

Exploration of Centennial Generation's Visual Attention Towards Digital Investment Platforms: An Eye-Tracking-Based Neuromarketing Approach

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Abstract

Purpose: The purpose of this study is to explore the visual attention patterns of Generation Z (Centennials) on digital investment platforms.

Research Methodology: Using an eye-tracking-based neuromarketing approach, supported by a quantitative approach, this study conducted an experiment to compare the visual behavior of novice and experienced investors. The sample in this study consisted of 90 students and capital market practitioners using a snowball collection technique

Results: The results show that investors predominantly focus on the order book, running trade, and stock chart features. Furthermore, there are significant differences. Experienced investors have a strategic attention pattern, starting with viewing the global market overview (Global Index) before focusing on specific data (Order Book, Running Trade). They also master analytical tools and spend time on chart indicators. In contrast, novice investors tend to be exploratory, spending more time processing real-time data and focusing more on price visualizations (Stock Charts).

Conclusions: The conclusions of this study emphasize the importance of app design tailored to user experience levels to effectively increase financial literacy and inclusion.

Limitations: This study is limited by its geographical focus on Generation Z participants in Surabaya, which may restrict the generalizability of the findings to other regions or demographic contexts. Additionally, the use of a single digital investment platform may limit cross-platform applicability.

Contributions: This study contributes original insights by integrating eye-tracking-based neuromarketing methods into the context of digital investment behavior among Generation Z in Indonesia an area that remains underexplored.

Keywords: Centennial Generation, Digital Investment, Eye Tracking, Neuromarketing, Visual Attention

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1. Introduction

Digital transformation in the financial sector has given birth to various application-based investment platforms([Gomber, Koch, & Siering, 2017](#)). According to [Giray \(2022\)](#), generation Z (Centennials) is

the one who born 2000-2010, they are the primary target of this service. They are known as digital natives who are responsive to technology (Lim, Gupta, Aggarwal, Paul, & Sadhna, 2024). However, in Indonesia, it has not yet fully demonstrated active participation in investment activities (Suprapti, Fibrianti, & Maharani, 2022). Many of them are emotionally attracted, but do not act immediately due to confusion in understanding the risks, potential returns, and platform features (Kusumawardhani, Mubarakah, Prihatin, & Hartono, 2025).

On the other hand, according to Thomason (2025), the emergence of illegal digital financial phenomena such as money games, fake trading robots, NFT illegal, binary options, ponzi schemes, and online gambling further worsening the condition. These illegal platforms often use an attractive visual approach and promise instant profits according to Amanda, Noval, and Herlina (2022), which is very tempting for the younger age group. As a result, instead of engaging in legal and productive investments, some Generation Z are trapped in detrimental speculative activities (Kurniadi & Herdinata, 2024). This phenomenon poses a major challenge to efforts to increase financial literacy and inclusion, as envisioned by the government through various programs. Furthermore, this situation also impacts the achievement of the Sustainable Development Goals (SDGs) (Mpofu, 2023). Especially point VIII (inclusive economic growth) and point X (reducing inequality). Without a proper understanding of financial information, the younger generation is vulnerable to digital manipulation and unable to make wise financial decisions (Nurjuman & Priana, 2025).

Most literacy improvement programs currently still use conventional approaches such as seminars or surveys (Dewi, Pahriah, & Purmadi, 2021). Unfortunately, these methods are not effective enough to uncover subconscious behavioral patterns that influence financial decisions, especially in the fast-paced and visual digital era (Dennison, Sazhin, & Smith, 2022). In this context, the neuromarketing approach, particularly using the Eye Tracking method, offers a more in-depth and objective solution. Eye tracking allows researchers to measure a person's visual attention to a digital display, including the area first viewed, gaze duration, and the path of attention shifts. This information is crucial for designing effective application interfaces and promotional visual materials. Data from eye tracking by Gheorghe, Purcarea, and Gheorghe (2023) also helps identify whether users are more engaged educational elements, such as risk information, or emotional elements, such as claims of large profits. Unfortunately, in Indonesia, behavioral financial research utilizing eye tracking technology is still very limited (Nugraha, Setiawan, Nathan, & Fekete-Farkas, 2022). Investment behavior studies generally rely solely on survey or interview methods, which cannot accurately capture subconscious reactions. This research aims to fill this gap, focusing on Generation Z in Surabaya as the research sample (Mashrur, Rahman, Miya, Vaidyanathan, Anwar, Sarker, & Mamun, 2024).

