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Judul : THE ROLE OF INVESTORS' BEHAVIOR AND PSYCHOLOGICAL UNBIASEDNESS ON THE DIGITIZATION OF THE CAPITAL MARKET IN INDONESIA: MEDIATING ROLE OF TECHNOLOGY ADVANCEMENT

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Sri Utami Ady <sri.utami@unitomo.ac.id>

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THE PHENOMENON OF TRADING ROBOTS AS THE DIGITIZATION OF THE CAPITAL MARKET, WILL CONVENTIONAL TRADERS VANISH?
EVIDENCE FROM THE INDONESIAN CAPITAL MARKET

Ady S.U.*[1]

Corresponding author

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
sri.utami@unitomo.ac.id
ORCID ID: 0000-0002-2093-4383

Winedar M.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
mustika.winedar@unitomo.ac.id
ORCID ID: 0000-0001-8143-6284

Farida I.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

ilya.farida@unitomo.ac.id

ORCID ID: 0000-0001-9395-5882

Mulyaningtyas A.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

alvymt@gmail.com

Susena D.O.S.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

dickenoktasansu17@gmail.com

Pratama A.H.

Faculty of Agriculture and Fisheries, University of Muhammadiyah Malang, Indonesia

adielherdi.sby@gmail.com

Abstract: Many investors have adopted robotic applications in stock trading to reduce risk and maximize returns in uncertain economic conditions and the Covid-19 pandemic. Sophisticated technology and algorithms owned by trading robots are expected to be able to provide profits without the complete control of traders. Although trading experience is insufficient, trading robots are considered capable of providing benefits equivalent to professional traders. But is it true that trading robots can work so efficiently that we can fully trust them? Will robots control trading activities in the future? Research results show

that using trading robots makes stock trading more straightforward and efficient, but not a few investors feel significant losses due to using the wrong trading robot. This study aimed to investigate how stock investors responded to digitalization, particularly in the financial and capital markets, and to examine the efficacy of trading robots in the capital market. This research used the qualitative phenomenological study to investigate investor behavior from an emic perspective. In-depth interviews, observation, and content analysis methods were carried out to gain an in-depth understanding to support the triangulation of the technique. The results indicated that trading robots were needed by short-term investors who traded in high frequency. Trading automation effectively reduces fear and greed that often overshadows trading, thus making investors' decisions more efficient. In some situations, trading robots won't be able to take over the function of humans in the market. Still, those who cannot adapt to a constantly changing world due to technology will be replaced by those who can innovate more quickly.

Introduction

The stock price is determined because of the behavior of market participants. When they are optimistic, the stock price rises, and vice versa. The market decline has resulted from damaging behavior. As a result, rather than being rational as it should be (Ady et al., 2022); (Sadiq et al., 2020), the stock price is more influenced by the psychological elements of market players. (Ady et al., 2013); (Ady, 2014); (Ady, 2015); (Sri Utami Ady, 2018b); (Jannah & Ady, 2017); (Ady & Hidayat, 2019); (Ady, Mulyaningtyas, et al., 2020)

Investors' discriminatory behavior includes representativeness, loss aversion, and self-attribution (Ady et al., 2013); (Ady, 2015). Shefrin, (2007) states that representativeness biases decision-making based on stereotypical thinking or analogy and will cause investors to make financial decisions that do not increase returns.

Loss aversion is a more incredible urge to avoid losses than to gain profits (Pompian, 2006). Loss Aversion makes investors risk-averse when evaluating possible profits because avoiding losses is more important than making profits (Shiller, 1998). When investments start to pay off, loss aversion individuals will quickly lock in profits and sell stocks because of fears that the market will reverse course and take profits. It causes investors to hold losing stocks and sell profitable stocks so that portfolio returns are not optimal (Sri Utami Ady, 2015); (Sri Utami Ady et al., 2013); (Yiwen, 2022).

Self-attribution bias is the tendency to describe the success experienced due to internal factors while the failure experienced due to external factors. This bias will cause: (1) Overconfidence (Ady, 2015), (2) overtrading (Jannah & Ady, 2017); (Ady & Hidayat, 2019), and (3) investors only hearing what they want to hear (Ady, 2018a), and (4) holding an underdiversified portfolio (Ady, Tyas, et al., 2020).

The Covid-19 epidemic has mentally paralyzed investors. It forces them to take more drastic measures to stop losses or seize chances to make large profits, which may create a moral hazard or put the capital market at further risk.

Many investors are resorting to automated stock trading programs to reduce risk and maximize profits in the face of uncertain market circumstances and the Covid-19 pandemic. Market participants are now using a method that is considered to be simpler for predicting future stock values as a result of the economy's digitization. Shah (2015) used data mining and machine learning approaches to create a prediction model to determine whether to purchase, sell, or keep shares. Azhikodan et al. (2019) offer automated swing trading utilizing deep reinforcement learning to identify whether to buy, sell, or hold positions. According to Pricope (2021), Deep Reinforcement Learning (DRL) in stock trading has excellent application potential and, under reasonable assumptions, can compete with expert traders (H. Yang et al., 2020). A set of trading strategies that use three basic algorithms, namely: Proximal Policy Optimization (PPO), Advantage Actor Critic (A2C), and Deep Deterministic Policy Gradient (DDPG), prove that the implementation of a set of strategies used in this study has succeeded in outperforming the Dow Jones industrial average and minimum variance portfolio allocation method, in terms of the Sharpe ratio by balancing risk and return under transaction costs. This condition raises the interest of the researchers to explore the behavior of investors in trading/investing stocks using applications to reduce trading psychology. Algorithm-based trading robots have also emerged. Sophisticated technology and algorithms owned by robots trading are expected to be able to provide profits without the complete control of traders. Even though the trading experience is not sufficient, trading robots are considered to be able to provide benefits equivalent to professional traders. However, is it true that trading robots can work so efficiently that we can fully trust them? Will robots control trade activities in the future? The specific purpose of this research is to explore the behavior of individual investors using robotic applications and attempt to answer the question: What is a Trading Robot? Why do Investors use trading robots? And how do investors do stock transactions using trading robots?

Literature Review
Behavioral Finance Theory
Behavioral finance is the application of psychology to financial science and has become a hot topic since the tech-stock bubble in March 2000 (Pompian, 2006). It is an investigative study that attempts to explain market inefficiencies using psychological theories. This theory observes that people often make mistakes and illogical assumptions regarding financial problems (Ady, 2015); (Ady, Mulyaningtyas, et al., 2020). Behavioral finance is a new paradigm in finance that provides a supplement to standard financial theory by introducing behavioral aspects of decision-making. It focuses on applying economic principles and principles to the development of financial decision-making (Olsen, 1998).

There are two topics in behavioral finance: (1) micro behavioral finance (BFMI), which examines the behavior or bias of individual investors that distinguishes them from rational individuals as in classical economic theory (Shefrin, 2005)(Ady et al., 2013); (Ady, 2015); (Jannah & Ady, 2017); (Ady, 2018a); (Ady & Hidayat, 2019); (Ady, Mulyaningtyas, et al., 2020), (2) macro behavioral finance (BFMA) which detects and describes anomalies in the efficient market hypothesis described in behavioral models (Nuroniyah et al., 2018); (Ady & Mulyaningtyas, 2017). This study focuses on BFMI, the study of individual investor behavior, to identify psychological biases and conduct behavioral investigations on asset allocation decisions to reduce bias in the investment process. The discriminatory behavior to be studied included Representativeness Bias, Loss Aversion, and Self Attribution Bias

Shefrin (2007) states that representativeness bias is decision-making based on stereotypical thinking or analogies and will cause investors to make wrong financial decisions. These, namely, financial choices, do not increase returns. Kahneman and Riepe (1998) stated in a similar review that investors who experience representativeness bias tend to overreact when processing information to make transaction decisions. Empirical evidence, including (Lakonishok et al., 1994); (Ady et al., 2013); (Ady, Tyas, et al., 2020), found that the representative way of thinking can mistakenly cause investors to think that a good company is a good investment.

Loss aversion is a tremendous urge to avoid loss than gain. A study of loss aversion has become a rule of thumb (psychologically); the probability of getting a loss has twice the motivational power of the likelihood of getting the same profit (Pompian, 2006). The loss aversion bias can make investors risk-averse when evaluating possible gains because avoiding losses is more important than making profits. When investments start to pay off, loss aversion individuals will quickly lock in profits and sell stocks because of fears that the market will reverse course and take profits. Loss aversion generally causes investors to hold losing and sell profitable stocks, so portfolio returns are not optimal (Ady, 2015); (Ady, Mulyaningtyas, et al., 2020);(Ady, Tyas, et al., 2020) .

Self-attribution bias is an individual's tendency to describe the success experienced due to internal factors while the failure experienced due to external factors. This bias will cause (Pompian, 2006): (1) Self-attribution bias after a long success will lead to excessive self-confidence, thus taking a greater risk of overconfidence, (2) Causing investors to trade too often (overtrading) high risk and, (3) Causing investors to only hear what they want to hear. (Ady, 2015) found that self-attribution bias appears in investors who are too confident that their success can come from their expertise, and the losses they experience come from external factors (Ady, Tyas, et al., 2020). These psychological biases make investors' returns decrease and even lose, which causes them to switch to trading robots.

Trading Algorithm

An algorithm is a set of instructions or steps written down systematically to solve logical and mathematical problems with a computer aid (Sismoro, 2005). Meanwhile, trading sells and buys products on the stock and foreign exchange markets. Thus, the trading algorithm is an algorithm that is made specifically for the process of buying and selling stocks and foreign exchange.

The role of the algorithm is essential to the computer. From the point of view of mathematics and statistics, the trading robot's ability is judged by its algorithm. Therefore, if external factors eliminate, they concluded that a trading robot could work effectively if the trading algorithm can work effectively. Trading algorithms make great use of statistics. Statistics itself is a branch of mathematics. Shah (2015) developed a predictive model to decide when to buy, sell or hold shares using data mining and machine learning techniques. Azhikodan et al. (2019) proposed automated swing trading using deep reinforcement learning. It experiments with swing trading to determine a buy, sell or hold the position. Pricope (2021) demonstrates that Deep Reinforcement Learning (DRL) in stock trading has enormous application potential that rivals professional traders under solid assumptions. Yang et al. (2020) A set of trading strategies that use three basic algorithms, namely: Proximal Policy Optimization (PPO), Advantage Actor Critic (A2C), and Deep Deterministic Policy Gradient (DDPG), shows that the implementation of a set of strategies used in this study successfully outperformed the average Dow Jones industrial rate and minimum variance portfolio allocation method, in terms of the Sharpe ratio by balancing risk and return under transaction costs.

Trading Algorithm Strategy for Young Traders

Young market participants today have a strong belief in technology. In lieu of continuing, individuals frequently choose to let the robot do its work. They have faith in trading robots due, in part, to the advantageous algorithms incorporated into these robots.

In addition to analyzing market conditions, the algorithm for trading also incorporates the tactics of professional traders. These include leveraging price discrepancies rapidly (arbitrage strategy) and projecting that prices would revert to the average price at a given point (mean revision strategy), among others. Young traders are hence considerably more confident with the trading algorithm. Quantitative trading, one of the most prominent approaches among trading algorithm strategies, is supported by scientific data.

Quantitative trading relies on quantitative analysis supported by mathematical and statistical modeling and is able to create predictions based on the obtained data. Because manufacturing is difficult, creating a quantitative method includes mathematicians, statisticians, and computers. Large corporations typically employ quantitative algorithms to seek long-term profits in the stock market or foreign exchange. However, humans also utilize premium trading robots using quantitative trading today. Thus, quantitative trading is a method of generating gains in the stock market through the use of mathematical calculations and forecasts. In the world of stocks, transaction speed is a crucial factor. If a trader conducts a deal that

yields a profit of 1 rupiah but is executed 1 million times in 1 second, he becomes a millionaire in just 17 minutes. On the other hand, Caporale et al. (2015) show that the employment of trading robots does not result in anomalous returns, whilst Nunes, (2021) demonstrates that the majority of forex trading robots are lucrative.

Method

We Used Qualitative paradigm research with phenomenological methods to explore the effectiveness of robotic applications. Robot applications are used as capital market digitization through inductive thinking processes in the actual context of stock investors. The main characteristics of the qualitative approach in this study are more concerned with meaning, context, and emic perspectives. The purpose of the research in this paradigm was to understand and explore to then interpreted the meaning, not to explained and predicted a relationship as in quantitative research. In general, qualitative research aimed to understand the phenomenon of what was experienced, why he experienced it and how he experienced it.

This study uses a qualitative interpretive paradigm with Schutz's phenomenology and deontology methods. It aims to see the phenomenon's meaning and the moral aspects of investor behavior—determination of informants with purposive and snowball techniques. The research setting is individual investors. Data collection methods used in-depth interviews, participant observation, and documentation. The criteria used for the validity of the data to test the validity and reliability of qualitative data are (Daymon & Holloway, 2007), (Shenton, 2004), credibility/trustworthiness using triangulation, member checking, and external audit. Authenticity/confirmability is done by bracketing and epoche. To complete the data and understand the problem under study, the researchers also took videos from YouTube using content analysis as part of the triangulation method.

Data analysis used phenomenological data analysis (Moustakas, 1994). Data analysis was carried out through the following stages: (1) meaning units and grouping themes. This stage is the phenomenological reduction stage. (2) Individual textural-structural descriptions, concluding each theme to make in-depth textural and structural descriptions (full descriptions) of the informants' experience. (3) Cross-site analysis. At this stage, cross-analysis was carried out for the same unit of meaning among the participants and made a textural and structural description for all participants (Composite textural and structural description) to find the essence of substance. (4) Identification of the experience's essence results from a composite textural-structural description narrative or cross-site analysis. This stage integrates intuition, tacit dimensions, self-search, and reflection from textural and structural descriptions (Creswell, 2007).

Finding

Robot trading is a type of automated trading. The software executes trading deals entirely automatically and according to programmable algorithms. Humans alter only the program parameters while this software operates autonomously. Robots

used in trading are not like those in science fiction. It takes the form of server-side software (high-performance computer). Therefore, traders of the future will be a group of trading servers. (Wira, 2021)

Trading robots or automated trading are often referred to as algorithmic trading. Generally, each trading robot has its strategy and algorithm, which its maker creates. These strategies and algorithms are called black boxes, referring to their secretive nature. Trading robots are often also called black box trading. Every major institution that plays in the financial market has its black box, for example, Chameleon (developed by BNP Paribas), Stealth (developed by Deutsche Bank), Sniper, and Guerilla (developed by Credit Suisse). Retail traders are now starting to use trading robots. For example, what is quite common is done by stock traders with their respective online trading software. Or trade Forex, commodities, and indices with an Expert Advisor (EA) in MetaTrader.

There are several advantages of using trading robots, including (1) Total elimination of the psychological elements involved in trading. Thus, it is expected that trading robots can eliminate human error; (2) large volume of transactions that can make continuously. The trading robot can carry out continuous transactions on all markets, applying the same algorithm repeatedly, without lag; (3) Speed; trading robots can execute transactions very quickly. It is analogous to the velocity of an electron. When first introduced trading robots, the speed factor became an advantage. But as more and more users of trading robots, the speed factor is no longer the main advantage.

Should Trading Robots be Used?

In March 2014, Virtu Financial, an HFT company, reported that it had made 1277 profitable trades over the past five years out of 1,278 days. Virtu only lost one day in 5 years. The claims given by Virtu indicate that trading robots can be profitable. But not all trading robots can be beneficial. For a trading robot to be good, it must have two conditions: 1. an excellent algorithm. 2. High-speed servers.

Retail traders do not have these two conditions. Fast servers are costly. Algorithms that are more powerful than institutions are also challenging to create. It takes intellectual abilities and very high research costs to make these algorithms.

Trading robots are all merely extensions of human emotions, even though they are getting more and more common. In the market, human psychology continues to be necessary. And because of that mentality, even the most advanced algorithms cannot predict the market. For traditional traders, mainly those still trading manually, there is always a chance to profit from the market.

The first reason why Forex employs trading robots more than the stock market is that the stock market is not as intense as the forex market. Thus retail traders don't need to use trading robots, claims Informant 1 (Fj) from Pintraco Securitas. Stocks and foreign exchange operate differently from one another fundamentally. Investors can sell foreign exchange in forex transactions even if they do not have foreign currency. Margin trading is the phrase used in trading. However, margin trading is not permitted in the capital market. As purchasing shares entails

purchasing a corporation, an investor who already has shares may sell them as follows:

> *"Well, if we buy shares, we buy a company. If we sell shares, we sell a company. However, if we already own a company, we can sell it because other things in shares are certain. For example, when we buy shares, we receive a certificate that our actual purchase will bind the company. If there is nothing comparable in Forex, you can discuss purchasing or selling first because it is simpler to move around if it is stock. You don't have to buy it first; then we can sell it. When the company makes a profit, we splash the dividend " (Fjr. .Als.1)*

Foreign exchange transactions are more accessible in transferring ownership from one investor to another because they are not related to the right to dividends as in stocks, so the recording is easier.

The absence of conditional orders is the second justification for not using a robot trading in stock trading. It indicates that in certain securities businesses, charges set in the trading system application are used to execute transactions involving the purchase or sale of shares. The state of the market largely influences every transaction made when you set up a purchase or sale order. It is contrary to the automatic purchase and selling transactions that take place in foreign exchange, as explained by Fjr:

> *"It's not like a robot in Forex that can be set up; if you buy the stock and then set it to sell, it will be set. The order condition is that when you want to sell, you must understand the conditional order on purchasing and selling. Yes, it has to do with selling it; therefore, we want to know how much to ask for it to share; at this point, I want to sell it for 1,500 or stop losing money."* (Fjr.Al.2)

The GTC (Got Till Cancel) menu, which is a feature to sell shares at the desired price with a time limit of one month or until the investor cancels the instruction, is present in stock trading programs, particularly in the Pintraco system. Investors who want to sell shares at a specific price without tracking the market and placing sell orders continuously are the target audience for this product. Therefore, if investors wish to sell their shares at a specific price, they can do it by using the GTC menu without having to keep an eye on price changes.

