I formulated a research question focused on the industry segment that exhibits the most substantial prospects for constant improvements and enhanced efficacy. The objective of this study is to establish the advantages that asset management firms can derive from the adoption of AI systems in their investment decision-making procedures pertaining to alternative assets. Specifically, I believe that these benefits encompass risk reduction through

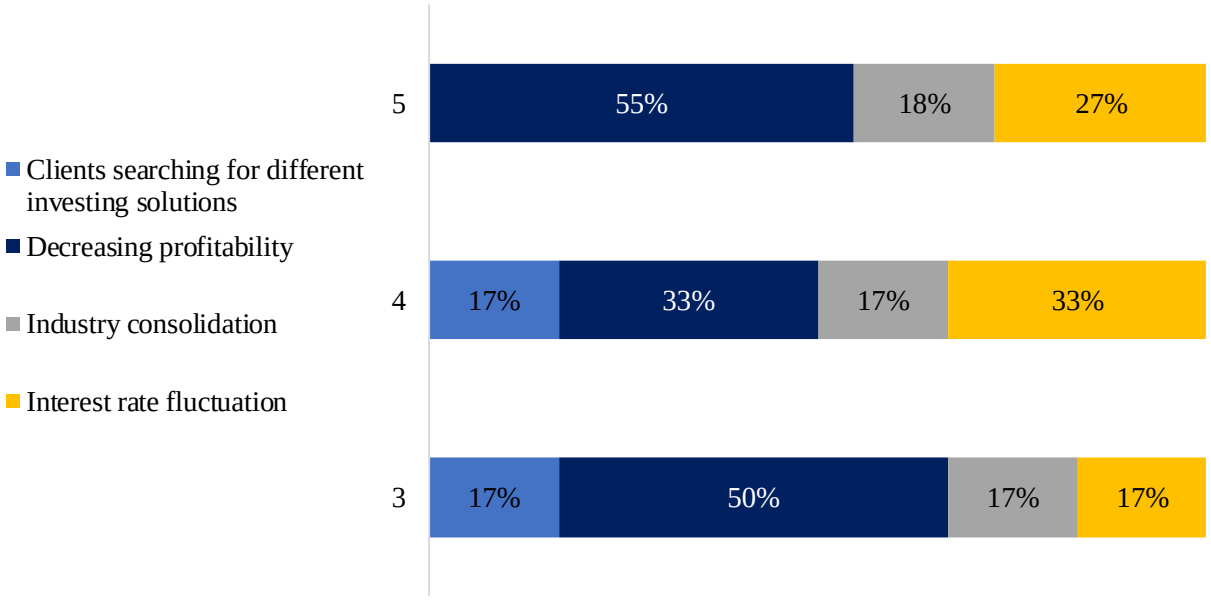
portfolio diversification, decrease of cost structure and enhancement of operational efficiency within the organization. The final result will be a general improvement of the industry's profitability and their margins, currently decreasing. I developed this idea through an analysis of the evolution of the business model of asset management companies and their future change as a result of this introduction. It has been an empirical project with two different data collection methods, a quantitative investigation and a case study. The first one is a survey to European asset management firms (specifically directed to partners, analysts or senior analysts) deeply involved in implementing AI systems in their business activity. The survey was distributed to a sample of 50 individuals, yielding a response rate of 46% (23 responses in total). In addition to intimate contacts, the survey was distributed via direct communications on the professional networking platform LinkedIn. This result is statistically significant due to the robust preponderance of industry professionals operating in the European context, resulting in a small number of participants relative to other industries. Then an in-depth analysis of a specific case study to evaluate other aspects of this trend and practically described possible applications and prove the concrete potential of this subject. A clearly articulated research question functions as a guiding framework for the entirety of the study. This research framework offers a coherent and structured approach to conducting research, covering several aspects of it.

