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Chapter 10: Building next-generation robo-advisory platforms and artificial intelligence-powered wealth management solutions

10.1. Introduction to Robo-Advisory Platforms

Over the past several years, the wealth management landscape has undergone a transformative shift. An increasing number of technology companies, who serve as financial service aggregators, have entered the fore to claim a piece of the wealth advisory pie. Further, these companies have disrupted traditional investment firms by incorporating digital advisory capabilities into their technology suites. These capabilities offer consumers instant access to financial advisors via text or arrange a video call - any time, anywhere - which, until a few years ago, were exclusive to private banking clients. As a result, customers have become more demanding, requiring greater responsive timeliness from their preferred service providers. In parallel, they have gained access to a pay-as-you-use pricing model that allows them to cherry-pick which services they would like to pay for. This trend has also forced financial institutions to rethink their service delivery models from a cost-to-serve perspective. In order to achieve greater economies of scale and to optimize profitability, wealth managers have increasingly reasonable fees while delegating human advisers for more complex investment management transactions, thereby leaving younger, less affluent IRAs and 401K investors to rely on automating their investment needs by means of robo-advisors (Jung et al., 2018; Belanche et al., 2019; Ankenbrand et al., 2021).

An early example of a robo-advisory platform was the launch of a platform in mid-2010. It described itself as an automated financial advisor that allowed consumers to invest, similar to that of an exchange-traded fund, in an array of index-based portfolios for an annually portfolio management fee of 0.35 percent. Years later, it dropped its admin fee to 0.25 percent, attributing its decision to an increased availability of low-cost ETFs.

Subsequently, other digital wealth managers adopted similar strategies, employing templated or standardized investment portfolios, thereby offering investors low-cost portfolio management services. In fact, both companies launched their robo-advisory service in early 2015, quoting fees of between 0 and 0.50 percent (Jung et al., 2018; Belanche et al., 2019; Ankenbrand et al., 2021).

10.1.1. Overview of Robo-Advisory Platforms

An investment platform, commonly known as a multi-asset investment service platform, supplies an end-to-end, integrated software solution for delivering on- and off-line investment advice, non-advised portfolios, or execution-only services. Several of these platforms also provide back-office file transfer and settlement services that support supervisory controls for relevant market participants. A variety of products for a wide range of clients are provided by pooled investment platforms; discretionary fund management platforms; and execution-only investment platforms. Investment platforms are utilized by a diverse set of clientele in order to package services into a lower cost attractive service offering, which can cover fund and portfolio execution, depository and custody services, and also advisor training and support.

Fig 10 . 1 : Robo-Advisory Platforms

In investment management, a pooled investment vehicle, also known as a mutual fund, is often used by investment managers to gain economies of scale. Investment platforms form a distinct but overlapping part of the investment funds industry, working with pools of capital held within investment wrappers. Investment platforms aggregate and compose together products available in the investment markets onto an electronic channel for clients to do invest in or execute a trade for investors. This is akin to technology suppliers creating a channel for banks who provide wealth management services to high net worth individuals and expatriates as wealth managers. These solutions can then decide to become platforms at a later date, as the low margins and high costs of fund execution force them to change their business models in order to compete effectively with the larger custodians who provide these services to asset managers.

10.2. The Evolution of Wealth Management

Wealth management assumes greater importance in people's lives as they progress through various stages, e.g., marriage, buying a house, or saving for retirement. Furthermore, across these life stages, there is a natural progression in the wealth of the individual. Starting with zero or low amounts of wealth and eventually progressing through middle class, upper middle class, and eventually becoming a high net worth individual, people go through various types of wealth management requirements and relationships. Their relationship with wealth managers, family offices, banks, and brokers also change as their need for wealth management products becomes more complex. Financial advisory and advisory services started with a few individuals focused on building the wealth management business with solutions for high net worth individuals. Specialized boutique firms were set up to cater to this market.

As the economy evolved globally, along with the wealth of individuals, the wealth management business also grew. Retail banks that focused on savings accounts and loans to the common man started catering to the affluent segments of people offering investment advisory and commodity trading. Full-service stockbrokers increased penetration with wealth management, trading, and investment products focused mainly on middle-income individuals. Additionally, well-capitalized large high net worth individual-focused firms started hiring experienced brokers from the retail banks and emphasized mutual funds and other types of fund products. This market evolved into the high net worth individual ultra-high net worth individual segment over the last 30 years. These wealth management firms, including the private banks, then invested to build research teams and specialized product-focused teams to meet the growing requirements of their clients. Wealth management advisory fees slowly changed from a commission-

based model to asset management fees tied to portfolio performance, thereby increasing focus on risk-adjusted performance.