The term stop loss means selling at a loss. It is performed by investors if the stock price continues to decline. To limit his losses, he uses the stop loss menu. If the price has been reached, the system will automatically sell to avoid more severe losses. There is another term called trailing stop. This menu is used when investors want to monitor the market and make transactions according to market conditions.

Because stock transactions are lengthy and highly conditional, according to Fjr, trading robots are rarely used in them. Instead, investors must keep an eye on the market and alter their menu as necessary. Investors can set up transactions using the settings menu in the securities application system. For example, each security will create its own software, "profit" for Pintraco Securities, "Mouse" for Mandiri Sekuritas, and so forth. Each business has unique qualities that help it draw in and facilitate investors. Some are straightforward and require a laptop, while others,

like Pintraco, may already be used on Android devices while still being more popular for foreign exchange transactions.

The stock market is more passive than the FX market, which is the third reason there is no need for trading robots in stocks. The capital market is less dynamic than the foreign exchange market, which changes rapidly every minute or even seconds. If the price is as desired, you simply monitor the market and sell it if necessary—possibly even on a different day for swing traders or position traders. In contrast to the foreign exchange market, which may be set up with a 1% selling down, it still requires manual market monitoring from humans every day, except for setting up robots, as previously mentioned.

> *"Yes, if the robot is set up, we don't need to watch it. For instance, buying for 1000 and then selling it at 1500, but I asked the computer to monitor it first up to 1,600, 1,700, precisely at the price of 1000, I input the trailing stop menu of 1,500." (Fjr.Al.4)*

Stocks are enduring, long-term investments. Pintraco Securities, on the other hand, offers possibilities for investors who desire quick trading. However, not all securities firms have access to this capability. However, each security has a unique application, and which one is created depends on the firm.

Because shares are stored rather than sold daily, mainly until they are sold at a loss, long-term investors who purchase shares to be maintained do not need to use stop loss, GTC, or trailing stop facilities. Because stock prices change, it is preferable to save. The cost of the stock that was bought this morning may have declined, but new investors who don't yet understand trading and yet have a high level of psychology may feel terrified and place a stop loss. In reality, the stock price spiked again a short while later, making investors regret their decision. According to the interview with Fjr, many investors still behave in the described manner simply because they were unaware of the differences between day trading and long-term investing.

> *"When someone has a need and does not have the opportunity to monitor it, he is represented by a stop loss. But if he is monitoring, then stop loss is not needed because stop loss takes time. If, for example, it goes down, it wants to go up and release the stop loss, so if we monitor the market, it's better. For example, it's time to sell - instead of seeing the price again, just sell it. A trader understands the time to sell, to use a stop loss, if it's still okay, you don't know the range of price movements selling little by little is what you want to trade."(Fjr.Plk.1)*

While each securities business produces its software, the features are often similar. However, the price movement in Forex is more active than in stocks, which can increase by 1% if you wait all day or even just for a half-hour. There can be just one that works with Android or solely on a laptop.

In line with the development of transactions on the stock exchange, transactions are generally carried out by manual trading. Manual trading is trading stocks manually. If there are exciting shares to buy, buy trading is carried out by investors manually by entering a buy order into the application system at a securities company by determining the desired price. And when it is felt that the profit obtained is quite

large, then a sell order is manually entered into the application system at the desired price.

Automation is when a process is set up, so we don't have to watch it constantly. On the Indonesia Stock Exchange, automation has been there while in the application system used by securities firms, such as the "pending order" feature when planning to sell shares at a specific price. Since the application system at the broker handles transaction execution, numerous third parties provide apps outside of stock brokers that create concepts for analysis before returning to the broker. As Ryan Filbert states, facilities like trailing stops are utilized to perform share buying or selling operations. Still, the system is necessary to monitor the market as investors desire.(Filbert, 2021),_:

The fact that the forex market is open 24 hours, five days a week, means that traders need more tools to monitor the market and even conduct regular trading, which brings us to the fourth reason why Forex needs trading robots more than stocks. On the other hand, the capital market is more laid back because it is only open from 9:00 to 15:00. Bear in mind that no trading robot can ensure that using a specific robot will always result in a profit and never a loss. It should mention that it is really a gimmick if something is offered. Every investment decision must have a risk associated, so no investment made utilizing any application will be risk-free. (Filbert, 2021):

On the other side, the use of robots was influenced by the state of the economy. The usage of trading robots is hazardous when the economy is unstable since investors find it challenging to set up trading robots owing to shifting circumstances, as stated by Brn below:

> In today's economic situation, trading robots, in my opinion, can potentially be risky. Never utilize it since the trading robot is useless now that the economy is shaking. We can use robots if the economy is stable. Most of the time, we can set up a trading robot when we know the economy is in trouble and pinpoint the problem. If this type of robot trading is challenging, we set it ourselves, and the level of protection is up to us." (Wwc.Brn.ALS_1)

Stages in Automation (Trading Robots)

Automation in stock trading goes through various stages. It happens following the times and the development of knowledge from investors. The stages in the development of trading automation are as follows:

1. Stage 1. Manual Trading

   At this stage, stock trading is performed manually by doing fundamental analysis, reading the issuer's financial reports, reading news in newspapers, and looking for information on the internet or anywhere. Self-performance includes doing technical analysis, making support-resistance, calculating indicators, and making charts to determine when buy and sell positions will be carried out; until then, carry out the execution (buy or sell) by yourself. Ryan Filbert defines it as "people who understand what they read." Here is the generation of trading manuals according to Rf (Filbert, 2020)

"The generation of automation occurs in several stages. We have discussed trading robots; if I'm not mistaken, that's the title. You can look it up 2 or 3 years ago, and I will refresh it again to make something more current. That more updated; yes, the first is the manual generation. The manual generation is the person who trades in a manual style, they can read a newspaper, he knows that it is above, he can know he is below, it is support, this is resistant this is a reversal. This direction is continuous. He knows whether to be right or wrong. Everyone who reads the newspaper knows what is going on. They can read a newspaper, and they can get the point. He can see the point, oh the point is above, below, on the left, oversold, overbought, right, there is a name called Break Out, Break Down, there is ascending, triangle lalalala, lalalala the point, is that manual means that people who understand what the manual reads " (Rf .Otm.1)

2. Applied Generation

At this stage, investors look for available analytical tools to make it easier to understand the news in the newspaper. He searches for various available indicators and performs filtering; which ones he feels are suitable will be used, and those deemed unsuitable will be discarded. Get to know moving averages, RSI, and so on, which are indicators that are available to help him do technical analysis, such as the following expression from Rf (Filbert, 2020):

"This generation has started adding applied moves. I have to find support- resistance- I'm not sure what tools can help me find out about support. And resistance aha its name is moving average- how to make a manual, it's applied instead of automatic. Why? Because the indicator has appeared, you just take it, and it appears; you have to read it. I don't fit this, I match this, I don't fit, I throw away what doesn't fit eh this one fits, but I'll modify it. It is an applied version that was taken and read to make it easier, so this is part of the technical analysis, but if I say modern technical analysis." (Rf.Otm.2)

3. Evolution Level One Generation

The evolution level one generation is a generation that searches for various tools/indicators in deciding to buy/sell shares and modifies various indicators it encounters to produce an applied analysis model for itself, which is a combination of multiple analyses. So that it can better understand the news, make independent decisions (Filbert, 2020).

"This generation is people who already know how to read newspapers. He understands the indicators, and he starts to know the weaknesses of this indicator, whether lagging, leading, false signals or the size is not quite right. So I will use this size - he already knows, so finally he says uhm if this and combined, it will produce something like this. It signifies a good application, so he made his version of the move, and so did I in the past because I have ideals. I also made my own applied version - so, for example, if you read in my book, the title

is stock investing swing trader world'ways. This book is a classic technical analysis and merged with the modern - I already have automation. The important thing is to increase profit and reduce costs, which means I can make more profit, so there's already a rebound. The sponsor's message at the beginning before concluding can't be a layman. Indeed trading can't be more common than an investor, so being a part of active trading can generate a profit. You have to be careful. If you leave it too much to the robot, you haven't concluded yet. Still, I've opened it halfway, so this level one Evolution generation doesn't only use applied science but already has its own applied knowledge. He can combine it, so it's like the one on the right of your screen, actually is an applied indicator of my version of the swing trading strategy that has a reborn that can measure the depth that I use to like". ((Rf.Otm.3)

4. Second Level Evolution Generation
    The automation generation is the second evolution stage; at this level, investors adjust a variety of indicators to determine whether to buy or sell a position, issue buys and sell alarm signals and carry out direct buys and sells, sometimes with the assistance of experienced advisers. For them to transact automatically, as explained in the following Rf (Filbert, 2020) :

    "In this generation, a robot is made that automatically gives signals when it's time to buy or sell so you can press buy or sell when the signal appears but can automate buy and sell. So at level 2, after he knows there is a buy, he will immediately buy the order if you opened the manual earlier, read your laptop, read it first after reading you take action. If this is you, don't you, you don't see, you just watch like this, as soon as he appears, the sign is immediately ordered, meaning that this move is much more complex. After all, it has arrived at buying and selling because someone said, " wow, Ryan, if I was again cooking, " it turns out that the indicator on the back of my laptop sounds ting-tung-ting-tung, buying-buying, but my hands are dirty, how do I do it? Yes right. Some people think with his strategy. Is it wrong? Of course not; why? Because maybe the strategy is concise, time precision matters for him. We don't know. Still, the point is that in this level 2 generation, it's already like pokemon; yes, there is evolve, level 1, that's an indicator that has been tweaked at level 2 until the one who tampered with was able to transfer orders to buy and sell". (Rf.Otm.4)

5. Third Evolution Generation Level. The third level of evolution is the generation of increasingly intelligent trading robots. These smart robots can learn to adjust to changing market conditions, where investors take different indicators and

modify them to determine to buy or sell positions and, at this level, increasingly sophisticated trading robots.

6. Copy Trade Generation

These investors trade by imitating the trades of others. It is comparable to the cooperative management of investment funds. The parent account is replicated to the members, ensuring that other investors will also receive any purchases made by investors on the parent account. It is comparable to fund management for an investment manager or a fund manager. We don't know if the parent account employs a computer or a human, but what is certain is that investors do nothing but follow what the parent account does. Each investor will receive a return under the percentage of funds entered. According to Rf below, this is one sort of trading automation frequently used. (Filbert, 2020):

"Trading automation is not only for robots. In more advanced times, there is also a name called copy trade, which means you copy someone else's account. Your account is someone else's account and will be mirrored like someone else's account. If he makes a purchase, you also make a purchase. If he sells, you also sell. We don't know if this person bought it because of a robot, so he installed it on the account. If your place is automatic, he is a robot, or he does a manual transaction. Why? Because you do nothing can also be called a percentage allocation management module. This fund manager is mostly Forex, so there is a pulling account. The money is placed as a percentage, and it will be transacted. Yes, it's still possible that the robot can be manual, in which automation of your trading goes up to the robot or up to the copy trade, where the copy trade is your account on the mirror. With someone's account or your money is put in one place with a percentage allocation management module so that in percentage terms it's like share ownership, it's like a business, the trading business is both your money is 10%, my money is 90%, who else's money is that, so the point is 100 People manage this %, buy and sell using this account and it turns out that if this is a profit or loss, this account will be divided prorated according to the ownership".(Rf.Otm.5)

Trading robots are becoming more complex and intelligent thanks to the increasingly quick pace of technological advancements, including artificial intelligence (AI) technology. Smart robots can now learn to adjust to changing market conditions. However, is it accurate to say that there are error-free trading robots? Rf's experience in the capital market shows that there has never been an unbeatable trading robot. A trading robot always wins because no matter what technology is used, it will never be 100% accurate. There will always be errors, things will go wrong, the market will change drastically, and other factors will prevent the robot from functioning best. Because the market is dynamic and not static, it will constantly change in response to factors such as politics, the economy,

and market emotion. Even if there is, Rf contends that it might not belong to the average retail investor. It is doubtful whether anyone who claims to have a trading robot that never loses is telling the truth because the conglomerate has much greater access to everything and can pay highly skilled individuals, including programmers and Nobel Prize winners. However, they are human and can make mistakes. Is Google Maps always correct, much like how it employs AI technology? We once discovered that Google Maps itself occasionally had glitches or errors.

Robots are used to assist humans in their work or as instruments for decision-making, but they cannot immediately take the position of humans since humans are the ones that set up robots, which needs to be done. Therefore, if people do not adapt to the times, grow in knowledge in line with the times, and better comprehend technology in line with the times, they will not be able to exist, and over time, they will be replaced by people who do. According to Rf, if stupid people use smart robots, so they will become stupid tools. To apply and understand these tools, he must have learned and understood trading, not people who are just becoming familiar with the capital market. These tools are less useful and high risk, as described in the following Rf. (Filbert, 2020):

In line with Rf, Brn also has the same opinion about trading robots, where the use of trading robots depends on the wearer. If the user can't analyze the market, then the use of robots will not be useful because robots function to help humans, but humans do the settings for the robots, as he stated:

> *"Because, once again, it's in our tendency to put anything up if the settings don't grasp how the robot performs effectively, the trading robot might have a positive or negative outcome depending on who uses it. We absolutely don't utilize robots when we understand and can assess the market. They will undoubtedly do their own calculations. Everyone has a different indicator, and how it is used will determine whether the robot survives."*
> *(Wwc.Brn.Rsk_1)*

So investors are required to be careful with advertisements that claim trading robots are invincible. Robots cannot make trades that are one hundred percent correct, because in the end it will lead to risks that may never be imagined.

Stock Trading Robot Investor Behavior Model

In terms of timezone or timeframe, there are two types of investors in investing: long-term investors and short-term investors. Long-term investors invest in a period of one year or more; they buy stocks to be kept in the long term. The second type of investor is a short-term investor, who invests in stocks in the short term (less than one year) and then resells them.

Ady et al. (2013); Ady (2015); Ady (2018a) shows that short-term investors can be distinguished according to how long they hold shares for later resale (Trading). These short-term investors can also be further divided into day traders, swing traders and position traders, where day traders are traders who make daily transactions, swing traders are traders for a period of weeks to months, and position traders are traders who trade stocks in the long term (monthly to 6 months). Short-

term investors often experience psychological pressure which causes their behavior in stock trading to experience biases such as overconfidence, representativeness, loss aversion, and self-attribution bias (Ady et al., 2013); (Ady, 2015); (Ady, 2018a). These various psychological biases make investors' returns decrease and even lose, which causes them to switch to trading robots.

In the age of globalization, automation or trading employing robot applications is becoming more prevalent. Digitization is used by many different life lines, including those in the financial market, to expedite and streamline work. The more sophisticated application systems used by securities firms, which have features or menus that investors can customize when they are unable to monitor the market, are examples of how the capital market is becoming more digital. These systems allow for successful and efficient trading. At the moment of trading, investors might still complete other tasks. For short-term investors, features like stoploss, trailing stops, got till cancel, and others improve the effectiveness and efficiency of trading.

The usage of automation and trading through robot applications is growing in the age of globalization. Digitization is used by a variety of industries, including the capital market, to expedite and streamline tasks. The increasingly sophisticated application systems used by securities firms, which have features or menus that investors can customize when they are unable to monitor the market, are examples of how the capital market is becoming more digitalized. These systems allow for effective and efficient trading. During trading hours, investors can still complete other tasks. The effectiveness and efficiency of trading for short-term investors is increased by features like stoploss, trailing stop, got till cancel, and others.
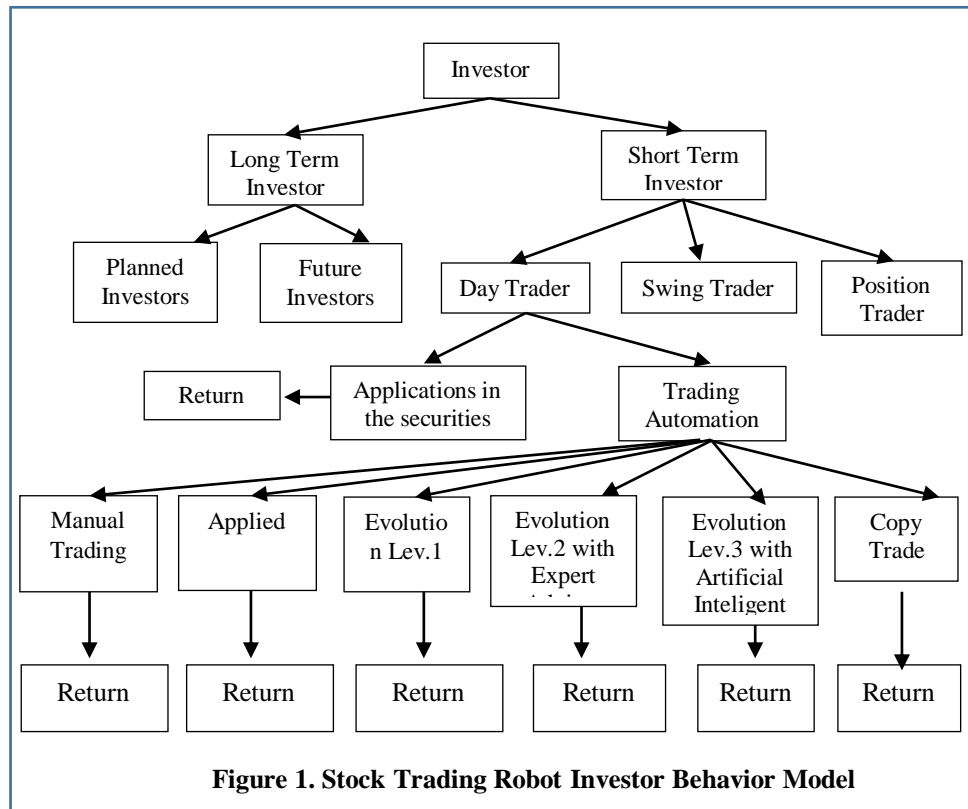
Automation has been carried out in stages in applications in securities companies. The existence of various menus such as pending orders, trailing stops, got till cancel (GTC) and so on is intended to provide facilities and conveniences for investors who cannot monitor the market fully due to other jobs, so that they can continue their work without having to monitor the market all day. However, all these facilities are actually only suitable for investors who do day trading, and less suitable for long-term investors. For long-term investors, when he uses fundamental analysis as a basis for stock selection, starting from looking at macro conditions both abroad and at home, looking at the good industrial sector at that time, and the company's financial condition, it will make it easier to choose stocks. Purchasing undervalued, highly liquid, and market-capable stores will lower the danger of losing investment capital (Capital lost). Nunes (2021) found that the main benefit of automated trading software is discipline and not making mistakes, compared to a trader who may find it challenging to stay focused on the plan. But a trader can take into account everything that happens and process it, while a robot can only make results based on pre-programmed situations. Lu (2016) demonstrates that only examining historical stock prices is insufficient to forecast future returns. (Boehmer et al., 2021) The beneficial effects of algorithmic trading are greater in large stocks than in small stocks.

