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| Business Case |
| **SMARTINvest** |
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Contents

[**1.** **Context** 2](#_Toc513455536)

[**2.** **SMARTINvest: A Technical overview** 3](#_Toc513455537)

[**3.** **SWOT analysis** 1](#_Toc513455538)

[**3.1.** **Strength** 1](#_Toc513455539)

[**3.2.** **Weakness** 1](#_Toc513455540)

[**3.3.** **Opportunity** 1](#_Toc513455541)

[**3.4.** **Threats** 2](#_Toc513455542)

[**4.** **Market analysis** 2](#_Toc513455543)

[**4.1.** **Market Analysis Summary** 2](#_Toc513455544)

[**4.2.** **Competition and Barrier to entry** 2](#_Toc513455545)

[**4.3.** **STP analysis** 3](#_Toc513455546)

[**4.3.1.** **Segmented and Target Market** 3](#_Toc513455547)

[**4.3.1.1.** **Geographic Segmentation** 4](#_Toc513455548)

[**4.3.1.2.** **Demographic Segmentation** 4](#_Toc513455549)

[**4.3.2.** **Positioning Statement** 4](#_Toc513455550)

[**4.4.** **Marketing Mix** 4](#_Toc513455551)

[**4.4.1.** **Services** 4](#_Toc513455552)

[**4.4.2.** **Place** 4](#_Toc513455553)

[**4.4.3.** **Promotion** 5](#_Toc513455554)

[**4.4.4.** **Price** 5](#_Toc513455555)

[**4.4.5.** **Factor Affecting the Pricing** 5](#_Toc513455556)

[**5.** **Strategy and Implementation Summary** 5](#_Toc513455557)

[**6.** **Competitive Edge** 5](#_Toc513455558)

[**7.** **Risks & potential problems** 6](#_Toc513455559)

[**8.** **Technical Analysis** 6](#_Toc513455560)

1. **Context**

16th September 2008, the world witnessed an earthquake shaking the American financial system as the Wall Street Journal wrote:

“Lehman Files for Bankruptcy, Merrill Sold, AIG Seeks Cash”

In spite of the reasons behind the fall of these firms, portfolio selection present one of the most complex and dynamic problems. The 2008 crisis exemplifies that even top highly qualified money manager can run into difficulties and make poor decisions. Portfolio management has always been carried out by investment firms who employ various expertise to locate, evaluate and decipher information (financial, economic or political) that affect/might affect the performance of assets. Even though various tools, and sophisticated techniques were developed by different companies to handle these investments problems, uncertainties still govern the process, and these can be undetected by even the very qualified experts.

Furthermore, with the significant evolution of technology (information systems) and automation, huge amounts of raw data about every firm and its financial performance is now available for exploitation. This massive data presents a challenge even for the skilled expertise in finance to analyze for patterns. Moreover, with the high number of transactions, load of investments money and number of assets and financial products, it is quite impossible for humans to efficiently monitor every asset in every portfolio. Indeed, this can explain to a certain extent the focus of these companies on the portfolio selection process[[1]](#footnote-1) (i.e., asset allocation), rather than on the continuous monitoring and evaluation of the portfolios content. Indeed, portfolio management is a dynamic investments process, in which an investor should continuously monitor and adapt his/her portfolio to market changes. To address this problem, we propose a multiagent investments platform called SMARTINvest. SMARTINvest will be composed of various agents that will help an investor monitor and adapt his/her portfolio.

A user will either input a customized portfolio or generate one using conventional optimization methods (Mean variance, Mean CVAR, Copula, efficiency etc..) into the platform. Upon the entry of the selected portfolio, the platform will check the performance class of the given portfolio and if it is not performant then suggestions on which assets to replace will be provided. Once the user portfolio is set the platform will be monitoring it on the bases of a predetermined period (weekly, biweekly, monthly, quarterly etc..). SMARTINvest will then proactively advise the user about the performance of his portfolio (High performance, Good performance, Low performance and Poor performance) and provide him with recommendation (which assets to switch) to increase the portfolio’ expected returns. With this platform at hand, the user should expect an efficient monitoring system that will dynamically lower investments risk and increase his expected returns. The platform doesn’t only target individuals but it might provide a business version for investments companies and portfolio managers.

1. **SMARTINvest: A Technical overview**

The fast growth of computing technology in the recent years (2018 International CES) made it rather easy to access financial market data sources over the internet. In order, to provide an efficient financial advisory and monitoring platform, we suggest multi-agent systems. A multi-agent system is composed of a set of smart agents that communicate among each other to achieve a specific task. In case of our platform, each agent is modeled as autonomous smart software with a machine learning core. Autonomous means the agent will be able is an operating on an owner's behalf or upon requests from other agents.