The findings of this study are expected to be useful academically and practically. Academically, it can enrich the literature on the investment behavior of the younger generation and the use of neuromarketing in the financial context. Practically, the results are useful for investment application developers, digital marketers, and regulators, to create a safe, attractive, and responsible investment ecosystem. The problem formulation in this study is: Which visual elements (action buttons) attract the most attention and become the main focus point, Is there a difference in visual attention patterns between novice users and experienced users in the context of digital investment? How are the visual attention patterns of Generation Z when interacting with the display of digital investment applications?

2. Literature Review

2.1 Centennial Generation

In his article, he stated that Generation Z are those who grew up where the Internet and other technologies already existed (digital natives), Generation Z are descendants of Generation X and a small proportion are descendants of the Millennial generation. It is still a matter of debate among academics about the beginning and end of Generation Z "Generation Z is the age group born between 2000 and 2010." They adapt quickly to technological developments, multitask in media use, and have a high sensitivity to visual displays and user experience in digital applications (Avalos, 2023;

[Wulandari, & Permana, 2025](#)). However, in the financial context, they are the main target of application-based investment services because of their adaptive characteristics to technology, even though they still show limitations in terms of financial literacy([Titania, 2025](#)).

2.2 Investment Digital Platforms

The digital investment platform is an application-based financial service innovation that provides easy access to the public in carrying out investment activities online ([Kasmon, Ibrahim, Daud, Raja Hisham, & Dian Wisika Prajanti, 2025](#)). Through intuitive visual displays and interactive features, the platform is designed to attract the attention of the younger generation, especially Generation Z, to become more involved in formal investment activities([Ozuem & Willis, 2024](#)). In the context of this research, digital platforms include visual components such as return information, risks, action buttons, promotions, and recommendation analysis which are the focus of measuring users' visual attention.

2.3 Visual Attention

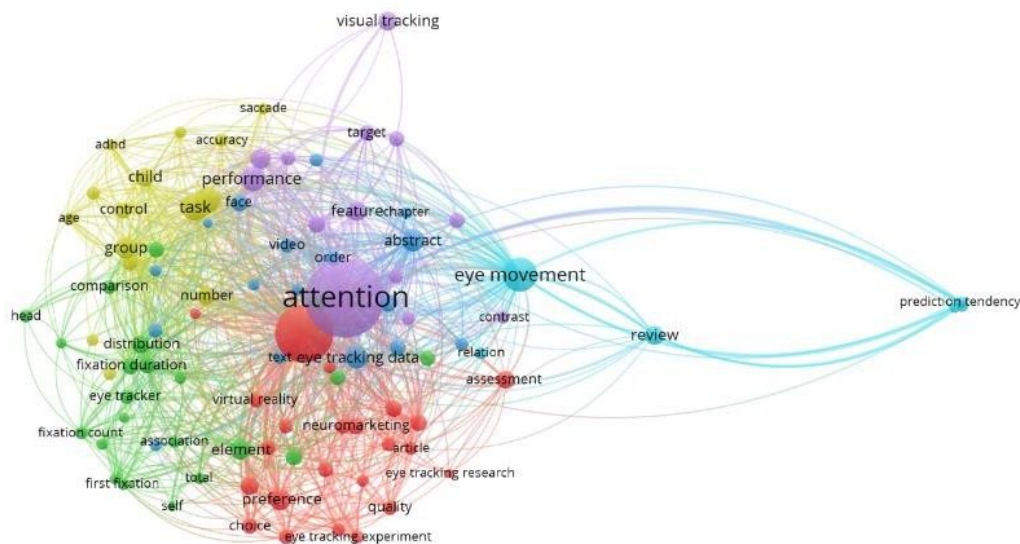
Visual attention is a selective mechanism in the human cognitive system that determines which elements in a visual display are processed in depth. By using eye tracking technology, visual attention can be observed through indicators such as the number of fixed gazes (fixation count), gaze duration (fixation duration), and starting point of attention (first fixation) ([Arslanyilmaz & Sullins, 2023](#)). In the context of digital investment applications, measuring visual attention helps understand which elements most engage users, both informatively and emotionally.