In contrast to long-term investors, who purchase shares intending to hold them for the long term, they do not need to employ the aforementioned features because

they believe they will not need to sell any time soon, negating the need to keep track of the market. In particular, position trading investors and long-term investors will sell the shares when the stock price is overvalued (Ady, 2018a); (Ady, Mulyaningtyas, et al., 2020).

Short-term investors/day traders use trading robots to help make analysis and decision-making easier. They do the settings on the robot according to the market conditions they face. It is done by investors, especially if they do not have time to monitor the market continuously. There are two ways to automate trading. The first is to use an application at a securities company. Various menus are increasingly growing according to the needs of investors. Currently, many securities companies provide trading automation facilities such as Got till cancel, trailing stop, and pending orders, which makes it more accessible as a form of automation trading. And secondly, to automate trading by the stages described in the previous subtitle for increased returns, level one evolution generation, level two evolution generation, level three evolution generation, and Copy Trade Generation. The stock trading robot investor behavior model can be seen in Figure 1.

Trading robots will be employed by short-term investors more and more in the future, yet ultimately their success will depend on their knowledge of and aptitude for market analysis. Robots do not replace people; yet, even the most advanced robots will be useless in the hands of fools who are ignorant of the financial market.

Figure 1. Stock Trading Robot Investor Behavior Model

The key advantage of automated trading software, unlike a trader who finds it challenging to maintain concentration on the plan, is discipline and not making mistakes. However, a trader can process everything that occurs, unlike a robot, which can only produce outcomes based on predetermined circumstances.

CONCLUSIONS AND RECOMMENDATIONS

Investors in the short term who trade frequently need trading robots. The establishment of psychological bias and cognitive bias behavior is often a consequence of trading with high frequency and limited time horizon. Trade automation will be particularly effective in minimizing the fear and greed that frequently overshadow trading, making investors' decisions worse and lowering returns. This biased behavior will be significantly reduced.

Various degrees of trading automation demonstrate the system's level of sophistication. Securities firms continuously offer inventive and unique menus to aid investors in automated trading. Stock trading does not require a trading robot because of several factors that set it apart from FX trading: (1) Since the stock market is less volatile than the forex market, retail traders are not required to use trading robots. (2) Order-conditional justifications. This indicates that in certain

securities businesses, orders set in the trading system application are used to execute transactions involving the purchase or sale of shares. (3) Because of how more passive the stock market is compared to the currency market, (4) Since the forex market is open five days a week, twenty-four hours a day, forex traders require more instruments that can track the market and even engage in regular trading. On the other side, the Indonesian capital market is more laid back because it is only open from 9:00 to 15:00.

Trading robots and automation will be employed more and more in the future, but it is important to keep in mind that no matter how clever a trading robot is, it cannot take the position of humans because it must be programmed by humans. However, those who refuse to change with the times and adopt new technology will be displaced by those who can keep up with it because, in the future, automation will be so advanced that it will permeate all industries, including finance and the capital markets.

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Sri Utami Ady <sri.utami@unitomo.ac.id>

your submission

1 pesan

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Dear Sri Utami Ady,

We have reached a decision regarding your submission to International Journal of eBusiness and eGovernment Studies , "The PHENOMENON OF TRADING ROBOTS AS THE DIGITIZATION OF THE CAPITAL MARKET, WILL CONVENTIONAL TRADERS VANISH?".

Our decision is: Revisions Required

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Reviewers Feedback:

Reviewer A and B:

- The title of the study is clear and adequately reflects the research. However, it is advised to mention the research settings in the title.
- Too much details regarding the findings of the study have been provided in the abstract. Briefly explain the key findings and discuss the research gap before explaining the aims and objectives of the research in abstract.
- Refer to the first line of introduction section "The stock price is created..." or the stock price is determined? Proofreading required.
- Could you please support your arguments with facts and data from the local context in the introduction regarding loss avoidance and automated stock trading programs and compare it to the global one.

- Literature review is not critical and insufficient to establish the rationale of the research. Therefore, it is suggested that a critical review of the literature be included in the light of the relevant theory and the research GAP be presented accordingly.

- Explain the sample size and data collection procedure in the methodology section.
- Please provide Implications, limitations and directions for future research in separate sections.

Recommendation: Revisions Required

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THE PHENOMENON OF TRADING ROBOTS AS THE DIGITIZATION OF THE CAPITAL MARKET, WILL CONVENTIONAL TRADERS VANISH? EVIDENCE FROM INDONESIA

Ady S.U.*[1]

Corresponding author

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
sri.utami@unitomo.ac.id
ORCID ID: 0000-0002-2093-4383

Winedar M.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
mustika.winedar@unitomo.ac.id
ORCID ID: 0000-0001-8143-6284

Farida I.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

ilya.farida@unitomo.ac.id

ORCID ID: 0000-0001-9395-5882

Mulyaningtyas A.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

alvymt@gmail.com

Susena D.O.S.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

dickenoktasansu17@gmail.com

Pratama A.H.

Faculty of Agriculture and Fisheries, University of Muhammadiyah Malang, Indonesia

adielherdi.sby@gmail.com

Abstract: Numerous investors have implemented robotic applications in stock trading to minimize risk and enhance earnings in the face of volatile economic conditions and the ongoing Covid-19 epidemic. As a result of the digitization of the economy, investors prefer a strategy deemed more straightforward for predicting future stock prices. Therefore, the purpose of the study was to explore how stock investors responded to digitization, particularly in the financial and capital markets,

as well as the effectiveness of trading robots in the setting of Indonesia's capital market. This qualitative study investigated investor behavior to gain a deeper understanding of financial digitization. Moreover, the traingulation method was utilized to enhance the study's credibility and validity. The results suggested that short-term, high-frequency traders need the use of trading robots. The studies also reveal that trading automation is beneficial in minimizing the fear and greed that frequently dominate trade, so making investors' decisions worse and decreasing their returns. In certain circumstances, trading robots will not be able to replace human market participants. Several recommendations and policy implications are presented at the conclusion of the paper for future scholars.

Key words: Phenomenology, automatic trading, investor behavior, qualitative, psychological bias.

Introduction

The price of a stock is determined by the actions of market players. The stock price increases when investors are hopeful, and vice versa. The market fall is the outcome of irresponsible conduct. Consequently, rather than being rational as it should be (Ady et al., 2022); (Sadiq et al., 2020), the stock price is more influenced by psychological factors of market participants. (Ady et al., 2013); (Ady, 2014); (Ady, 2015); (Sri Utami Ady, 2018b); (Jannah & Ady, 2017); (Ady & Hidayat, 2019); (Ady, Mulyaningtyas, et al., 2020)

The discriminatory conduct of investors is characterized by representativeness, loss aversion, and self-attribution (Ady et al., 2013); (Ady, 2015). According to Shefrin (2007), representativeness biases decision-making based on stereotypical thinking or analogy, causing investors to make non-return-enhancing financial decisions.

Loss aversion is a greater compulsion to avoid losses than to acquire profits (Pompian, 2006). Loss Aversion makes investors risk-averse when evaluating possible profits because avoiding losses is more important than making profits (Shiller, 1998). When investments start to pay off, loss aversion individuals will quickly lock in profits and sell stocks because of fears that the market will reverse course and take profits. It causes investors to hold losing stocks and sell profitable stocks so that portfolio returns are not optimal (Ady, 2015); (Ady et al., 2013); (Yiwen, 2022). Loss aversion has made people avoid the stock market even though this market offers high returns. For example, in 1984, only 28% of US households owned shares, and only 12% owned shares of more than $10,000. Currently, families own 50% of the shares (L. Yang, 2019). This reluctance to invest in the stock market is associated with loss aversion. Investors are more sensitive to losses than gains, and because stock returns fluctuate, holding stocks will make investors often face losses, and thus they are reluctant to invest in the stock market (L. Yang, 2019).

Self-attribution bias is the tendency to attribute one's success to internal sources while attributing one's failure to external factors. This bias will result in (1) overconfidence (Ady, 2015), (2) overtrading (Jannah & Ady, 2017); (Ady &

Hidayat, 2019), (3) investors hearing only what they want to hear (Ady, 2018a), and (4) an underdiversified portfolio (Ady, Tyas, et al., 2020).

The Covid-19 outbreak has rendered investors mentally immobilized. It forces individuals to take more dramatic actions to stop losses or seize opportunities to make significant profits, which may produce moral hazard or increase the risk on the capital market.

In the face of volatile market conditions and the Covivirus-19 epidemic, many investors are utilizing automated stock trading tools to minimize risk and increase profits. As a result of the digitization of the economy, market participants are increasingly employing a simplified strategy for predicting future stock prices. Shah (2015) created a prediction model using data mining and machine learning techniques to determine whether to buy, sell, or hold shares. Azhikodan et al. (2019) provide automated swing trading using deep reinforcement learning to determine whether to purchase, sell, or hold positions. According to Pricope (2021), Deep Reinforcement Learning (DRL) in stock trading has tremendous application potential and can compete with expert traders given realistic assumptions (Yang et al., 2020). A set of trading strategies based on three fundamental algorithms, namely Proximal Policy Optimization (PPO), Advantage Actor Critic (A2C), and Deep Deterministic Policy Gradient (DDPG), demonstrate that the implementation of a set of strategies used in this study has outperformed the Dow Jones industrial average and the minimum variance portfolio allocation method in terms of the Sharpe ratio by balancing risk and return under transaction costs. This condition piques the researchers' interest in examining the behavior of investors in trading/investing stocks utilizing programs that lessen trading psychology. In addition, algorithm-based trading robots have emerged. It is anticipated that sophisticated technology and algorithms held by trading robots would be able to generate profits without the full control of traders. Even though trading experience is insufficient, it is believed that trading robots can deliver the same benefits as professional traders.

As a result of COVID 19, the Indonesian capital market is seeing significant growth despite the adverse economic climate, particularly in the areas of trading frequency and investor growth. According to 2020 figures, the average daily volume of stock trading increased to 667,430 times per day (Berliana, Ambarwati & Yacobus, 2022). Also, the number of investors, particularly in the capital market, has increased by 92.99% compared to the previous year's total of 7,489,337. Also, investors from the baby boomer generation are transferring to the millennial and younger generation. The proportion of investors under 30 years old is 60.02

percent, compared to investors of other age categories. However, capital market investors represent barely 1% of the population (Widyasari & Aruan, 2022).. In addition, the increased interest in investment does not correspond with a high financial literacy rate. The national poll on financial literacy done by OJK reveals a financial literacy rating of 38.03 percent. Specifically on the capital market, the ratio falls to 4.92 percent, which is fairly low (Berliana, Ambarwati & Yacobus, 2022).

Therefore, it is necessary to evaluate the behavior of individual investors using robotic applications and attempt to answer the question: What is a Trading Robot? Why do Investors use trading robots? And how do investors do stock transactions using trading robots?

Literature Review
Behavioral Finance Theory
Since March 2000, when the tech-stock bubble burst, behavioral finance, the application of psychology to financial science, has been a trendy issue (Pompian, 2006). Using psychological theories, this investigation aims to explain market inefficiencies. This idea asserts that individuals frequently make erroneous and unreasonable assumptions regarding financial issues (Ady, 2015); (Ady, Mulyaningtyas, et al., 2020). Behavioral finance is a new paradigm in finance that complements conventional financial theory by including behavioral components of decision-making. It emphasizes the application of economic principles and concepts to the formation of financial decision-making (Olsen, 1998).

(1) micro behavioral finance (BFMI), which examines the behavior or bias of individual investors that distinguishes them from rational individuals as in classical economic theory (Shefrin, 2005)(Ady et al., 2013); (Ady, 2015); (Jannah & Ady, 2017); (Ady & Hidayat, 2019); (Ady, Mulyaningtyas, et al., 2020); and (2) macro behavioral finance (BFMA), which (Ady & Mulyaningtyas, 2017). This study focuses on BFMI, the study of individual investor behavior, in order to discover psychological biases and conduct behavioral investigations on asset allocation decisions in order to minimize bias in the investment process. To be analyzed were Representativeness Bias, Loss Aversion, and Self Attribution Bias.

According to Shefrin (2007), representativeness bias is decision-making based on stereotypical thinking or analogies, which will lead to investors making poor financial decisions. These, specifically financial decisions, do not boost returns. In a similar study, Kahneman and Riepe (1998) found that investors who are susceptible to representativeness bias tend to overreact while processing information to make transaction decisions. Empirical research, such as (Lakonishok et al., 1994); (Ady et al., 2013); (Ady, Tyas, et al., 2020), demonstrates that the representative style of thinking might lead investors to erroneously believe that a good company is a good investment.

Loss aversion is a powerful desire to avoid loss rather than gain. The research of loss aversion has established a psychological rule of thumb; the probability of incurring a loss is twice as motivating as the probability of earning the same profit (Pompian, 2006). The loss aversion bias can make investors risk-averse when evaluating potential rewards, as avoiding losses is deemed more important than generating profits. When investments begin to pay off, individuals with a high loss aversion will immediately lock in profits and sell equities out of fear that the market would reverse course and wipe out their gains. In general, loss aversion encourages investors to hold losing equities and sell profitable ones, resulting in suboptimal portfolio returns (Ady, 2015); (Ady, Mulyaningtyas, et al., 2020); (Ady, Tyas, et al., 2020).

Self-attribution bias is the tendency of an individual to attribute success to internal factors and failure to external ones. This bias will cause (Pompian, 2006): (1) Self-attribution bias over a long period of success will lead to excessive self-confidence, hence increasing the risk of overconfidence; (2) Investors to trade too frequently (overtrading); and (3) Investors to only hear what they want to hear. Ady (2015) discovered that self-attribution bias occurs among investors who are overly sure that their success is due to their competence, whereas their losses are due to external reasons (Ady, Tyas, et al., 2020). These psychological biases lead investors' returns to decline and even incur losses, prompting them to adopt trading robots.

Trading Algorithm
An algorithm is a series of written instructions or methods for solving logical and mathematical problems with the aid of a computer (Sismoro, 2005). In the meantime, trading sells and purchases merchandise on the stock and foreign exchange markets. Therefore, the trading algorithm is an algorithm designed specifically for the buying and selling of stocks and foreign currency.
The algorithm serves a crucial function for the computer. From a mathematical and statistical perspective, the trading robot's ability is measured by its algorithm. Therefore, they concluded that if external factors are eliminated, a trading robot could be effective if the trading algorithm is good. Trading algorithms utilize statistics extensively. Statistics is an application of mathematics. Using data mining and machine learning approaches, Shah (2015) created a prediction algorithm to select when to purchase, sell, or keep shares. Automated swing trading was proposed by Azhikodan et al. (2019) utilizing deep reinforcement learning. It uses swing trading to determine whether to buy, sell, or maintain a position. Under reasonable assumptions, Pricope (2021) demonstrates that Deep Reinforcement Learning (DRL) in stock trading has significant application potential that rivals that of experienced traders. Yang et al (2020) The implementation of a set of trading strategies using three fundamental algorithms, namely Proximal Policy Optimization (PPO), Advantage Actor Critic (A2C), and Deep Deterministic Policy

Gradient (DDPG), outperformed the average Dow Jones industrial rate and minimum variance portfolio allocation method in terms of the Sharpe ratio by balancing risk and return under transaction costs.

Robot Trading vs. conventional trader

Trading automation research was conducted by Azhikodan et al. (2019). Using deep reinforcement learning, experiment with swing trading to determine a buy, sell or hold the position. This study answers the need to predict stock value trends that work along the reinforcement algorithm—also implementing a sentiment analysis model using a recurrent convolutional neural network to predict stock trends based on financial news. This paper aims to prove that the reinforcement learning method can teach stock trading tricks. Shah (2015) developed a predictive model to decide when to buy, sell or hold shares using data mining and machine learning techniques. Machine learning techniques such as Naive Bayes, k-Nearest Neighbor(k-NN), Support Vector Machine(SVM), Artificial Neural Network(ANN), and Random Forest are used for predictive model development. Using data mining and machine learning techniques, the model provides buy-and-hold signals for the capital market to capital market users, such as the amount invested, time duration, minimum profit, and maximum loss. Using these buy and sell signals will reduce investors' psychological factors.