Chapter 4: Findings and Research Results

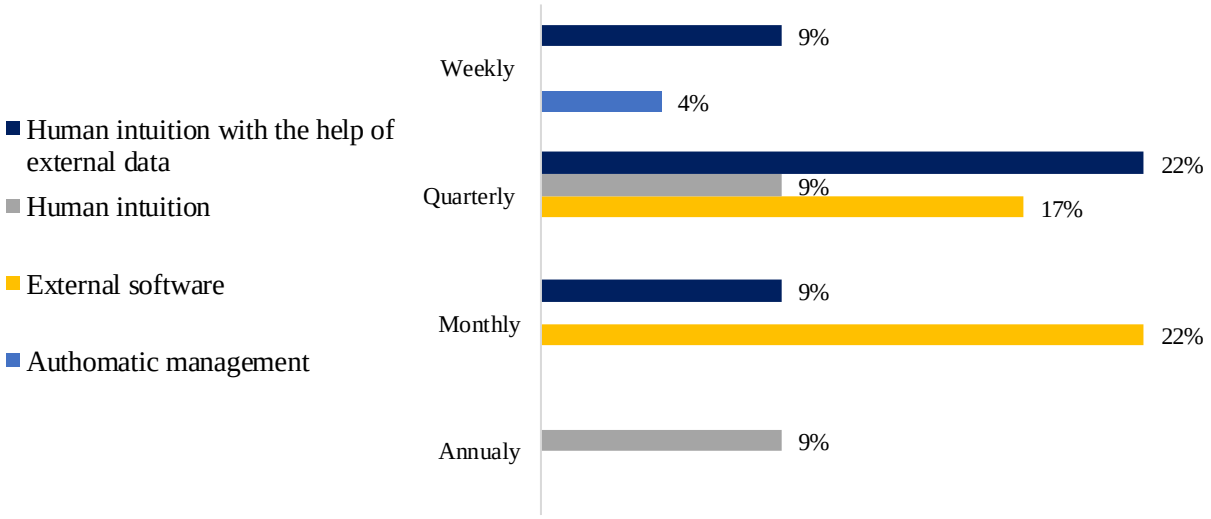
The survey provided has obtained a lot of information and insights about the current situation of the industry overall, more than practical solutions. I obtained a good understanding of the current gaps that the sector is incurring on and other issues that may arrive in the future. Riporto di seguito alcuni dei risultati più importanti a riguardo.

The provided graph depicts the inferences drawn from the responses to the question regarding the use of external partners with substantial expertise in technology activities to improve the margin aspect of asset management firms (where 5 is the highest likelihood to utilize these kind of partners to introduce AI technologies in their organization). This combination is compared with the response pertinent to the industry's primary medium-to-long-term challenge. An intriguing observation is that the vast majority of respondents who gave the highest rating (5) to the initial question also ascribed a high level of significance to the issue of fluctuating (rising) interest rates. This correlation suggests

that the latter factor may have an impact on the profit margins of industry-operating companies.

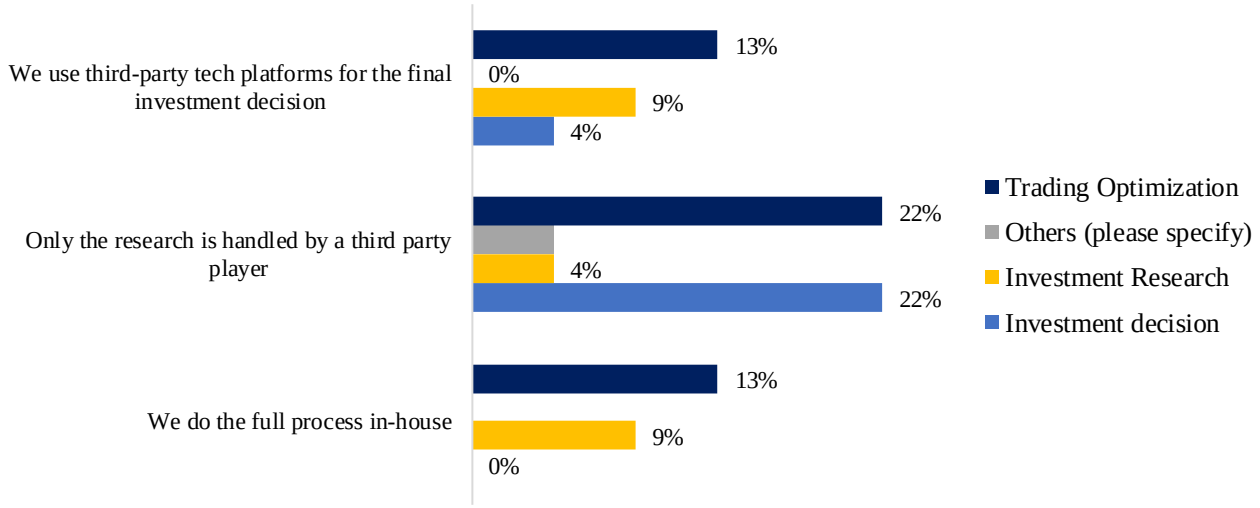


Thus, for market players who see the industry's decreasing profitability as the biggest problem, the use of external technology companies to compensate for their lack of key competencies seems to be the most likely. Another very interesting fact is the frequency with which clients' assets are updated. We explained in the first chapters that diversification is the reason to exist of asset management companies, and this is not constant over time. It must therefore be constantly updated in order to remain competitive and take advantage of the opportunities that the market grants.