10.2.1. Historical Development of Robo-Advisory Services

Robo-advisory services have seen a rapid development in recent years. However, innovation in wealth management solutions does not start with the emergence of robo-advisory services. The introduction of low-fee passive index investing was the first serious effort to democratize capital markets. Further attempts to democratize accessible investments were made when workplace retirement plans and their defaults became popular. Technology was key in making these innovations happen. Portfolio optimization approaches have been proposed since 1952. State-of-the-art decision-making technology enabled firms to offer low-fee passive investment products. However, low-cost passive investing lacks flexibility. It primarily allows for low-fee diversified investing in a limited number of asset classes based on a particular allocation model with no consideration of time-varying risks. Such deficiencies motivated investment firms, led by some of the largest brokerage firms, to develop capability beyond passive investing.

The emergence of the internet, facilitating the relatively inexpensive dissemination of information and knowledge, enabled differences in resources to decrease. Now, everyday investors have access to similar information and knowledge as large institutional investors and portfolio managers. Additionally, improvements in technology-enabled market operations and investments also facilitated the emergence of next-generation robo-advisory services. Given recent advances in algorithms, investor-type classification, trading enhancements, and advanced tools, what was previously a service with little added value has transformed into a powerful wealth management solution at an extremely low price.

10.3. Key Features of Next-Generation Robo-Advisors

Robo advisors have a number of key features that will be helpful for Retail and Institutional investors. These key features include Automated Portfolio Management, Personalized Investment Strategies, User Experience and Interface Design. All the above key features would have a deep Positional understanding of Affects Driven behavior of the User. Further, huge financial data processing capabilities and Cloud-based advanced architectures would compliment the above key features to make them a reality. Robo advisors will develop & use newer technologies in scalable calculation engines and memory storage engines, improving thereby processing capabilities of better processing algorithms. The next generation Robo-Advisors would help Retail and Institutional

investors to define their goal and proceed with the investment plan during the advisor-agent mode of operation.

1. Automated Portfolio Management

The “Want” is that even if the Investor is sitting idle on the couch watching TV or playing with kids, the Portfolio does its job, either recommending changes, nudging or automatically actioning the investment actions required – Advisor-Agent Mode. "Do" is the market keeps throwing signals every moment, how to make User-Behavioral-Age-Earnings-Profile-Mix decision easy so that advisory is sucked in by the casual investor – The “Do” would include listening to “Want” and automating repetitive tasks digitally through the Pipeline Connecting processes, Algorithms, Technologies with all possible Data Building Blocks at Piece and Portfolio Levels. All the above services would require nudging and automatic actions by the Advisor on the User's behalf until the Investor reaches the stage of Investment Maturity where the Investor Start’s Resourcing and Agency Model While creating SOPs for his/her investments portfolio.

2. Personalized Investment Strategies

Robo-Advisors would also take the whole Investment to the next level by creating Personalized Experiences starting from Market Segmentation, Personalized UX in their operations, Marketing, Promotion, and Pricing for their Advisors Including POCs and Free Trials. AI-Powered ML Algorithms would also develop over the period of time, Investment strategies tailored, the ones which would suit Individual Goals, preferences, and Risk Tolerance factors. Further, these strategies would evolve as per User goals and mapping goals to investments with suggested investment vehicles for Reverse Agent Functioning by Investors and also Hedge Investment strategies for each individual investor with Family & Personal Life Stage.

3. User Experience and Interface Design

While AI-ML would automate activities like Asset Allocation, Trade Execution, Portfolio Management automatically managing the Clients-Customers-Users Relationships with the investment advisors, Factors like Risk Profile Techniques, Ease of Investment and Customer Service would still be the deciding factors for the success of Robo Advisors. The next-gen Robo-Advisors would fulfill these requirements by providing beautiful and meaningful User Experience & Interface Designs making investments planning and execution easy and smart through Intelligent Visualization Tools. Intelligent Tools for Visualization would not only help the Retail and Institutional decision-makers in their current decisions and understanding their portfolio value today but also assist in forecasting their future Returns & Portfolio values through what-if Scenarios with Required Input Forecasting Designs and Maintenance.

10.3.1. Automated Portfolio Management

The roots of modern portfolio theory can be traced to the insights provided in the work of Markowitz in 1952. In it, he proposed that if risk-averse investors could select from an efficient set of portfolios, then by constructing the portfolios using mean-variance criteria, they would be bailed out of possible regret associated with having unsystematic risk in their asset portfolio choices. However, it took robo-advisors to commercialize the theoretical findings in this quest for portfolio risk maturity, by utilizing technology for minimization of transaction costs by reducing human decision-making, and hence, advisory fees, especially for lower account sizes. Automated investment services provided by robo-advisors are called Automated or Algorithmic Portfolio Management Services. Robo-Advisors specialize in portfolio management by automating three main functions: Portfolio Risk Allocation, Investment Monitoring, and Portfolio Simulation. Here are the popular features of portfolio management technology provided by next-generation robo-advisors.

