News RSS with Stock Recommender

BY

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A REPORT

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I declare that this report entitled "**News RSS with Stock Recommender**" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

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ABSTRACT

This project is about the development of window applications for News RSS with Stock Recommendations involves sentence matching techniques and provide the recommend stock. This project aims to empower new graduates and institutional investors financially while imparting knowledge and expertise on developing window applications. The goal of this project is to overcome the analysis of news data to locate relevant news and provide listed companies in Bursa Malaysia. By providing real-time news updates, automatic suggestions, and educational materials, the initiative will improve the effectiveness of the recommendation process and serve as a perfect entry point for anyone wishing to start investing. The project uses a combination of text mining approaches to extract meaningful information from massive amounts of news data. Moreover, accessibility and usability are given top priority in the application's user-centric design, guaranteeing that both inexperienced and expert investors may easily utilize its features. The project seeks to develop a robust and user-friendly platform that can give rapid and precise stock recommendations to all users through exhaustive testing and upgraded enhancements. Lastly, outlines the goals of the project, its approach, and the anticipated effects on users. It highlights how the project can free up a significant amount of users' valuable time while also enabling people to make informed investment decisions while browsing and reading the news in a constantly changing financial environment.

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LIST OF ABBREVIATIONS

NLP   Natural Language Processing

API   Application Programming Interface

MACD   Moving Average Convergence Divergence

RSI   Relative Strength Index

EMA   Exponential Moving Average

SMA   Simple Moving Average

OBV   On-Balance Volume

HTML   HyperText Markup Language

RAKE   Rapid Automatic Keyword Extraction

HAP   Html Agility Pack

DOM   Document Object Model

IDE   Integrated Development Environment

UX   User Experience

UI   User Interface

JSON   JavaScript Object Notation

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Chapter 1   Introduction

In this chapter, we introduce our project, which aims to improve the stock selection process by integrating real-time news with advanced Natural Language Processing (NLP). Traditional stock analysis methods, often reliant on complex graphs and charts, can be confusing, particularly for beginners. This platform addresses this challenge by providing a user-friendly solution suitable for novice and experienced investors. By delivering the most relevant news linked to stock movements, the system empowers users to make informed investment decisions quickly and easily. Ultimately, this project seeks to democratize financial insights by opening them up to a wider audience and enabling more individuals to manage their investments confidently.

1.1   Problem Statement and Motivation

- **Limited Accuracy in Sentence Matching of News Content and Stock Profiles**

One of the main challenges of the project was to ensure the accuracy of matching sentences in news content with other relevant news or relevant stock-related profiles. News content usually covers a multitude of topics and categories, each with varying degrees of relevance to a particular stock. However, accurately identifying sentences or phrases pertinent to a specific stock among vast amounts of data remains a difficult task. The probability between two sentences indicates how similar they are to each other. In many cases, it is important to determine the similarity between sentences in various applications. Put differently, sentence similarity plays a crucial role in detecting plagiarism in various natural language tasks such as document categorization, question answering, summarization, and sentiment analysis [1]. Measuring two sentences' similarity can be difficult because they can be lexically or semantically similar. Lexical similarity examines character sequences within sentences, while semantic similarity assesses the underlying meaning of the sentences. Sentences in string-based similarity techniques are treated as character sequences, and similarity is calculated based on their resemblance to one another. The semantic similarity technique compares sentences based on their meanings, in contrast to other methods. Deep learning techniques have been used to comprehend the meaning of sentences through the analysis of extensive collections of text. However, despite these advancements, extracting relevant stock market information from news articles remains time-consuming and complex, primarily due to the need to accurately identify and match keywords and phrases.

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- **Key indicators producing untimely buy and sell signals**

Another significant challenge in this project is the effective analysis of stock-related data. The stock exchange is a dynamic marketplace where securities such as stocks, bonds, and commodities are continuously bought and sold. This generates a vast amount of data, including historical price movements, trading volumes, financial reports, and news updates. Despite the wealth of data available, extracting meaningful insights from it presents considerable difficulties. The complexity of processing and analyzing real-time financial data stems from the rapid and voluminous nature of data generation within the stock market. This is due to the immense number of transactions that occur on a daily basis across a wide spectrum of financial instruments, including stocks, bonds, commodities, and derivatives. The sheer scale of these transactions necessitates advanced technological infrastructure and data processing capabilities to effectively capture, store, and analyze the data in real-time. Accessing or analyzing critical information in a timely manner is essential for making well-informed trading and investment decisions. Delays in obtaining or processing this information can have detrimental effects, potentially resulting in suboptimal outcomes and missed opportunities in the financial markets. Therefore, it is crucial to ensure efficient and timely access to all relevant data for informed decision-making. To tackle these challenges, it's crucial to employ advanced analytical techniques and tools to interpret market trends and understand investor behavior. This is often influenced by historical price trends and trading volumes.

- **Lack of application that effectively mash-up news with stock recommendations.**

In most cases, individuals are required to utilize distinct platforms to obtain financial news and stock analysis. This situation results in inefficiencies and obstacles, particularly for novice or inexperienced investors. Traditional news websites usually provide the most recent updates on market events, breaking news, and historical perspectives. In contrast, stock recommendation platforms focus on analyzing stock performance by using various indicators such as moving averages, RSI, and MACD to offer insights and recommendations for investors. The available resources are frequently contained within isolated channels, necessitating users to navigate across multiple websites in order to acquire the necessary information. It can be hard for investors to keep up with information about a specific stock. They might have to read news on one website and then look at stock recommendations and analysis on another site. This makes it difficult to get all the information they need and increases the chances of missing important data that could affect their investment choices. This is especially difficult for new investors

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who might not know where to look for information or how to use it. They might not know which websites to use, what information to focus on, or how to understand the data they find.

1.2   Objectives

• **To implement advanced Natural Language Processing (NLP) techniques that enhance sentence matching through a statistical approach.**

In the context of news content and stock profiles, sentence matching is the process of establishing the connection between two sentences by assessing their degree of similarity or dissimilarity. This plays a crucial role in accurately associating news content with the appropriate stock profiles. Recent advancements in dependency parsing and semantic role labeling technologies have significantly streamlined the extraction of dependable structural information, encompassing syntactic structure and semantic roles [2]. This is crucial for the enhancement of natural language processing (NLP) systems and the optimization of sentence-matching tasks. In order to improve the system's sentence-matching capabilities, we have integrated stopword filtering and implemented a keyword-matching algorithm utilizing statistical methods. The algorithm employs a sophisticated analysis to assess the extent of alignment between keywords found in news articles and stock profiles. This involves a deep dive into the intricate relationships between these keywords and their occurrences. Through this comprehensive analysis, the system can effectively pinpoint relevant matches with heightened precision and dependability, thereby contributing to more accurate and reliable outcomes. The system will significantly enhance its keyword-matching capabilities by seamlessly integrating these advanced statistical techniques into the mass data. This improvement allows users to quickly access relevant news articles and stock profiles, streamlining the stock analysis process and enhancing the overall experience. Users can easily find the information they need without having to sift through overwhelming amounts of data.

• **To implement an integrated approach that combines news content with stock data and trendline analysis.**

In the world of capital markets, making timely investment decisions is crucial. While traditional indicators like RSI, MACD, SMA, and EMA are commonly relied upon, they can occasionally produce signals that are either premature or delayed. This can potentially lead to less-than-ideal decisions, such as selling at low prices or buying at high prices, ultimately impacting the financial returns of the investor. Our system aims to overcome this challenge by integrating trendline analysis, which provides a more accurate depiction of market behavior. Trendlines

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are highly adept at pinpointing the fundamental track of stock prices and can assist in minimizing the potential risks stemming from untimely or belated signals produced by alternative indicators. By harmonizing trendline analysis with real-time news updates and stock data, the system elevates signal precision, granting users well-timed, dependable insights that can be acted upon with confidence. Moreover, the system has been meticulously crafted to offer a user-friendly experience, presenting a clear and intuitive visualization that enables users to swiftly evaluate stock performance. While traditional indicators retain their importance in the analysis toolkit, the incorporation of trendlines offers a superior approach to capturing market trends and refining investment strategies. This methodology enables individuals to make well-informed decisions, potentially resulting in enhanced profitability and increased financial achievement. The capacity to tailor the analysis according to individual investment criteria also guarantees the relevance of the information provided, reducing the time spent on irrelevant data and optimizing the efficiency of the decision-making process.

• **To implement a Windows Desktop Application that retrieves data from various sources into simple dashboard.**

Through the automatic daily aggregation of news updates from pertinent sources and their integration with historical stock price data, the system guarantees users access to the most current and pertinent information without the need to consult multiple websites. This integration is particularly advantageous as it provides users with immediate visibility into the potential effects of recent developments on stock market performance. The dashboard provides information in a visually comprehensible format, simplifying the process for users to interpret and take action. By centralizing all necessary data in one location, users can make faster and well-informed decisions instead of having to switch between various websites and manually assembling information.

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1.3   Project Scope and Direction

This project aims to develop and build a news RSS with stock recommender window application. It provides users with seamless access to real-time news updates in Malaysia and personalized stock analyses on their laptop devices. We are aiming to create a decentralized application that will utilize advanced Natural Language Processing (NLP) techniques to extract keywords from a wide range of news content accurately. These keywords will then be used to find matching stock profiles and identify the most related companies, in conjunction with technical indicators to identify stocks that are potentially overbought or oversold effectively. This innovative approach will enable users to make more informed decisions when it comes to stock trading and investment strategies. The primary objective is to provide a user-friendly and effective platform that offers in-depth analysis of market dynamics and identifies potential areas for investment. The application for News RSS with Stock Recommender System on laptop devices is designed with features and functionalities aimed at enhancing user experience and improving efficiency while analyzing stocks including:

I.   The system aggregates news articles and reports from various sources, ensuring users have access to a wide range of news categories.

II.   The system enables users to personalize their news feed by choosing specific categories of interest, such as sports, banking, technology, and more. This allows them to concentrate on relevant content.

III.   The system utilizes advanced NLP algorithms to analyze news articles and accurately link them to relevant stock profiles, providing precise and actionable insights.

IV.   The system provides in-depth stock analysis by considering news sentiment and important key indicators, enabling users to make well-informed investment choices.

V.   The system offers real-time updates on breaking news and stock price fluctuations, empowering users to react to market shifts and make informed investment choices promptly.

VI.   The system offers users an intuitive interface through which they can peruse and select from a meticulously curated compendium of news articles. The selection process is based on the titles of interest, allowing users to delve deeper into the chosen topics.

VII.   The platform automatically generates a column of relevant news articles based on the content of the selected article, providing users with in-depth insights into related topics.

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VIII.   The system enables users to compare different types of key indicators to determine which ones are more accurate for making investment decisions, specifically to identify optimal buy and sell opportunities.

1.4   Contributions

The advancement of robust stock recommendation systems signifies a major breakthrough in financial technology, with the potential to transform the way people and businesses interact with the stock market. These systems use sophisticated algorithms, data analytics, and text mining techniques to potentially drive economic growth, eliminate poverty, and decrease social inequalities, all while encouraging financial inclusion. The News RSS with Stock Recommender system not only revolutionizes financial markets but also functions as a comprehensive educational tool. The platform provides users with comprehensive insights into stock market operations, investment strategies, and financial literacy. Having this knowledge enables individuals to make informed investment choices, allowing them to make well-thought-out decisions rather than just following the crowd. The platform enables users to conduct analysis on market trends, assess stock performance, and evaluate economic indicators. When analyzing historical data, investors have the opportunity to uncover valuable patterns that can guide their decision-making process when it comes to investing. There is a diverse range of investment techniques and strategies to choose from, and each of these can be tailored to align with an individual's specific risk tolerance, financial objectives, and time frame for investing. Investors can leverage the system's educational resources to develop and execute lucrative investment strategies, irrespective of their inclination towards value, growth, or dividend-based investment approaches.

In addition, the system increases time efficiency by enabling users to tailor their news feeds based on their individual preferences. This personalized feature sifts through irrelevant information, guaranteeing that users only receive the most pertinent and significant news updates. By concentrating on content that matches their specific interests and investment criteria, users can save precious time and boost their productivity.

The accessibility of financial information and analysis plays a pivotal role in today's interconnected global landscape. It serves as a cornerstone in empowering individuals to navigate the intricacies of the stock market and safeguard their financial well-being. This system represents a formidable force in democratizing access to these crucial resources, offering a user-friendly interface that accommodates individuals of diverse backgrounds and

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experience levels. By providing intuitive functionality, the system significantly simplifies the onboarding process for new users, fostering an inclusive environment that welcomes individuals without prior financial expertise. Whether individuals aspire to amass wealth, plan for retirement, or pursue other financial objectives, this system arms them with the requisite tools and resources to make well-informed decisions and attain enduring financial security.

Solving Problem: Limited Accuracy in Sentence Matching of News Content and Stock Profiles

Developing effective systems that utilize advanced algorithms, data analytics, and text mining techniques can help address the challenge of limited accuracy in sentence matching of news content and stock profiles. By leveraging sophisticated algorithms, the system can accurately analyze news articles and extract relevant information about stocks and financial markets. This enhances the system's ability to match news updates with relevant stocks and provide users with timely and accurate recommendations.

Solving Problem: Key indicators producing untimely buy and sell signals

The system integrates news updates with stock recommendations, providing users with comprehensive insights into market trends, listed companies in Bursa Malaysia, stock performance, and economic indicators. Users can analyze historical data patterns and make informed investment decisions based on personalized investment strategies. Moreover, the system offers educational tools and resources to help users understand the workings of the stock market, investment strategies, and financial literacy. This empowers users to create and execute profitable investment plans tailored to their unique preferences and financial goals.

Solving Problem: Lack of application that effectively mash-up news with stock recommendations.

By automatically gathering daily news updates from relevant sources and combining them with historical stock price data, the system reduces the time and effort traditionally needed to collect and analyze information from multiple websites. Users no longer have to browse through different platforms or manually put together data to comprehend market trends. Instead, all essential information is presented in a visually intuitive dashboard, making it easier for users to interpret and react to market changes.

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1.5   Report Organization

The report is organized to cover all aspects of the project comprehensively. It begins with Chapter 1, which introduces the project by outlining its objectives and scope. Following this, Chapter 2 provides a review of similar systems to offer context and highlight gaps in existing solutions. Chapter 3 details the methodology and approach used in developing the system. In Chapter 4, the report describes the design of the News RSS with Stock Recommender system, including its architecture and components. Chapter 5 covers the development process of the system, focusing on implementation details. Chapter 6 evaluates the system's performance and effectiveness through testing. Finally, Chapter 7 concludes the report by summarizing the project's findings, reflecting on its outcomes, and offering recommendations for future work.

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Chapter 2 Literature Review

2.1 Introduction on Literature Review

This chapter provides a review of selected online news websites and stock market indicators relevant to the development of a News RSS with Stock Recommender system. While numerous news platforms exist, I have chosen to focus on four prominent Malaysian news websites: The Star, The Vibes, Malaysiakini, and BERNAMA. Each site will be examined for its strengths and weaknesses in delivering news content, particularly focusing on its features, such as the ability to provide related news, news filtering options, and the overall user experience for accessing relevant financial information. Additionally, this review also explores widely used technical indicators in stock market analysis, specifically the Relative Strength Index (RSI), Moving Average Convergence Divergence (MACD), Simple Moving Average (SMA), and On-Balance Volume (OBV). These indicators play a crucial role in stock trading decisions and will be integrated into the stock recommender component of the project.