Multi-agent-based systems in this case provide the perfect tool to divide and conquer financial complexity (data gathering and processing). SMARTINvest provides a combination between machine learning algorithms and Multiagent-based systems. In this platform, we have six main agents: **User-Interface-Agent**, **Task Agents** (Bensh\_Agent, Recom\_Agent), **Information-Agents** (Analyst\_Agent, Insight\_Agent, Quant\_Agent).

**User-Interface-Agent:** This is the main agent to interact with the user and retrieve the information regarding the user portfolio.

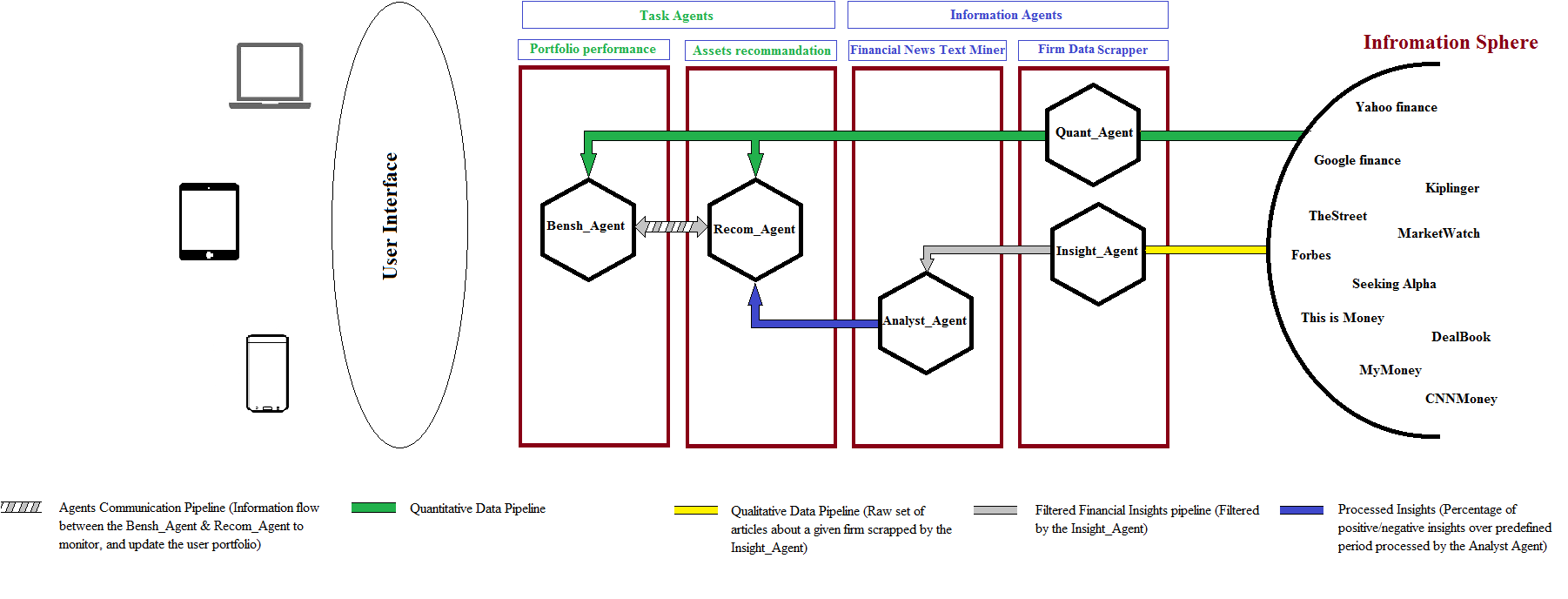
**Task Agents:** These kinds of agent will conduct the main task of pattern recognition to efficiently monitor and proactively suggest changes to the given portfolio on a predefined period

* **Bensh\_Agent:** Will classify the portfolio performance (Sharpe Ratio based) as requested by the **User-Interface-Agent**
* **Recom\_Agent:** Will check every firm ‘performance in a given portfolio. The agent will retrieve quantitative data the **Quant\_Agent** and instruct the **Analyst\_Agent** to provide him with qualitative insights.

**Information Agents:** In addition to quantitative information (quote history & key metrics) which will be scrapped by the **Quant\_Agent**, it would be great to have qualitative insight from the published financial reports and news feed about every company. Such task remains quite impossible for financial analyst to achieve as they cannot analyze and read every report or news feed about every company. In order to collect and provide such insight we propose the **Analyst\_Agent and Insight\_Agent.** This tow agents will be responsible for retrieving and processing qualitative data, which are chaotic and huge in amounts.