This graph shows the inference between the frequency of updating of invested assets (annual, semi-annual, etc.) with the way companies invest. It is evident that the management of this process is predominantly facilitated through the utilization of automated internal systems or external software.

The primary element, nevertheless, remains closely associated with the combination of personal intuition, which is informed by years of experience in the field and knowledge specific to the relevant sector, and the acquisition of external data from specialized agencies or industry experts, either through tailored arrangements or regular updates. Therefore, the more frequent the update, the more companies use automated methods to manage this phase, leading to greater diversification and higher returns. The graph below, on the other hand, shows the inference between the company's current level of outsourcing (questions on the left) and the stage of management where they see the greatest potential.



At a fundamental level, it is evident that a significant number of organizations are presently engaging external corporations to assist with various stages of investment management, as opposed to exclusively doing all aspects internally. As a result, given the considerable prevalence of organizations that presently depend on external entities for initial investment research and decision-making, the discussions pertaining to the potential of AI primarily revolve around the phase that these companies tend to outsource to a lesser extent, namely **trading optimization**. It is imperative to regularly update one's portfolio to account for emerging market possibilities and optimal timing. Here is the real untapped potential, and this is what I have tried to investigate in the case study below. The quantitative study presented many other industry gaps and findings, which I refer to the dedicated chapter for a summary of the abstract.

Case Study

Qraft Technologies is a fintech company dedicated to revolutionizing the asset management processes. Their mission is to utilize AI in several aspects such as AI-powered exchange-traded funds (ETFs) and AI trade execution, in order to enhance the ability to identify alpha (excess returns) without incurring disproportionately high costs. Qraft Technologies is not just a traditional asset management company, but a software firm that helps strategic partners such as institutional funds, asset raising companies or companies looking for an optimal allocation of capital, and to do so in an alternative way. Qraft Technologies is a firm that leverages AI technology to address the inefficiencies prevalent in the asset management sector, hence fostering innovation.

<table>
<tr>
<td rowspan="2">Key Partner

- Strategic alliances between non-competitor companies, especially with important investiment banks or tech firms

- Joint Venture for the creation of personalized and specific products</td>
<td>Key Activities

- Creation and improvement of AI processes

- ETF issuance in financial markets</td>
<td rowspan="2">Value Proposition

- Offer of innovative solutions in the financial markets utilizing AI systems

- Quantitative investing strategies

- Tailored solutions for strategic partners

- Continuous improvement and machine learning system for investing solution</td>
<td>Customer Relationship

- Automatic services and online touchpoints

- Co-creation sharing the value creation process</td>
<td rowspan="2">Customer Segments

- B2B clients on a segments market

- Financial Institutions, such as investment banks or any kind of asset management firms

- Tech Corporates searching for innovative investing solutions

- Public institutions</td>
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<tr>
<td>Key Resources

- Patents on AI systems and processes

- highly skilled employees with different backgrounds</td>
<td>Channels

- Indirect online channels

- Personal communication within companies' top management</td>
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<tr>
<td colspan="3">Cost Structure

- Personnel costs

- Maintenance of IT systems

- ETF issuance costs</td>
<td colspan="2">Revenue Streams

- Management Fee (0.75%)

- Tailored contracts with strategic partners

- Other fees from AuM</td>
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This is the business model analyzed for a comprehensive overview of the company. The main solution grounds on three key sections:

1- Data processing: Qraft machine learning is a computational procedure via which computer systems can acquire knowledge from data in order to generate predictions, make decisions, or carry out tasks without the need for explicit programming. The initial stage involves the collection of pertinent data. Then, the data can be categorized into structured data, such as tables, unstructured data, such as text or photos, or a combination of both. This stage includes activities such as data normalization, addressing missing values, and doing feature engineering. Then, Qraft's algorithm partitions the data into multiple sets, namely the training set, validation set, and test set. The training set is employed for the purpose of training the

machine learning model, while the validation set is utilized for hyperparameter tuning and model selection. Lastly, the test set is employed to assess the performance of the model on previously unseen data. Model training is the stage in machine learning where the model acquires knowledge and improves its performance by analysing and processing the training data, especially historical financial data, market insights from newspaper or specialized articles, as well as any other useful data to make a correct decision. The model endeavors to identify patterns, correlations, or decision boundaries within the dataset, enabling it to generate predictions or classifications.

2- Research and Asset Allocation: KIRIN API ® is Qrfat Technologies' registered system for collecting data and formulating the best allocation in each asset type. The Kirin API was created by the AI Research team to offer a diverse range of financial data integrated with various widely utilized databases. This includes corporate market data from sources such as S&P Global's Compustat database and Thomson Reuters' Datastream, as well as economic macro data from APIs like FRED or Quandl. All of these datasets are accessible through a single endpoint. It is a service in direct contact with the client, who can request access to this gateway and obtain in real time, after an initial screening of his needs, the best tools to make optimal asset allocation decisions.