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2.2   The Star [3]
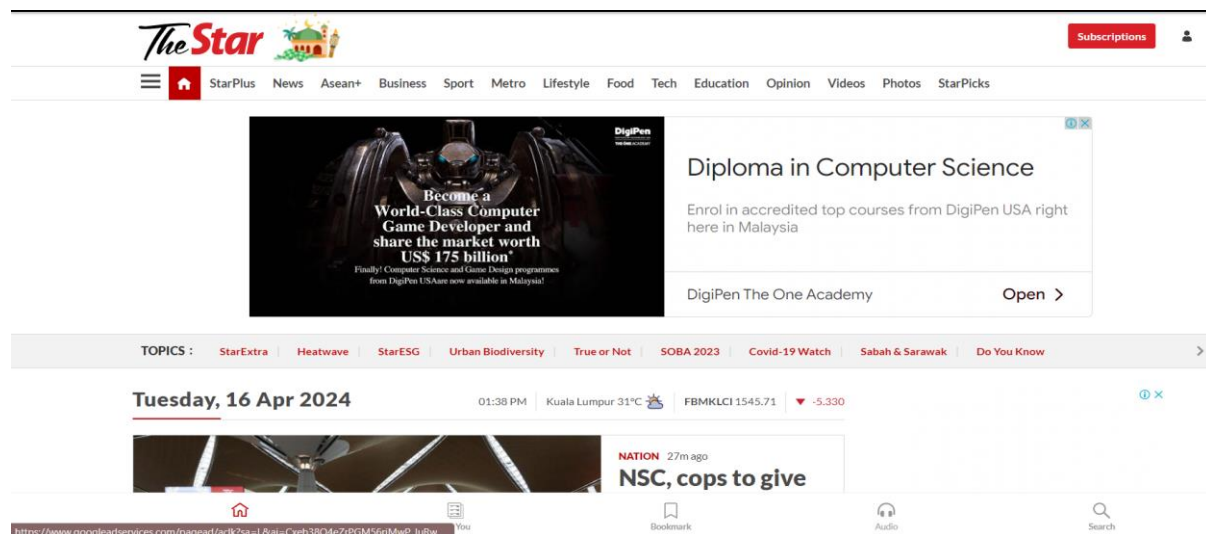
Figure 2.1 The Star News Website

The Star Online, Malaysia's first digital news platform, launched on June 23, 1995, marking a significant milestone in the country's media landscape. As the first of its kind in Malaysia, The Star Online offers an extensive array of content spanning multiple categories, including national and international news, business, sports, technology, lifestyle, and global events. The platform is committed to delivering up-to-the-minute breaking news, compelling stories, and thought-provoking commentary that caters to a diverse audience. With a robust online presence, The Star Online has cultivated a vibrant community of more than one million followers across major social media platforms like Facebook and Twitter, enhancing its reach and engagement. In 2014, the platform's excellence was recognized by the World Association of Newspapers and News Publishers (WAN-IFRA), which named it one of Asia's premier news websites. The Star Online also provides a comprehensive media experience through multiple formats, including traditional print, ePaper, and a user-friendly mobile app, making it accessible to readers on various digital and physical channels.

Strengths

- Offers users a broad selection of categories to choose from, ensuring a wide range of interests are catered to.
- Features an intuitive search function with popular keyword suggestions, making it easier for users to find relevant content quickly.

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- Provides real-time customer service support to assist users with any issues or inquiries they may have.

- Offers related news articles to enrich the browsing experience, helping users discover more relevant content.

Weakness

- Currently supports only the English language, with no options for other languages, potentially limiting its accessibility to non-English-speaking audiences.

- Lacks robust date filtering options, including the inability to select articles from a specific date range, which can hinder users looking for content from particular time periods.

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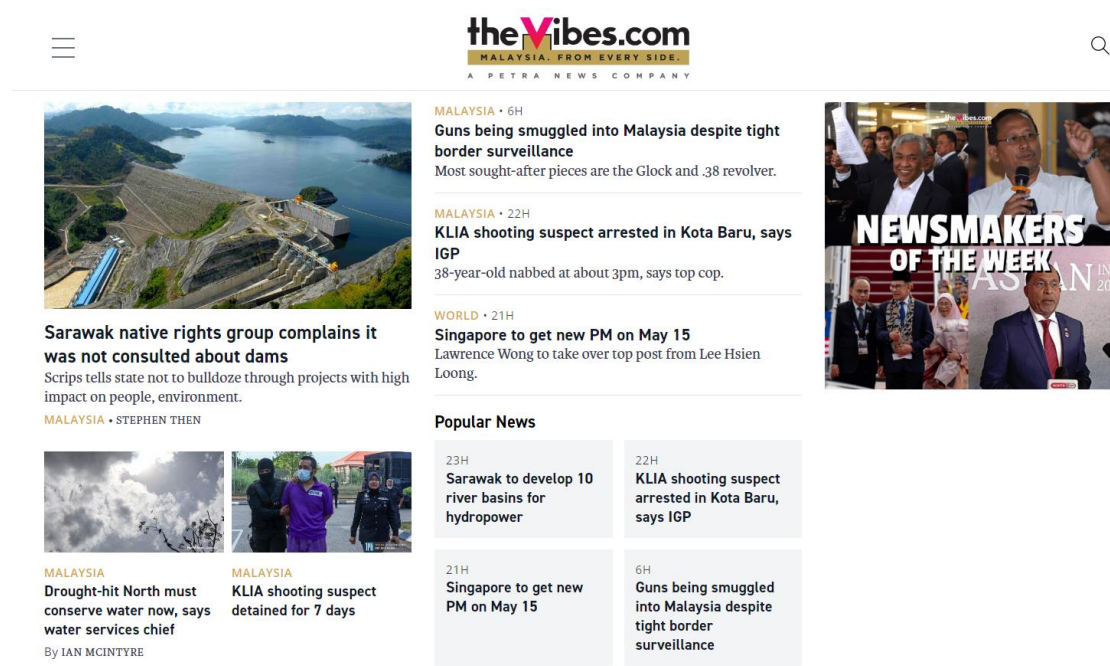
2.3   The Vibes [4]

Figure 2.2 The Vibes News Website

The Vibes is a Malaysian online news portal that began its operations on September 19, 2020. With a focus on delivering breaking news and the latest stories from various viewpoints, it carries the tagline "#FromEverySide," reflecting its commitment to providing diverse and balanced coverage. The Vibes positions itself as a platform dedicated to giving voice to the people and promoting fair, unbiased, and inclusive journalism. At its core, The Vibes is built on a foundation of journalistic integrity, holding itself accountable to the highest standards of reporting. It is devoted to fostering equality, diversity, justice, and integrity within society, consistently advocating for transparency and fairness in all aspects of its news coverage. By being dedicated to these principles, The Vibes aims to be a reliable provider of news that connects with a broad audience and promotes the principles of fairness and diversity.

Strength

- Offers a search feature that enables users to find specific keywords or information within the website, enhancing the overall user experience.
- Provides users with a diverse selection of categories, ensuring coverage of various topics and interests.

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- Recommends related news articles to users, fostering an enhanced and more engaging browsing experience.

Weakness

- Lacks real-time customer service support, which could limit assistance for users with immediate inquiries or issues.
- Fails to provide tools for filtering articles by date, making it challenging for users to locate content from specific time frames.
- Supports only the English language, reducing accessibility for non-English-speaking audiences.

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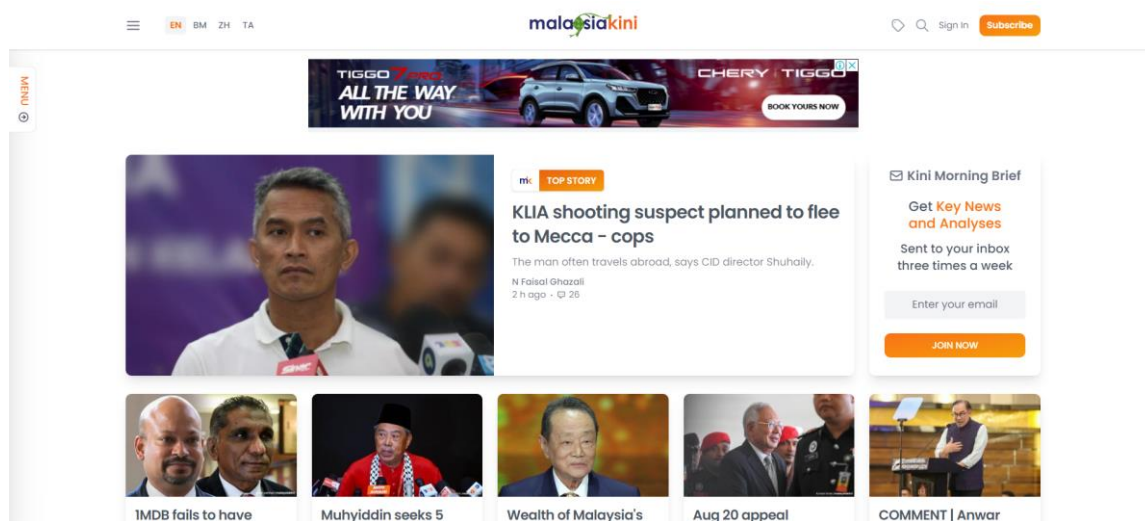
2.4   Malaysiakini [5]

Figure 2.3 Malaysiakini News Website

Malaysiakini, also known as "Malaysia Now," is a respected online news portal established in 1999 by founders Premesh Chandran and Steven Gan. The platform is renowned for its dedication to delivering impartial and fair news coverage, striving to set new standards in the field of journalism. Malaysiakini is deeply committed to advancing freedom of expression, social justice, and democratic principles within Malaysia. Its reporting and advocacy efforts play a pivotal role in promoting these values, positioning Malaysiakini as a significant player in the media landscape. By prioritising unbiased journalism and supporting democratic discourse, Malaysiakini contributes to a more informed and engaged public.

Strength

- Provides a range of language options, enhancing accessibility for a diverse audience.
- Offers real-time assistance through live chat, addressing user inquiries and issues promptly.
- Includes a search feature that allows users to find specific content by keywords.
- Allows users to filter articles by date, making it easier to locate content from specific time periods.

Weakness

- Lacks the ability for users to select from predefined categories, which may limit the ease of navigating diverse content.
- Does not offer an option to save articles for future reading, which could be inconvenient for users who want to revisit content later.

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2.5   BERNAMA [6]

Figure 2.4 BERNAMA News Website

BERNAMA, operated by the Malaysian National News Agency, is a key player in delivering timely, credible news and accurate information. As a trusted source for both the public and media professionals, BERNAMA is dedicated to providing up-to-the-minute updates and comprehensive coverage of national and international events. Its commitment to reliability and accuracy ensures that it remains a vital resource for keeping its audience informed and engaged.

Strength

- Offers various language options to cater to a diverse audience.
- Provides a categorized browsing experience, making it easier for users to find content of interest.
- Includes a search feature that allows users to locate specific articles or information using keywords.
- Recommends related articles to enhance user engagement and provide additional context.

Weakness

- Lacks real-time customer support, which could limit assistance for users needing immediate help.
- Does not offer options for filtering articles by date, which may make it harder to find content from specific time periods.

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- Does not allow users to save articles for future reading, which can be inconvenient for those who wish to revisit content later.

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2.6   Proposed System

2.6.1   Search Functionality

Our system comes with an advanced feature that combines news updates with stock recommendations. This means that users can not only access relevant articles but also quickly assess how these news updates influence stock prices. They gain actionable insights directly from the search results, eliminating the need to switch between multiple platforms for news and financial analysis.

2.6.2   Related News Suggestion

Our proposed system significantly enhances user experience by integrating related news articles with stock performance and market trends. By doing so, users not only receive comprehensive news coverage on a specific topic, but they also gain valuable insights into the potential impact of these developments on their stock investments.

2.6.3   Implement Historical Chart

None of the platforms we assessed include historical stock charts as part of their services, which is a crucial component of our system. Being able to examine historical charts in conjunction with pertinent news pieces gives users a distinct edge. This functionality enables people to assess previous stock trends and tie them to market news, thereby allowing for more well-informed investment choices. Incorporating historical data allows for a more comprehensive understanding of long-term trends, which is vital for strategic financial planning.

2.6.4   Remove Login Requirements

The majority of websites necessitate that users log in to access premium content; however, our Proposed System eliminates this requirement. Users have the ability to utilize the system's complete array of features, such as stock recommendations and news updates, without having to log in. This choice guarantees that the platform stays open, easily accessible, and user-friendly, ultimately drawing in a wider audience and promoting engagement from both casual users and seasoned investors.

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2.7   Comparison Between Similar News Websites

	The Star	The Vibes	Malaysiakini	BERNAMA	Proposed System (NEWS)
Categories Selection	✓	✓	✗	✓	✗
Search Functionality	✓	✓	✓	✓	✓
Related News Suggestion	✓	✓	✗	✓	✓
Language Selection	✗	✗	✓	✓	✗
Live Customer Support	✓	✗	✓	✗	✗
Date Filtering	✗	✗	✓	✗	✗
Historical Chart	✗	✗	✗	✗	✓
Daily article selection	✗	✗	✗	✗	✓
Login Required	✓	✗	✓	✗	✗

Table 2.1: Comparison between similar news websites

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2.8   Relative Strength Index (RSI) [7]

The Relative Strength Index (RSI) is a widely used technical indicator that measures momentum in financial markets. It is especially useful for identifying important market points such as reversals, peaks, and troughs when studied alongside a stock's price chart. Created by J. Welles Wilder, the RSI keeps an eye on market conditions and identifies times when an asset may be overbought or oversold [7]. The RSI evaluates market conditions by analyzing recent price movements to gauge the speed and scale of gains and losses. It produces a numerical value between 0 and 100, which helps traders spot potential overbought or oversold situations. When the RSI reading exceeds 70, it usually indicates that an asset might be overbought, suggesting a potential price reversal or decline. On the other hand, an RSI reading below 30 suggests that an asset could be oversold, potentially hinting at an upcoming price increase. Traders often pay close attention to these extreme RSI values to predict future market changes and make well-informed trading choices.

$$RS = \frac{Avg.Gain}{Avg.Loss}$$

$$RSI = 100 - \frac{100}{1 + RS}$$

Figure 2.5 Formula RSI

Average Gain = Total gain / 14

Average Loss = Total loss / 14

Strength

- Accurately measures both upward and downward momentum, providing a clear view of market strength.
- Clearly establishes thresholds for overbought (above 70) and oversold (below 30) conditions, helping traders identify potential reversal points.
- Allows for adjustments based on changes in market sentiment, offering dynamic insights into market conditions.

Weakness

- As a lagging indicator, it may delay signals, potentially leading to less timely investment decisions.

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- Extended trends can result in delayed reversal signals or premature buy/sell recommendations, which may affect trading effectiveness.
- The intricate nature of RSI chart patterns can be challenging for novice traders to interpret and use effectively.