* **Analyst\_Agent:** will classify the filtered news and reports provided by the **Insight\_Agent** into either positive or negative over a predefined period and then supply a summary (% of negative and % of positive feeds). This agent will instruct the **Insight\_Agent** to scrap and filter relevant financial reports and news.
* **Insight\_Agent:** Is a scrapper who will fetch financial reports and news from various financial websites.In order to filter the data and only supply relevant information to the **Analyst\_Agent,** the **Insight\_Agent** will classify scrapped data into predefined classes.

The above multiagent system is further depicted in the next figure and the proceeding use case.



A user will communicate the list of the selected firms constituting his portfolio to the **User-Interface-Agent and the periodicity of monitoring (Weekly, Biweekly, Monthly or Quarterly).** The latter will then instruct the **Bensh\_Agent** to verify the portfolio’ overall performance and the information agents (**Analyst\_Agent, Insight\_Agent, Quant\_Agent**) to fetch the relevant information per firm in the portfolio.

Once communicated SMARTINvest will proceed as follows:

**Step 1:** **User-Interface-Agent** to instruct the **Bensh\_Agent** to verify the overall performance and the information agents to retrieve and process financial reports and news about each firm**.**

**Step 2:** The **Bensh\_Agent** will classify the portfolio performance into one of four preset classes.

* **Sub-step 2.1**: Request the **Quant\_Agent** to scrap and update quantitative financial information database.
* **Sub-step 2.2:** Assign a class to the portfolio

*If portfolio class is not “Poor performance[[2]](#footnote-2)” then proceed to step 3*

**Step 3:** **Bensh\_Agent** to instruct the **Recom\_Agent** to switch the least performant firms with better ones from an existing database given the investor preference (investment sector and **risk parameter**).

* **Sub-step 3.1:** **Insight\_Agent** to scrap and filter financial news and reports
* **Sub-step 3.2:** **Analyst\_Agent** to classify the scrapped reports/news into negative and positive.
* **Sub-step 3.3: Recom\_Agent** to retrieve key metrics data, historical quote and the percentage of negative/positive feeds.
* **Sub-step 3.4: Recom\_Agent** to determine to which efficiency frontier every firm belongs to and determine the least performant firms.
* **Sub-step 3.5: Recom\_Agent** to recommend better performing firms to replace the least performant ones.

**Step 4**: **User-Interface-Agent** to provide the suggestions to the user who can either confirm or reject the advice.

If the user is happy with the recommendations changes will take place and the algorithm will be executed from **step 1** throughout **step 4** until the class assigned by the **Bensh\_Agent** becomes “high performance” else the algorithm will settle until the next monitoring date. Once the set monitoring date is reached, the system will execute **step 1** throughout **step 4** and so on

1. **SWOT analysis** 
   1. **Strength**

* Ability to collect and process huge amount of structured/unstructured data in a timely efficient matter
* Machine learning and more specifically deep learning provide the advantage of fast learning through the existing financial reports and market data.
* Capacity to evolve and adapt its learning capacity
* Various well-coordinated agents that communicate to efficiently collect and process data
* Lower cost to use automated smart agents instead of hiring various financial analysts
* Ability to provide aggregated insights instead of the classic huge amount of indicators
* Capacity to monitor and readapt the client portfolio in a timely manner.
* Low cost and high number of targeted clients (Bottom of the pyramid customers)
  1. **Weakness**
* New brand with limited recognition
* Access to valuable data to teach the set of agents
  1. **Opportunity**
* The huge amount of dynamically changing financial information that comes in various and mostly unstructured format
* High cost to hire various analysts to go through the various reports, news and quantitative data.
* The high volume and variety of data and indicators that should be used in financial assessments and monitoring (Technical reports, financial news, financial statements and reports, market data, mathematical models etc.…)
* Market volatility and environment uncertainty that requires continuous monitoring through processing huge amount of data in real time
* Timeliness and criticality of financial information that require fast processing.
  1. **Threats**
* Even though they provide classic services and tools like assets evaluation, market data, and financial news, the existing platform that target individuals remains a well-established threat
* Financial industries remains one of the main businesses that resist technological advancements (individual might not trust insights from automated smart agents)

1. **Market analysis**
   1. **Market Analysis Summary**

With the overhauling digital revolution, accessibility to financial markets sky rocked in the past years. Prior to this revolution the main source for information used to be newspapers that is revenue reached $50 billion in the mid-2000s. In today market, Bloomberg and Reuters terminals dominate the market for financial information. Our platform is not intended to compete directly with these platforms, however we are competing with various robo-advisory and robo-investor platforms.