Pricope (2021) shows that Algorithmic stock trading has become a staple in today's financial markets. The majority of trading is fully automated. Deep Reinforcement Learning (DRL) agents are proving to be a force to be reckoned with in stock trading. They have demonstrated enormous potential for an application that rivals professional traders under solid assumptions, although this research is still in a very early stage of development. Ashfaq et al. (2021) show that to predict future prices, use machine learning to use past stock prices. However, Caporale et al. (2016) using trading robots shows that trading strategies exploiting daily patterns do not produce abnormal returns. There is no significant difference between the sub-periods of 2005 – 2006 (Normal), 2007-2009 (Crisis), and 2019-2011 (post-crisis). Lu, (2016) Simply looking at past stock prices is not enough to predict future returns using automated trading. A better way is to look at all the targeted sectors and use historical price information from all companies in that sector to predict the target return for the next day. Boehmer et al. (2021) Show that the average algorithmic trading improves liquidity and informational efficiency but increases short-term volatility. Ani Omuchesi & Bosire (2014) Showed that the introduction of ATS did not have a statistically significant effect on the Nairobi Securities Exchange market efficiency. Overall, the results show that automation has not yielded the expected benefits in increasing the efficiency of the Nairobi Stock Exchange.

Nunes (2021) conducted qualitative research analyzing the advantages and disadvantages of trading algorithms, showing: (1) BNP Paribas has developed many automated trading systems (ATS), but there is still much room for improvement and implementation of new systems. (2) The main benefits of the tool Automated trading software are disciplined and making no mistakes, compared to a

trader who may find it challenging to stay focused on the plan. Nevertheless, a trader can take into account everything that happens and process it, while a robot can only make results based on a pre-programmed situation. (3) Automated trading systems are cheaper and increase business volume. Automated trading systems increase business profits and efficiency. However, limits must be set to maximum drawdown that can damage the robot triggered by the stop loss on each trade.

Based on the research findings above, there is a gap in the use of trading robots compared to conventional traders about whether trading robots can fully replace the human role in stock trading. Are trading robots capable of working so efficiently that we can fully trust them? Will robots control trading activities in the future?

Method

We examined the effectiveness of robotic applications through qualitative paradigm research and phenomenological approaches. To do this, we conducted 5 interviews with investors to assess their behavior and perceptions on robot trading. Due to this, the primary elements of the qualitative methodology utilized in this study are centered on meaning, context, and emic viewpoints. In contrast to quantitative research, the objective of this paradigm was to comprehend and investigate in order to interpret the meaning, not to explain and forecast a link. In general, qualitative research sought to comprehend what was experienced, why it was experienced, and how it was experienced.

This study employs a qualitative interpretative paradigm and the phenomenology and deontology approaches of Schutz. It seeks to comprehend the phenomenon's significance and the moral dimensions of investor behavior through the selection of informants using purposeful and snowball tactics. The context of the study is individual investors. The search for informants was carried out using a purposive method, namely selecting informants by looking at predetermined qualifications. Informants are active investors who have invested in stocks for at least five years. In-depth interviews were conducted at a place agreed upon by the informants within four months. The data collection process is interactive, with a duration of 1 to 2 hours, depending on the conditions of the interview. To get key informants, researchers obtain information from securities companies, then search for others informants using the snowball technique. In-depth interviews were conducted three to four times until they reached saturation depending on the researcher's subjectivity and the research problem to be investigated (Bogdan & Biklen, 2003); (Glaser & Strauss, 1967); (Guba & Lincoln, 2004).

 Qualitative research does not aim to draw general conclusions but to explore the unique experience of each informant. Hence, the importance of qualitative research is not the sample size but the depth and uniqueness of the perceptions and experiences of each informant. In-depth interviews, participant observation, and documentation were employed to collect data. To verify the validity and reliability of qualitative data, the following criteria are used: (Daymon & Holloway, 2007), (Shenton, 2004), credibility/trustworthiness employing triangulation, member

checking, and external audit. Bracketing and epoche are used for authenticity/confirmability. As part of the triangulation technique, the researchers also analyzed YouTube videos' content in order to collect additional data and gain a deeper understanding of the issue under investigation.

The analysis of data employed phenomenological data analysis (Moustakas, 1994). Through the following steps, data analysis was conducted: (1) defining units and categorizing topics. This is the step of phenomenological reduction. (2) Individual textual-structural descriptions, completing each subject with detailed textual and structural descriptions (comprehensive descriptions) of the informants' experience. (3) Site-to-site analysis At this stage, cross-analysis was performed on the participants for the same unit of meaning and a textual and structural description was created for all participants (Composite textual and structural description) in order to determine the essence of substance. (4) The identification of the experience's essence is the product of a composite textual-structural narrative or cross-site analysis. This phase combines intuition, implicit dimensions, introspection, and reflection with textual and structural descriptions (Creswell, 2007). In order to extract the pertinent material from the interviews, we applied thematic analysis and assigned codes to common terminology on this basis. With this assistance, themes were able to be discovered, allowing for the sequential interpretation of findings.

Finding

Automated trading is a sort of robot trading. The software executes trading transactions completely automatically and in accordance with predefined algorithms. Only the program parameters can be altered by humans, while this software runs autonomously. The robots employed in commerce are unlike those seen in science fiction. It consists of server-side software (high-performance computer). Therefore, future traders will be a collection of trading servers. (Wira, 2021)

Typically, algorithmic trading refers to trading robots or automated trading. Generally, each trading robot has a unique strategy and algorithm that is designed by its manufacturer. These techniques and algorithms are referred regarded as black boxes due to their secrecy. Trading robots are frequently referred to as black box trading. Every major financial institution has its own black box, such as Chameleon (created by BNP Paribas), Stealth (created by Deutsche Bank), Sniper, and Guerrilla (developed by Credit Suisse). Now, retail traders are beginning to employ trading robots. For instance, it is typical for stock traders to utilize their individual online trading software. Or trade Forex, commodities, and indices using a MetaTrader Expert Advisor (EA).

There are numerous benefits to use trading robots, including (1) the elimination of all psychological aspects of trading. Thus, it is anticipated that trading robots would reduce human error and execute a high volume of transactions continually. The trading robot is able to conduct continuous transactions on all markets by repeatedly using the same algorithm; (3) Speed; trading robots are capable of executing transactions very quickly. It is comparable to the speed of an electron. When trading robots were initially created, speed became an advantage. As more and more people utilize trading robots, speed is no longer the primary advantage.

Should Trading Robots be Used?

In March 2014, Virtu Financial, an HFT company, announced that it has completed 1277 profitable transactions out of 1,267 days during the previous five years. In a period of five years, Virtu lost only one day. According to Virtu's promises, automated trading can be successful. However, not all trading robots are advantageous. To be effective, a trading robot must satisfy two conditions: 1. a superior algorithm Servers with a high bandwidth

These two prerequisites are not met by retailers. Rapid servers are expensive. Creating algorithms that are more powerful than institutions is likewise difficult. The development of these algorithms requires intellectual capacity and a substantial investment in research.

Even though they are becoming increasingly widespread, trading robots are only extensions of human emotions. Human psychology continues to be necessary in the marketplace. Due to this mentality, even the most sophisticated algorithms are incapable of predicting the market. There is always a chance for conventional traders, particularly those who still trade manually, to profit from the market.

Forex utilizes trading robots more than the stock market since the stock market is less volatile than the forex market. Informant 1 (Fj) from Pintraco Securitas asserts that retail traders do not need to use trading robots. Foreign exchange and stocks behave differently on a fundamental level. In forex transactions, investors can sell foreign exchange even if they do not possess foreign currency. Margin trading is a term used in the trading industry. However, trading on margin is prohibited on the capital market. As the acquisition of shares includes the acquisition of a corporation, an investor who already possesses shares may sell them as follows.

> "Well, if we buy shares, we buy a company. If we sell shares, we sell a company. However, if we already own a company, we can sell it because other things in shares are certain. For example, when we buy shares, we receive a certificate that our actual purchase will bind the company. If there is nothing comparable in Forex, you can discuss purchasing or selling first because it is simpler to move around if it is stock. You don't have to buy it first; then we can sell it. When the company makes a profit, we splash the dividend " (Fjr. .Als.1)

Foreign currency transactions are more accessible for transferring ownership from one investor to another since they are not tied to the right to dividends, as is the case with stocks. Consequently, the registration of these transactions is less

complicated. The absence of conditional orders is the second reason why robot trading should not be used in stock trading. It shows that in certain securities firms, trading system application-determined fees are employed to perform transactions involving the buy and sale of shares. When placing a purchase or sale order, the state of the market has a significant impact on every transaction. As noted by Fjr, it is opposed to the automatic buying and selling operations that occur in foreign exchange:

> *"It's not like a robot in Forex that can be set up; if you buy the stock and then set it to sell, it will be set. The order condition is that when you want to sell, you must understand the conditional order on purchasing and selling. Yes, it has to do with selling it; therefore, we want to know how much to ask for it to share; at this point, I want to sell it for 1,500 or stop losing money."*
> *(Fjr.Al.2)*

The GTC (Got Till Cancel) menu, which is a function to sell shares at the specified price for one month or until the investor cancels the instruction, is available in stock trading programs, particularly the Pintraco system. This product is aimed for investors who wish to sell shares at a certain price without continuously monitoring the market and making sell orders. Consequently, investors who intend to sell their shares at a specified price can do so using the GTC menu without having to monitor price fluctuations.

Stop loss refers to selling at a loss. The action is taken by investors if the stock price continues to fall. Utilizing the stop loss option, he attempts to reduce his losses. If the price is reached, the system will sell automatically to prevent further losses. There is a separate word known as trailing stop. This menu is utilized by investors who wish to monitor the market and conduct trades based on market conditions.

According to Fjr, because stock transactions are lengthy and very conditional, trading robots are seldom used in them. Instead, investors must monitor the market and adjust their strategies accordingly. Using the settings menu of the securities application system, investors are able to configure transactions. Each security will develop its own program, such as "profit" for Pintraco Securities, "Mouse" for Mandiri Sekuritas, etc. Each firm has distinctive characteristics that attract and enable investors. Some are simple and require a laptop, although others, such as Pintraco, may already be used on Android devices, but are still more popular for foreign exchange transactions.

The stock market is more passive than the foreign exchange market, which is the third reason why trading robots are unnecessary in the stock market. The foreign currency market is more active than the capital market, which fluctuates slowly every minute or even second. If the price is satisfactory, you just monitor the market and, if necessary, sell the asset—possibly on a separate day for swing traders or position traders. In contrast to the foreign exchange market, which can be set up with a 1% selling down, this market still requires daily manual market monitoring by humans, with the exception of the previously described setting up of robots.

> *"Yes, if the robot is set up, we don't need to watch it. For instance, buying for 1000 and then selling it at 1500, but I asked the computer to monitor it first up to 1,600, 1,700, precisely at the price of 1000, I input the trailing stop menu of 1,500." (Fjr.Al.4)*

Stocks are long-term, durable investments. Pintraco Securities, on the other hand, provides opportunities for investors desiring rapid trading. Not all securities firms, however, have access to this capacity. However, each security has a distinct application, and the firm determines which one is developed. Long-term investors who purchase shares for storage do not need to utilize stop loss, GTC, or trailing stop facilities since shares are held rather than sold daily, mostly until they are sold at a loss. Due to fluctuating stock prices, it is recommended to save. The price of the stock purchased this morning may have decreased, but novice traders with a high level of psychological sophistication may feel afraid and apply a stop loss. In actuality, the stock price increased shortly thereafter, causing investors to lament their decision. According to Fjr's interview, many investors continue to act as stated because they are uninformed of the distinctions between day trading and long-term investing.

> *"When someone has a need and does not have the opportunity to monitor it, he is represented by a stop loss. But if he is monitoring, then stop loss is not needed because stop loss takes time. If, for example, it goes down, it wants to go up and release the stop loss, so if we monitor the market, it's better. For example, it's time to sell - instead of seeing the price again, just sell it. A trader understands the time to sell, to use a stop loss, if it's still okay, you don't know the range of price movements selling little by little is what you want to trade."(Fjr.Plk.1)*

While each securities firm develops its own software, the characteristics are frequently comparable. However, Forex price fluctuations are more volatile than stock price fluctuations, which can climb by 1% if you wait all day or even just half an hour. There may be only one that operates on Android or only on a computer.

In accordance with the evolution of transactions on the stock exchange, most transactions are conducted manually. Manual trading is the act of trading stocks by hand. Investors engage in buy trading manually by submitting a buy order into the application system of a securities firm after calculating the desired price, if there are desirable shares to purchase. And when it is determined that the profit obtained is substantial, a sell order at the desired price is manually placed into the application system.

Automation is when a process is set up such that it does not require ongoing monitoring. On the Indonesia Stock Exchange, automation has existed in the application system utilized by securities firms, such as the "pending order" function when planning to sell shares at a specific price. Since the broker's application system controls transaction execution, various third parties offer applications that generate concepts for analysis before sending them back to the broker. According to Ryan Filbert, services such as trailing stops are utilized for share trading operations. Nonetheless, the system is required to monitor the market as desired by investors. (Filbert, 2021),:

Because the forex market is open 24 hours a day, five days a week, traders want more tools to monitor the market and even undertake regular trading, which leads us to the fourth reason why Forex requires trading robots more than equities. The capital market, on the other hand, is less hectic because it is only open from 9:00 to 15:00. Keep in mind that no trading robot can guarantee that using a certain robot will always result in a profit. If something is presented, it should be noted that it is actually a gimmick. Every investment decision must involve risk, so no investment made using any program will be entirely risk-free. (Filbert, 2021):

On the other hand, the state of the economy affected the use of robots. When the economy is unstable, the use of trading robots is risky because investors find it difficult to set up trading robots due to fluctuating market conditions, as indicated by Brn below.

> *In today's economic situation, trading robots, in my opinion, can potentially be risky. Never utilize it since the trading robot is useless now that the economy is shaking. We can use robots if the economy is stable. Most of the time, we can set up a trading robot when we know the economy is in trouble and pinpoint the problem. If this type of robot trading is challenging, we set it ourselves, and the level of protection is up to us." (Wwc.Brn.ALS_1)*

Stages in Automation (Trading Robots)

Various stages of stock trading automation exist. It occurs in accordance with the epoch and the evolution of investor knowledge. The following are the stages in the evolution of trading automation:

1. Phase 1. Trading by Hand

Currently, stock trading is conducted manually by performing fundamental analysis, examining the issuer's financial reports, reading the news in newspapers, and searching the Internet or anywhere else for information. Self-performance entails performing technical analysis, creating support-and-resistance, calculating indicators, and creating charts to identify when buy and sell positions will be executed; until then, perform the execution (buy or sell) yourself. It is defined by Ryan Filbert as "those who comprehend what they read." Here is the Rf-compliant generation of trade manuals (Filbert, 2020)

> *"The generation of automation occurs in several stages. We have discussed trading robots; if I'm not mistaken, that's the title. You can look it up 2 or 3 years ago, and I will refresh it again to make something more current. That more updated; yes, the first is the manual generation. The manual generation is the person who trades in a manual style, they can read a newspaper, he knows that it is above, he can know he is below, it is support, this is resistant this is a reversal. This direction is continuous. He knows whether to be right or wrong. Everyone who reads the newspaper knows what is going on. They can read a newspaper, and they can get the point. He can see the point, oh the point is above, below, on the left, oversold, overbought, right, there is a name called Break Out, Break Down, there is*

ascending, triangle lalalala, lalalala the point, is that manual means that people who understand what the manual reads " (Rf .Otm.1)

2. Applied Generation

At this stage, investors look for available analytical tools to make it easier to understand the news in the newspaper. He searches for various available indicators and performs filtering; which ones he feels are suitable will be used, and those deemed unsuitable will be discarded. Get to know moving averages, RSI, and so on, which are indicators that are available to help him do technical analysis, such as the following expression from Rf (Filbert, 2020):

"This generation has started adding applied moves. I have to find support-resistance- I'm not sure what tools can help me find out about support. And resistance aha its name is moving average- how to make a manual, it's applied instead of automatic. Why? Because the indicator has appeared, you just take it, and it appears; you have to read it. I don't fit this, I match this, I don't fit, I throw away what doesn't fit eh this one fits, but I'll modify it. It is an applied version that was taken and read to make it easier, so this is part of the technical analysis, but if I say modern technical analysis." (Rf.Otm.2)

3. Evolution Level One Generation

The evolution level one generation is a generation that searches for various tools/indicators in deciding to buy/sell shares and modifies various indicators it encounters to produce an applied analysis model for itself, which is a combination of multiple analyses. So that it can better understand the news, make independent decisions (Filbert, 2020).