Robo-advisors typically link goal-based risk profiles to portfolio asset allocation solutions based on modern portfolio theory principles capable of delivering optimal risk-adjusted returns in their chosen asset class. They do this by offering risk-return asset allocation models across different asset classes, e.g., Equity, Bonds, Gold, Commodities, Printed Money, Real Estate, and Asset Allocation strategy via mean variance optimization approach, and risk-based approach to investing via factor-based risk parity models. They examine how adviser-driven portfolio creation models change once the client is removed, and the resulting self-service technology allows significant cost savings for asset management firms, which they can share with clients.

10.3.2. Personalized Investment Strategies

These days, clients expect personalized investment solutions that can adapt and grow alongside their financial lives. What's more, they want to maintain complete control of their portfolios at all times updated to reflect any major changes in their situations. Today, investing is not just about risk profile questionnaires. Advisors should utilize leading-edge technology that can incorporate a user's complete financial and life situation into their portfolios. Also, the user should always be able to adjust any parameters to reflect, say, an evolving risk tolerance or investment time frame. From there, investing can take many forms. Next-gen robo-advisory platforms are combining principles from both traditional portfolio theory and more modern behavioral portfolio theory, offering core solutions both as a multi-asset class risk-targeting strategy built exclusively on ETFs and a bespoke asset-class-targeting solution featuring individual securities. Investment strategies incorporate rigorous upfront planning based on the client's objectives, desires, and complete financial picture – current and future. Once

implemented, these strategies become a benchmark for advising reconsideration and financial corrections throughout the often-difficult journey ahead. Our proprietary algorithms automatically adjust the portfolio or recommend a change based on these principles, generating daily updates. The client-facing dashboard allows users to manually personalize their portfolios, whether by risk levels, regional markets, sectors, or individual assets. Additionally, the platform offers user-generated model portfolios or clearly curated socially responsible portfolios. Each individual user can see the delineation of their custom portfolios versus the core model and portfolio options, allowing them to easily shift assets between risk levels.

10.3.3. User Experience and Interface Design

Investing in a managed service has usually been reserved for the high-net worth community. However, thanks to technology, it is now within reach of virtually everyone. The emergence of robot-advisors — or algorithms that manage portfolios — mean that even those with limited funds can have their accounts tracked and managed by a being which is less excuse-prone than even the best portfolio manager. However, that does not mean simply putting a portfolio allocation recommendation into a computer is sufficient. Clients are asking for information but in ways that are more intuitive than investment policy statements. More information is available and translators are needed to help turn raw data into intelligence. Most investors have limited objectivity when it comes to their accounts, and behavioral finance factors are often on display. Attention to an intuitive architecture and mobile user interfaces will soon be key to the success of any organization purporting to be a robot-advisor.

While wealth management and advisory needs have tended towards ever-more specialization for a number of years, technology has finally pushed back – enabling the movement towards low-cost investing and macro portfolio management. Retail investors can now receive high-quality customized portfolios of investments that were previously the province of the wealthy. Robo-advisors now allow clients to hold portfolios of both exchange-traded funds focused on equity beta and hedge-fund-like portfolios composed of lower liquidity return-enhancing single-stocks, private equity and venture capital positions. The lowest fees are found within the portfolios comprised exclusively of exchange-traded funds.

10.4. AI Technologies in Wealth Management

To build a next-generation robo-advisory platform with enhanced automated and AI-powered capabilities, we take inspiration from the next-generation wealth management solutions adopted by the largest global investment banks and wealth managers. These

solutions represent the confluence of the latest financial services technology and the latest AI optimization techniques. AI has many roles to play in wealth management, including enhancement of decision-making processes as well as process automation from portfolio construction and trading to compliance. There has been much focus in recent years on the adoption of AI in finance, with significant accuracy gains possible in finance problems such as time-series prediction, anomaly detection, risk assessment, sentiment analysis, document ranking, and natural language understanding and generation.

Fig 10 . 2 : AI Technologies in Wealth Management

These techniques integrate very well into wealth management. Financial market forecasting and analysis is a vital part of traditional wealth management, especially asset allocation and global strategy. Prediction of financial asset prices and event impacts is also the first step, and critical for the success of next-generation robo-advisory platforms. Risk assessment and mitigation is another key area where AI can help in wealth management given the large amounts of built-up market and sentiment data. AI can aid robo-advisors to mitigate risk and loss from portfolios by better predicting vistas of wealth portfolio degradation.