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2.9   Moving Average Convergence Divergence (MACD) [8]

Moving Average Convergence Divergence (MACD) is a widely used momentum-based indicator that was developed by American financial analyst Gerald Appel in 1979 [8]. It functions as a tool to track trends and identify the momentum of price movements in financial markets. Although it was initially designed for the stock market, its adaptability has allowed it to be applied to a variety of financial instruments such as commodities, forex, and cryptocurrencies. The MACD is commonly utilized to analyze market trends, identify overbought or oversold conditions, and generate buy or sell signals. The MACD line is derived from the difference between the 12-period EMA and the 26-period EMA, emphasizing the asset's short-term and long-term momentum. Meanwhile, the signal line represents a 9-period EMA of the MACD line.

$$MACD\ Line = EMA_{12} - EMA_{26}$$

$$Signal\ Line = EMA_{MACD\ Line\ 9\ days}$$

$$MACD\ Histogram = MACD\ Line - Signal\ Line$$

Figure 2.6 Formula MACD

Strength

- This indicator is versatile and can be applied to various financial markets and timeframes, making it a flexible tool for different trading situations.
- Effectively identifies stable and robust trends in price movements
- Generates consistent buy and sell signals.

Weakness

- Tendency to give off false signals, particularly during low volatility or sideways markets.
- Being considered a lagging indicator means that it may not immediately respond to sharp price movements or market reversals.
- The MACD is not as reliable on shorter timeframes since it may encounter signal delays and reduced effectiveness in those situations.

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2.10   On-Balance Volume (OBV) [9]

On-Balance Volume (OBV) is a volume-based technical indicator introduced by financial analyst Joseph E. Granville in 1963. Granville developed OBV under the belief that volume is a critical driver of price movements in financial markets [9]. According to Granville's theory, price trends are preceded by changes in trading volume. OBV is based on the concept that increasing volume during an uptrend indicates institutional traders are buying, signaling an upcoming rise in the broader market's prices. Conversely, in downtrends, a volume increase suggests institutional selling, indicating that the market is likely to follow the price downward. The OBV is based on the idea that notable changes in trade volume frequently anticipate significant price swings. The OBV indicator tracks these fluctuations in volume and can be used to predict bullish or bearish momentum and market sentiment. It provides information about possible market trends and helps traders in making justifiable judgments based on volume-driven signals by reflecting the actions of both major institutional traders and other market participants.

$$OBV = OBV_{prev} + \begin{cases} volume & \text{if } close > close_{prev} \\ 0 & \text{if } close = close_{prev} \\ -volume & \text{if } close < close_{prev} \end{cases}$$

Figure 2.7 Formula On-Balance Volume

Strength

- The calculation is straightforward to understand and may be used even by inexperienced traders.
- A minimal time lag enables traders to predict price changes in advance, as compared to responding after the fact.
- Highly effective at predicting positive or negative volume trends.
- Offer a variety of signals, from trend confirmations to divergences.

Weakness

- False signals on closing prices.
- Performs poorly in markets with low volatility or low trading volumes.
- Less reliable in predicting short-term price movements.
- Requires access to a substantial history of trading data to provide meaningful insights.

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2.11 Simple Moving Average (SMA) [10]

The Simple Moving Average (SMA) is a widely used technical indicator that determines an asset's average price over a given period. Typically, the SMA is determined using the asset's closing prices [10]. By averaging prices across a predetermined number of periods, the SMA smoothest out price volatility, making it easier to identify trends in the asset's price movements. If the SMA is sloping upward, it suggests that the security's price is growing over the specified period. In contrast, a downward-sloping SMA implies that the asset's price is declining [11].

$$SMA = \frac{A_1 + A_2 + \ldots + n}{n}$$

Where:

A = each of the data points

n = number of time periods

IG.COM

Figure 2.8 Formula SMA

Strength

- Offers a smooth and less volatile line.
- Simplifies price data.
- Effective in helping traders identify bullish or bearish trends.

Weakness

- Slower to react to rapid price changes.
- It introduces a significant lag due to its computation approach.
- Produce misleading signals in volatile markets.
- Dependence heavily on time frame

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2.12   Proposed System

The Trendline Analysis proposal not only accurately measures momentum, but it also gives a broad view of the stock's overall direction. By eliminating short-term fluctuations, the trendline provides a better understanding of price movements over time, giving investors a more dependable tool for momentum analysis compared to SMA, which is less precise in this regard. Instead, it also has the ability to identify overbought and oversold conditions, but it does so more reliably by focusing on longer-term price movements. This reduces the chances of false positives and provides a more dependable signal for when a stock is overextended, giving investors greater confidence in their buy/sell decisions. In addition, it aims to simplify this process by reducing the reliance on external confirmation. The trendlines themselves offer a clearer signal, allowing investors to make decisions with more confidence and without having to check multiple data points. This results in a more efficient and simplified decision-making process for users. In the same way, our Trendline Analysis solves this problem by offering live market updates, guaranteeing that investors get timely signals that represent the present market conditions. The capacity to react swiftly using precise, up-to-date data is a significant advantage, especially in rapidly changing markets.

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2.13   Comparison Between Key Indicators

	RSI	MACD	SMA	OBV	Proposed System (Trendline)
Precise Momentum	✓	✓	✗	✓	✓
Overbought/Oversold	✓	✓	✗	✗	✓
Versatility	✗	✓	✓	✓	✓
Confirmation Needed	✗	✓	✓	✓	✗
False Signals	✓	✓	✓	✓	✗
Market Trend Dependency	✓	✓	✓	✓	✓
Time Lag	✓	✓	✓	✗	✗
Signal Accuracy in Low Volatility	✗	✗	✗	✗	✓

Table 2.2: Comparison Between Key Indicators

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Chapter 3 System Methodology/Approach

3.1 System Design Diagram

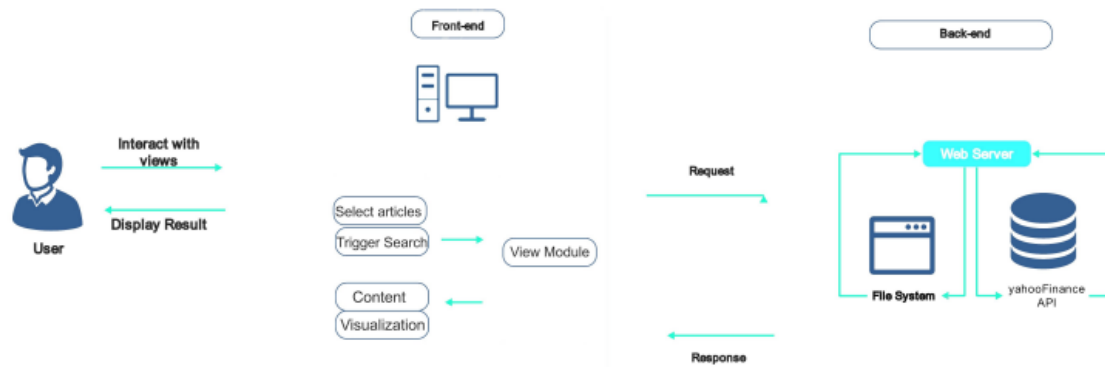### 3.1.1 System Architecture Diagram

Figure 3.1.3.1 System Architecture Diagram

Figure 3.1.1 shows our application's architecture diagram. It clearly illustrates the separation between the front-end user interface and the back-end processing components. Users interact with the system through views, where they can select articles and initiate searches. These actions are managed by the front-end's view module. The front-end then sends these requests to the back-end, where a web server processes them by accessing a file system that stores data and utilizing the YahooFinance API to fetch real-time stock information. Once the data is processed, it's sent back to the front-end and presented to the user in a user-friendly format.

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3.1.2 Use Case Diagram
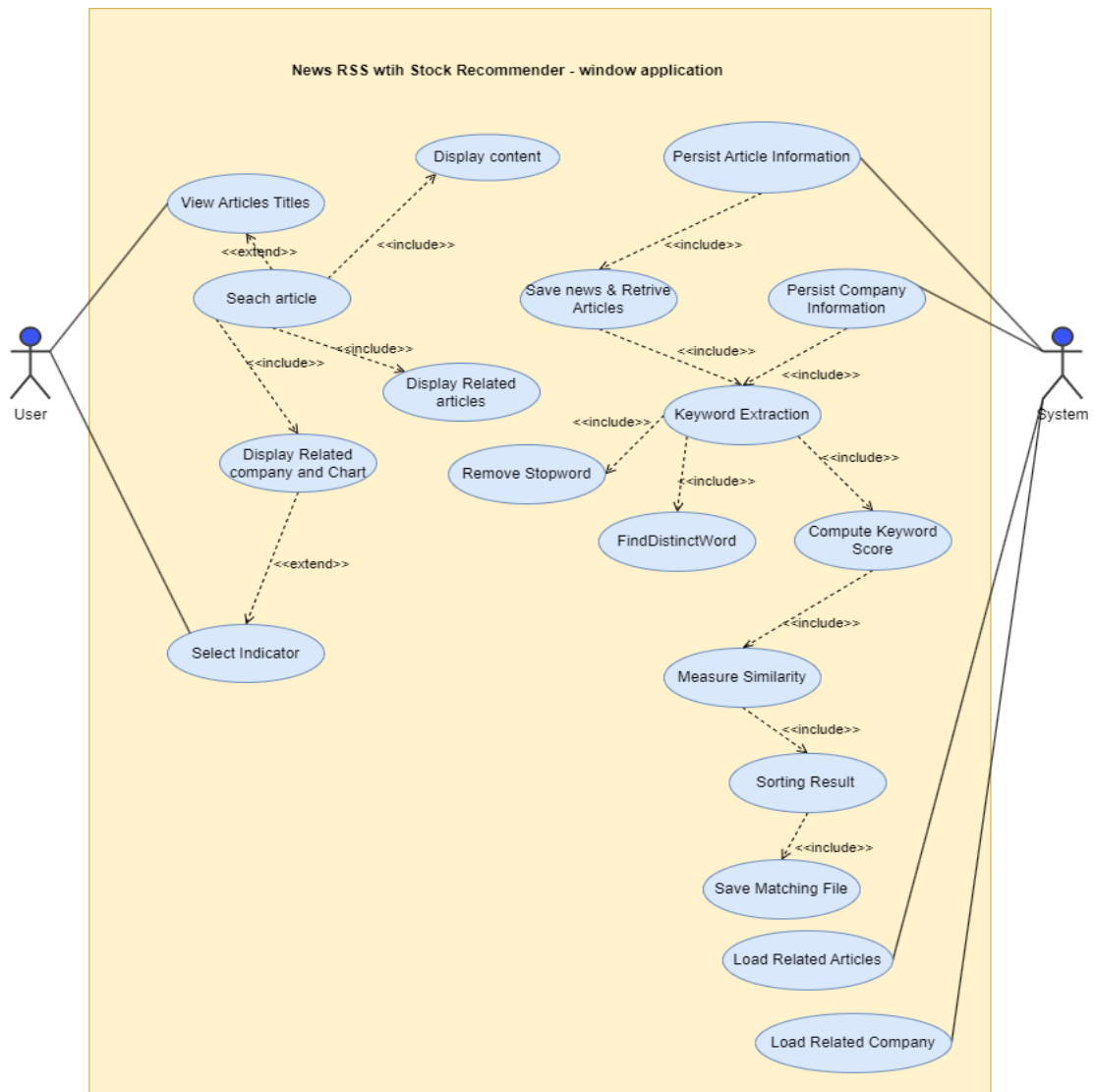
Figure 3.1.4.1 Use Case Diagram

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3.1.2.1 Persist Article Information – Use Case Description

Use case	Persist Article Information
Purpose	The article information are saved for future reference and data retrieval.
Actor	System
Trigger	The system fetches new articles data from an external source and needs to store it.
Main Flow	1. The system retrieves new article data from an external source. 2. The system checks if the article titles already exist in the file. 3. If the titles are new, the system appends the article information to the "NewsContent.txt" file
Alternate flow	none

Table 3.1.2.1: Persist Article Information – Use Case Description

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3.1.2.2 Persist Company Information – Use Case Description

Use case	Persist Company Information
Purpose	The company information is saved for future reference and data retrieval.
Actor	System
Trigger	The system initializes or refreshes and needs to load company data from a file.
Main Flow	1. The system reads company profile data from the "CompanyProfile.txt" file. 2. The system parses the data to extract company name, description, and code. 3. The system loads the parsed company information into memory for further processing.
Alternate flow	none

Table 3.1.2.2: Persist Company Information – Use Case Description

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3.1.2.3 Load Related Articles – Use Case Description

Use case	Load Related Articles
Purpose	Load related articles for an article from the stored data for further analysis.
Actor	System
Trigger	The system starts up or when the user selects an article.
Main Flow	1. The system reads the "MatchingArticles.txt" file to retrieve the list of related articles. 2. The system parses the file content to map each article with its related articles. 3. The system stores the related articles in a dictionary for quick access during user interactions.
Alternate flow	none

Table 3.1.2.3: Load Related Articles – Use Case Description

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3.1.2.4 Load Related Company – Use Case Description

Use case	Load Related Company
Purpose	Load related companies for an article from the stored data for further analysis
Actor	System
Trigger	The system starts up or when the user selects an articles
Main Flow	1. The system reads the "MatchingCompany.txt" file to retrieve the list of related companies. 2. The system parses the file content to map each articles with its related companies. 3. The system stores the related companies in a dictionary for quick access during user interactions.
Alternate flow	none

Table 3.1.2.4: Load Related Company – Use Case Description

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3.1.2.5 View Articles Titles – Use Case Description

Use case	View Articles Titles
Purpose	Allows the user to view a list of available article titles.
Actor	User
Trigger	The user opens the application or clicks on the articles dropdown
Main Flow	1. The system loads the article titles from the "NewsContent.txt" file. 2. The system populates the article titles into the ComboBox. 3. The user selects an article title from the ComboBox. 4. The system displays the content of the selected article in the designated text area.
Alternate flow	none

Table 3.1.2.5: View Articles Titles – Use Case Description

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3.1.2.6 Select Indicator – Use Case Description

Use case	Select Indicator
Purpose	Allows the user to select a specific financial indicator to be displayed on the chart.
Actor	User
Trigger	The user decides to compare stock data using different financial indicators.
Main Flow	1. The system displays the default chart without any additional indicators when the application get related company information. 2. The user selects an indicator option from the user interface. 3. The system retrieves the selected indicator data. 4. The system updates the chart panel to display the chart with the selected indicator data.
Alternate flow	If the user does not select any indicator: 1. The system continues to display the default chart without any additional indicators. 2. The user can still view the default stock data without the need for further selection.