2.4 Neuromarketing

Neuromarketing is an interdisciplinary approach that combines the principles of neuroscience with marketing strategies to understand how consumers respond to marketing stimuli at a subconscious level. This approach aims to explore the emotional, cognitive, and behavioral aspects of the consumer decision-making process that cannot be revealed directly through conventional surveys or interviews ([Halkiopoulou, Antonopoulou, Gkintoni, & Aroutzidis, 2022](#)). Neuromarketing is also a scientific approach that integrates cognitive and sensory technologies to understand how consumers process marketing information. This is achieved by utilizing devices such as eye tracker([Alsharif et al., 2025](#)). In the context of this research, neuromarketing serves as a foundation for exploring Generation Z's visual attention patterns when interacting with digital investment application displays.

2.5 Bibliometric analysis with keywords "Visual Attention, Centennial, Investment, Neuromarketing, Eye Tracking"

In the initial stage, a search for sample articles was conducted using keywords and synonyms, namely: "Visual Attention, Centennial, Investment, Neuromarketing, Eye Tracking", in the publish or perish application and found 746 articles from 1000 search articles published from 2010 to 2025. After 746 articles were collected from the publish or perish software, they were then processed with VOSviewer software. Analysis with the VOSviewer application shows that there are 5 clusters with red, blue, and green colors. In red, the most frequently appearing words are: "Trucking", "Virtual Reality", "Neuromarketing", "performance". While in the blue cluster are "Eye Movement", "Neural Speech", "prediction Tendency". While in the green cluster are "Eye Tracking", "Distribution Duration", "Fixation Count". While in the purple cluster are "Attention", "Visual Tracking", "Feature". While in the yellow cluster are "Evidence", "Saccade", "Acuuracy"



Based on the results of VOSviewer Figure 1, it shows that scientists currently have paid very little attention, and none have directly involved the variables "Visual Attention, Centennial Generation, Digital Investment, Neuromarketing, Eye Tracking." Therefore, it is important to include variables rarely included in previous research to generate new discoveries.

3. Research Methodology

This research is a mixed-method study, using quantitative and qualitative assessments. The first stage of the research is quantitative because it focuses on collecting and analyzing numerical data to objectively explain observed phenomena ([Creswell & Inoue, 2025](#)). Phase I Research An eye-tracking-based laboratory experimental approach. Eye Tracking in Experimental Research is a neuromarketing technique used to measure visual attention and user attention patterns ([Gheorghe, Purcărea, & Gheorghe, 2023](#)). With this tool, researchers obtained data about which parts of the screen were viewed the most, the duration of viewing, and the order of attention (scanpath), which provides insight into the subconscious decision-making process ([Hämäläinen, Sipiläinen, Heilala, Helovuori, & Lehesvuori, 2024](#)). Eye tracking records participants' eye movements while interacting ([Valtakari, Hooge, Viktorsson, Nyström, Falck-Ytter, & Hessels, 2021](#)).

Eye tracking provides data on eye position and how the eyes move, then takes the data and interprets it to provide a point of focus area (Bouma, 2022). This experiment was designed to conduct research under realistic conditions, as if participants were actually interacting directly with the capital market through the Indopremier securities platform. The overall eye-tracking experiment procedure is illustrated in Figure 2. The process begins with participants being asked to open the investment application platform, and the application page displays various parameters to attract participants' attention. These parameters include all displayed images that respondents are familiar with based on pre-experiment interviews. In the first stage, respondents were selected based on predetermined criteria. In the second stage, respondents were given a tutorial on how to use the eye-tracking website. In the next stage, the device was calibrated by displaying several uniformly distributed dots. After successful calibration, participants interacted with the Indopremier investment platform while their eye movements were recorded using GazeRecorder. The recorded gaze data was then processed to extract fixation metrics, including dwell time and first glance, which were then analyzed to identify visual elements that attracted participants' attention. The data was then analyzed, as in the research model by Oian, Arichi, Price, Eden, and Noh (2021) in Figure 2.