We will discuss specific AI types and algorithms suited for these solutions in the following sections. These next-generation solutions automate many phases of the wealth management process and also help to cut down time, effort, and costs involved, while improving accuracy, client personalization, and hence value provided to clients. Next-generation robo-advisory platforms are set to revolutionize the wealth management space by providing speedy and efficient services to investors and clients that are currently inaccessible both in terms of time and cost. Let us first delve into the AI types and algorithms to be used in these solutions.

10.4.1. Machine Learning Algorithms

Machine learning is a subset of AI that refers to the process of enabling computers to understand data without human intervention. Machine learning algorithms are tools that systematically analyze data to uncover hidden, valuable patterns. Banks and investment managers have started using machine learning in increasingly sophisticated ways. Banks harvest customer data for predictive modeling about customer preferences, channel interaction, and product recommendations through natural language and image recognition of voice commands or selfies to enhance customer onboarding, suitability, and prevention of money laundering and fraud. Chatbots developed through reinforcement learning of natural language processing are used to provide advice at the lower end of the asset management spectrum.

Machine learning conventionally requires the development of highly specific predictive models, which are useful only for a targeted purpose such as predicting whether a customer will repay a loan. But by pulling together massive amounts of data across a range of different tasks, and by training using a powerful new architecture called deep neural networks, machine learning has now advanced to the point where it can learn the general templates that govern almost all predictive modeling, or, more technically speaking, to build a general-purpose model capable of transferring learning among various tasks. This progress allows some finance, insurance, and investment companies to leverage general-purpose machine learning models and techniques to build systems that perform a range of general-purpose functions that closely approximate human capabilities—from computer vision and medical diagnosis to self-driving cars and the use of chatbots and other AI tools for customer service and engagement—by fine-tuning existing models to perform specific tasks with locally available data.

10.4.2. Natural Language Processing

Natural Language Processing (NLP) is one of the most interesting research topics in the world of computing. The development of AI algorithms for reasoning about human

language can unlock a multitude of use cases. When the trading of stocks began, human brokers had to use their intuition and judgment based on leverage predictions while attempting to time trades. Stock movements are incredibly difficult for humans (and machines) to schedule. This gives algorithms that support decision making based on reports about recent activity higher importance. Furthermore, considering the ability of machines to read many such documents, and analyze pattern shifts, it is likely they will outperform human traders. Algorithms can be programmed to monitor news and social media 24/7, 365 days a year, looking for market-moving headlines in both preformed text and the ever-growing area of user-generated content on social media.

Machine learning has made great progress in western languages, however other languages are more difficult. For the latter, deep learning requires additional training and preparation time. For financial companies engaged in cross-border investment and related strategy allocations, developing NLP language models should be a priority. NLP affects the entire cycle of investment in not only execution of transactions but also developments to how financial industry participants do their research. Its power is equally apparent for both processing unformatted data and in providing additional insights into structured or cleaned datasets that companies already provide.

10.4.3. Predictive Analytics

Many financial decisions rely on predicting the future more often than not. From investments, savings, retirement, loan, to insurance, wealth managers need to provide proper guidance based on the predictions of future financial conditions and events. Predictive analytics is a technique for predicting, looking for patterns in historicals, and predicting for newly created or arriving resources or items. It has been increasingly popular and important within the wealth and financial management service sectors. With the birth of big data and digitalization of finance, a huge amount of customer-related data become available for wealth management use.

Within the wealth management sector, accuracy of predictions is of paramount importance. Provided the nature of the domain, the highest probability of achieving such goal is to create models built upon an immense set of indicators, carefully selected and appropriated for the risk domain they are predicting in the defined time frames. Those indicators vary from purely economic oriented along the lines of expectations of future earnings or dividends, as well as interest rates, term structure of interest rates, risk premiums or stock market returns.

Furthermore, and importantly, customer-related micro and macro data, e.g., individuals characteristics, demographics, socio-economics, as well as customer's traits, life cycles involving their jobs and families, or their wealth, are of a great influence on financial

predictions. Predictions of transactions should be prepared with caution, and models constantly updated with the latest data and are able to capture the sufficient and appropriate number of variables while keeping a reasonable level of accuracy should be used. Wealth management involves complex interactions between multiple agents, including investors, financial intermediaries, central banks, and fiscal authorities.

10.5. Regulatory Considerations

Robo-advisory platforms and AI-powered investment solutions are not immune to the various regulations governing the financial services industry. They must therefore ensure compliance with applicable laws regarding the provision of investment advice services, activities subject to fiduciary duties and the obligation to act in the best interests of the client, the offer and sale of securities, general consumer protection considerations, anti-money laundering, payment processing operations, the use of trading algorithms, and tax considerations.