In 2018, the number of users in the Robo-Advisors sector hit the one million users across Europe and 0.02 million users in France alone. In fact, the total value of Assets under Management (AuM) in 2018 amounts to €11,594m in Europe and €286m in France. This is coupled with €12,113.27average assets under management per user. Even though, the European market is not as big as its US counterpart (€241,046m in 2018), it’s a grown market with huge potential and opportunities for startups.

Based on statista[[3]](#footnote-3), AuM are expected to grow by 47.9% reaching a total value of €55,509m in 2022 across Europe. In term of users, the number will hit 3.4 million by 2022.

* 1. **Competition and Barrier to entry**

With the grown automated solutions presented in the investment market it’s extremely hard to position ourselves compared to existing platforms. In fact, we consider robo-investors and more specifically robo-advisors as our main competitors. It’s true that brokers, and trading firms are also our competitors, but their customer acquisition costs and time constraints faced by these firms and brokers (Human advisors) have left many middle-class investors under advised and in most cases unable to obtain portfolio management services because of the minimums imposed on investable assets.

Based on Better Finance Report[[4]](#footnote-4) our potential competitors in Europe are the following

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| **Robo-Type** | **Names of the platforms** | **Websites** |
| **Advisor** | FEELCAPITAL (Spain) | <https://www.Feelcapital.com/> |
| **Investor** | EASYVEST (Belgium) | <https://www.easyvest.be/> |
| **Investor** | LIQID (Germany) | <https://www.liqid.de/> |
| **Advisor** | MARIE-QUANTIER (France) | <https://mariequantier.com/> |
| **Investor** | MONEY FARM (UK & Germany) | <https://www.moneyfarm.com/> |
| **Investor** | NUTMEG (UK) | <http://www.nutmeg.com/> |
| **Investor** | SCALABLE CAPITAL (UK & Italy) | <https://uk.scalable.capital/> |
| **Investor** | VAAMO (Germany) | <https://www.vaamo.de/> |
| **Investor** | YOMONI (France) | <https://www.yomoni.fr/> |

All of the above are competitors however investor robots provide asset management services which we do not intend to provide, mainly due to complicated regulation. For the aforementioned reason, we consider the main competitors to be FEELCAPITAL (Spain) and MARIE-QUANTIER (France) who are considered purely robo-advisory platforms. FEELCAPITAL is the biggest robo-advisory service provider in Europe in terms of advised assets€ 1.7 billion in assets).

The main barriers to entry remain in the hand of the existing competition. The number of existing firms operating in robo-advisory and the fact that the most European robo-investing providers are still in start-up mode*[[5]](#footnote-5)*, suggest a near perfect competition market thus negligible artificial barriers to entry.

* 1. **STP analysis**
     1. **Segmented and Target Market**

SMARTINvest intends to target primarily individual investors and these can be broken based on two segments types:

* + - 1. **Geographic Segmentation**

#### As a startup SMARTINvest will target European markets starting from the Paris exchange, London and Frankfurt then expanding throughout Europe.

* + - 1. **Demographic Segmentation**

Regarding demographics our customers can be broken down based on age and income & occupation:

* **Age:** we can easily target various age groups but our main focus will be on the younger and adults’ investors as they are more interested in technological solution
* **Income and occupation:** this segmentation would help us better target people with relatively medium to high disposal income by providing convenient services for low prices (Bottom of the Pyramid kind of business)
  + 1. **Positioning Statement**

For Individuals who want to be sure their portfolios are always monitored reliably, SMARTINvest is a trusted strategic online platform who makes sure; to provide to provide with high quality recommendation to increase your expected returns. Unlike the existing platforms, SMARTINvest will employ a mix of artificial intelligence and economic models to provide viable recommendations to its customers.

* 1. **Marketing Mix**
     1. **Services**

Our service consists of three main parts:

* Monitoring portfolios performance over time
* Provide timely information about which assets to sell or buy
* Provide an analysis per selected assets that include a mix of three main sources: Historical Quotes, Key Metrics, Positive/Negative Financial News
  + 1. **Place**

Given that SMARTINvest is a digital platform we are capable of targeting various locations however best start in EU market.

* + 1. **Promotion**

Deep learning, artificial intelligence and machine learning are today buzz words and can be a starting strategy to boost our services demand. Furthermore, potential reinforcement of our platform with mobile based solution and an easy to use website would make SMARTINvest more attractive than other platforms.