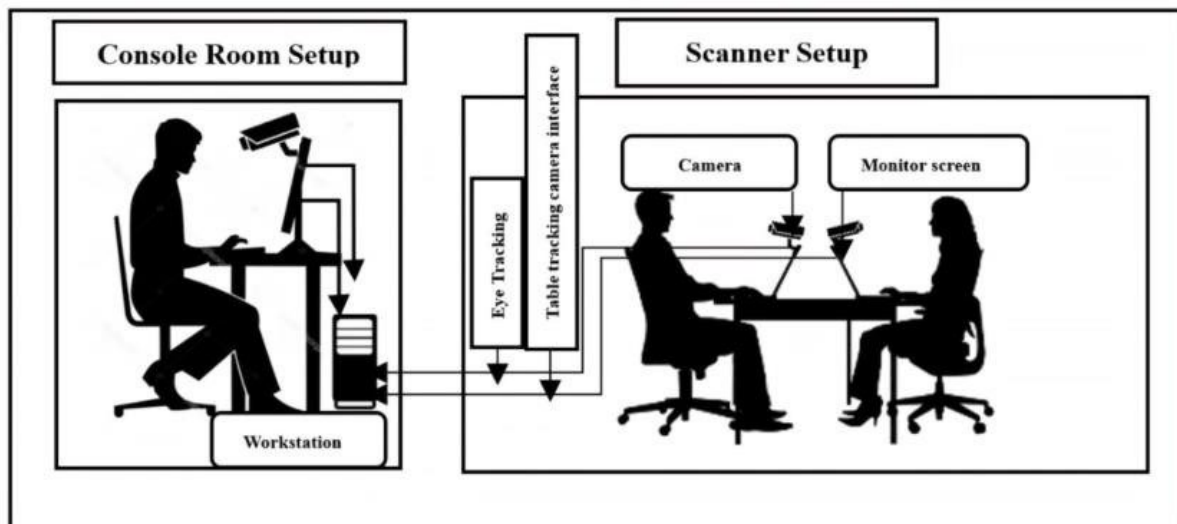


Figure 2. Data collection through eye tracking

The software used to capture the data was GazeRecorder, which displays the Indopremier Securities investment application. After recording the participants' eye movements, a high-resolution webcam was used to extract fixations for specific areas within the given stimulus. If the eye recordings were inaccurate, participants were asked to re-record their eyes. Eye trackers collect several metrics such as dwell time and first view. Overall, this combination of tools allows for more effective and accurate research.

According to [Denny and Weckesser \(2022\)](#), after conducting the first stage of research, in the second stage the research approach used was qualitative is a research procedure that produces descriptive verbal data and written words from the observed objects of phenomena and behavior. This type of research uses a case study design, a type of qualitative approach that examines a case that occurs in real life, the researcher chooses the type of collective case study or multiple case study where in this method the researcher focuses on one issue. The data obtained is then processed using the Spiral Model analysis technique popularized by [Younas, Fàbregues, Munce, and Creswell \(2025\)](#) to simplify the analysis, the researchers also used Nvivo 12 software, both for coding and case analysis.

In this study, the population and sample were divided into two categories: beginner investors, those who have been investing for less than 2 years, and professional investors, those who have been investing for more than 5 years. The beginner category consisted of students. Fakultas Ekonomi Bisnis Universitas Airlangga and students Fakultas Ilmu Administrasi Universitas Brawijaya who have invested through the Investment Gallery, which is estimated. This study used a non-probability sampling approach with the snowball sampling method. This technique was chosen because the population we focused on has unique characteristics that are not easily identified directly ([Stratton, 2024](#)). So the number of samples cannot be determined, until the researcher finds the saturation point, where the information obtained from the participants is the same until a total of 90 participants were collected, consisting of novice and experienced investors ([Oranga, 2025](#)).

4. Results and Discussions

4.1 Region of Interest (RoI)

The object used in this study is the Indopremier Securities PC application, which is divided into two image layouts: the first is the initial display and the second is the analysis chart. Each object presented lasts 30 seconds. From the display objects that appear on the Indopremier Securities homepage, there are six ROIs used for this study, consisting of: (RoI 1 broker summary, RoI 2 watchlist, RoI 3 order book, RoI 4 running trade, RoI 5 global index, RoI 6 chart) looks like in Figure 3.