Regulatory authorities generally require registration and submission to oversight for any business that is engaged in activities such as entering into contracts with others to provide investment advice for compensation (unless exempt), supplying investment advice, managing another person's investments through a managed account, or offering securities of a fund relying on one of the regulation's exemptions or a person meeting the fiduciary standard.

In the United States, these advisers have a fiduciary duty to their clients and are required to make suitable investment recommendations and provide disclosures of the material risks of the investments and any conflicts of interest, including any fees for the advisory services, the methodology used to select investments, the fees charged by the issuer of any security recommended, and the expected profits to be realized.

10.5.1. Compliance with Financial Regulations

Regulatory compliance has been a thorny issue for both traditional wealth management players and robo-advisors since they handle customers' money at the end of the day. Investment products and services are among the most protected of all consumer financial services in terms of regulation. On top of the standard anti-money laundering, anti-fraud, or data protection laws that all financial services firms have to comply with, wealth managers are also bound to a wholesale set of laws that have the explicit aim of protecting the credulous, vulnerable, and often most needy of citizens from the potentially pernicious effects of financial market participation. Due to the manifested incapacity of financial market participants to look after their own interests, it is deemed

that investment firms have a duty to protect them and are therefore subject to strict and thorough requirements. Although these regulations apply to all players in the market equally, large players are better capable of undertaking the significant financial and operational commitments that compliance entails. They are likely to better navigate the minefield of compliance hurdles and have made the necessary investments to have the right infrastructure in place in order to satisfy necessary compliance reviews and reporting. Fintech startups that compete with these traditional companies lack the resources and finances to comply with the full breadth of regulations, making them much more likely to attract regulatory scrutiny. As a consequence, this has motivated an evolution where robo-advisors have affiliated with large, traditional firms that have the infrastructure to support compliance.

10.5.2. Data Privacy and Security

For wealth managers and advisors, responsibility goes beyond simply investing clients' money. In the information age, security compliance and data privacy are key areas of responsibility. As wealth management becomes increasingly digital, with robo-advisors providing services that were once only available in-person, technology firms and financial institutions now must abide by stricter legislative and regulatory requirements. The obliging principles will ensure that client data remain safe, and their investing wealth remains safe from fraud.

Around 20% of enterprise accounts have sensitive data but lack the necessary security controls. This applies especially to third-party apps and platforms that connect to enterprise accounts. With the wrong integrations in place, not only is sensitive information at risk of being stolen, but the enterprise accounts could also become compromised through the applications. Cybersecurity has developed as a technology within technology. Major corporations have teams solely focused on the cybersecurity segment. There's a good reason for this aggressive marketing of cybersecurity: more platforms are becoming web- and app-based. Both startups and enterprise companies are at risk of having their data stolen. Just like administrative access to the enterprise account, personal accounts of executives need to have the right security in place to create a constant chain of trust.

No matter what business it is, there are regulations. And these regulations are applied to a business because of market demand, customer need, and authority recognition. For businesses that operate with sensitive information—such as healthcare account records or financial data—having regulations operates as a safe barrier that protects clients so they can have peace of mind opening up with their personalized details. For something like online or AI-driven wealth management, regulations vouch for consumers that this technology will give them the right tools to invest and grow their wealth.

10.6. Market Trends and Consumer Behavior

Robo-advisory platforms and investment technology solutions have been enjoying a strong tailwind and are bringing major efficiencies to the wealth management industry. A near doubling of private assets under management in the last 5 years, the trend of passive investment outsourcing towards the wealth management industry, and increased interest in portfolio diversification through private market investments have fueled demand for next-generation investment technology. From the advisor perspective, lowering operating costs through better technology has been a strong motivator behind a shift towards outsourced implementation solutions. From the investor perspective, improved ease-of-access to investments, and the ability to benefit from better investment outcomes at lower costs is expected to lead to further strong demand for these offerings from investors.

Demographic Shifts in Investment

Millennials and Generation Z investors are forcing a fundamental rethinking not only of how investment services are delivered, but also of investment decisions themselves. Social concerns, including climate change and equality, are beginning to dominate the minds of young investors. Awareness of credible implications of investment decisions on social development, as well as the ability to find suitable investment solutions that match these concerns, are critical for the millennials and Generation Z. Younger investors are more focused on using investments to drive positive change in society, while older investors are more focused on performance. Financial investment and the real-world impacts these investments are making are likely to diverge over the next ten years. Because of their differing priorities, millennials are significantly under-invested compared to baby boomers and Generation X.