"This generation is people who already know how to read newspapers. He understands the indicators, and he starts to know the weaknesses of this indicator, whether lagging, leading, false signals or the size is not quite right. So I will use this size - he already knows, so finally he says uhm if this and combined, it will produce something like this. It signifies a good application, so he made his version of the move, and so did I in the past because I have ideals. I also made my own applied version - so, for example, if you read in my book, the title is stock investing swing trader world'ways. This book is a classic technical analysis and merged with the modern - I already have automation. The important thing is to increase profit and reduce costs, which means I can make more profit, so there's already a rebound. The sponsor's message at the beginning before concluding can't be a layman. Indeed trading can't be more common than an investor, so being a part of active trading can generate a profit. You have to be careful. If you leave it too much to the robot, you haven't concluded yet. Still, I've opened it halfway, so this level one Evolution generation doesn't only use applied science but already has its own applied knowledge. He can combine it, so it's like the one on the right of your screen, actually is an applied indicator of my version of the swing trading strategy that has a reborn that can measure the depth that I use to like". ((Rf.Otm.3)

4. Second Level Evolution Generation

The automation generation is the second evolution stage; at this level, investors adjust a variety of indicators to determine whether to buy or sell a position, issue buys and sell alarm signals and carry out direct buys and sells, sometimes with the assistance of experienced advisers. For them to transact automatically, as explained in the following Rf (Filbert, 2020) :

> *"In this generation, a robot is made that automatically gives signals when it's time to buy or sell so you can press buy or sell when the signal appears but can automate buy and sell. So at level 2, after he knows there is a buy, he will immediately buy the order if you opened the manual earlier, read your laptop, read it first after reading you take action. If this is you, don't you, you don't see, you just watch like this, as soon as he appears, the sign is immediately ordered, meaning that this move is much more complex. After all, it has arrived at buying and selling because someone said, " wow, Ryan, if I was again cooking, " it turns out that the indicator on the back of my laptop sounds ting-tung-ting-tung, buying-buying, but my hands are dirty, how do I do it? Yes right. Some people think with his strategy. Is it wrong? Of course not; why? Because maybe the strategy is concise, time precision matters for him. We don't know. Still, the point is that in this level 2 generation, it's already like pokemon; yes, there is evolve, level 1, that's an indicator that has been tweaked at level 2 until the one who tampered with was able to transfer orders to buy and sell". (Rf.Otm.4)*

5. Third Evolution Generation Level. The third level of evolution is the generation of increasingly intelligent trading robots. These smart robots can learn to adjust to changing market conditions, where investors take different indicators and modify them to determine to buy or sell positions and, at this level, increasingly sophisticated trading robots.

6. Copy Trade Generation

   These investors trade by imitating the trades of others. It is comparable to the cooperative management of investment funds. The parent account is replicated to the members, ensuring that other investors will also receive any purchases made by investors on the parent account. It is comparable to fund management for an investment manager or a fund manager. We don't know if the parent account employs a computer or a human, but what is certain is that investors do nothing but follow what the parent account does. Each investor will receive a return under the percentage of funds entered. According to Rf below, this is one sort of trading automation frequently used. (Filbert, 2020):

   > *"Trading automation is not only for robots. In more advanced times, there is also a name called copy trade, which means you copy someone else's account. Your account is someone else's account and will be mirrored like someone else's account. If he makes a purchase, you also make a purchase. If he sells, you also sell. We don't know if this person bought it because of a robot, so he installed it on the account. If your place is automatic, he is a robot, or he does a manual transaction. Why? Because you do nothing can also be called a percentage allocation management module. This fund manager is mostly Forex, so there is a pulling account. The money is placed*

as a percentage, and it will be transacted. Yes, it's still possible that the robot can be manual, in which automation of your trading goes up to the robot or up to the copy trade, where the copy trade is your account on the mirror. With someone's account or your money is put in one place with a percentage allocation management module so that in percentage terms it's like share ownership, it's like a business, the trading business is both your money is 10%, my money is 90%, who else's money is that, so the point is 100 People manage this %, buy and sell using this account and it turns out that if this is a profit or loss, this account will be divided prorated according to the ownership".(Rf.Otm.5)

Due to the rapid rate of technical breakthroughs, particularly artificial intelligence (AI) technologies, trading robots are becoming increasingly sophisticated and clever. Intelligent robots may now adapt to shifting market conditions. Nevertheless, is it true that there are error-free trading robots? Capital market experience demonstrates that there has never been an unbeatable trading robot. No matter what technology is used, a trading robot will always win since it will never be 100 percent correct. There will always be errors, things will go wrong, the market will fluctuate rapidly, and other circumstances will hinder the robot's optimal performance. Due to the fact that the market is not static, it will constantly alter in response to factors such as politics, the economy, and market sentiment. Even if there is, Rf argues that it may not be accessible to the average retail investor. It seems unlikely that anyone who claims to have a trading robot that never loses is telling the truth, given that the corporation has access to everything and can afford to hire highly talented individuals, such as programmers and Nobel laureates. However, they are human and capable of making errors. Is Google Maps always accurate, similar to how it uses AI technology? We once observed that Google Maps itself has faults and mistakes on occasion.

Robots are employed to aid humans in their work or as decision-making tools, but they cannot immediately replace humans because humans must set up robots, which is a necessary step. Therefore, if people do not adapt to the times, increase their knowledge in accordance with the times, and better comprehend technology in accordance with the times, they will not be able to continue existing, and they will be replaced over time by those who do. According to Rf, if idiots utilize intelligent robots, they will become idiotic tools. To apply and comprehend these instruments, he must have learnt and comprehended trading, which is not the case for individuals who are just becoming acquainted with the capital market. According to the following Rf (Filbert, 2020), these tools are less effective and high-risk.

Brn shares the same view as Rf regarding trading robots, namely that their use is dependent on the wearer. If the user cannot assess the market, then the usage of robots will be ineffective because robots are designed to assist humans, but humans control the robots' settings, as he stated:

"Because, once again, it's in our tendency to put anything up if the settings don't grasp how the robot performs effectively, the trading robot might have a positive or negative outcome depending on who uses it. We absolutely

don't utilize robots when we understand and can assess the market. They will undoubtedly do their own calculations. Everyone has a different indicator, and how it is used will determine whether the robot survives."
(Wwc.Brn.Rsk_1)

So investors are required to be careful with advertisements that claim trading robots are invincible. Robots cannot make trades that are one hundred percent correct, because in the end it will lead to risks that may never be imagined.

Stock Trading Robot Investor Behavior Model

There are two categories of investors in terms of timezone or timeframe: long-term investors and short-term investors. Long-term investors invest for a period of one year or longer; they purchase stocks for long-term holding. The second sort of investor is a short-term investor, who purchases equities for less than a year and resells them.

According to Ady et al. (2013), Ady (2015), and Ady (2018a), short-term investors can be identified by the length of time they retain shares for subsequent resale (Trading). These short-term investors can further be subdivided into day traders, swing traders, and position traders, where day traders are traders that conduct daily transactions, swing traders trade for a period of weeks to months, and position traders trade equities over the long term (monthly to 6 months). Short-term investors frequently encounter psychological pressure, which results in biases such as overconfidence, representativeness, loss aversion, and self-attribution bias in their stock trading behavior (Ady et al., 2013); (Ady, 2015); (Ady, 2018a). These different psychological biases lead investors' returns to decline and even incur losses, prompting them to adopt trading robots.

In the era of globalization, automation or trading utilizing robot applications is becoming increasingly common. Numerous industries, including the financial market, employ digitization to speed and streamline labor processes. Digitalization of the capital market is exemplified by the more sophisticated application systems employed by securities firms, which contain features or menus that investors can configure while they are unable to monitor the market. These solutions facilitate profitable and efficient trading. At the time of trade, investors may perform additional duties. Features such as stoploss, trailing stops, got till cancel, and others enhance the effectiveness and efficiency of trading for short-term investors.
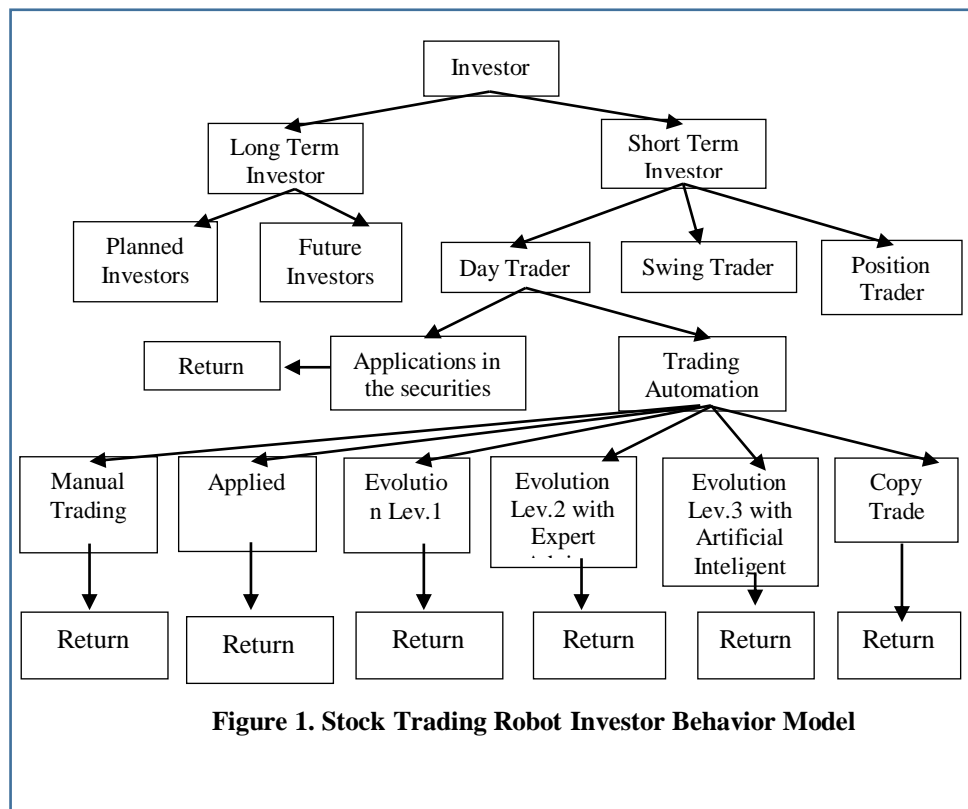
In this age of globalization, the use of robot applications for trading and automation is increasing. Diverse businesses, including the financial market, use digitization to speed and streamline activities. The more sophisticated application systems employed by securities firms, which include features or menus that investors can configure while they cannot monitor the market, are examples of how the capital market is becoming increasingly digitized. These systems enable efficient and effective trade. During trading hours, investors may perform additional duties. Features such as stoploss, trailing stop, got till cancel, and others boost the effectiveness and efficiency of trading for short-term investors.

Applications within securities companies have been automated in stages. The purpose of menus such as pending orders, trailing stops, got till cancel (GTC), etc. is to give facilities and conveniences for investors who cannot completely monitor the market due to other responsibilities, allowing them to continue working without having to monitor the market all day. All of these capabilities are, however, more suited to day traders than to investors with a longer-term perspective. It will be easier for long-term investors to choose stocks when fundamental research is used as a basis for stock selection, beginning with an examination of macroeconomic conditions both domestically and internationally, the company's industrial sector, and its financial health. Purchasing undervalued, highly liquid, and marketable stores will reduce the risk of capital loss (Capital lost). According to Nunes (2021), the primary advantage of automated trading software is discipline and avoiding errors, as opposed to a trader who may find it difficult to stay focused on the plan. A trader, however, can take into consideration and process everything that occurs, whereas a robot can only respond to pre-programmed events. Lu (2016) illustrates that previous stock prices alone are insufficient for predicting future profits. (Boehmer et al., 2021) The advantages of algorithmic trading are larger for large equities than for small ones.

In contrast to long-term investors, who purchase shares with the intention of holding them for the long term, short-term investors do not need to utilize the aforementioned features because they do not anticipate selling any time soon, eliminating the need to monitor the market. Specifically, position trading investors and long-term investors will sell the company when it is overvalued (Ady, 2018a); (Ady, Mulyaningtyas, et al., 2020).

Day traders and short-term investors utilize trading robots to facilitate analysis and decision-making. They configure the robot based on the market conditions they encounter. It is performed by investors, especially if they lack the time to regularly monitor the market. Two methods exist for automating trading. The initial step is to utilize an application at a securities firm. Various menus are expanding in response to the needs of investors. Currently, numerous securities firms offer trading automation features such as Got until cancel, trailing stop, and pending orders, making it more accessible as a type of automated trading. And secondly, to automate trading according to the stages outlined in the preceding subheading for greater returns: level one evolution generation, level two evolution generation, level three evolution generation, and Copy Trade Generation. Figure 1 depicts the investor behavior model for stock-trading robots.

In the future, more and more short-term investors will use trading robots, but their success will ultimately depend on their market analytical skills and knowledge. People are not replaced by robots; yet, even the most advanced robots will be useless in the hands of fools who lack financial market knowledge.

Figure 1. Stock Trading Robot Investor Behavior Model

The primary advantage of automated trading software, as opposed to a trader who finds it difficult to retain focus on the plan, is discipline and the absence of errors. Contrary to a robot, who can only provide outcomes based on predetermined conditions, a trader is capable of analyzing all events.

CONCLUSIONS

Frequently trading short-term investors require trading robots. Trading with high frequency and a short time horizon frequently results in the development of psychological bias and cognitive bias. Trade automation will be especially successful in reducing the fear and greed that frequently overshadow trading, hence improving investor decisions and increasing profits. This biased behavior will be drastically diminished.

Implications

Different levels of trading automation reflect the sophistication of the system. Consistently, securities businesses provide investors with imaginative and distinctive menus to facilitate automated trading. Stock trading does not necessitate

a trading robot due to many features that distinguish it from foreign exchange trading: (1) Since the stock market is less volatile than the foreign exchange market, retail traders are not forced to employ trading robots. (2) Order-conditional justifications. This signifies that orders entered into the trading system application are utilized to execute transactions involving the purchase or selling of shares in certain securities businesses. (3) The stock market is more passive than the currency market (4) Since the forex market is open five days a week, 24 hours a day, forex traders need more instruments that can follow the market and engage in regular trading. The Indonesian capital market, on the other hand, is more relaxed because it is only open from 9:00 to 15:00.

Limitations

The limitation of this research is the absence of female informants who can complement the behavior of investors from a different gender perspective. The limited number of investors willing to participate in being interviewed and the condition of the COVID-19 pandemic that has not entirely subsided are limitations too for researchers in collecting data.

Future Direction

Future use of trading robots and automation will increase, but it is crucial to remember that no matter how intelligent a trading robot is, it cannot replace humans because it must be trained by humans. In the future, however, automation will be so advanced that it will pervade all industries, including finance and the financial markets. Therefore, this study provides guidance for future researchers to investigate the applicability of trading robots in a more comprehensive manner.

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Sri Utami Ady <sri.utami@unitomo.ac.id>

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Dear Sri Utami Ady,

Reviewers have now commented on your paper. You will see that there are a number of issues that need to be addressed before the paper can be accepted for publication by International Journal of eBusiness and eGovernmment Studies.

Reviewers' comments:

The topic is very interesting, and the approach used is justified in literature. The paper is well written. I have few suggestions to improve the paper.
1) Title needs to be revised.
2) Even though abstract is written in precise manner, there is still room for improvement, for e.g. problem statement and methods can be improved further in the abstract
3) Section 1 defines exactly the novelty of the paper which I think need to be improved with clear insights. Motivation should be revised.
4) The analysis should be revised as in the current state it is very weak and need significant improvement.
5) Results Section provided enough inputs. Finally, the policy choice deriving by this tool. I suggest the authors to define a specific policy implication that defines the policy aspect.
6) Update the paper with relevant and recent references.
7) Add the limitations and future recommendations of the study

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THE ROLE OF INVESTORS' BEHAVIOR AND PSYCHOLOGICAL UNBIASEDNESS ON THE DIGITIZATION OF THE CAPITAL MARKET IN INDONESIA: MEDIATING ROLE OF TECHNOLOGY ADVANCEMENT

Ady S.U.*[1]

Corresponding author

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
sri.utami@unitomo.ac.id

ORCID ID: 0000-0002-2093-4383

Winedar M.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.
mustika.winedar@unitomo.ac.id

ORCID ID: 0000-0001-8143-6284

Farida I.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

ilya.farida@unitomo.ac.id

ORCID ID: 0000-0001-9395-5882

Mulyaningtyas A.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

alvymt@gmail.com

Susena D.O.S.

Economic and Business Faculty, University of Dr. Soetomo, Indonesia.

dickenoktasansu17@gmail.com

Pratama A.H.

Faculty of Agriculture and Fisheries, University of Muhammadiyah Malang, Indonesia

adielherdi.sby@gmail.com

Abstract: Recently, the digitalization of the financial markets is the requirement of the modern world that requires the attention of regulators and researchers. Hence, the current article investigates the impact of investors' behavior towards technology adoption and psychological unbiasedness about technology advancement on the digitalization of the capital market in Indonesia. The study also examines the mediating role of technology advancement among investors' behavior toward technology adoption, psychological unbiasedness about technology

advancement and digitalization of the capital market in Indonesia. The article used questionnaires to collect the data from the selected respondents. The study also applied the PLS-SEM to test the association between the variables using smart-PLS. The results indicated that the investors' behavior towards technology adoption and psychological unbiasedness about technology advancement have positive relationships with the digitalization of the capital market in Indonesia. The findings also exposed that the technology advancement mediates among investors' behavior and psychological unbiasedness and digitalization of the capital market in Indonesia. The study guides the policymakers in establishing policies related to the digitalization of the capital market by promoting the investors' behavior and psychological unbiasedness towards technology adoption.