* + 1. **Price**

It is clear that the price of our services is the most influencing factor to customer’s opinions and views about our business. For this reason, we seek to provide some highly competitive price targeting clients with medium to high disposable income

* + 1. **Factor Affecting the Pricing**

The major and Main Factor affecting the price of service is the cost of data from terminals like Reuters.

1. **Strategy and Implementation Summary**

SMARTINvest strategy is based on capturing a great percentage of individual with medium to high disposable income through a convenient pricing strategy. Also, SMARTINvest intends to create a premier brand in intelligent financial insights, so that it can eventually capture market share across other financial actors. SMARTINvest intends to win customer loyalty following an appropriate usage of a mix of artificial agents and mathematical model to capture valuable insights and monitor portfolios. SMARTINvest will develop an easy-to-use website, accompanied with a mobile based application.

1. **Competitive Edge**

SMARTINvest competitive edge will be their easy-to-use website and a fee-based pricing fostering trust with our clients. This is a main competitive edge over our traditional counterparts who offer a commission–based. The website design will be a competitive advantage because research indicates that an easy-to-use website and transparency about the advisory procedure fosters customer loyalty. The design of SMARTINvest website will encourage subscription to our services due to its efficiency. In fact, often subscriptions are lost because of complex platforms that are far from intuitive. Furthermore, the SMARTINvest website will be further reinforced with a mobile solution.

SMARTINvest other competitive edge over existing robo-advisors might be its superior mix of deep learning algorithms and classic mathematical model through a well-structured multi-agent system to capture and analyze high quality financial information to monitor portfolios.

1. **Risks & potential problems**

* **Relatively little differentiation:** Robo-advisors can be easily replicated in term of business model and services making it hard for startups to differentiate their services. However, we can mitigate this risk through our investment in Multi-Agent based systems and deep learning
* **High fixed costs**: For deep learning algorithms to be efficient a powerful IT infrastructure is required. In short term, we might be able to use services such as Amazon EMR to solve this issue. However, in the long term acquiring our own infrastructure will be a requirement.
* The current project is based on an overall market study making it a bit weak. However, a more coherent feasibility study of the market and existing competition would be required to adopt the project to market demand and competition.

1. **Technical Analysis**

The core technology requirements for this platform to function are the following:

**A single data repository:** The common data repository to capture and store data related to clients, assets and the monitored portfolios over time. Due to the difference of data structures and types, Hadoop Distributed File System(HDFS) would serve as a great tool to efficiently operate the platform.

**Algorithms:** The core of this platform are the machine/deep learning algorithms programmed in Python. The first is the **Bench\_Agent**, to classify the performance of the portfolio upon the client request. The second is the **Recom\_Agent**, to recommend which stocks to switch to make the portfolio better. In its simplest form, the **Recom\_Agent** will combine two main statistics into a composite indicator to benchmark the different stocks.

* The first statistic is the percentage of times a given stock overperform a benchmarking portfolio (Example S&P 500)
* The second statistic is the percentage of time the stock received a positive feed (positive financial news).

The third is the **Analyst\_Agent** to classify the scrapped reports/news into negative and positive. Finally, the **Quant\_Agent** and the **Insight\_Agent**, who will scrap quantitative and qualitative data from the information sphere.

**Web platform**: The web platform of SMARTINvest will be developed in Django Python this will be further supported by mobile solution in both Android and IOS.

1. R. Trippi and E. e. Turban. Investment Management: Decision Support and Expert Systems. Van Nostrand Reinhold, 1990. [↑](#footnote-ref-1)
2. This is a class generated from the learning data. During the teaching step for the Bensh\_Agent a K number of randomly generated portfolios (Monte Carlo simulation) will be constructed with their relevant Sharpe ratio. After that we will identify 2 classes; Good performance (assets belonging to the top 50% Sharpe-performant assets), Poor performance (assets belonging to the least 50% Sharpe-performant assets) [↑](#footnote-ref-2)
3. https://www.statista.com/outlook/337/102/robo-advisors/europe?currency=eur [↑](#footnote-ref-3)
4. http://betterfinance.eu/fileadmin/user\_upload/documents/Research\_Reports/en/Robo\_Investing\_Report\_070617.pdf [↑](#footnote-ref-4)
5. http://betterfinance.eu/fileadmin/user\_upload/documents/Research\_Reports/en/Robot\_Advice\_Research\_Paper\_FINAL.pdf [↑](#footnote-ref-5)