Impact of Economic Factors

Growing global wealth and technology trends are likely to compound the speed and magnitude of change on the supply side of the wealth management industry. The nature of wealth creation has changed, becoming more geographically dispersed, sector-focused, and concentrated among the super-rich. The macroeconomic backdrop of higher inflation, higher taxes, and lower economic growth than the previous four decades is likely to impose structural breaks. What an acceptable rate of return is going to be for investors, and how investments are going to be impacted tax-wise, is likely to have an important influence on investor behavior and focus.

10.6.1. Demographic Shifts in Investment

Over the next 30 years, a fundamental transfer of wealth in the vicinity of $68 trillion is projected to take place from baby boomers to younger generations, leading to a fundamental change in the types of investments flowing into various asset classes. Asset allocation is expected to see a shift from the adult baby boomers with a propensity to invest in bonds to the younger generations of millennials with a penchant for technology and a preference for investment in equities, cryptocurrencies, and alternative investments. Over the longer term, the accelerated pace of new technological innovation is also expected to favor investment flows toward riskier asset classes that feed off this wave of new founding. The net effect of these changes may be to drive down the overall risk-free rate and accelerate economic growth leading to a higher than expected economic growth trajectory.

As millennials become a greater share of discretionary investors, ESG-centric investing will become more prevalent. Coinvestments in for-profit and not-for-profit companies will be a mainstay of family office allocations. The more DIY-focused Gen Z consumer and the growing remote-worker class of millennials will seek direct investments in creative commercial and residential real estate opportunities. Ultimately, marketplaces that provide an ever-growing ambit of differentiated and creative asset classes will be in demand. Online fractional platforms and mobile wallet consolidators will bring enhanced usability to investment activity. AI-assisted wealth allocators will be a key feature of this activity, helping the doggedly persistent DIY investor navigate the growing array of local and international assets and asset classes, whether physical or digital. In addition, in order to access store-of-value type crypto investments most family offices are seeking alternative custodians who can provide security assurances comparable to those of banks but who are compliant.

10.6.2. Impact of Economic Factors

Impending inflation and recessionary cycles have exacerbated the existing mental strain accompanying the historic rise and subsequent fall of global equity markets. Even with the potential for other unforeseen economic disruptions, contemporary individuals recognize that financial independence requires self-directed, proactive engagement with their financial futures. As fee-paying customers of advisory platforms, Main Street investors are well-aware of historical asset growth trajectories, generally recognizing that without investment management, uncertainty around eventual outcomes also increases. They are frustrated by a lack of inclusive and evolving financial advisory solutions, especially as complex life events precipitate demands for more thoughtful responses, input, and support from professional experts. Impossible goals, unrealistic risk expectations, and insensible time horizons are too often expressed or presumed.

Unsurprisingly, disappointed and disenchanted advisors and clients alike have been left questioning how often these assessments take place and who other than algorithm-driven options are truly prepared or able to assist.

Against this backdrop of market uncertainty, risk-return asymmetries have contributed to growing consumer demand for alternative solutions, such as thematic investing, cryptocurrency, environmental, sustainable and governance, equities focused on inflation-hedging-related characteristics, and fractionalization-related niche areas, among others. Client retention remains vital in the face of competent in-house and DIY alternatives, yet the consequences of burnout in both prospective clients and existing clients are both real and palpable. As the past cycle demonstrated, clawbacks and outflows are painful. Market dislocation is born of real-world events. Volatility requires frequent communication, and it is the responsibility of all stakeholders to remain in contact. Both traditional incumbents and innovative new entrants require organizational-wide approaches to act. Either solution committees need to be established, or briefer ad hoc decision loops need to be made. Trust matters. Nurturing it ensures its reciprocity.

10.7. Challenges in Implementing AI Solutions

Robos have a number of challenges, especially when incorporating AI and machine learning. Over the next decade, as more traditional wealth managers seek to innovate and duplicate the latest offerings from disruptive fintechs, they may run into the following roadblocks. This may inhibit their ability to provide meaningful and valuable solutions for investors.

When implementing wealth management solutions, financial service firms often run into technical limitations. This can come at any number of points in the process, ranging from integrating with back-end and third-party technologies to the actual investment offerings. For instance, while AI may be great at creating a personalized investment journey for the investor, what happens at the actual product selection or trading stage? If the firm has no other alternative investment exposures and only traditional publicly listed equities, ETFs, bonds, and maybe some private equity partnerships, how dynamic and responsive can the chosen allocation be? Will the client really appreciate an 80% equity concentration for a one- to three-year time horizon if it includes 4 or 5 risky emerging markets countries? Or will they leave for a firm that has a more diversified investments platform that includes less-publicly traded asset classes for cushioning mean-variance deficiencies?