Figure 3. Layout of the first object observed



Figure 4. Layout of the second object observed

Meanwhile, in the two layout displays, there are 4 ROIs used for this research consisting of (RoI 1 Settings, RoI 2 Stock Chart Indicator, RoI 3 Stock Chart, RoI 4 Stock Trading Volume) as shown in Figure 4. In eye tracking, RoI plays an important role as a defined area for analyzing visual attention (Russo, Junior, & Villani, 2024). The use of ROI in eye tracking helps in collecting more relevant and specific data related to user eye behavior, which can be used to understand user preferences, or conduct human behavior research. Based on Figure 3, there are several ROIs marked with yellow squares, where the objects used are order books, charts, running trade, global index, watchlist, broker summary.

4.2 Heatmaps

The following are the heatmap results from participants displayed for order books, charts, running trades, global indexes, watchlists, and brokers, divided into two, namely experienced investors and novice investors. Experienced investors can be seen in Figure 5, while the heatmap results for novice investors can be seen in Figure 6.



Figure 5. Heatmaps results from experienced investors on application layouts



Figure 6. Heatmaps results from novice investors on the application layout

Next is the second heatmaps display which analyzes the chart results consisting of RoI 1 Settings, RoI 2 Stock Chart Indicator, RoI 3 Stock Chart, RoI 4 Stock Trading Volume for experienced investor participants in Figure 7, while Figure 8 shows the results for novice investors.

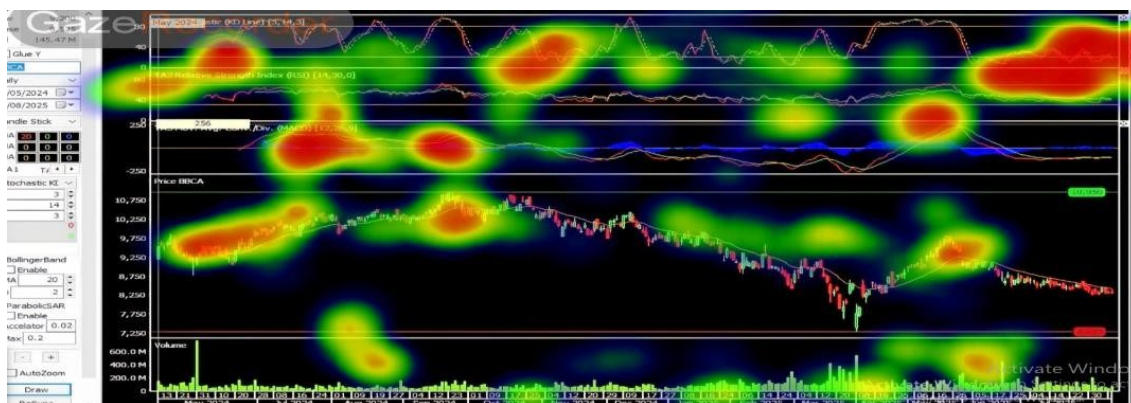


Figure 7. Heatmaps results from experienced investors on stock charts in the application

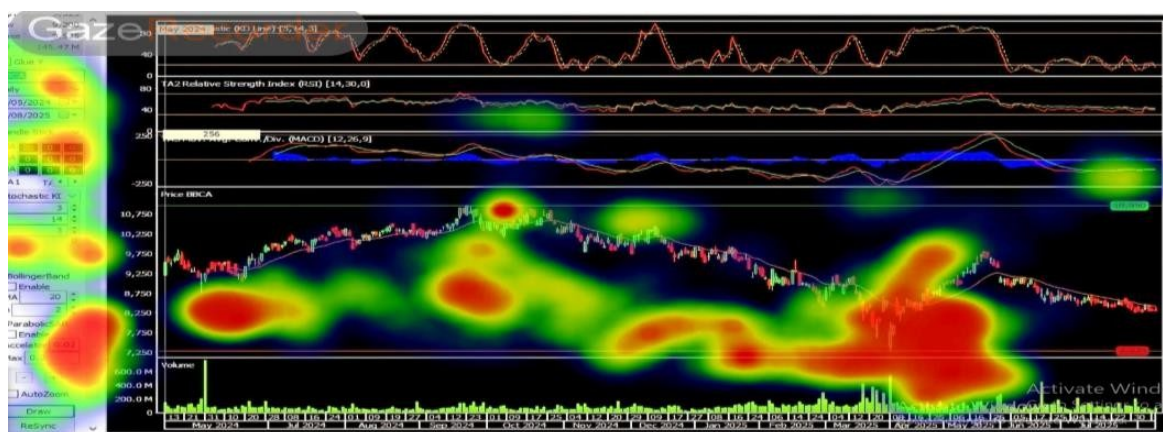


Figure 8. Heatmaps results from novice investors on stock charts in the application