Table 3.1.2.6: Select Indicator – Use Case Description

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3.1.3 Activity Diagram

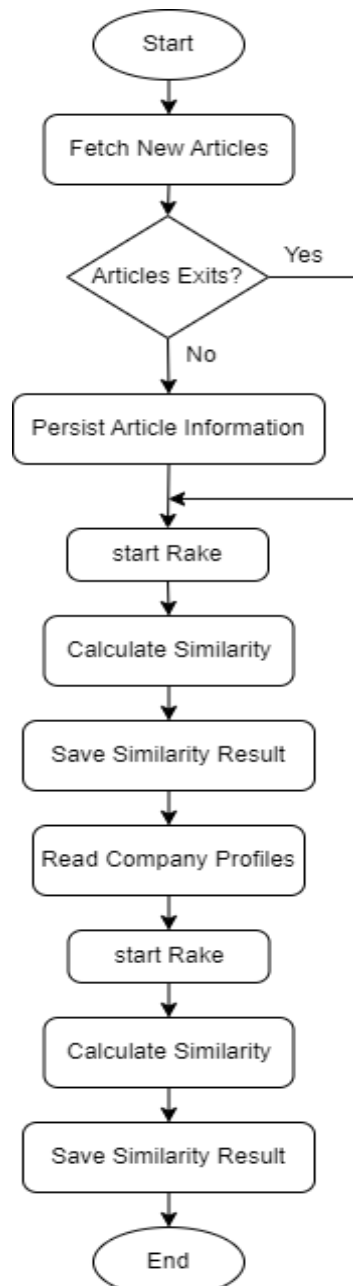### 3.1.3.1 Article Processing and Company Similarity Calculation

Figure 3.1.3.1 Activity Diagram for Article Processing and Company Similarity Calculation

When the system boots up, it retrieves articles and checks for existing titles. If a title is new, the article is saved, and then RAKE is used to extract keywords. The system proceeds to calculate similarities between the new and existing articles, saving these results. It also reads company profiles, extracts keywords using RAKE, and then calculates similarities between articles and companies, identifying relevant connections. Finally, the results are saved, thus completing the process of linking articles to related content and companies.

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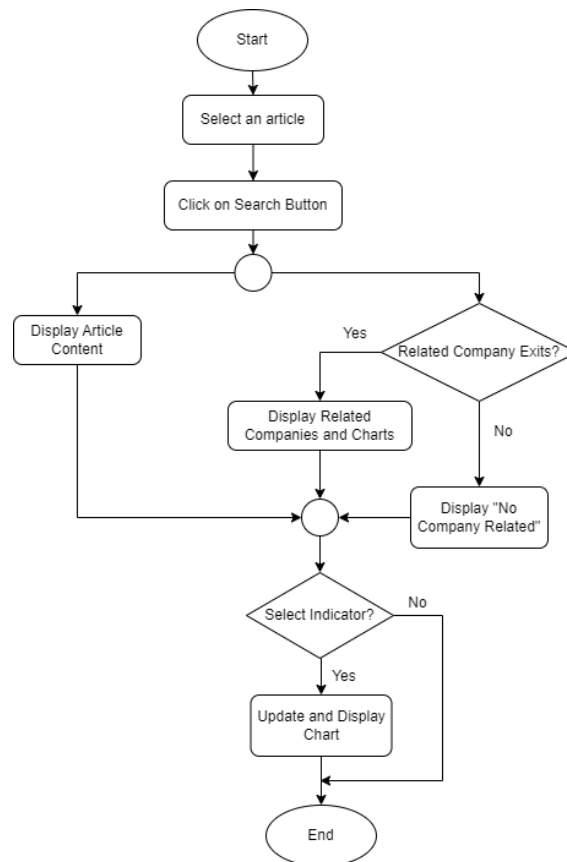
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3.1.3.2 User Interaction with the System

Figure 3.1.3.2 Activity Diagram for User Interaction with the System

When the user picks an article from the dropdown menu and clicks the search button, the system will then show the article's content and examine if there are any associated companies. If there are related companies, the system will display them along with their corresponding charts. A "No Company Related" message will be displayed if no related companies are found. The user can then decide whether to choose an indicator. If an indicator is selected, the chart will be updated accordingly. If not, the process will end without any further changes.

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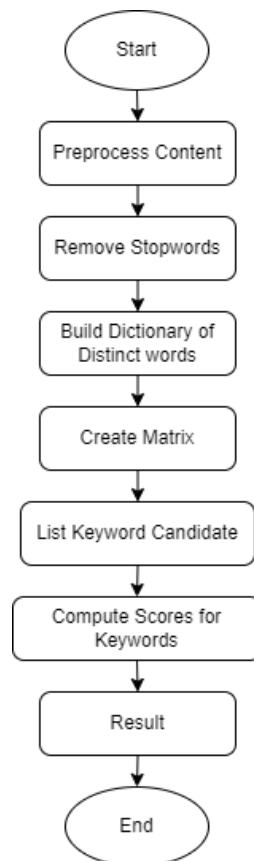
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3.1.3.3 RAKE Keyword Extraction Process

Figure 3.1.3.3 Activity Diagram for RAKE Keyword Extraction

First, the content goes through preprocessing, where the text is cleaned and readied for further analysis. Next, the system eliminates stopwords, which don't add significantly to the meaning of the content. It then constructs a dictionary of unique words, capturing the distinct terms after removing stopwords. After this, a matrix is generated to depict the relationships between these words, aiding in identifying word co-occurrences. Utilizing this matrix, the system generates a list of potential keywords by assessing word pairs or commonly occurring phrases. Finally, the system calculates scores for the keywords based on factors such as word frequency and co-occurrence patterns.

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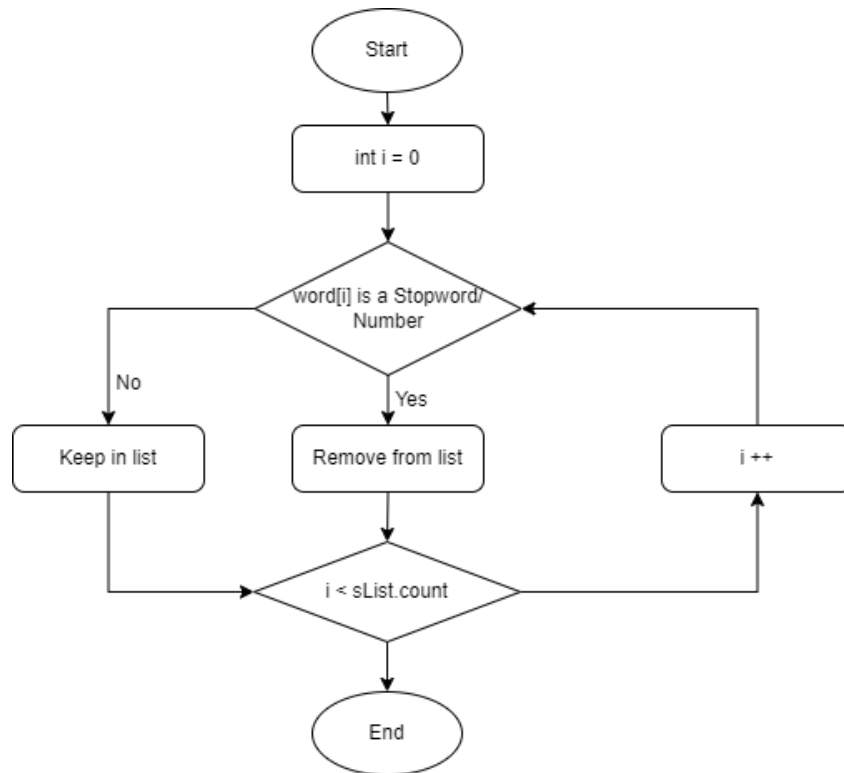
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3.1.3.4 Removing Stopwords

Figure 3.1.3.4 Activity Diagram for Removing Stopwords

The system goes through the list, checking each word to see if it's a stopword or a number. If the word meets either of these criteria, it is removed from the list; otherwise, it is kept. This process repeats until every word in the list has been checked.

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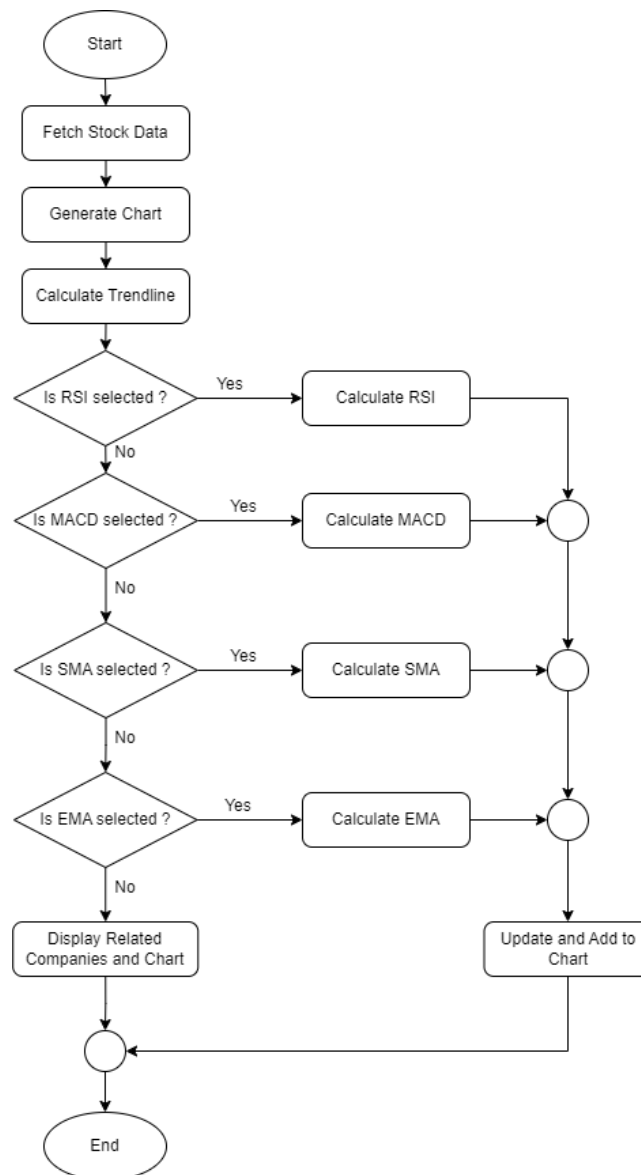
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3.1.3.5 Generate Chart

Figure 3.1.3.5 Activity Diagram for Generating Chart

The process starts by fetching stock data and creating an initial chart. After that, the system calculates the trendline based on the stock data. Then, the system goes through a series of decision points to check if the user has selected specific indicators such as RSI, MACD, SMA, or EMA. For each chosen indicator, the system computes the respective value. Once these calculations are done, the chart gets updated, and the results are incorporated. Finally, irrespective of whether any indicators are selected, the system will display the related companies and the chart

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Chapter 4 System Design

4.1 System Flow Description

To utilize the News RSS with Stock Recommender window application, the user is required to establish an internet connection on their laptop or computer. Real-time data retrieval from the website necessitates an active internet connection.

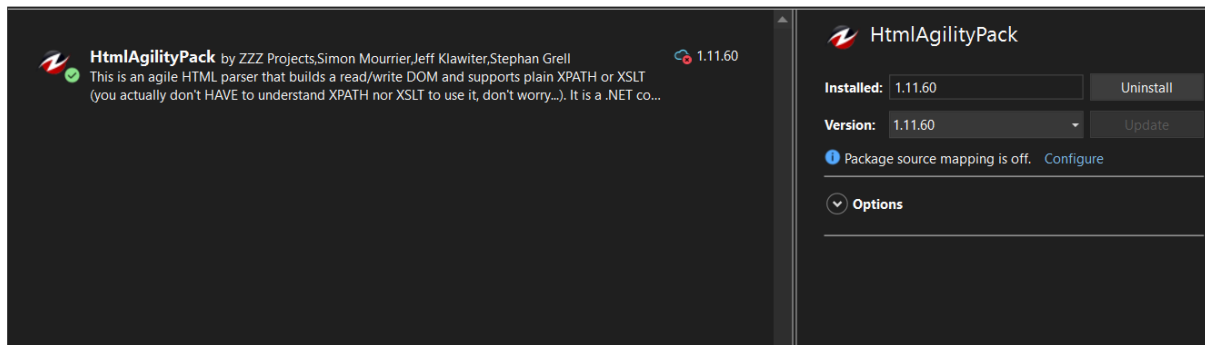### 4.1.1   Install the needed packages (HTMLAgilityPack)

Figure 4.1.1 Install HTML Agility Pack

The Html Agility Pack (HAP) plays a crucial role in our system by offering essential functionality for web scraping. Web scraping involves the extraction of data from websites through the navigation of the Document Object Model (DOM) to pinpoint specific elements. HAP streamlines the web scraping process by supplying methods to traverse the HTML structure of web pages and extract the desired information. One particularly valuable capability enabled by HAP is parsing, which involves breaking down HTML content into a structured format that our system can understand and utilize for further processing.

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4.1.2   Design Retrieve Data from External Source and Write into File

```csharp
public async Task WriteFile()
{
    List<string> existingTitles = ReadExistingTitles(@"NewsContent.txt");

    Random random = new Random();

    // Create web client.
    var client = new HttpClient();

    // Download string.
    string value = await client.GetStringAsync("https://theedgemalaysia.com/");

    var doc = new HtmlAgilityPack.HtmlDocument();
    doc.LoadHtml(value);

    var items = doc.DocumentNode.SelectNodes("//script[@type='application/json']")
        .Select(p => p.InnerText)
        .ToList();

    if (items.Count > 0)
    {
        var result = JsonSerializer.Deserialize<Prop>(items[0]);
        var itemList = result?.props?.pageProps?.homeData;
        if (itemList?.Count > 0)
        {
            foreach (var data in itemList)
            {
                var title = data.title;
                var alias = data.alias;
                var updated = data.updated;

                var articleDate = DateTime.UnixEpoch.AddMilliseconds(updated).ToLocalTime().ToString("dddd, dd MMM yyyy");

                string paragraphs = "";

                string valueBrows = await client.GetStringAsync("https://theedgemalaysia.com/" + alias);

                doc.LoadHtml(valueBrows);
                var docNode = doc.DocumentNode.SelectNodes("//div[@class='newsTextDataWrapInner']//p");
                if (docNode != null)
                {
```

Figure 4.1.2 WriteFile function

The WriteFile() function plays a crucial role in the backend operations as it is responsible for extracting and storing pertinent news articles from a specific website. To avoid duplicating articles, the function first reads the existing titles from the NewsContent.txt file. Then, it utilizes an HTTP client to download the webpage content from "The Edge Malaysia." After acquiring the HTML content, the function utilizes HtmlAgilityPack to parse the page and extract structured JSON data from specific scripts. This data is then transformed into objects containing article titles, aliases, and update timestamps. Before saving the article, the function verifies if the title already exists in the list of existing titles. If the title is new, it merges the title, content, and date into a single string and appends this information to the NewsContent.txt file. This process ensures that only unique articles are stored, thus preventing duplicates. The stored news articles can be used for further analysis or for user interaction within the system.

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4.1.3 File Format of Storing News Information

Figure 4.1.3 Save News Information File Format

The NewsContent.txt file format is specifically crafted for efficient storage and retrieval of news articles. Each line in the file contains a single article, with its title, content, and publication date all combined into a single string. These elements are separated by a specific delimiter, which simplifies the process of parsing the data later on. This format ensures that all relevant information about an article is neatly organized in one place. The concise structure of this file format is particularly advantageous for tasks like batch processing, allowing the system to efficiently read and process multiple articles at once. This format strikes a balance between the need for simplicity, speed, and accuracy in handling large volumes of news data, making it a practical choice for backend operations.