Another technical challenge is how current AI solutions are disjointed or separate from each other. While firms may boast of cutting edge algorithms for on-boarding, client screening, product selection, trade execution, and daily risk management, few offer a

completely seamless, integrated approach. Whether it is different OCR and KYC modules at the start of the customer journey, programmatic investment models at the portfolio accounting level, or exploring draw-down recoveries at the re-balancing phase, robo-advisors are often patchwork solutions. That essentially is the current state of wealth management. Mass affluent and ultra-high net worth customers have the same diversified portfolios, but different solution approaches at each phase.

10.7.1. Technical Limitations

In the last decade of research and development in the area of Artificial Intelligence, a number of technical limitations are now at the forefront of discussions. Some of these models are primarily data-driven approaches, which often rely on black-box AI solutions, assuming that available data can be used to predict the asset's future returns or risks without taking into consideration the economic factors driving the system. Particularly, parameter-driven approaches, which simultaneously utilize both numeric and textual data originating from different sources, including user profile, can reach much better performances. Humans also use qualitative factors -such as sentiment- and briefly but constantly assess the economic characteristics behind every event; given that, using qualitative factors and economic constraints in automated ways is where hybrid models, employing Deep Learning and Knowledge-Based Systems, can help the automated system to outperform experts with state-of-the-art contributions, especially in short time horizons.

Additional technical limitations include a lack of accountability in the AI model for critical applications. AI predictions can contain considerable errors, given potential data quality issues; indeed, the impact of financial firm's decisions can be so sensational that it requires human validation; these conditions can hardly be satisfied for systems predicting asset short-term returns. Therefore, it should be guaranteed compliance by explaining the decision-making process, and then establishing metrics for gradually measuring the systems, and subsequently tuning internals of the models. Furthermore, humans are experts in combining binary and multi-class elastic predictions about returns and/or risk being fully aware of the non-linear economic aspects; hence, errors from classical econometric models or from experts can be easily used to improve prediction by using standard machine learning techniques. The default mute ability of classical econometric error regressions has become majorly popular among machine learning specialists, greatly contributing to the amazing growth of hybrids combining human brain and automation.

10.7.2. Ethical Considerations

The technical limitations of current AI approaches raise a number of ethical questions. Developers and programmers face several moral quandaries when incorporating AI into the investment industry. For instance, ethical concerns are raised by the introduction of technical systems that will make the combination of theory and quantitative analysis into a black-box process. Such opaque decision models raise issues of trust and confidence among employees and require regulators and human oversight. Where robust AI solutions are used to enhance human decision-making, or automate business processes for which human oversight is retained, AI augments and enhances the expertise of skilled professionals.

Using market data to make predictions may have different implications in financial markets than in other sectors. The design of retribution systems for investment decision-making is an interesting problem. For example, errors — both temporal and relative — may not be equally weighted, affecting the calculation of trader or advisor retribution, particularly in long-term investing. As financial markets are not truly blind, any system decision increasing profits and returns has different implications than corresponding systems in other sectors. There are issues and concerns around the need to regularly recalibrate the model, not just with local events but also important macro-events. The appetite for explainable models increases with model complexity and the use of big data. Finally, markets will react to decisions made by robo-advisors and algorithms, warranting additional caution in high-frequency environments.

In the traditional financial sector, fundamental and qualitative approaches underpin more guidance-oriented narratives, with love-hate relationships that emphasize understanding but eschew quantification. From the perspective of the needs of the client, product, or service — whether it is an investment plan, account, or other needed services — understanding and depth often trump numbers. By contrast, fintech firms operating with more quantitative and algorithmic inclinations, connecting users to data-driven strategies via user platforms, emphasize implementation and solutions that may demean the roles of expert advisory and product providers.

10.8. Conclusion

There is good reason why technology has taken such a prominent position in the financial services marketplace. Over recent decades it has been demonstrated to improve company operational efficiency, cut costs, and widen profit margins. Technology has also been extensively used to create unique competitive advantages, to widen the service networks of complex institutions whilst partnering with the smaller challenger companies, and to develop innovative new services and products for consumers, pension funds, and other

investors, often in lucrative niche markets. This is especially the case in the area of regulatory compliance, where specific pieces of software can save the firms potentially billions of dollars in fines and penalty payments.