4.3 Application Table Results on Indopremier Securities

Based on the heatmaps, all participants were shown the Indopremier application page. The tabulation results for each group were grouped into two categories: the first was experienced investors and the second was novice investors. The parameters of Dwell time, First View, and View by for 6 ROIs on each object were used to assess both groups of participants. Table 1 to Table 2 describe the group that understands and is experienced in investing in the capital market:

Table 1. Analysis of the initial display of the indopremier application for participants with experience in investing

RoI	Object	Dwell Time	Percentage (%)	First View
1	Broker Summary	1.1	4	10.56
2	Watchlist	1.17	4	2.99
3	Order Book	6.1	20	0.58
4	Running Trade	3.67	12	0.84
5	Global Index	021	1	15.36
6	Chart	3.41	11	1.82

Table 2. Analysis of indopremier application chart display on experienced investment participants

RoI	Object	Dwell Time	Percentage (%)	First View
1	Setting	0.13	0	23.45
2	Chart Indicators	16.34	55	0.25
3	Stock Chart	5.86	20	0.91
6	Stock Trading Volume	0.6	5	14.78

Next, the assessment for the group of participants who are less knowledgeable or are still in the beginner investor category is outlined in Table 3 to Table 4 below.

Table 3. Analysis of the indopremier app's initial display for beginner investing participants

RoI	Object	Dwell Time	Percentage (%)	First View
1	Broker Summary	1.24	4	2.05
2	Watchlist	1.34	5	1.41
3	Order Book	7.27	25	0.01
4	Running Trade	11.71	40	0.28
5	Global Index	0.5	2	0.88
6	Chart	0.97	3	20.88

Table 4. Analysis of indopremier app chart display for beginner investing participants

RoI	Object	Dwell Time	Percentage (%)	First View
1	Setting	6.34	21	4.88
2	Chart Indicators	0.8	3	21.81
3	Stock Chart	14.64	49	0.02
6	Stock Trading Volume	2.14	7	21.34

4.4 Participant Groups in the Indopremier Application Display

The empirical findings reveal distinct visual attention patterns between experienced and novice investors regarding the application layout, as illustrated in Figure 9. For experienced investors, the longest viewing time during the dwell time phase was allocated to the Order Book (6.1 seconds, 20%), followed by the Running Trade (3.67 seconds, 12%) and Chart (3.41 seconds, 11%). In terms of initial visual inspection (First View), experienced investors predominantly focused on the Global Index (15.36%), followed by the Broker Summary (10.56%) and Chart (1.82%). Although the Global Index accounted for only 0.21 seconds (1%) of their total dwell time, it served as the primary entry point for their initial visual attention.



Figure 9. Comparison of dwell time and first view of two types of participants regarding application layout

In contrast, novice investors exhibited a markedly different attention pattern. Their dwell time was heavily concentrated on the Running Trade (11.71 seconds, 40%), followed by the Order Book (7.27 seconds, 25%) and Broker Summary (1.24 seconds, 4%). Regarding their initial attention (First View), novices were heavily attracted to the Chart (20.88%), while displaying significantly lower initial interest in the Broker Summary (2.05%) and Global Index (0.88%).

Comparative Analysis of Main Focus: Experienced investors focus more on the Order Book and Running Trade as sources of transaction data, indicating a tendency to immediately seek out price and market volume information for quick analysis and decision-making in capital market investments. Meanwhile, novice investors spend more time on Running Trade and the Order Book, but the duration of Running Trade is much higher (40% vs. 12% for experienced investors). This phenomenon indicates that novice investors may be trying to understand real-time transaction movements but need more time to digest the information. **Experienced investors' Initial Attention (First View)** tends to direct their initial attention to the Global Index (15.36%), which provides an overview of the market. This phenomenon indicates a market-oriented strategy before focusing on details. **Beginners:** Initial attention is highest on the Chart (20.88%), indicating an interest in price visualization over textual data. **Experienced Information Processing Pattern:** Dwell time is relatively more evenly distributed across several key features (Order Book, Running Trade, Chart), reflecting the ability to shift focus efficiently. **Beginner:** Dwell time is heavily concentrated on one or two features (Running Trade and Order Book), which indicates a narrow focus and possible difficulty in optimally utilizing other features.