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4.1.4   Retrieve and Process News Information from File

```csharp
public void getArticle()
{
    articles.Clear();
    // Define the path to the file to be read
    string filePath = "NewsContent.txt";

    // Open the file for reading
    using (StreamReader reader = new StreamReader(filePath))
    {
        string? line;
        // Read each line until the end of the file
        while ((line = reader.ReadLine()) != null)
        {
            // Split the line using the special character "■"
            string[] parts = line.Split('■');

            // Extract Title, Content, and Date from the split parts
            string title = parts[0];
            string content = parts[1].ToLower();
            string date = parts[2];

            // Create an Article object and add it to the list
            articles.Add(new Article { Title = title, Content = content, Date = date });
        }
    }

    // Clear existing items in the combo box
    comboBox1.Items.Clear();
    comboBox1.Text = "Select News";

    // Add titles to the combo box
    foreach (var article in articles)
    {
        comboBox1.Items.Add(article.Title ?? "Unknown Title");
    }

    startRake();
}
```

Figure 4.1.4 getArticle function

The getArticle() function reads and processes news articles from the NewsContent.txt file. It splits the information into parts and stores them in Article objects, which are then added to a list for future analysis. After the data is stored, the function fills a ComboBox with the article titles, allowing users to easily select and view them. This setup offers a seamless way to manage, analyze, and interact with the article data.

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4.1.5   Retrieve and Process Company Information from File

```csharp
public void getCompany()
{
    companyList.Clear();
    // Define the path to the file to be read
    string filePath = "CompanyProfile.txt";

    // Open the file for reading
    using (StreamReader reader = new StreamReader(filePath))
    {
        string? line;
        // Read each line until the end of the file
        while ((line = reader.ReadLine()) != null)
        {
            // Split the line using the special character "¤"
            string[] parts = line.Split('¤');

            // Extract Name and Description from the split parts
            string name = parts[0];
            string description = parts[1];
            string companyCode = parts[2];

            // Create a Company object and add it to the list
            companyList.Add(new Company { Name = name, Description = description, CompanyCode = companyCode });
        }
    }
}
```

Figure 4.1.5 getCompany function

The getCompany() function is created to parse company details from a text file. It extracts the company's name, description, and code, efficiently storing this information in a list of Company objects. This ensures easy access and manipulation for future operations, thereby enabling seamless analysis and integration into other parts of the system.

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4.1.6   Design Rake Function

```
private void startRake()
{
    string s;
    int index = 0;
    List<string> sList = new List<string>();
    List<string> dictionaryList = new List<string>();
    List<string> stopwordList = new List<string>();
    List<List<int>> matrixList = new List<List<int>>();
    List<List<string>> keywordCandidateList = new List<List<string>>();
    List<NameScoreModel> scoreList = new List<NameScoreModel>();
    // List<NameScoreModel> baseListA = new List<NameScoreModel>();
    //  List<NameScoreModel> compareList = new List<NameScoreModel>();
    List<List<NameScoreModel>> nameScoreList = new List<List<NameScoreModel>>();

    stopwordList = File.ReadAllLines("SmartStoplist.txt").ToList();
    foreach (var item in articles)
    {
        index++;

        dictionaryList.Clear();
        matrixList.Clear();
        keywordCandidateList.Clear();
        scoreList = [];

        s = item?.Content ?? "";
        //richTextBox3.Text += item?.Title + "\n";

        s = s.Replace(",", " ,");
        s = s.Replace(".", " .");
        s = s.Replace("(", "( ");
        s = s.Replace(")", " )");
        s = s.Replace("\"", "\" ");
        s = s.Replace("\"", " \"");
        s = s.Replace("«", "« ");
        s = s.Replace(":", " :");


        sList = s.Split(' ').ToList();
        removeStopword(ref sList, stopwordList);
```

Figure 4.1.6 Rake Function

```
a
a's
able
about
above
according
accordingly
across
actually
after
afterwards
again
against
ain't
all
allow
allows
almost
alone
```

Figure 4.1.7 Information Stopward List

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The startRake() function is a fully functional implementation of the RAKE (Rapid Automatic Keyword Extraction) algorithm. Its main purpose is to process article content by removing irrelevant words and identifying important keywords. The function accesses a list of stopwords from a file named "SmartStoplist.txt." These stopwords are words that are commonly filtered out because they don't contribute significant information for keyword extraction. The RAKE algorithm assesses scores for each keyword based on its co-occurrence data, with higher scores indicating more important keywords.

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4.1.7 Cosine Similarity Function

```
public static double GetCosineSimilarity(List<double> V1, List<double> V2)
{
    double dot = 0.0d;
    double mag1 = 0.0d;
    double mag2 = 0.0d;
    for (int n = 0; n < V1.Count; n++)
    {
        dot += V1[n] * V2[n];
        mag1 += Math.Pow(V1[n], 2);
        mag2 += Math.Pow(V2[n], 2);
    }

    var result = dot / (Math.Sqrt(mag1) * Math.Sqrt(mag2));

    return double.IsNaN(result) ? 0 : result;
}
```

Figure 4.1.6 Cosine Similarity function

The GetCosineSimilarity() function determines how similar two articles are by comparing their feature vectors, which represent important aspects like the significance of keywords. It calculates the cosine of the angle between these vectors by first finding their dot product and then normalizing this value by the product of their magnitudes. The resulting cosine similarity score ranges from 0 to 1, with 1 indicating identical content and 0 indicating no similarity. This method effectively quantifies how closely related two articles are based on their feature vectors.

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4.1.8   Store Matching Articles Information

```
foreach (var kvp in articleResults)
{
    // Add the article pair to the matching articles string
    matchingArticles.Append($"{kvp.Key} = ");
    matchingArticles.Append(string.Join(",", kvp.Value.Take(topMatchArticles).Select(result => result.Split("With Article")[1].Split('-')[0].Trim())));

    matchingArticles.AppendLine();

    count++;
    if (count >= topMatchArticles)
    {
        // Reset the counter when the desired number of articles is reached
        count = 0;
    }
}

// Write the matching articles to the file
File.WriteAllText(@"MatchingArticles.txt", matchingArticles.ToString());
```

Figure 4.1.7 Storing Matching Articles Index

```
1  = 284,215,147,107,128,231
2  = 296,287,5,272,187,45
3  = 159,126,266,160,188,100
4  = 252,296,272,148,287,302
5  = 287,296,2,272,301,148
6  = 125,180,129,238,78,283
7  = 131,50,19,93,203,22
8  = 201,289,241,282,118,295
9  = 278,288,147,128,61,113
10 = 11,65,277,32,217,113
11 = 10,65,295,277,21,192
12 = 101,227,159,163,18,275
```

Figure 4.1.8 Index format of matching articles

Once the cosine similarity between articles is calculated and the results are sorted in descending order, we employ the Math.Log function to decide how many of the top-matching articles should be chosen as related articles. These top articles are then identified by their indices and stored in the "MatchingArticles.txt" file for future use. This process ensures that only the most relevant articles are kept as related content.

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4.1.9 Store Matching Company Information

```
foreach (var kvp in articleResults)
{
    // Add the article pair to the matching articles string
    matchingArticles.Append($"{kvp.Key} = ");
    if (kvp.Value.Count > 0)
    {
        matchingArticles.Append(string.Join(",", kvp.Value.Take(topMatchArticles)));
    }

    matchingArticles.AppendLine();

    count++;
    if (count >= topMatchArticles)
    {
        // Reset the counter when the desired number of articles is reached
        count = 0;
    }
}

// Write the matching articles to the file
File.WriteAllText(@"MatchingCompany.txt", matchingArticles.ToString());
}
```

Figure 4.1.11 Storing Matching Company Index

```
1  = 622,160,1047,411,796,774
2  = 876,103,198,621,434,439
3  = 295,895,757,695,842,431
4  = 365,468,748,942,199,379
5  = 1028,967,198,562,942,748
6  = 675,654,1006,123,440,683
7  = 683,539,140,217,1006,858
8  = 70,808,880,874,807,182
9  = 808,54,1027,123,858,904
10 = 198,387,948,807,376,631
11 = 530,807,316,690,113,1037
12 = 824,965,732,446,470,659
```

Figure 4.1.12 Index Format of Company Matching

Discovering keywords and assessing the similarity between articles and companies is the same steps to identifying related articles. After extracting the keywords and computing the cosine similarity, the results are organized to pinpoint the companies most closely aligned with each article. These matches are then recorded in the "MatchingCompany.txt" file, providing a convenient reference for future use in determining which companies are most related to specific articles.

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4.1.10 Installing and Setting Up Stock Data Retrieval Packages
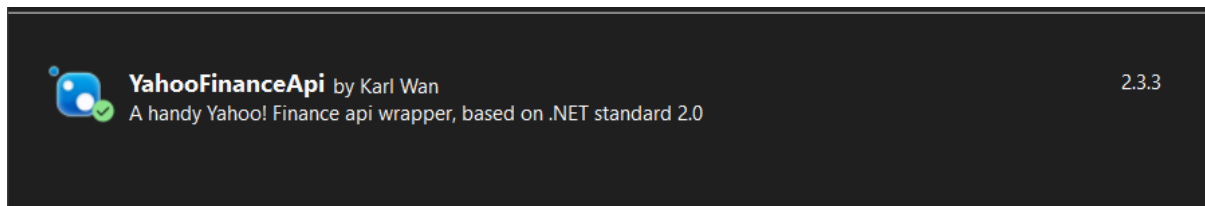
Figure 4.1.9 Install YahooFinanceApi packages

Figure 4.1.10 Stock Fetcher Function

The Yahoo Finance API is a widely-used resource for financial data, offering real-time stock quotes, historical data, and financial news across various financial instruments such as stocks, bonds, currencies, and commodities [12]. By installing the YahooFinanceAPI NuGet package, developers can access the API to retrieve historical stock data for a specified symbol over a given period. The StockFetcher class is specifically designed to asynchronously fetch this data, starting from the current date and going back the specified number of years. This data is then transformed into a list of StockData objects, which contain vital stock information such as opening and closing prices, volume, and adjusted close prices, making it ready for further analysis within the system.

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4.1.11 Generate Chart

```
// Generate Chart
2 references
private Chart GenerateChart(Company company, List<StockData> stockData)
{
    // Calculate the min and max closing prices for y-axis range
    var closePrices = stockData.Select(data => data.Close).ToList();
    double minClose = closePrices.Min();
    double maxClose = closePrices.Max();

    // Dynamic padding based on the range of prices
    double range = maxClose - minClose;
    double yAxisPadding = range * 0.1; // 10% padding

    // Ensure minimum value is reasonable and avoid negative values
    double minRounded = Math.Floor((minClose - yAxisPadding) * 1000) / 1000;
    if (minRounded < 0) minRounded = 0;

    double maxRounded = Math.Ceiling((maxClose + yAxisPadding) * 1000) / 1000;
    // Create a new chart
    Chart chart = new Chart
    {
        Dock = DockStyle.Fill  // Make sure it fits inside the panel
    };
```

Figure 4.1.11 Generating Chart Function

After retrieving the stock data, the system creates a chart that visually displays the stock's price movements over time. The chart includes the StockPrice series, showing the actual closing prices, and the TrendLine series, a calculated line representing the overall price trend. The trend line helps to identify the stock's momentum, smoothing out short-term fluctuations and highlighting the longer-term trend. Additionally, the chart title displays the company name, providing a clear and informative visual representation of the stock's historical performance.

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4.1.12 Calculate and Display RSI Indicator

```
// Conditionally add RSI chart area and series if the RSI radio button is checked
if (RSIradioButton1.Checked)
{
    // RSI ChartArea below the Stock Prices
    ChartArea chartAreaRSI = new ChartArea("RSIArea")
    {
        Position = new ElementPosition(0, 70, 100, 25), // Positioned below the price chart
        AlignWithChartArea = "MainArea",
        BorderColor = Color.Gray,
        AxisX = new Axis
        {
            MajorGrid = { LineColor = Color.LightGray, LineDashStyle = ChartDashStyle.Solid },
            LabelStyle = { Format = "MM/yyyy", Angle = -45 },
            IntervalType = DateTimeIntervalType.Months,
            Interval = 1,
            IsMarginVisible = false
        },
        AxisY = new Axis
        {
            MajorGrid = { LineColor = Color.LightGray, LineDashStyle = ChartDashStyle.Solid },
            Minimum = 0,
            Maximum = 100,
            Interval = 20,
            IsStartedFromZero = true,
            CustomLabels =
    {
        new CustomLabel(18, 22, "20", 0, LabelMarkStyle.LineSideMark),
        new CustomLabel(78, 82, "80", 0, LabelMarkStyle.LineSideMark)
    }
        }
    };

    chart.ChartAreas.Add(chartAreaRSI);

    // RSI Series
    double[] rsiValues = CalculateRSI(stockData.Select(s => (double)s.Close).ToList(), 14);
```

Figure 4.1.12 RSI Visualization

```
// RSI Calculation
1 reference
private double[] CalculateRSI(List<double> closePrices, int period)
{
    double[] rsi = new double[closePrices.Count];
    double[] gains = new double[closePrices.Count];
    double[] losses = new double[closePrices.Count];

    for (int i = 1; i < closePrices.Count; i++)
    {
        double change = closePrices[i] - closePrices[i - 1];
        gains[i] = Math.Max(0, change);
        losses[i] = Math.Max(0, -change);
    }

    double avgGain = gains.Take(period).Average();
    double avgLoss = losses.Take(period).Average();

    rsi[period] = avgLoss == 0 ? 100 : 100 - (100 / (1 + avgGain / avgLoss));

    for (int i = period + 1; i < closePrices.Count; i++)
    {
        avgGain = (avgGain * (period - 1) + gains[i]) / period;
        avgLoss = (avgLoss * (period - 1) + losses[i]) / period;

        rsi[i] = avgLoss == 0 ? 100 : 100 - (100 / (1 + avgGain / avgLoss));
    }

    return rsi;
}
```

Figure 4.1.13 Calculation of RSI

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When the user select the RSI indicator, the system determines the RSI values by utilizing the stock's closing prices over a predetermined time frame, usually 14 days. The calculated RSI is then displayed on the chart, positioned just below the main stock price chart area. With the assistance of this arrangement, users can determine which indicator generates more precise buy or sell signals by comparing the RSI indicator and the movements of the stock price clearly. Based on the selected technical indicator, users can make well-informed selections because the chart is dynamically updated to reflect the RSI values.

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4.1.13 Calculate and Display MACD Indicator

```
// Conditionally add MACD chart area and series if the macdRadioBtn is checked
if (macdRadioBtn.Checked)
{
    // MACD ChartArea below the Stock Prices
    ChartArea chartAreaMACD = new ChartArea("MACDArea")
    {
        Position = new ElementPosition(0, 70, 100, 25), // Positioned below the price chart
        AlignWithChartArea = "MainArea",
        BorderColor = Color.Gray,
        AxisX = new Axis
        {
            MajorGrid = { LineColor = Color.LightGray, LineDashStyle = ChartDashStyle.Solid },
            LabelStyle = { Format = "MM/yyyy", Angle = -45 },
            IntervalType = DateTimeIntervalType.Months,
            Interval = 1,
            IsMarginVisible = false
        },
        AxisY = new Axis
        {
            MajorGrid = { LineColor = Color.LightGray, LineDashStyle = ChartDashStyle.Solid },
            Minimum = -2,   // Set minimum to -2
            Maximum = 2,    // Set maximum to 2
            Interval = 1, // Set interval as needed
            IsStartedFromZero = true,
            LabelAutoFitStyle = LabelAutoFitStyles.None // Disable auto-fitting
        }
    };

    chart.ChartAreas.Add(chartAreaMACD);

    // MACD Series
    double[] macdLine = CalculateMACDLine(stockData.Select(s => (double)s.Close).ToList(), 12, 26);
    Series macdSeries = new Series
    {
        Name = "MACD",
        Color = Color.Blue,
        ChartType = SeriesChartType.Line,
        XValueType = ChartValueType.Date,
        ChartArea = "MACDArea",
        BorderWidth = 1
    };
```

Figure 4.1.14 MACD Visualization

```
private double[] CalculateMACDLine(List<double> closePrices, int shortPeriod, int longPeriod)
{
    double[] shortEMA = CalculateEMA(closePrices, shortPeriod);
    double[] longEMA = CalculateEMA(closePrices, longPeriod);

    double[] macdLine = new double[closePrices.Count];
    for (int i = 0; i < closePrices.Count; i++)
    {
        macdLine[i] = shortEMA[i] - longEMA[i];
    }
    return macdLine;
}
```

Figure 4.1.15 Calculation of MACD

When the MACD option is selected, the system will automatically calculate both the MACD line and the Signal line based on the provided data. After the calculations, the system will update the chart to display the generated MACD chart. This provides users with the ability to visually compare the MACD chart with a trendline in order to make informed decisions about whether to buy or sell.