Introduction

The capital market of any country is one of the key supporters and contributors to the country's economy. The capital market is also the indicator of foreign direct investment, whether to invest in the country or not. As the capital market is an organized physical location where securities are exchanged (O. Kim, 2020; Żebrowska-Suchodolska & Mentel, 2018). It is essential to realize that the stock market is a structured system that connects direct and indirect sellers and purchasers of securities. Over the past few years, one of the factors which affected the financial markets all around the globe is Covid pandemic. As the Covid-19 pandemic put a lot of pressure on Indonesia's stock market throughout 2020, the number of investors in the market has seen a significant increasing trend. With the frequency of the increased transactions, the total number of investors in the capital market climbed to 3.88 million, there is a 56% increase from the previous year. The number of investors continued to rise to 4 million investors till January 2021. According to KSEI statistics from October 2020, a fintech trading agent attracted over 49.75 percent of capital market participants (Hamzah, 2018; Hani, Heru, & Isworo, 2020). These statistics demonstrate how a change in consumer behavior affects the industry's move to digital platforms. Thus, there is an association between consumer behavior (which build from the individual psyche) and the digitalization of any industry in the country (Sima, Gheorghe, Subić, & Nancu, 2020; Valverde & Fernández, 2020).

Despite that, there are numerous challenges faced by the investors regarding digitalization of the capital market like investor resistance in terms of avoidance of market digitalization, investor psyche, and country's economic as well as political circumstances. The present study will address the investor's role in capital market digitalization. The retention of the investors is the ultimate aim of the capital market. Market while having decision analyze every aspect of the decision to avoid any sort of resistance. Indonesia is a developing country, therefore, likewise, the developed countries it's not fully digitalized. With the view to meet international clients the capital market gets itself digitalized. This digitalization is expressing the effect on that people. The factors like investor behavior along with psychological biasedness are the key element in the entire process (ady, 2013); (Ady, 2018); (Ady, 2019) . Therefore, the present study will address the investor's role in the digitalization of the capital market. Indonesian capital market conditions are given in figure 1.
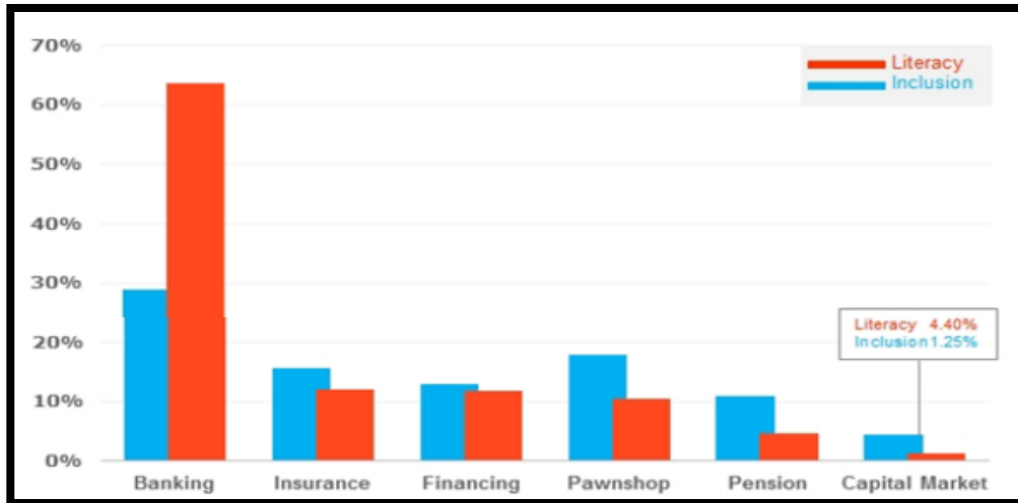
Figure 1: Indonesian capital market conditions

The present study will address some gaps does exist in the literature like 1) as a result of globalization the technological revolution has enforced every aspect of society to adopt it. Similar is the case with the financial market. Now the investors also prefers to operate their investment from anywhere, although the capital market adopted the digitalization but still there are number of investors who still not accept this digitalization, being one of the important and highlighted factors although its researched although but still there are number of factors yet to explore, 2) Uddin, Islam, and Rahat (2021), worked on the necessity of the capital market digitalization in Bangladesh while Pandemic situation, whereas the present study will check it with investors behavior and psychology in Indonesian perspective with the fresh data set, 3) Spindler (2019), investigated the capital market digitalization from corporate law point of view, whereas the present study will investigate it with investors behavior, psychological unbiasedness and also with the addition of moderation effect in Indonesian perspective with the fresh data set, 4) Basrowi and Utami (2020), worked on the Islamic Sharia Capital market along with digital technology, whereas the present study will check it in traditional capital market with the addition of moderating variable i.e. technological advancement from Indonesian perspective, 5) the model consist of investors behavior, psychological unbiasedness, technological advancement and digitalization of the capital market is not tested before in Indonesian in the recent time, 6) Kalbhor and Jagannathan (2020), worked on the capital market and investor decision making in India, whereas the present study will check the capital market from digitalization perspective along with addition of moderating variable technological advancement in Indonesia. The significance of the study is 1) will highlight the importance of capital market digitalization for the market expansion as well as for the investors particularly in Indonesia, 2) will be helpful for the capital market related professional to revamp their policies with the view to convincing the investors to accept the digitalization in the capital market, and 3) will help the researchers to explore more aspects of capital market digitalization in particularly in Indonesia.

Structurally the paper is divided into different chapters. In the first chapter, the overall introduction of the study including the study gap and significance will be presented. The second phase will present the evidence about investor's behavior, psychological unbiasedness, technological advancement, and digitalization of the capital market in connection with past studies will be discussed. The third chapter of the study will provide the methodology, i.e., the collection of data about investor behavior, psychological unbiasedness, technological advancement, and digitalization of the capital market. After that will, the validity of the data will be analyzed. The results received after data analysis will be presented in the fourth chapter. Finally, the study conclusion, implications, and recommendations will be presented.

Literature Review

Over the past few decades, the financial markets also witnessed different changes as a result of advancement. There are different factors that affect the capital market decision making like digitalization or any other sort of technological changes. The market forces while having any decision ensure maximum analysis of investors who are the ultimate effect of these changes. The digitalization of the market has different effects on different investors. Investors who avoid much technology involvement usually avoid any such changes. But the market forces ensure the proper support of such individuals as the individual behavior affects the capital market (Kalbhor & Jagannathan, 2020; Parveen, Satti, Subhan, & Jamil, 2020). As the investors of the capital market play a vital role in the overall performance of the capital market. The market is the combination of investors like well-literate or less literate (Ady & Hidayat, 2019). The behavior of the investors who changes themselves with the technological and other changes is different from those who ignored the adoption of the change. Factors like financial literacy affect individual behavior which further affects the capital market and any sort of decision like digitalization. In this context, Shaik, Kethan, Jaggaiah, and Khizerulla (2022) worked on the association between financial literacy and the behavior of the investor, particularly in India. The data set of 100 respondents was collected and tested with the help of SPSS. The results of the study revealed that there are a number of factors that affect the investor psyche and one of them is financial literacy. Financial literacy helped the investor for a better understanding of the capital market which further affects individual behavior in any sort of decision-making pertaining to the capital market (Ady & Hidayat, 2019). Investors that exhibit herding behavior replicate the behaviors of others (Ady, 2020). The Covid pandemic has affected herding behavior in two different ways investors first take into account the information available to maintain and/or invest in the capital markets based on their beliefs and then they consider other agents who are more informed and adapt their behavior. This is done in response to the economy's decline and the medical and social uncertainties. In this context, Espinosa-Méndez and Arias (2021), worked on the relationship between herding behavior and the capital market as a result of the Covid pandemic. The study was conducted in Europe. The data set of 20 years like from 2000 to 2020 was collected and tested. The results of the study revealed that the Covid pandemic has resulted in increase in the herding behavior in the capital market of France, Germany, Italy, UK and Spain. Thus, the investor's behavior

effects the capital market. Thus, the hypotheses derived from the above debate is as under:

H1: Investors' behavior significantly influences the digitalization of the capital market.

The investors are the ultimate stakeholders of any financial market. Similar is the case with the capital market. Investor involvement decides the future of any market. Over time the capital markets change themselves with the view to facilitate their investors with the aim to support their investors. The investor psyche plays a vital role in its decision making which further affects the market decisions like digitalization (Haque, Qian, Hoque, & Lucky, 2022; Madaan & Singh, 2019). With the passage of time, every financial market adopts digitalization in order to meet rapidly changing technological needs. The investor's psyche pays to affect the capital market in terms of its decision-making. In this context, Kalbhor and Jagannathan (2020), worked on individual behavior and decision-making in the capital market. The study was conducted in the Indian capital market. The data set of 241 respondents were collected and tested with the help of SEM. The results of the study revealed a substantial association between the personalities of Individualist and guardian and all three biases like a celebrity and straight arrow and both anchoring and herding biases, and adventurer and just herding bias. Furthermore, it is discovered that all of the personalities, with the exception of the straight arrow, have a substantial association with demographics. While having decisions regarding the capital market the individual should remain unbiased as biases can cause impulsive decision-making. Individual psychosocial unbiasedness plays a vital role in the case of capital market decision-making (Sol, 2022; Uddin et al., 2021). Similarly, Shahid, Aftab, Latif, and Mahmood (2018), worked on the investor's psychology and capital market. The study was conducted in Pakistan. The data set of 30 interviews were conducted. The results of the study revealed that investor behavioral biases affect the investor's decision-making. The investor's decisions with unbiasedness can lead to a good decision on the other hand any sort of biases can lead to adverse decision making. The psychology is one of the strong tools for the individual behavior. The behaviors biasness based on the psychology. An investor with positive psychology will lead to an unbiased decision making. In this context, Shah, Ahmad, and Mahmood (2018) worked on the biases in investor decision-making and their effect on the capital market performance. The study was conducted in Pakistan. The data set of 143 investors were collected and tested with the help of the PS technique. The results of the study revealed an empirical understanding of how investment choices, heuristic biases, and perceived market efficiency are related. Thus, the hypotheses derived from the above debate is as under:

H2: Psychological unbiasedness significantly influences the digitalization of the capital market.

The investor's behavior regarding investment and the financial market changes over time. There are multiple reasons for it like individual behavior, psyche, market conditions, and market internal and external force's reaction. If the investment is in good flow for the investor the one avoids any sort of changes in the market that might affect

the investment (as per investor developed opinion) (Davoudi, Khozein, & Naderian, 2022; Setiyono & Perwitasari, 2020). The world is getting more digitalized which also expresses its effect on the capital market. The markets are getting digitalized with the view to meet world demand. There is a mixed response from investors reporting on such digitalization. The investors who like the changes usually accept them wholeheartedly but on the other hand, the investors who prefer the traditional ways avoid them. Thus, technological changes get affected by investor behavior which further affects the digitalization of the capital market; thus, technological advancement can act as an active mediator. In this context, Feng, Wang, and Liang (2021) worked on the mediating role of technological innovation in the relationship between environmental information and economic development. The study was conducted in China. The data set of 10 years like from 2008 to 2018 was collected and tested. The results of the study revealed that technological advancement in terms of innovation significantly acts as a mediator in the relationship. Moreover, Kulathunga, Ye, Sharma, and Weerathunga (2020), also investigated the mediating role of technological advancement in terms of enterprise resource planning (ERP). The study was conducted on SMEs. The data set of 319 SME employees was collected and tested. The results of the study revealed that technological innovation in terms of innovation significantly acts as a mediator. Similarly, Susilawati, Khaira, and Pratama (2021), also explored the technological advancement mediating role in terms of technological innovation. The study was conducted in Indonesia. The results of the study revealed that technological innovation significantly act as a mediator. Thus, the hypotheses derived from the above debate is as under:

H3: Technological advancement significantly acts as a mediator in the relationship between investors' behavior and the digitalization of the capital market.

There are numerous factors that affect individual decisions and one of the prime factors is individual psychology. The individual psyche leads to biasness or unbiasedness in one's decision-making. The individual psyche further gets affected by many factors like an individual opinion regarding any practice. Once an individual is satisfied with any practice then any deviation from that practice may lead that individual to express biases and change will affect his comfort zone in terms of running practice. Similar is the case with the investor. If an investor is comfortable with any capital market practice, then any change in that practice will affect the investor psyche. Thus, the changes which impact the individual psyche lead to biasness decision-making (Haritha & Uchil, 2020; Upadhayay, 2019). Many investors in the market avoid excessive digitalization. Thus, they express biased decision-making. The investor's unbiased decision-making will support digitalization in the capital market. Better awareness of technological changes will lead to a change the investor psychology regarding digitalization. In this context, Bagheri, Mitchelmore, Bamiatzi, and Nikolopoulos (2019) investigated the mediating role of technological innovation in the relationship between international orientation in SMEs. The results of the study revealed that technological innovation significantly acts as a mediator in the relationship. Moreover, Khin and Ho (2018), also explored the mediating role of digital innovation in the relationship between digital technology and organization performance. The results of the study revealed that digital innovation

positively mediates the relationship between digital technology and organization performance particularly in Malaysia. Thus, the hypotheses derived from the above debate is as under:

H4: Technological advancement significantly acts as a mediator in the relationship between psychological unbiasedness and the digitalization of the capital market.

Research Methods

The article investigates the impact of investors' behavior and psychological unbiasedness about technology advancement on the digitalization of the capital market and also examines the mediating role of technology advancement among investors' behavior, psychological unbiasedness about technology advancement and digitalization of capital market in Indonesia. The article used questionnaires to collect the data from the selected respondents. The items were used to measure the variables of the study. These items are taken from past studies, for example, investors' behavior was measured with six items taken from Wang, Yuan, Li, and Li (2019), psychological unbiasedness was measured with eight items taken from Stanovich and Toplak (2019), technology advancement measured with five items extracted from Janse van Rensburg, Rothmann, and Diedericks (2018) and digitalization of capital market measured with ten items taken from Youssef, Boubaker, Dedaj, and Carabregu-Vokshi (2021).

The investors of the capital market are the respondents of the study. They were selected based on simple random sampling. The surveys were distributed to the selected investors through the mail. The researchers distributed the 570 surveys to the respondents, but only 290 were received after one month. These surveys have an approximately 50.88 per cent response rate. Moreover, the study also applied the PLS-SEM to test the association between the variables using smart-PLS. This tool is suitable when the data is collected from questionnaires. It provides reliable results in the case of small and large data sets. PLS-SEM is also a suitable technique that provides reliable results even when researchers use complex frameworks. The study used two predictors, investors' behavior (IB) and psychological unbiasedness (PUB) about technology advancement. In addition, the article also used one mediating variable, such as technology advancement (TAD) and also took one dependent variable named digitalization of capital market (DCM). These constructs are presented in the framework in Figure 2.
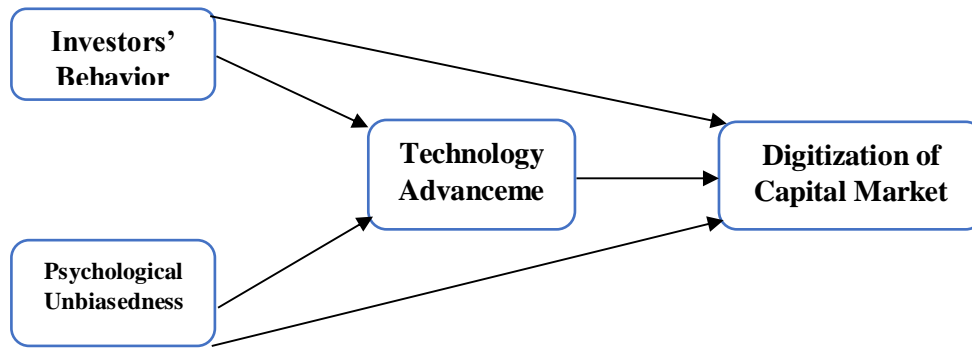
Figure 2: Theoretical model

Research Findings

The study shows the convergent validity that shows the correlation between the items. The study used composite reliability (CR) and Alpha to check the reliability. The results indicated that the values are higher than 0.70 and exposed valid reliability. In addition, the study used the factor loadings and average variance extracted (AVE) to check the validity. The results indicated that the values were higher than 0.50 and exposed valid convergent validity. These values are given in Table 1.

Table 1: Convergent validity

Constructs	Items	Loadings	Alpha	CR	AVE
Digitalization of Capital Market	DCM1	0.807	0.907	0.924	0.579
	DCM10	0.641			
	DCM2	0.795			
	DCM3	0.821			
	DCM4	0.805			
	DCM5	0.788			
	DCM7	0.773			
	DCM8	0.802			
	DCM9	0.577			
Investors' Behavior	IB1	0.836	0.893	0.919	0.655
	IB2	0.849			
	IB3	0.705			
	IB4	0.768			
	IB5	0.838			
	IB6	0.849			
Psychological Unbiasedness	PUB1	0.901	0.975	0.979	0.869
	PUB2	0.928			
	PUB3	0.956			
	PUB4	0.944			

	PUB6	0.911			
	PUB7	0.953			
	PUB8	0.929			
Technology Advancement	TAD1	0.844	0.917	0.938	0.751
	TAD2	0.881			
	TAD3	0.874			
	TAD4	0.834			
	TAD5	0.900			

The study shows the discriminant validity that shows the correlation between the variables. Cross-loadings and Fornell Larcker were used to check the discriminant validity. The results indicated that the values that show the association between the variable itself are bigger than the values that show the association with other variables. These results exposed low association among variables and valid discriminant validity. These values are given in Table 2 and Table 3.