Neuromarketing of experienced investors, prioritizing concise and global data for fast decision making, this phenomenon is in line with the theory of capital market analysis called Top Down analysis ([Htun, Biehl, & Petkov, 2023](#)), where investors first conduct a global market analysis, then go down to which sector or industry is profitable and finally choose the right company ([Popescu, Hitaj, & Benetto, 2021](#)). Therefore, the application layout should facilitate quick access to index and order data. Meanwhile, novice investors need an educational display of charts and running trades, with guides to help interpret data, so that screen time can be more efficient and informative.

4.5 Histogram of 2 Participant Groups in the Indopremier Chart Menu Display

Experienced Participants, as shown in Figure 10, had the highest Dwell Time for the Chart Indicator (16.34 seconds, 55%), followed by the Stock Chart (5.86 seconds, 20%). The largest First View was for Settings (23.45%), followed by Stock Trading Volume (14.78%). Although Settings only took 0.13 seconds (0%), this object immediately attracted significant initial attention, as shown in Figure 10.



Figure 10. Comparison of waiting time and first look of two types of experienced and novice investors regarding application charts

Beginner participants in Figure 10 had the highest dwell time on the Stock Chart (14.64 seconds, 49%), followed by Settings (6.34 seconds, 21%). The largest first views were on Chart Indicators (21.81%) and Stock Trading Volume (21.34%), as shown in Figure 10. Chart Indicators had a high first view but a low dwell time (0.8 seconds, 3%), indicating initial interest without long-term exploration. Comparative Analysis: The main focus for experienced investors is that more time is spent on Chart Indicators (55%), indicating that they rely on technical indicators as the basis for their analysis ([Suryawan, Setyanto, & Utami, 2024](#)). Stock charts themselves are only 20% of the attention, which means they are used to reading signals from indicators, not just price patterns. According to [Liu and Son \(2025\)](#), the majority of novice investors spend time on Stock Charts (49%), which are more visual, indicating they rely on price observation without too much indicator interpretation and there is a possibility that novice investors are not yet able to understand and utilize indicators.

Experienced investors' initial attention (First View) is mostly focused on Settings (23.45%) because they immediately check or adjust chart settings before analysis, followed by trading volume (14.78%). Meanwhile, novice investors' First View is more widespread, focusing on Chart Indicators (21.81%) and Stock Trading Volume (21.34%). This indicates an initial interest in additional aspects beyond price, although it is not followed by a long-term in- depth analysis. Experienced investors' information processing patterns are more strategic, starting with chart settings, then focusing on technical indicators, and briefly glancing at volume. This is efficient for quick decision-making ([Kumbure, Lohrmann, Luukka, & Porras, 2022](#)). Meanwhile, novice investors tend to be visually focused and exploratory, spending more time looking at raw price charts and settings, but with minimal analysis of indicators. This shows that novice investors are understanding how indicators work by focusing more on the settings menu.

4.6 Post Exposure Survey

After completing the data recording, participants were asked to answer questions through a questionnaire, including questions about their favorite features in the application. The collected data was then processed using Nvivo 12 software using the coding method, as shown in Figure 11.