3- Trading execution: Qraft has created AXE®. AXE (AI eXEcution) is a trading insights platform that utilizes deep reinforcement learning. The primary objective of AXE is to mitigate the adverse effects on the market resulting from the execution of substantial orders, while concurrently diminishing the expenses associated with transactions. This is achieved by the identification and implementation of optimal trading techniques, as well as the ability to swiftly adjust to dynamic market conditions. Qraft offers trading signals to clients via its AXE platform, which may be included into their trade execution procedures. There is no end point in this execution system, but rather a continuous circle of improvement and refinement in trading in equity and other types of stocks. The system takes into account two fundamental elements, order execution and market impact. Order execution refers to the procedural steps involved in the purchase or sale of a predetermined quantity of specific securities.

Qrfat not only forms these services for its partner companies, but also uses them for the creation, issuance and management of its own ETFs. Qraft manages AuM capital like a traditional asset management fund. It has then refined this process with the application of AI systems that have made the company internationally known. Indeed, the company has issued a number of ETFs on the NYSE from 2018 onwards that have attracted considerable interest from investors from the outset, both for their uniqueness and for their positive returns. The goal of Qraft ETF strategy is seeking an advantage

with AI in Active Management employing AI-driven strategies that leverage machine learning techniques to select stocks inside the investment universe, as defined by human experts. The primary objective is still to uncover equities that exhibit the highest potential for generating alpha. The company has currently issued 4 ETFs, with an AuM of around $30m, all of which have generated positive returns to the target market, with strategies related to the correct selection of underlying assets and the timing of order execution. Numerous asset management firms can purchase an additional service from Qraft at a price that is almost always proportional to the financial return it generates. This solves the issue of implementing an AI system **in-house**, which is difficult to construct and requires specialized knowledge not typically possessed by traditional asset management firms. The fact that Qraft AI systems are created by professionals with extensive knowledge of the field and their practical implementations (solving the **lack of key resources**) is advantageous for these businesses. Rather than constructing AI solutions from scratch, organizations can effectively maximize their time and resources by leveraging existing expertise. The creation of artificial intelligence may require considerable time and resources. The ability to swiftly respond to market demands or adapt to dynamic situations is of uttermost importance in industries where being fast to market or rapidly adjusting to changes provides a competitive edge.

Chapter 5: Discussion and conclusions on research question

This study aimed to determine the effect of implementing AI systems on the business model transformation of asset management firms. Specifically, I wished to investigate how such systems could foster industry expansion and resolve the profitability issues that are currently transforming the entire sector. Throughout the literature review, quantitative research, and case study, I investigated the following hypotheses regarding the application of AI to the management systems of asset management companies:

a- AI and alternative investments: AI is advantageous for predicting financial or economic variables utilized in risk management, such as the likelihood of insolvency, value at risk, interest rates, and exchange rates. Long-term success in the realm of alternative investments requires an accurate assessment and management of risk. It can also deal with high amount of data in a short period of time, making the work of alternative vehicles, such as hedge funds, easier and more efficient.

b- Externalization of trading process: the investment phase the section than can receive the best improvement is for sure the trading optimization, that is extraordinarily effective in order execution (trading), where the optimal order execution strategy is deduced by learning transaction data and limit order book data of individual equities. Utilizing Qraft as example,

the artificial neural network functions as a universal function approximator, capable of approximating any function given sufficient data, and exhibits outstanding performance with regard to problems of this nature. Each company can therefore freely decide to outsource one of these steps according to its needs, core competencies and cost structure.

c- Industry democratisation and less consolidation: The study demonstrates that the reduction in transaction costs caused by AI would have a direct impact on cost reduction and, consequently, margin expansion. Everything would be possible if there were freer access (also through increased supply) and external resources to provide these services, thereby preventing internal development that would result in a significant initial cost increase without the capital required to efficiently manage this investment. The implementation of such technologies would lead to the "democratization" of the industry, as large investment banks and financial institutions would no longer be the only one able to make such investments on a large scale and reap the benefits described above.

d- Lack of key resources: The most significant barrier to these technologies gaining a foothold in the industry is the lack of key resources. Many of these businesses suffer from an important lack of technological expertise, with almost all employees having a background in finance or economics.

In conclusion, I would assert that a portion of the research question can be confirmed. The initial assumption was that the introduction of AI processes in the asset management industry would provide decisive cost savings and revenue growth, thereby improving the margins and profitability of these companies and, as I demonstrate more precisely in the course of my thesis, this assumption proves to be true.