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4.1.14 Calculate and Display SMA Indicator

```
// Conditionally calculate and add the SMA (50) if SMArb is checked
if (SMArb.Checked)
{
    List<double> smaValues = CalculateSMA(prices, 50);

    Series smaSeries = new Series
    {
        Name = "SMA50",
        Color = Color.Blue, // You can choose any color you prefer
        ChartType = SeriesChartType.Line,
        XValueType = ChartValueType.Date,
        BorderWidth = 1
    };

    for (int i = 0; i < dates.Count; i++)
    {
        smaSeries.Points.AddXY(dates[i], smaValues[i]);
    }

    chart.Series.Add(smaSeries);
}
```

Figure 4.1.16 SMA Visualization

```
private List<double> CalculateSMA(List<double> prices, int period)
{
    List<double> sma = new List<double>();

    for (int i = 0; i < prices.Count; i++)
    {
        if (i >= period - 1)
        {
            double sum = 0;
            for (int j = 0; j < period; j++)
            {
                sum += prices[i - j];
            }
            sma.Add(sum / period);
        }
        else
        {
            sma.Add(double.NaN); // Adding NaN for the initial values where SMA cannot be calculated
        }
    }

    return sma;
}
```

Figure 4.1.17 Calculation of SMA

When the user chooses the SMA option, the system will calculate the SMA values based on the 50 days and display them on the chart. This feature lets users visually contrast the SMA with the trendline, empowering them to make well-informed decisions regarding buying or selling.

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4.1.15 Calculate and Display EMA Indicator

```
// Conditionally calculate and add the EMA (50) if EMArb is checked
if (EMArb.Checked)
{
    List<double> emaValues = CalculateEMAs(prices, 50);

    Series emaSeries = new Series
    {
        Name = "EMA50",
        Color = Color.OliveDrab, // You can choose any color you prefer
        ChartType = SeriesChartType.Line,
        XValueType = ChartValueType.Date,
        BorderWidth = 1
    };

    for (int i = 0; i < dates.Count; i++)
    {
        emaSeries.Points.AddXY(dates[i], emaValues[i]);
    }

    chart.Series.Add(emaSeries);
}
```

Figure 4.1.18 EMA Visualization

```
private List<double> CalculateEMAs(List<double> prices, int period)
{
    List<double> ema = new List<double>();

    double multiplier = 2.0 / (period + 1);
    double prevEma = prices.Take(period).Average(); // Initial EMA based on SMA of the first 'period' prices
    ema.Add(prevEma);

    for (int i = period; i < prices.Count; i++)
    {
        double currentEma = ((prices[i] - prevEma) * multiplier) + prevEma;
        ema.Add(currentEma);
        prevEma = currentEma;
    }

    // Prepend NaNs for the initial values where EMA cannot be calculated
    for (int i = 0; i < period - 1; i++)
    {
        ema.Insert(0, double.NaN);
    }

    return ema;
}
```

Figure 4.1.19 Calculation of EMA

The addition of the EMA to the chart is triggered when the user chooses the EMA indicator. The EMA is computed based on a user-specified period, for instance, 50 days, and the resulting data points are then graphed on the chart. This feature allows users to make a more comprehensive assessment of trends and potential buy or sell signals by comparing the EMA with the trendline

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Chapter 5 System Implementation

5.1 Methodology

The methodology adopted for developing the News RSS with Stock Recommender window application in this project is the prototype model. This model facilitates a deeper understanding of customer needs by soliciting user feedback after each phase. This iterative approach allows for continuous improvement and refinement of the prototype based on user input. The flexibility inherent in the prototype model enables swift identification of issues and incorporation of new functionalities as the project scope evolves. Consequently, customers are more likely to be satisfied and comfortable with the final product, as it can readily accommodate their evolving requirements.
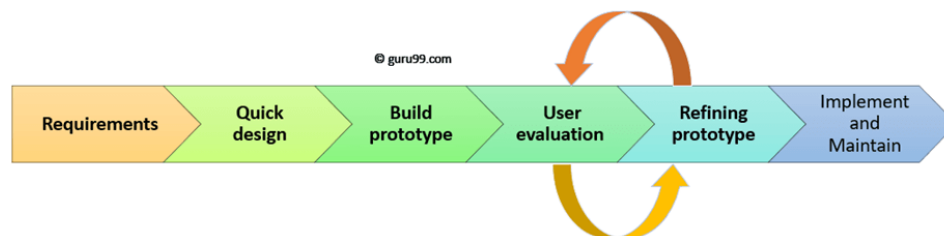
Figure 5.1 Prototype Model

The prototype model has following six phases:

Step 1: Requirement gathering and analysis

The initial stage of developing a system includes gathering information about the needs and expectations of the users who will be using it. This information is then analysed to determine the users' perceptions of the system. It is possible that users will be content if they feel involved in the development process from the beginning.

Step 2: Quick Design

In the second step of the prototyping model, a preliminary design or quick design is created based on the result of the first phase. This design only includes a simple system design and is not yet complete. Its purpose is to outline how users will interact with the system, and it helps to develop the prototype later. The complete details for the implementation of the system are investigated in later phases.

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Step 3: Build a Prototype

The next step is to create a prototype based on the data and results from the initial design or quick design. However, only a small working model or a part of the stock recommendation system is required.

Step 4: Initial user evaluation

In the fourth phase, the prototype of the system is presented to the client for an initial evaluation, which helps to assess the effectiveness and robustness of the working model. All comments and feedback from the client are collected to identify areas for improvement in the proposed system, including the possibility of discovering missing features in the stock recommendation system.

Step 5: Refining prototype

After receiving suggestions and feedback from the client, we will refine the prototype to address any areas of dissatisfaction. It is important to iterate on the prototype based on the feedback received to ensure that it meets the customer's needs. This refinement process is essential to achieve a prototype that fully meets the customer's expectations. Once the final prototype has been approved, we proceed with the development of the final system prior to its acceptance by the customer.

Step 6: Implement Product and Maintain

In this final phase, once the final system has been built based on the approved prototype, it undergoes extensive testing before going into production. Regular maintenance procedures are then implemented to ensure optimum system performance, minimise downtime and reduce the risk of widespread failure.

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5.2 Hardware Setup

The hardware used in the implementation of the project is a computer. The computer is used to develop the application and a server to host the backend services.

Description	Specifications
Model	Huawei MateBook D15
Processor	AMD Ryzen 5 3500U with Radeon Vega Mobile Gfx 2.10 GHz
Operating System	Window 11
Graphic Card	AMD Radeon (TM) Vega 8 Graphic
RAM	8.00 GB DDR4 2400MHz
Storage	TEAM TM8FPD512G

Table 5.2: Specifications of Laptop

5.3 Software Setup

The application has been thoroughly tested and deployed as a desktop application using Visual Studio (IDE) widely recognized for its robustness in software development. The entire project is built using the C# programming language, employed for both the front-end and back-end components of the application.

5.4 Setting and Configuration

After completing the development phase, the application is primed for testing, deployment, and regular use. Using Visual Studio as the development environment for this project streamlines the process of launching and running the application on a laptop or desktop computer. Once the build is successful, the developer can easily click the "Run" button in Visual Studio, which initiates the application in the chosen environment.

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5.5 System Operation

The News RSS with Stock Recommender system, named "NEWS," is designed with a user-friendly and intuitive interface, providing a seamless experience for users. When the application is opened, it launches in a clean state, offering a blank canvas with no preloaded content. This allows users to dive right in without any distractions or unnecessary clutter.
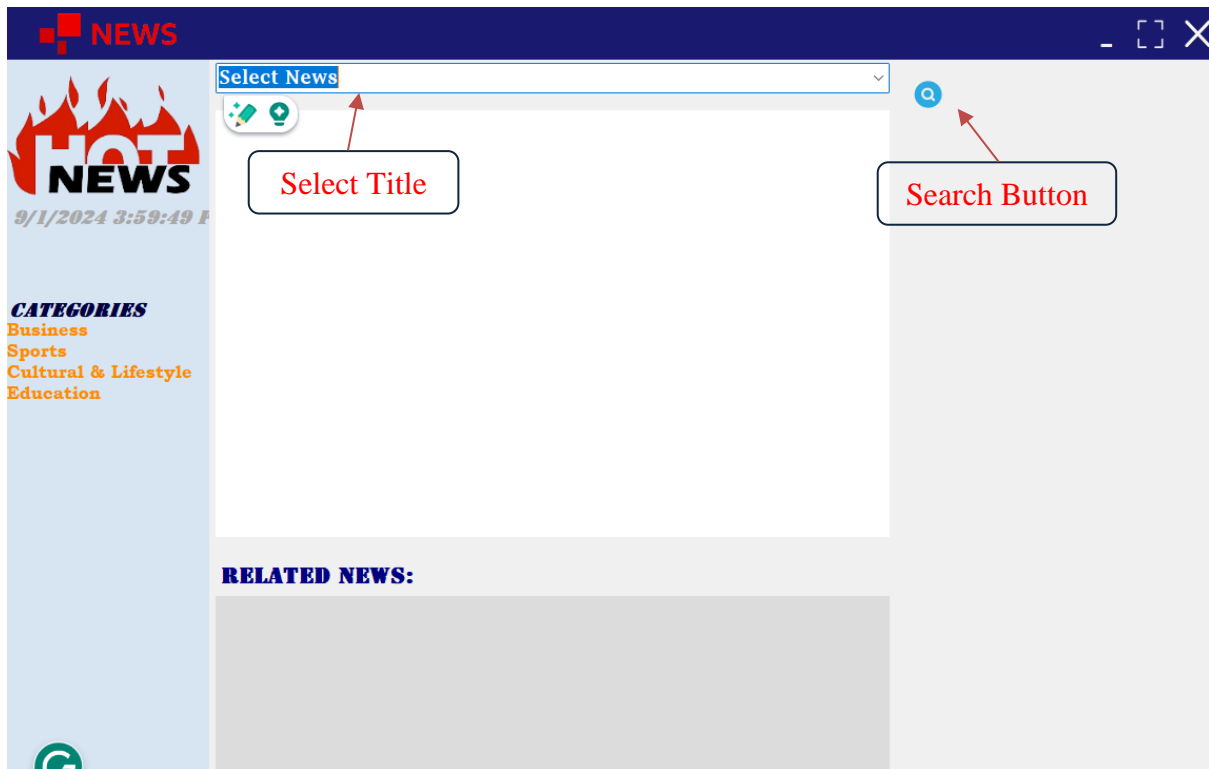
Figure 5.2 Main Page

The system's main page is designed with an intuitive and user-friendly interface that allows users to easily interact with financial data and news content. The interface is organized to make navigation simple and provide quick access to essential features. Users can select an article title from a dropdown menu and then click the "Search" button to retrieve and display the relevant content.

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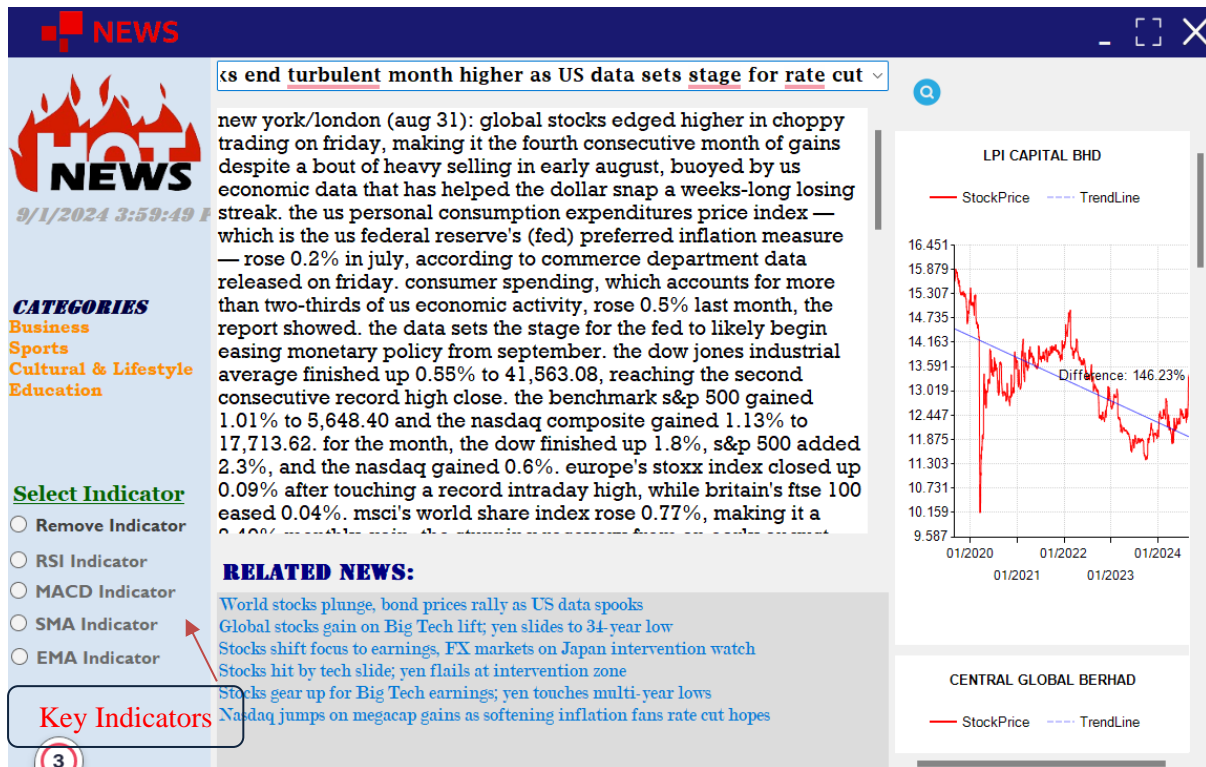
Figure 5.3 Content and Chart Presented

After the user clicks the "Search" button, the interface seamlessly transitions to display a dedicated section that showcases the content of the selected news article. In addition to the main article, the interface automatically curated and displayed a list of related news articles title, making it simple for user to browse and choose content that is contextually related to the original topic. Accompanying the news articles is a dynamic charting area, visually representing the stock prices of the associated companies over time. These charts update in real-time, giving users valuable insight into the correlation between the selected news and the companies involved. Once the stock prices are displayed, an additional section labeled "Select Indicator" becomes visible. This allows users to choose various technical indicators such as RSI, MACD, SMA, or EMA to further analyze the stock performance.