Table 2: Fornell Larcker

	DCM	IB	PUB	TAD
DCM	0.761			
IB	0.508	0.809		
PUB	0.471	0.494	0.932	
TAD	0.381	0.425	0.415	0.867

Table 3: Cross-loadings

	DCM	IB	PUB	TAD
DCM1	**0.807**	0.358	0.305	0.292
DCM10	**0.641**	0.260	0.341	0.211
DCM2	**0.795**	0.373	0.325	0.332
DCM3	**0.821**	0.403	0.332	0.326
DCM4	**0.805**	0.350	0.306	0.286
DCM5	**0.788**	0.455	0.393	0.301
DCM7	**0.773**	0.460	0.429	0.335
DCM8	**0.802**	0.447	0.406	0.305
DCM9	**0.577**	0.304	0.358	0.184
IB1	0.405	**0.836**	0.384	0.334
IB2	0.451	**0.849**	0.451	0.346
IB3	0.361	**0.705**	0.317	0.339
IB4	0.394	**0.768**	0.400	0.360
IB5	0.401	**0.838**	0.378	0.335
IB6	0.448	**0.849**	0.456	0.351
PUB1	0.420	0.455	**0.901**	0.388
PUB2	0.459	0.444	**0.928**	0.356
PUB3	0.441	0.471	**0.956**	0.406
PUB4	0.417	0.476	**0.944**	0.415
PUB6	0.430	0.462	**0.911**	0.384

PUB7	0.445	0.468	**0.953**	0.402
PUB8	0.462	0.446	**0.929**	0.358
TAD1	0.339	0.309	0.346	**0.844**
TAD2	0.352	0.390	0.357	**0.881**
TAD3	0.335	0.374	0.346	**0.874**
TAD4	0.303	0.391	0.382	**0.834**
TAD5	0.323	0.376	0.369	**0.900**

The study shows the discriminant validity using Heterotrait Monotrait (HTMT) ratio. The results indicated that the values are lower than 0.85. These results exposed low association among variables and valid discriminant validity. These values are given in Table 4.

Table 4: Heterotrait Monotrait ratio

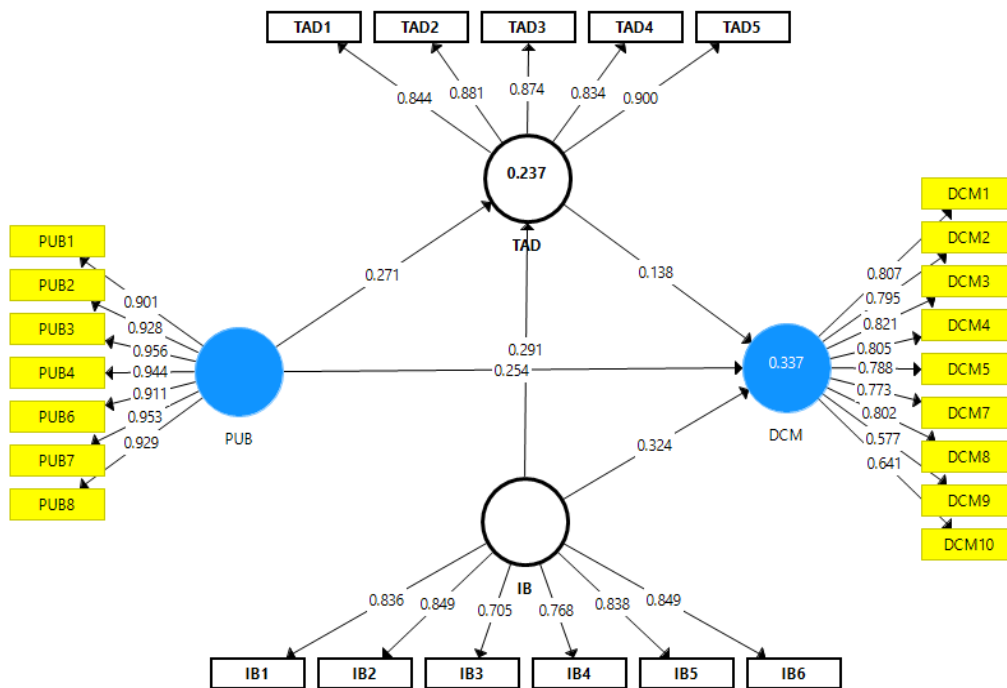|	DCM	IB	PUB	TAD
DCM				
IB	0.555			
PUB	0.499	0.527		
TAD	0.414	0.470	0.439	

Figure 3: Measurement model assessment

The results indicated that the investors' behavior towards technology adoption and psychological unbiasedness about technology advancement have positive relationships with the digitalization of the capital market in Indonesia and accept H1 and H2. The findings also exposed that technological advancement mediates among investors'

behavior and psychological unbiasedness, and the digitalization of the capital market in Indonesia and accept H3 and H4. These values are given in Table 5.

Table 5: Path analysis

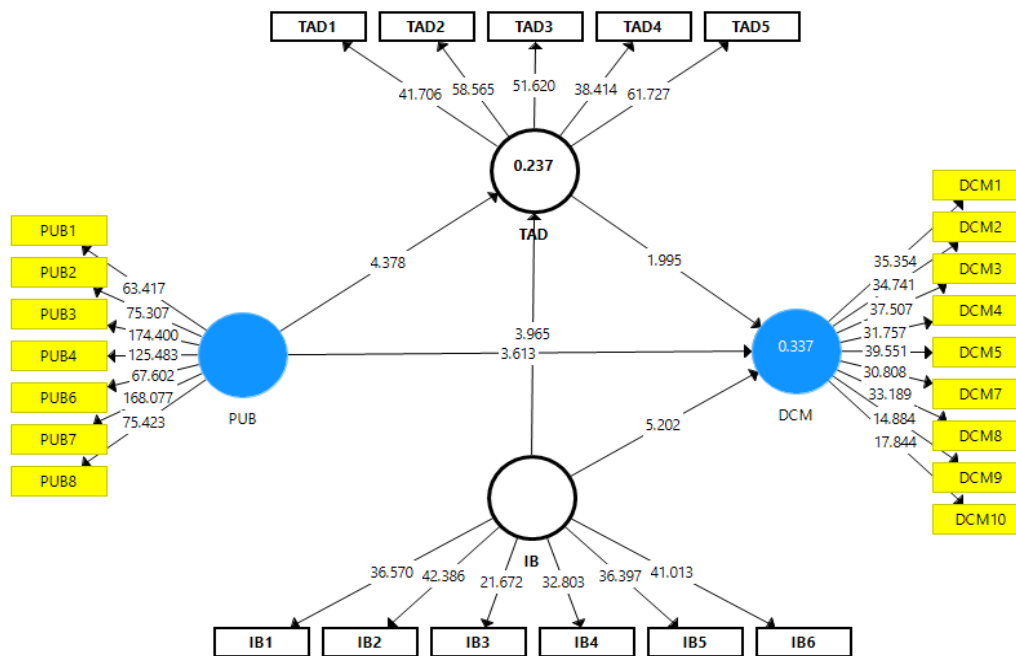| Relationships	Beta	S.D.	T Statistics	P Values
IB -> DCM	0.324	0.062	5.202	0.000
IB -> TAD	0.291	0.073	3.965	0.000
PUB -> DCM	0.254	0.070	3.613	0.000
PUB -> TAD	0.271	0.062	4.378	0.000
TAD -> DCM	0.138	0.069	1.995	0.024

Figure 4: Structural model assessment

Discussions

The results revealed that investors' behavior has a positive association with the digitalization of the capital market. These results are in line with the past study of Hossnofsky and Junge (2019). The study posits that the performance of the capital market depends on investors' behavior when the investors have good behaviors to know about the innovations, interact with the new technologies, and acquire the skills required for running that technology. In this way, the use of technologies within the capital market increases. These results also agree with the study of Chen, Zhang, Jiang, Meng, and Sun (2022), which highlights that when investors bring positivity to their behaviors while going to adopt new technology, it becomes possible to digitalize the capital market. The results revealed that investors' psychological unbiasedness has a positive association with the digitalization of the capital market. These results are in line with the past study of H. K. Kim and Lee (2021), which explains that one of the great hurdles in technology adoption is the users' biasedness. Investors who are not the subject of

psychological biasedness have a wide acceptance of novel technologies. It is the source of the digitalization of the capital market. These results also agree with the study of Škare and Soriano (2021), which shows that when investors have the least psychological biasedness, they can think freely about the ease and usefulness of technologies. This thinking encourages the digitalization of the capital market.

The results revealed that technological advancement is a significant mediator between investors' behavior and the digitalization of the capital market. These results are in line with the past study of Estrin, Khavul, and Wright (2022), which claims that the positivity in investors' behavior about the usefulness and adoption of technologies encourages them to move towards technological advancement and this technological advancement leads to the digitalization of the capital market. These results also agree with the study of J. Wang et al. (2019), which states that technological advancement in a country is triggered by users' positive behaviors. Investors with positive behavior enhance technological advancement, which further assures the digitalization of the capital market. The results revealed that technological advancement is a significant mediator between investors' psychological unbiasedness and the digitalization of the capital market. These results are in line with the past study of Ricci, Scafarto, Ferri, and Tron (2020). This literary workout states that the investors' psychological unbiasedness improves perception about technology use, and this allows technological advancement and, thereby, encourages the digitalization of the capital market. These results also agree with the study of Zaborovskaia, Nadezhina, and Avduevskaya (2020), which highlights that investors' psychological unbiasedness motivates them to the adoption of technologies and encourages them to move towards technological advancement and this technological advancement leads to the digitalization of the capital market.

Theoretical Implications

The current study has guidelines for academics because it has a significant contribution to the literature. The study analyzes the influences of investors' behavior and psychological unbiasedness on the digitalization of the capital market. The previous literature has a discussion about the impacts of investors' behavior and psychological unbiasedness on the digitalization of the capital market. But a single study has discussed the role of either the investors' behavior or the investors' psychological unbiasedness in the digitalization of the capital market. With the simultaneous analysis of these factors' relationship, the current study adds to the literature. One major contribution is to explore the mediating impacts of technological advancement between investors' behavior and psychological unbiasedness and the digitalization of the capital market. This study extends the literature in the sense that it analyzes investors' behavior and psychological unbiasedness role in the digitalization of the capital market for Indonesia.

Empirical Implications

This study has considerable significance to emerging economies like Indonesia. It addresses the critical issue of the economy in the contemporary era, which is the digitalization of the capital market. This study throws light on the ways to promote digitalization in the capital market that is a source of finance and its circulation. The study guides the economists and actors of the capital market in that they must struggle

to develop positivity in investors' behavior towards different types of technology designed for communication, information and data management, and financial administration. This would be helpful in the digitalization of the capital market. It also suggests that psychological unbiasedness must be developed in investors to enhance the digitalization of the capital market. The study guides the policymakers in establishing policies related to the digitalization of the capital market by promoting the investors' behavior and psychological unbiasedness towards technology adoption. Furthermore, the study conveys that the policymakers and regulators should motivate the investors for positive behavior and psychological unbiasedness to promote technological advancement and digitalization of the capital market.

Conclusion

The objective of the study was to explore the influences of investors' behavior and psychological unbiasedness on the digitalization of the capital market. It was also to check what the role of technological advancement is in the association between investors' behavior, psychological unbiasedness, and digitalization of the capital market. The authors collected information on investors' behavior, investors' psychological unbiasedness, technological advancement, and digitalization of the capital market in Indonesia. They inferred that investors' behavior and psychological unbiasedness positively influence the digitalization of the capital market. The results showed that when the investors adopt a positive behavior toward the selection and use of modern technologies in order to perform their functions and achieve goals, the use of digital technologies increases within the capital market. The results also indicated that the investors have psychological unbiasedness, not only sticking to typical techniques of communication, information management, and financial management. But they are ready to accept novel technologies, and the actual adoption of technologies enhances the digitalization of the capital market. The results highlighted that technological advancement mediates the relationship between investors' behavior and psychological unbiasedness and the digitalization of the capital market. When the investors have positive behavior and psychological unbiasedness, there is demand and encouragement for technological advancements. The increasing technological advancements encourage the digitalization of the capital market.

Limitations

There are some limitations still associated with the current study. These limitations are likely to be removed in future literature, and the same study can be improved. This study examines only two factors, investors' behavior and psychological unbiasedness, which influence the digitalization of the capital market. As a result, the study is limited, and it is recommended that scholars they must explore more factors that have an influence on the digitalization of the capital market. Moreover, the results about the relationship of investors' behavior and psychological unbiasedness to the digitalization of the capital market are not general because the data were collected from the Indonesian capital market alone. In the future, authors must collect information about different economies for more valid and general results.

Acknowledgement

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Sri Utami Ady <sri.utami@unitomo.ac.id>

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Kepada: sri.utami@unitomo.ac.id

Acceptance

Authors name: Sri Utami Ady, Ilya Farida, Mustika Winedar, Alvy Mulyaningtyas, Dicken Okta Sandra Susena, Adiel Herdi Pratama

Corresponding author: Sri Utami Ady
Economic and Business Faculty, University of Dr. Soetomo
Email: sri.utami@unitomo.ac.id

It's my pleasure to inform you that, after the peer review, your article (**TITLE: The Role of Investors' Behavior and Psychological Unbiasedness on the Digitization of the Capital Market in Indonesia: Mediating Role of Technology Advancement**) has been accepted for publication in **International Journal of eBusiness and eGovernment Studies.**

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-RESEARCH ARTICLE-

THE ROLE OF INVESTORS' BEHAVIOR AND PSYCHOLOGICAL UNBIASEDNESS ON THE DIGITIZATION OF THE CAPITAL MARKET IN INDONESIA: MEDIATING ROLE OF TECHNOLOGY ADVANCEMENT

Sri Utami Ady

Economic and Business Faculty, University of Dr. Soetomo
Email: sri.utami@unitomo.ac.id
https://orcid.org/0000-0002-2093-4383

Ilya Farida

Economic and Business Faculty, University of Dr. Soetomo
Email: ilya.farida@unitomo.ac.id
https://orcid.org/0000-0001-9395-5882

Mustika Winedar

Economic and Business Faculty, University of Dr. Soetomo
Email: mustika.winedar@unitomo.ac.id
https://orcid.org/0000-0001-8143-6284

Alvy Mulyaningtyas

Economic and Business Faculty, University of Dr. Soetomo
Email: alvymt@gmail.com
https://orcid.org/0000-0003-4600-64235

Dicken Okta Sandra Susena

Economic and Business Faculty, University of Dr. Soetomo
Email: dickenoktasansu17@gmail.com
https://orcid.org/0000-0001-9826-6867

Adiel Herdi Pratama

Faculty of Agriculture and Fisheries, University of
Muhammadiyah Malang, Indonesia
Email; adielherdi.sby@gmail.com
https://orcid.org/0000-0002-1259-5879

─**Abstract**─

Recently, the digitalization of the financial markets is the requirement of the modern world that requires the attention of regulators and researchers. Hence, the current article investigates the impact of investors' behavior towards technology adoption and psychological unbiasedness about technology advancement on the digitalization of the capital market in Indonesia. The study also examines the mediating role of technology advancement among investors' behavior toward technology adoption, psychological unbiasedness about technology advancement and digitalization of the capital market in Indonesia. The article used questionnaires to collect the data from the selected respondents. The study also applied the PLS-SEM to test the association between the variables using smart-PLS. The results indicated that the investors' behavior towards technology adoption and psychological unbiasedness about technology advancement have positive relationships with the digitalization of the capital market in Indonesia. The findings also exposed that the technology advancement mediates among investors' behavior and psychological unbiasedness and digitalization of the capital market in Indonesia. The study guides the policymakers in establishing policies related to the digitalization of the capital market by promoting the investors' behavior and psychological unbiasedness towards technology adoption.

Keywords: Digitalization of capital market, psychological unbiasedness, technology advancement, investors' behavior

1. INTRODUCTION

The capital market of any country is one of the key supporters and contributors to the country's economy. The capital market is also the indicator of foreign direct investment, whether to invest in the country or not. As the capital market is an organized physical location where securities are exchanged (O. Kim, 2020; Żebrowska-Suchodolska et al., 2018). It is essential to realize that the stock market is a structured system that connects direct and indirect sellers and purchasers of securities. Over the past few years, one of the factors which affected the financial markets all around the globe is Covid pandemic. As the Covid-19 pandemic put a lot of pressure on Indonesia's stock market throughout 2020, the number of investors in the market has seen a significant increasing trend. With

the frequency of the increased transactions, the total number of investors in the capital market climbed to 3.88 million, there is a 56% increase from the previous year. The number of investors continued to rise to 4 million investors till January 2021. According to KSEI statistics from October 2020, a fintech trading agent attracted over 49.75 percent of capital market participants (Hamzah, 2018; Hani et al., 2020). These statistics demonstrate how a change in consumer behavior affects the industry's move to digital platforms. Thus, there is an association between consumer behavior (which build from the individual psyche) and the digitalization of any industry in the country (Sima et al., 2020; Valverde et al., 2020).