Automation is reshaping the financial services landscape, and in the investment industry it is allowing investment and wealth management organizations to increase their influence and penetration into the affordable and mass affluent investor segments. Digital technology is allowing the mimicking of human advisors, principally via virtual apps and chatbots, combined with the use of machine learning and artificial intelligence. The future appears set on a path for the human advisor to become a luxury resource, costing a lot more money while delivering services to the few high-net-to-ultra high-net worth individuals who have reached an investible asset quantum where such personal investment advisory and management services can be regularly justified. Consumers and investors at the lower end of the asset quantum scale will be catered to by the smart robo-advisors, increasingly enhanced and supplemented by AI technologies. The latter will allow the robo-advisors to deliver complex, risk-adjusted portfolio performance at levels of connectivity and availability that are impossible to achieve when using human advisors.

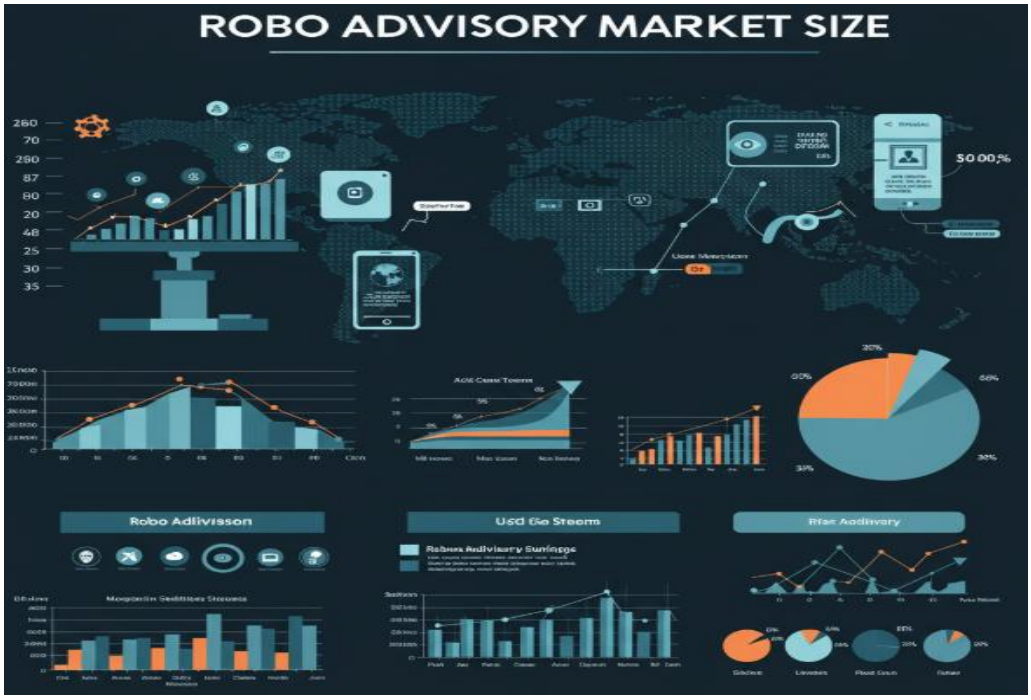

Fig 10 . 3 : Robo Advisory Market Size

10.8.1. Future Outlook and Innovations in Robo-Advisory

Advancements in technologies like AI, NLP, and ML are rapidly reshaping the landscape of wealth management and the financial advisory industry. Robo-advisory platforms are increasingly favoring intelligent automation of manual investment advisory and management processes. Unlike in traditional investment planning, which is often based on vague user inputs on goal and risk tolerance, new-generation robo-advisors use ML-based research to refine, clarify, and even enrich user information, improving the investment recommendations accuracy. From cognitive analytics to leverage portfolio performance data and user financial data over time, to instinctive visual dashboards and alerts powered by UX design principles, to sentiment analysis and NLP capabilities that assess user intent or level of understanding, the adoption of AI at every level can greatly enhance the robo-advisory experience for customers. Moreover, with considerations for behavioral finance and a deeper understanding of individuals' motivations playing an increasingly important role in effective financial advisory, new-gen solutions are focusing on ways to incorporate behavioral nudges into their operating models. The potential for adoption of next-gen robo-advisory platforms based on innovative user experiences, superior asset performance reporting, and the ability to model portfolios based on user values and belief centers are thus significant. Such platforms will not only challenge existing players in both bottom lines and top-tier client segments but will also enhance wealth management options across diversity, budgets, and the investment lifecycle. Users in the high-net-worth bracket have traditionally preferred dealing directly with wealth managers for the complexity of their financial situations and the size of their portfolios. But as wealth comes to be distributed more evenly across different sectors of the economy, with tech industry employees and entrepreneurs bringing major wealth into new and emerging areas, the demand from new-age investors for non-homogeneous options, often-forgotten niches, and investment-move customizations across risk tolerance and liquidity needs will become increasingly evident, placing pressure on wealth investment organizations to create more innovative approaches to client engagement and experience.

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