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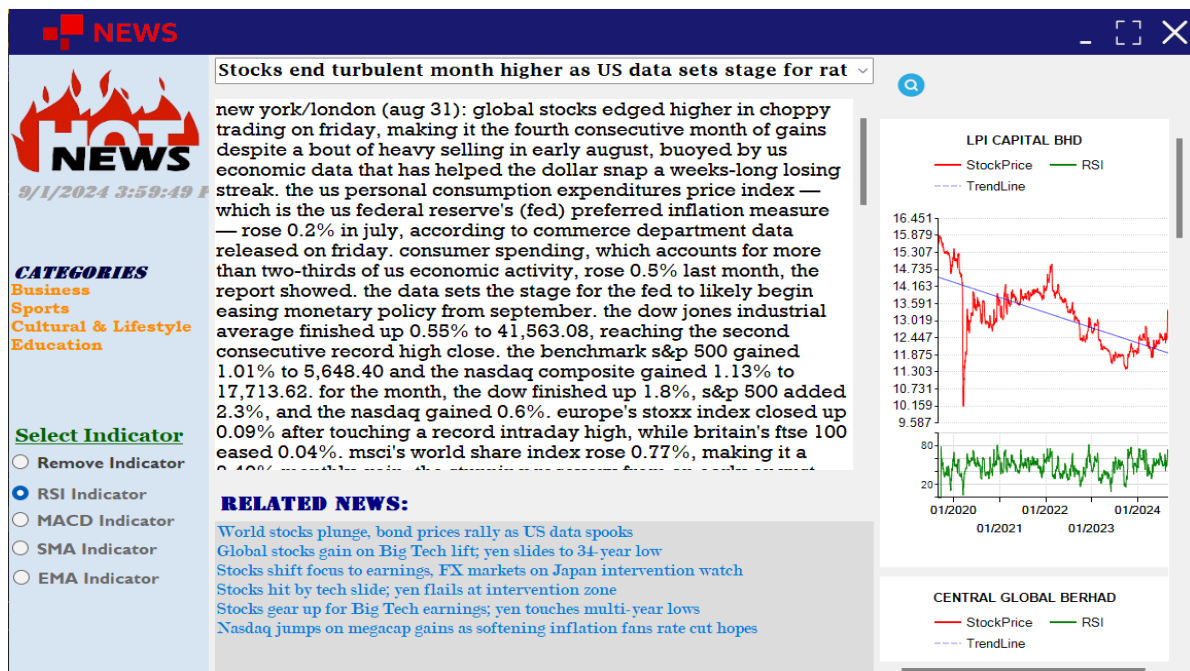
Figure 5.4 RSI Chart Updated

When the user chooses the "RSI Indicator" from the "Select Indicator" section, the system instantly updates the stock price chart to show the RSI overlay. This integration of the RSI into the stock price chart allows users to conduct in-depth technical analysis by visually comparing the stock's price movements with the RSI. The RSI, a momentum oscillator, measures the speed and change of price movements, helping users identify overbought or oversold conditions and make more informed decisions about buying or selling stocks.

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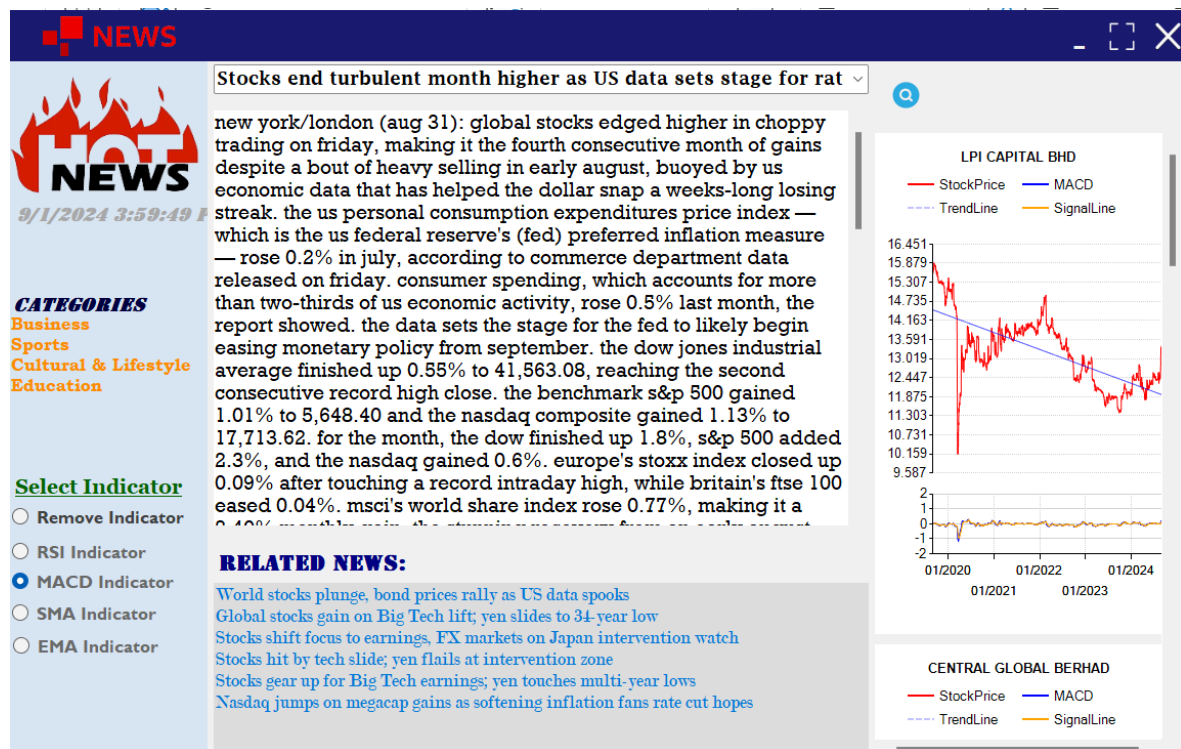
Figure 5.5 MACD Chart Updated

When the "MACD Indicator" option is chosen from the "Select Indicator" section, the stock price chart is dynamically updated to incorporate the MACD overlay. The MACD, which is a trend-following momentum indicator, illustrates the correlation between two moving averages of a stock's price. With the addition of the MACD line and the signal line to the chart, users can visually detect changes in the strength, direction, momentum, and duration of a trend in the stock price. This functionality allows users to identify possible buying or selling opportunities by comparing the convergence or divergence of the moving averages.

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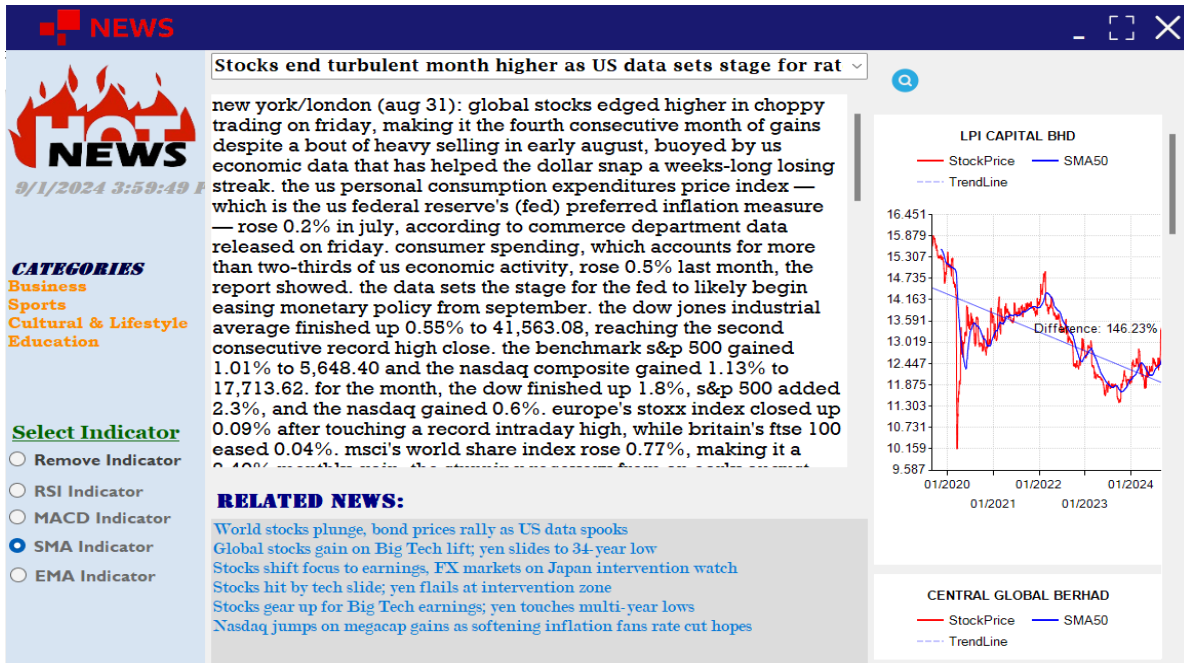
Figure 5.6 SMA Chart Updated

When the user chooses the "SMA Indicator" option, the system instantly updates the stock price chart to show the SMA line. The SMA is a widely used indicator in technical analysis that smooths out price data by creating a constantly updated average price. In this scenario, the SMA is plotted on the stock price chart, offering users a visual representation of the stock's average price over a 50-day period. This enables users to track the trend direction and evaluate the stock's performance compared to its historical average, thereby supporting more informed decision-making when it comes to buying or selling the stock.

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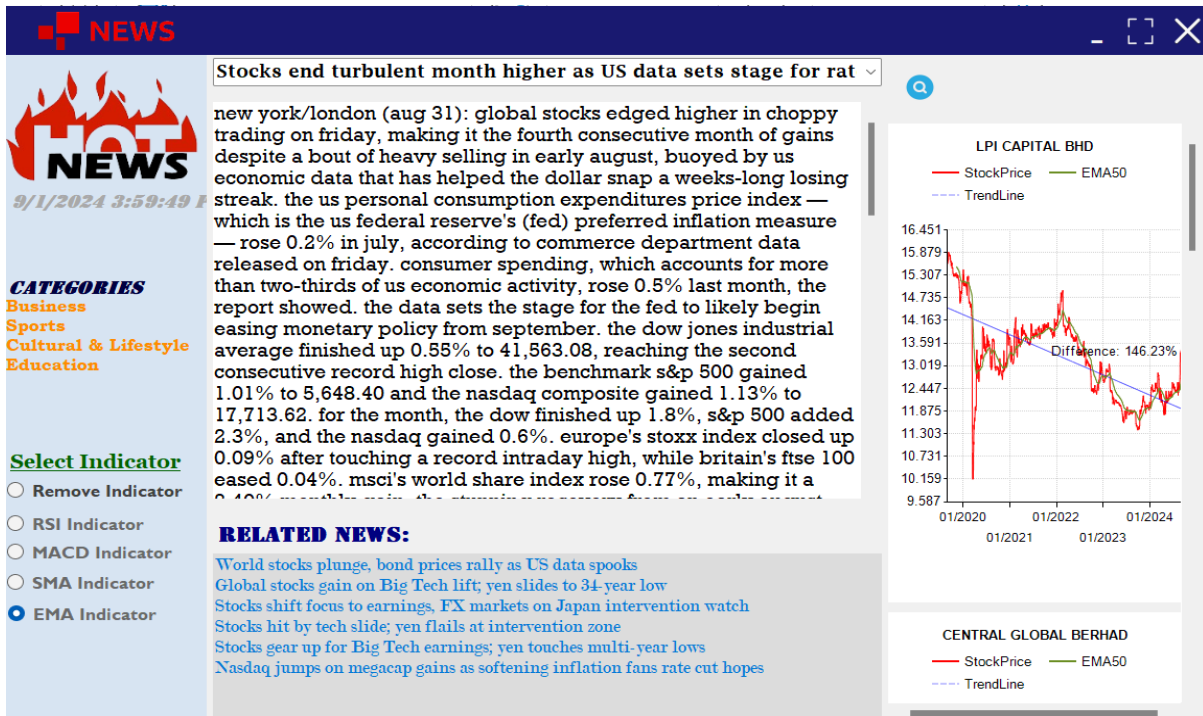
Figure 5.7 EMA Chart Updated

When you choose the "EMA Indicator," the stock price chart will be automatically updated to display the EMA line. The EMA is a sophisticated technical tool that gives more importance to recent price data by assigning greater weight to the most recent prices. This results in a more sensitive trend line. When the EMA is plotted along with the stock prices over 50 days, it enables users to determine the underlying momentum of the stock rapidly. This feature is particularly valuable for identifying potential reversal points or confirming ongoing trends, empowering users to make more timely and well-informed trading decisions.

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5.6   Implementation Issues and Challenges

The development and implementation of the News RSS with Stock Recommender application presented several challenges. A primary challenge was the unfamiliarity with advanced technologies such as keyword matching algorithms and accurate stock recommendation systems. Incorporating these complex technologies required extensive learning and considerable effort to ensure that the application could deliver relevant news content alongside accurate stock recommendations. This process involved not only mastering new programming concepts but also ensuring that the application capability to process real-time data and offer valuable insights to users.

Another major challenge was addressing the trustworthiness of stock recommendations within the application. In many regions, including my country, there is a lack of confidence in stock recommendation systems, leading users to be wary of relying on technology for investment decisions. In order to clear up users' doubts, we needed to focus on the reliability and accuracy of the system, ensuring that it could provide users with confident and informed recommendations. Additionally, the development process needed to address scalability, performance, and compliance with financial regulations ,thereby ensuring the effective deployment and acceptance of the system by users. Despite these challenges, the experience gained through this project has resulted in a more sophisticated and user-friendly application.

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Chapter 6 System Evaluation and Discussion

6.1 System Testing and Performance Matrix

In this chapter, we discuss the comprehensive system testing methodology and performance metrics for evaluating the News RSS with Stock Recommender application. It is crucial to employ different software testing methods like black box testing, white box testing, integration testing, and acceptance testing to ensure the system's strength and dependability. Each methodology has its own strengths and is applicable in different situations.

For our project, we utilized unit testing as our main methodology. The importance of unit testing lies in its ability to confirm the proper functioning of individual system components. It also guarantees the accurate implementation of all features and prevents potentially critical errors.

The system should fulfill specific basic requirements in terms of performance: minimal memory usage, rapid API calls (especially with YahooFinanceAPI), and overall quick responsiveness.

6.2 Testing Setup and Result

To ensure the reliability and accuracy of the News RSS with Stock Recommender application, we conducted a series of unit tests. Each test targeted a functionality within the system. The testing was performed using predefined inputs with corresponding expected outputs. The system's actual output was compared to these expectations to evaluate its performance.