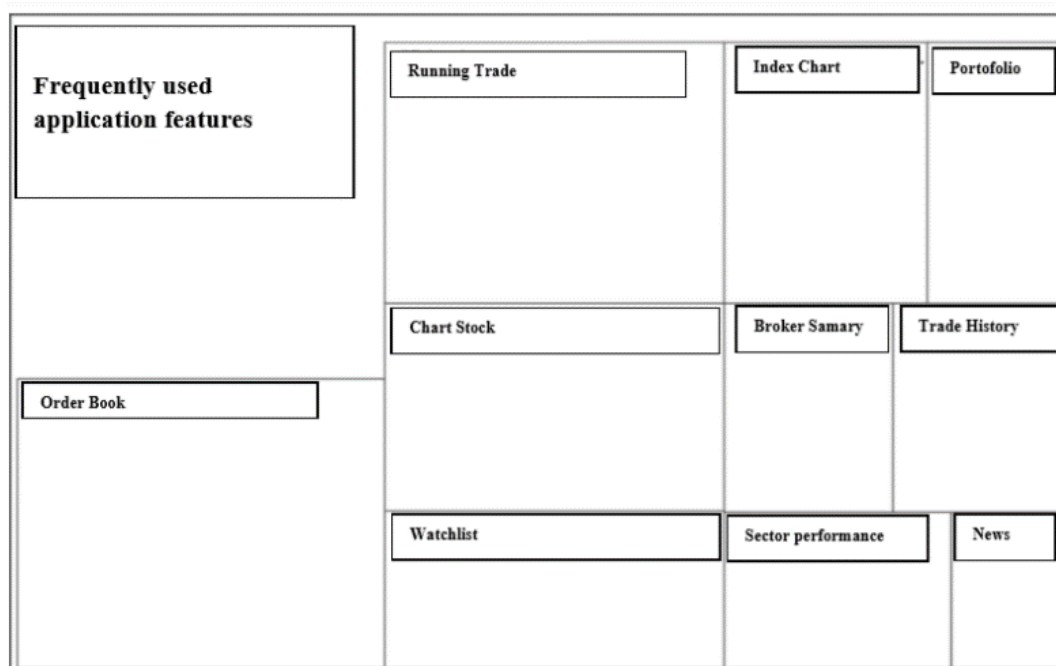


Figure 11. Data coding results using Nvivo 12 software

The most commonly used feature by investors is the order book. This feature is chosen because investors believe it is a key feature in stock market trading. With this feature, investors can view bids and offers, and can view the number of lots being traded in real time ([Almansour, Elkrggli, & Almansour, 2023](#)). The second feature is running trade, which allows investors to see price movements, whether they are rising or falling in real time. Investors can quickly determine which stocks are experiencing increases or decreases, allowing them to make faster decisions. The third feature is the stock chart, which analyzes and predicts stock price movements. The watchlist feature monitors selected stocks, the index chart monitors the movement of the composite stock index, and the sector performance feature displays sectors that are experiencing increases or decreases. There are also brokers, trade history, portfolios, and the latest news.

5. Conclusions

5.1 Conclusion

This study aims to explore the visual attention patterns of Generation Z (Centennials) on digital investment platforms. It uses an eye-tracking-based neuromarketing approach. The results show significant differences in visual attention patterns between novice and experienced Generation Z investors. Experienced investors exhibit more strategic and efficient behavior. Their eyes tend to focus on key data such as the Global Index initially, then shift to the Order Book and Running Trade for quick transaction analysis. When analyzing charts, they immediately move to Chart Indicators and Settings, indicating mastery of technical analysis tools. In contrast, novice investors exhibit a more exploratory pattern. They spend a significant amount of time on Running Trade and the Order Book, indicating they are slowly trying to understand the data. When viewing charts, their primary focus is on the Stock Chart itself and they pay less attention to technical indicators. This pattern indicates a reliance on raw price visualizations and a possible lack of mastery of more sophisticated analysis tools.

5.2 Research Limitations

This study has several limitations. First, the respondents were limited to Generation Z in Surabaya, so the results may not necessarily reflect the entire population in Indonesia. Second, the experiment did not employ a think-aloud technique, so the psychological reasons behind participants' gaze duration were not fully explored. Third, the new analysis focused on visual attention patterns and did not test for a direct correlation with actual investment decisions after the experiment. Fourth, this study used only one sensor, eye tracking, so the data accuracy is less precise in capturing emotional aspects. In the future, this method needs to be collaborated with other emotion detection tools such as Galvanic Skin Response (GSR), which measures sweat gland activity, for more accurate results.

5.3 Suggestions and Directions for Future Research

For future research, it is recommended to expand the sample size, integrate think-aloud methods to explore psychological motives in real time, and test the direct correlation between visual attention and actual investment decisions. Furthermore, further research should employ a multi-sensory approach by combining eye tracking and other biosensors such as Galvanic Skin Response (GSR) to measure sweat gland activity or EEG to improve the accuracy of users' subconscious emotional data.

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Author Contributions

SAAKP was responsible for the conceptualization, research design, methodology development, data collection, formal analysis, and preparation of the original manuscript, while YFAA contributed to the literature review, validation, interpretation of results, manuscript revision, and final review. Both authors have read and approved the final version of the manuscript.

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