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6.2.1   Reading Current Articles

Input	Description	Expected Output	System Output
Preloaded articles in NewsContent.txt	Test the system's ability to read existing articles	Articles are read from NewsContent.txt without errors.	Articles from NewsContent.txt are read correctly.
NewsContent.txt is empty.	Test the system's ability to handle an empty NewsContent.txt	System should handle an empty file gracefully.	No errors encountered.
None	Test the system's ability to avoid adding duplicate articles	Duplicate articles should not be appended to NewsContent.txt	Duplicate titles detected and skipped

Table 6.2.1 Unit Testing – Reading Current Articles

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6.2.2   Testing New Article Fetching and Processing

Input	Description	Expected Output	System Output
"The edge Malaysia" website	Test the system's ability to fetch and process a valid new article and append it to the file	Title, content, and date are correctly displayed and appended to file	Successfully appended to NewsContent.txt.
"The edge Malaysia" website	Test the system's handling when there are no new articles to fetch	No new articles are added to NewsContent.txt	No new articles found. NewsContent.txt remains unchanged.
"The edge Malaysia" website	Test the system's ability to handle duplicate titles by skipping the addition of existing articles.	Titles already present are not added again	Article already exists. Skipped appending.
Article with HTML tags	Test the system's ability to handle articles with special HTML tags and extract content accurately.	Content is extracted correctly without special HTML tags.	Successfully appended to NewsContent.txt . Special HTML tags removed.

Table 6.2.2 Unit Testing – Testing New Article Fetching and Processing

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6.2.3   Validating Company Profile Retrieval

Input	Description	Expected Output	System Output
CompanyProfile.txt	Test the system's ability to read and display a valid company profile from the file.	Display company profile with accurate information	Company Profile retrieved and displayed correctly.
Loaded CompanyProfile.txt	Test the system's ability to handle files with missing or incorrect data fields.	Display an error message or handle incomplete profile data gracefully.	System display warning for incomplete data

Table 6.2.3 Unit Testing – Validating Company Profile Retrieval

6.2.4   Keyword Extraction

Input	Description	Expected Output	System Output
Content: "The new advancements in artificial intelligence are significant." Stopword List: ["the", "are", "in"]	Test the system's ability to remove common stopwords and extract meaningful keywords.	Extracted keywords: "advancements", "artificial", "intelligence", "significant"	Extracted keywords: "advancements", "artificial", "intelligence", "significant"
Content: "AI (Artificial Intelligence) is the future." Stopword List: []	Test the system's ability to handle special characters and extract keywords.	Extracted keywords: "AI", "Artificial", "Intelligence", "future"	Extracted keywords: "AI", "Artificial", "Intelligence", "future"
Content: "AI AI AI is transforming AI technology." Stopword List: []	Test the system's ability to handle and process duplicate keywords.	Duplicates removed	Duplicates successfully removed.

Table 6.2.4 Unit Testing – Keyword Extraction

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6.2.5   Evaluating Similarity Between Articles and Company Profiles

Input	Description	Expected Output	System Output
Article 1 and list of articles	Test similarity calculation between Article 1 and a list of other articles with overlapping keywords.	Similarity score generated between Article 1 and each article in the list.	Similarity score between 0 and 1 for each article in the list.
Article 1 with a list of various company profile	Verify the calculation of similarity between Article 1 and each company profile to determine top matches.	Top company profiles listed correctly based on similarity scores	Matching companies appended to the file correctly.

Table 6.2.5 Unit Testing – Evaluating Similarity Between Articles and Company Profiles

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6.2.6   Stock Data Retrieval Tests

Input	Description	Expected Output	System Output
Valid company code and duration of 5 years	Test the system's ability to fetch historical stock data for the valid company code over 5-year period.	Stock data is accurately retrieved and displayed for the past 5 years.	Stock data retrieved with no errors.
Invalid code and duration 5 years	Test the system's response to an invalid company code.	The system should handle the invalid input gracefully and provide an appropriate error message.	Error message: "Invalid company code".

Table 6.2.6 Unit Testing – Stock Data Retrieval Tests

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6.2.7   Chart Display Functionality

Input	Description	Expected Output	System Output
Valid stock data	Testing basic chart display functionality with valid stock data.	A line chart displaying the stock prices over time.	The chart displayed accurately with stock prices over time. The chart was properly labeled with the company name.
Stock data with low volume.	Testing chart generation with minimal data.	The chart should still render correctly, though with fewer data points.	The chart is rendered correctly, showing fewer data points without issues.
Stock data with indicators enabled.	Testing chart display with various indicators enabled.	The chart should include lines for each indicator with correct calculated and labels.	All indicators were correctly calculated, labeled, and displayed on the chart.
Stock data with missing prices.	Testing how the chart handles missing data.	The chart should handle missing values by skipping gaps without crashing.	The chart handled missing values appropriately, skipping gaps without errors.

Table 6.2.7 Unit Testing – Chart Display Functionality

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6.3 Objective Evaluation

The project has effectively achieved its objectives by providing a complete system that combines various user features into a single platform. This platform provides personalized stock recommendations tailored to each user's preferences and investment objectives, thereby improving the relevance and precision of stock recommendations. Moreover, it offers adaptable data analysis features, which enable users to investigate and understand stock data in a way that meets their particular requirements. This adaptability facilitates different analytical approaches, empowering users to acquire a deeper understanding of market trends and stock performance.

Moreover, the platform demonstrates strong capabilities in visualizing data by displaying complex stock data in a comprehensible and easy-to-understand manner. By utilizing advanced charting methods and visual illustrations, individuals can readily interpret and analyze complex data collections. The integration of these features guarantees that users no more have to depend on external sources for stock information, thereby streamlining their work process and enhancing overall productivity. The initiative not just simplifies stock management but also improves the user experience by offering a more intuitive and efficient method for stock analysis and recommendations.

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6.4   Timeline

Activity	Period													
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
1. INTRODUCTION														
Problem Statement and Motivation	■													
Objectives	■													
Project Scope and Direction	■													
Contributions	■													
Complete Introduction	■													
2. LITERATURE REVIEW														
Fact Finding	■													
Compare Existing Systems	■													
3. SYSTEM METHODOLOGY/ APPROACH														
System Architecture Diagram		■												
Use Case Diagram and Description		■												
Activity Diagram			■											
4. SYSTEM DESIGN														
Complete System Flow			■											
Complete System Design			■	■										
5. SYSTEM IMPLEMENTATION														
Methodology				■										
Software Setup				■										
Setting and Configuration				■										
System Operation (with Screenshot)					■									
Implementation Issues and Challenges					■									
6. SYSTEM EVALUATION AND DISCUSSION														
System Testing and Performance Metrics						■	■							
Testing Setup and Result								■	■	■				
Objective Evaluation											■	■		
Timeline												■		
7. CONCLUSION AND RECOMMENDATION														
Conclusion													■	■
Recommendation													■	■
Finalize Report													■	■
Complete Conclusion and Recommendation													■	■

Table 6.4: Gantt Chart

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Chapter 7 Conclusion and Recommendation

7.1 Conclusion

The proposed system, News RSS with Stock Recommender, is a Windows-based application designed to serve both novice and experienced investors by seamlessly integrating relevant financial news with stock recommendations. The main objective of this project is to create a platform that is easy for users to navigate and is also effective, allowing investors to promptly and confidently make well-informed choices. The system improves users' capacity to respond to timely information by providing real-time news associated with stock market fluctuations, thereby democratizing financial knowledge and broadening its accessibility to a wider audience. As discussed throughout this report, the project represents a significant advancement in financial technology. It leverages sophisticated algorithms, data analytics, and text mining techniques to offer tailored stock recommendations, potentially driving economic growth, reducing poverty, and promoting financial inclusion. This platform doesn't just change how investors and businesses interact with the stock market, but also provides an extensive educational resource, giving important perspectives on investment tactics, market patterns, and financial knowledge. Through the analysis of past data, investors can use the system to recognize trends and make informed choices, rather than basing decisions solely blindly following trends.

After looking at existing news websites, I saw that while they cover a lot of news, they don't have the advanced features users need. Even the ones I found during my research in Chapter 2 don't offer all the features I need. The key indicators for stock analysis are often not very accurate or detailed, which is why I decided to create a more thorough and reliable solution. That's why I developed the News RSS with Stock Recommender. It's designed to address these limitations by offering tailored financial news and comprehensive stock analysis tools, creating a more effective and user-centered experience for investors.

The methodology that is going to be used for developing the system is the prototyping model. This model allows for simultaneous analysis, design, and implementation. This iterative approach made it easier to get ongoing user feedback and to identify defects, especially concerning the accuracy of stock price chart displays. In the implementation phase, I faced various challenges, such as managing the complexity of the system and familiarizing myself

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with new methods and packages in C#. The adaptability of C# and the availability of customizable components were extremely helpful, although developing a complete system independently presented major challenges.

Through this project, I encountered numerous challenges, from my lack of experience to the complexities of desktop application development. However, these challenges have proven to be invaluable learning opportunities. My knowledge of application development, especially in financial technology, has deepened significantly. This experience has motivated me to strive for continuous improvement and ongoing learning. Ultimately, the successful completion of this project underscores the significance of perseverance, continuous learning, and seeking assistance when needed.

7.2   Recommendation

The current version of the News RSS with Stock Recommender system is a functional and basic build, but there is still considerable room for improvement. Although the application currently offers essential features, there are several crucial areas that need enhancements to deliver a more comprehensive and user-friendly experience. Improving the precision of stock recommendations stands as a key focus area. Enabling more advanced stock market indicators is essential for aiding investors more effectively. Incorporating cutting-edge technologies like superior predictive models and analyses based on live data could markedly refine the system's proficiency in assisting users with their purchasing or selling decisions. To simplify the decision-making process and make it more accessible to new investors, providing straightforward and comprehensible visual indicators, such as color-coded alerts or diagrams, would reduce stock analysis complexity.

Improving user experience (UX) and interface (UI) design can enhance overall user satisfaction. This can be achieved by refining the layout and design of the interface, focusing on intuitive navigation, visual clarity, and responsive design. Additionally, implementing user customization options, such as personalized dashboards and the ability to rearrange widgets, can further enhance usability. As the project expands, it's important to prioritize scalability in future development. This will involve enhancing the system to accommodate advanced features like multi-language support, integration with other financial tools, and cross-platform

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accessibility (mobile and web). These enhancements will make the system more flexible and better equipped to meet a wide range of user needs.

Furthermore, an important consideration for future development involves reducing the dependency on third-party packages, such as YahooFinanceAPI. While these external APIs provide vital stock data, they may encounter issues like downtime or limitations that could disrupt the system's functionality. For instance, if YahooFinanceAPI experiences a problem, the system would be unable to retrieve stock data, leading to a negative impact on user experience. To address this risk, it is crucial to establish alternative data retrieval methods or put contingency plans in place to handle such issues effectively. This approach would increase the system's reliability and reduce the likelihood of disruptions, thereby ensuring continued functionality even if third-party services encounter problems.

In summary, although the current system has essential features, there is significant room for improvement. By prioritizing the enhancement of stock recommendation accuracy, refining news filtering functions, improving user interface design, and reducing reliance on third-party packages, the News RSS with Stock Recommendation can transform into a powerful and flexible tool that caters to investors of varying levels of expertise.

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FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: T3, Y3	**Study week no.: 2**
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

Completed Chapter 1: Introduction and Chapter 2: Literature Review in FYP2 report.

2. WORK TO BE DONE

Chapter 3: Proposed Method/Approach and determine the design and functionalities of proposed project.

3. PROBLEMS ENCOUNTERED

No problem encounter in week 2

4. SELF EVALUATION OF THE PROGRESS

The starting progress is smooth as I have completed 2 Chapter in week 1 as planned.

_____   _____
Supervisor's signature   Student's signature

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FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: T3, Y3	Study week no.: 4
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

---

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

- Determine which function needs to be implemented and improved.
- Describe each function in the use case table and create an activity diagram.

---

2. WORK TO BE DONE

- Complete system design on FYP2 report
- Discuss new function in system.

---

3. PROBLEMS ENCOUNTERED

No problem encountered.

---

4. SELF EVALUATION OF THE PROGRESS

Project is on scheduled.

_____
Supervisor's signature

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Student's signature

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FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: T3, Y3	Study week no.: 6
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

---

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

- Complete system design on FYP2 report.
- Completed Extraction Stock Function.

---

2. WORK TO BE DONE

- Develop chart and displaying.

---

3. PROBLEMS ENCOUNTERED

No problem encountered.

---

4. SELF EVALUATION OF THE PROGRESS

Project is on scheduled.

_____
Supervisor's signature

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Student's signature

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FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: T3, Y3	**Study week no.: 8**
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

---

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

- Present the visualization and functionality with supervisor.

---

2. WORK TO BE DONE

- Enhance the functionality by adding user interactivity.
- Continue to work on the coding part.

---

3. PROBLEMS ENCOUNTERED

No problem encountered.

---

4. SELF EVALUATION OF THE PROGRESS

Project is on scheduled.

_____   _____

Supervisor's signature   Student's signature

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FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: T3, Y3	Study week no.: 10
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

- Present the supervisor the latest enhanced version of the application.
- Completed Chapter 5 System Implementation in the report.

2. WORK TO BE DONE

- Continue to complete the whole report (Chapter 6 and Chapter 7).

3. PROBLEMS ENCOUNTERED

No problem encountered.

4. SELF EVALUATION OF THE PROGRESS

Project is on scheduled.

_____
Supervisor's signature

_____
Student's signature

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FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: T3, Y3	Study week no.: 12
Student Name & ID: Chin Zhi Yi 20ACB04705	
Supervisor: Mr. Yong Tien Fui	
Project Title: News RSS with Stock Recommender – A window application Development	

---

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

- Completed the draft of FYP2 report.
- Completed the development of prototype.
- Completed the testing of prototype.

---

2. WORK TO BE DONE

- Ready to submit FYP2 report
- Prepare presentation

---

3. PROBLEMS ENCOUNTERED

No problem encountered.

---

4. SELF EVALUATION OF THE PROGRESS

Having good time management skills allowed me to successfully complete FYP2 according to the schedule.

_____
Supervisor's signature

_____
Student's signature

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PLAGIARISM CHECK RESULT

News RSS with Stock Recommender

ORIGINALITY REPORT

6%	6%	2%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1of 1

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

Full Name(s) of Candidate(s)	Chin Zhi Yi
ID Number(s)	20ACB04705
Programme / Course	IB
Title of Final Year Project	News RSS with Stock Recommender

Similarity	**Supervisor's Comments** **(Compulsory if parameters of originality exceeds the limits approved by UTAR)**
Overall similarity index:___6____ % **Similarity by source** Internet Sources: _____6_____% Publications: _____2_____ % Student Papers: _____0_____ %	Within range.
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Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

_____   _____
 Signature of Supervisor   Signature of Co-Supervisor

 Name: _Yong Tien Fui_____   Name: _____

 Date: ____9/9/2024_____   Date: _____

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FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY
(KAMPAR CAMPUS)
CHECKLIST FOR FYP2 THESIS SUBMISSION

Student Id	20ACB04705
Student Name	Chin Zhi Yi
Supervisor Name	Mr. Yong Tien Fui

TICK (√)	DOCUMENT ITEMS Your report must include all the items below. Put a tick on the left column after you have checked your report with respect to the corresponding item.
√	Title Page
√	Signed Report Status Declaration Form
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√	Abstract
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√	List of Figures (if applicable)
√	List of Tables (if applicable)
√	List of Symbols (if applicable)
√	List of Abbreviations (if applicable)
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√	I agree 5 marks will be deducted due to incorrect format, declare wrongly the ticked of these items, and/or any dispute happening for these items in this report.

*Include this form (checklist) in the thesis (Bind together as the last page)

I, the author, have checked and confirmed all the items listed in the table are included in my report.

_____
(Signature of Student)
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