Despite that, there are numerous challenges faced by the investors regarding digitalization of the capital market like investor resistance in terms of avoidance of market digitalization, investor psyche, and country's economic as well as political circumstances. The present study will address the investor's role in capital market digitalization. The retention of the investors is the ultimate aim of the capital market. Market while having decision analyze every aspect of the decision to avoid any sort of resistance. Indonesia is a developing country, therefore, likewise, the developed countries it's not fully digitalized. With the view to meet international clients the capital market gets itself digitalized. This digitalization is expressing the effect on that people. The factors like investor behavior along with psychological biasedness are the key element in the entire process (Ady, 2018, 2019; Ady et al., 2013). Therefore, the present study will address the investor's role in the digitalization of the capital market. Indonesian capital market conditions are given in figure 1.
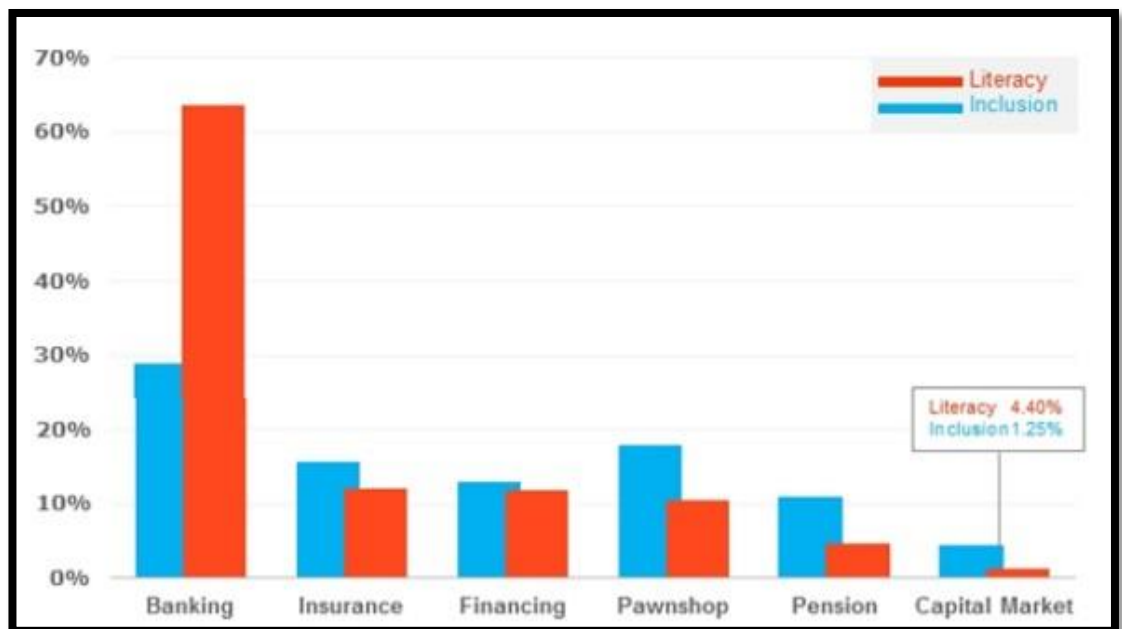
Figure 1: Indonesian capital market conditions

The present study will address some gaps does exist in the literature like 1) as a result of globalization the technological revolution has enforced every aspect of society to adopt it. Similar is the case with the financial market. Now the investors also prefers to operate their investment from anywhere, although the capital market adopted the digitalization but still there are number of investors who still not accept this digitalization, being one of the important and highlighted factors although its researched although but still there are number of factors yet to explore, 2) Uddin et al. (2021), worked on the necessity of the capital market digitalization in Bangladesh while Pandemic situation, whereas the present study will check it with investors behavior and psychology in Indonesian perspective with the fresh data set, 3) Spindler (2019), investigated the capital market digitalization from corporate law point of view, whereas the present study will investigate it with investors behavior, psychological unbiasedness and also with the addition of moderation effect in Indonesian perspective with the fresh data set, 4) Basrowi et al. (2020), worked on the Islamic Sharia Capital market along with digital technology, whereas the present study will check it in traditional capital market with the addition of moderating variable i.e. technological advancement from Indonesian perspective, 5) the model consist of investors behavior, psychological unbiasedness, technological advancement and digitalization of the capital market is not tested before in Indonesian in the recent time, 6) Kalbhor et al. (2020), worked on the capital market and investor decision making in India, whereas the present study will check the capital market from digitalization perspective along with addition of moderating variable technological advancement in Indonesia. The significance of the study is 1) will highlight the importance of capital market digitalization for the market expansion as well as for the investors particularly in Indonesia, 2) will be helpful for the capital market related professional to revamp their policies with the view to convincing the investors to accept the digitalization in the capital market, and 3) will help the researchers to explore more aspects of capital market digitalization in particularly in Indonesia.

Structurally the paper is divided into different chapters. In the first chapter, the overall introduction of the study including the study gap and significance will be presented. The second phase will present the evidence about investor's behavior, psychological unbiasedness, technological advancement, and digitalization of the capital market in connection with past studies will be discussed. The third chapter of the study will provide the methodology, i.e., the collection of data about investor behavior, psychological unbiasedness, technological advancement, and digitalization of the capital market. After that will, the validity of the data will be analyzed. The results received after data analysis will be presented in the fourth chapter. Finally, the study conclusion, implications, and recommendations will be presented.

2. LITERATURE REVIEW

Over the past few decades, the financial markets also witnessed different changes as a result of advancement. There are different factors that affect the capital market decision making like digitalization or any other sort of technological changes. The market forces while having any decision ensure maximum analysis of investors who are the ultimate effect of these changes. The digitalization of the market has different effects on different investors. Investors who avoid much technology involvement usually avoid any such changes. But the market forces ensure the proper support of such individuals as the individual behavior affects the capital market (Kalbhor et al., 2020; Parveen et al., 2020). As the investors of the capital market play a vital role in the overall performance of the capital market. The market is the combination of investors like well-literate or less literate (Ady, 2019). The behavior of the investors who changes themselves with the technological and other changes is different from those who ignored the adoption of the change. Factors like financial literacy affect individual behavior which further affects the capital market and any sort of decision like digitalization. In this context, Shaik et al. (2022) worked on the association between financial literacy and the behavior of the investor, particularly in India. The data set of 100 respondents was collected and tested with the help of SPSS. The results of the study revealed that there are a number of factors that affect the investor psyche and one of them is financial literacy. Financial literacy helped the investor for a better understanding of the capital market which further affects individual behavior in any sort of decision-making pertaining to the capital market (Ady, 2019). Investors that exhibit herding behavior replicate the behaviors of others (Ady et al., 2020; Hartani et al., 2021). The Covid pandemic has affected herding behavior in two different ways investors first take into account the information available to maintain and/or invest in the capital markets based on their beliefs and then they consider other agents who are more informed and adapt their behavior. This is done in response to the economy's decline and the medical and social uncertainties. In this context, Espinosa-Méndez et al. (2021), worked on the relationship between herding behavior and the capital market as a result of the Covid pandemic. The study was conducted in Europe. The data set of 20 years like from 2000 to 2020 was collected and tested. The results of the study revealed that the Covid pandemic has resulted in increase in the herding behavior in the capital market of France, Germany, Italy, UK and Spain. Thus, the investor's behavior effects the capital market. Thus, the hypotheses derived from the above debate is as under:

H1: Investors' behavior significantly influences the digitalization of the capital market.

The investors are the ultimate stakeholders of any financial market. Similar is the case with the capital market. Investor involvement decides the future of any market. Over time the capital markets change themselves with the view to facilitate their investors with the aim to support their investors. The investor psyche plays a vital role in its decision making which further affects the market decisions like digitalization (Haque et

al., 2022; Madaan et al., 2019). With the passage of time, every financial market adopts digitalization in order to meet rapidly changing technological needs. The investor's psyche pays to affect the capital market in terms of its decision-making. In this context, Kalbhor et al. (2020), worked on individual behavior and decision-making in the capital market. The study was conducted in the Indian capital market. The data set of 241 respondents were collected and tested with the help of SEM. The results of the study revealed a substantial association between the personalities of Individualist and guardian and all three biases like a celebrity and straight arrow and both anchoring and herding biases, and adventurer and just herding bias. Furthermore, it is discovered that all of the personalities, with the exception of the straight arrow, have a substantial association with demographics. While having decisions regarding the capital market the individualshould remain unbiased as biases can cause impulsive decision-making. Individual psychosocial unbiasedness plays a vital role in the case of capital market decision- making (Sol, 2022; Uddin et al., 2021). Similarly, Shahid et al. (2018), worked on the investor's psychology and capital market. The study was conducted in Pakistan. The dataset of 30 interviews were conducted. The results of the study revealed that investor behavioral biases affect the investor's decision-making. The investor's decisions with unbiasedness can lead to a good decision on the other hand any sort of biases can lead to adverse decision making. The psychology is one of the strong tools for the individualbehavior. The behaviors biasness based on the psychology. An investor with positive psychology will lead to an unbiased decision making. In this context, Shah et al. (2018)worked on the biases in investor decision-making and their effect on the capital market performance. The study was conducted in Pakistan. The data set of 143 investors were collected and tested with the help of the PS technique. The results of the study revealedan empirical understanding of how investment choices, heuristic biases, and perceived market efficiency are related. Thus, the hypotheses derived from the above debate is as under:

H2: Psychological unbiasedness significantly influences the digitalization of the capital market.

The investor's behavior regarding investment and the financial market changes over time. There are multiple reasons for it like individual behavior, psyche, market conditions, and market internal and external force's reaction. If the investment is in good flow for the investor the one avoids any sort of changes in the market that might affect the investment (as per investor developed opinion) (Davoudi et al., 2022; Perwitasari et al., 2020). The world is getting more digitalized which also expresses its effect on the capital market. The markets are getting digitalized with the view to meet world demand. There is a mixed response from investors reporting on such digitalization. The investors who like the changes usually accept them wholeheartedly but on the other hand, the investors who prefer the traditional ways avoid them. Thus, technological changes get affected by investor behavior which further affects the digitalization of the capital

market; thus, technological advancement can act as an active mediator. In this context, Feng et al. (2021) worked on the mediating role of technological innovation in the relationship between environmental information and economic development. The study was conducted in China. The data set of 10 years like from 2008 to 2018 was collected and tested. The results of the study revealed that technological advancement in terms of innovation significantly acts as a mediator in the relationship. Moreover, Kulathunga et al. (2020), also investigated the mediating role of technological advancement in terms of enterprise resource planning (ERP). The study was conducted on SMEs. The data set of 319 SME employees was collected and tested. The results of the study revealed that technological innovation in terms of innovation significantly acts as a mediator. Similarly, Susilawati et al. (2021), also explored the technological advancement mediating role in terms of technological innovation. The study was conducted in Indonesia. The results of the study revealed that technological innovation significantly act as a mediator. Thus, the hypotheses derived from the above debate is as under:

H3: Technological advancement significantly acts as a mediator in the relationship between investors' behavior and the digitalization of the capital market.

There are numerous factors that affect individual decisions and one of the prime factors is individual psychology. The individual psyche leads to biasness or unbiasedness in one's decision-making. The individual psyche further gets affected by many factors like an individual opinion regarding any practice. Once an individual is satisfied with any practice then any deviation from that practice may lead that individual to express biases and change will affect his comfort zone in terms of running practice. Similar is the case with the investor. If an investor is comfortable with any capital market practice, then any change in that practice will affect the investor psyche. Thus, the changes which impact the individual psyche lead to biasness decision-making (P.H et al., 2020; Upadhayay, 2019). Many investors in the market avoid excessive digitalization. Thus, they express biased decision-making. The investor's unbiased decision-making will support digitalization in the capital market. Better awareness of technological changes will lead to a change the investor psychology regarding digitalization. In this context, Bagheri et al. (2019) investigated the mediating role of technological innovation in the relationship between international orientation in SMEs. The results of the study revealed that technological innovation significantly acts as a mediator in the relationship. Moreover, Khin et al. (2020), also explored the mediating role of digital innovation in the relationship between digital technology and organization performance. The results of the study revealed that digital innovation positively mediates the relationship between digital technology and organization performance particularly in Malaysia. Thus, the hypotheses derived from the above debate is as under:

H4: Technological advancement significantly acts as a mediator in the relationship between psychological unbiasedness and the digitalization of the capital market.

3. RESEARCH METHODS

The article investigates the impact of investors' behavior and psychological unbiasedness about technology advancement on the digitalization of the capital market and also examines the mediating role of technology advancement among investors' behavior, psychological unbiasedness about technology advancement and digitalization of capital market in Indonesia. The article used questionnaires to collect the data from the selected respondents. The items were used to measure the variables of the study. These items are taken from past studies, for example, investors' behavior was measured with six items taken from H. Wang et al. (2019), psychological unbiasedness was measured with eight items taken from Stanovich et al. (2019), technology advancement measured with five items extracted from Janse van Rensburg et al. (2018) and digitalization of capital market measured with ten items taken from Youssef et al. (2021).

The investors of the capital market are the respondents of the study. They were selected based on simple random sampling. The surveys were distributed to the selected investors through the mail. The researchers distributed the 570 surveys to the respondents, but only 290 were received after one month. These surveys have an approximately 50.88 per cent response rate. Moreover, the study also applied the PLS-SEM to test the association between the variables using smart-PLS. This tool is suitable when the data is collected from questionnaires. It provides reliable results in the case of small and large data sets. PLS-SEM is also a suitable technique that provides reliable results even when researchers use complex frameworks. The study used two predictors, investors' behavior (IB) and psychological unbiasedness (PUB) about technology advancement. In addition, the article also used one mediating variable, such as technology advancement (TAD) and also took one dependent variable named digitalization of capital market (DCM). These constructs are presented in the framework in Figure 2.
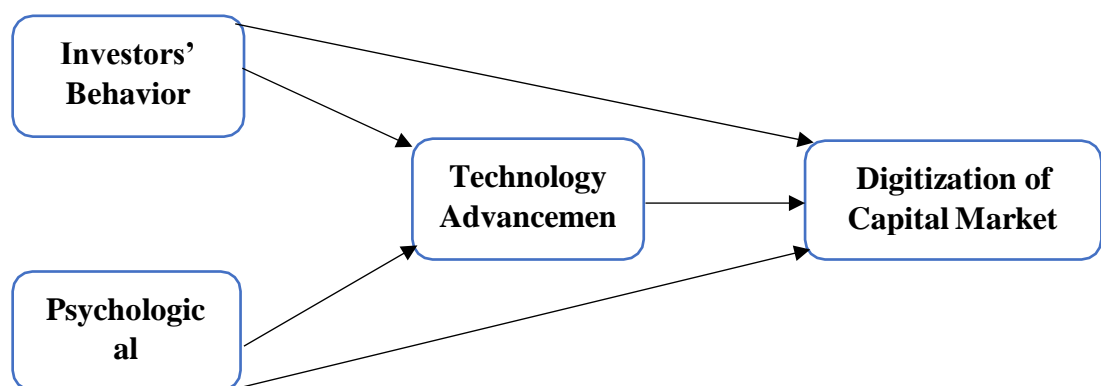

Figure 2: Theoretical Model

4. RESEARCH FINDINGS

The study shows the convergent validity that shows the correlation between the items. The study used composite reliability (CR) and Alpha to check the reliability. The results indicated that the values are higher than 0.70 and exposed valid reliability. In addition, the study used the factor loadings and average variance extracted (AVE) to check the validity. The results indicated that the values were higher than 0.50 and exposed valid convergent validity. These values are given in Table 1.

Table 1. Convergent Validity

Constructs	Items	Loadings	Alpha	CR	AVE
Digitalization of Capital Market	DCM1	0.807	0.907	0.924	0.579
	DCM10	0.641			
	DCM2	0.795			
	DCM3	0.821			
	DCM4	0.805			
	DCM5	0.788			
	DCM7	0.773			
	DCM8	0.802			
	DCM9	0.577			
Investors' Behavior	IB1	0.836	0.893	0.919	0.655
	IB2	0.849			
	IB3	0.705			
	IB4	0.768			
	IB5	0.838			
	IB6	0.849			
Psychological Unbiasedness	PUB1	0.901	0.975	0.979	0.869
	PUB2	0.928			
	PUB3	0.956			
	PUB4	0.944			
	PUB6	0.911			
	PUB7	0.953			
	PUB8	0.929			
Technology Advancement	TAD1	0.844	0.917	0.938	0.751
	TAD2	0.881			
	TAD3	0.874			
	TAD4	0.834			
	TAD5	0.900			

The study shows the discriminant validity that shows the correlation between the variables. Cross-loadings and Fornell Larcker were used to check the discriminant validity. The results indicated that the values that show the association between the variable itself are bigger than the values that show the association with other variables. These results exposed low association among variables and valid discriminant validity. These values are given in Table 2 and Table 3.

Table 2: Fornell Larcker

	DCM	IB	PUB	TAD
DCM	0.761			
IB	0.508	0.809		
PUB	0.471	0.494	0.932	
TAD	0.381	0.425	0.415	0.867

Table 3: Cross-Loadings

	DCM	IB	PUB	TAD
DCM1	**0.807**	0.358	0.305	0.292
DCM10	**0.641**	0.260	0.341	0.211
DCM2	**0.795**	0.373	0.325	0.332
DCM3	**0.821**	0.403	0.332	0.326
DCM4	**0.805**	0.350	0.306	0.286
DCM5	**0.788**	0.455	0.393	0.301
DCM7	**0.773**	0.460	0.429	0.335
DCM8	**0.802**	0.447	0.406	0.305
DCM9	**0.577**	0.304	0.358	0.184
IB1	0.405	**0.836**	0.384	0.334
IB2	0.451	**0.849**	0.451	0.346
IB3	0.361	**0.705**	0.317	0.339
IB4	0.394	**0.768**	0.400	0.360
IB5	0.401	**0.838**	0.378	0.335
IB6	0.448	**0.849**	0.456	0.351
PUB1	0.420	0.455	**0.901**	0.388
PUB2	0.459	0.444	**0.928**	0.356
PUB3	0.441	0.471	**0.956**	0.406
PUB4	0.417	0.476	**0.944**	0.415
PUB6	0.430	0.462	**0.911**	0.384
PUB7	0.445	0.468	**0.953**	0.402
PUB8	0.462	0.446	**0.929**	0.358

TAD1	0.339	0.309	0.346	**0.844**
TAD2	0.352	0.390	0.357	**0.881**
TAD3	0.335	0.374	0.346	**0.874**
TAD4	0.303	0.391	0.382	**0.834**
TAD5	0.323	0.376	0.369	**0.900**

The study shows the discriminant validity using Heterotrait Monotrait (HTMT) ratio. The results indicated that the values are lower than 0.85. These results exposed low association among variables and valid discriminant validity. These values are given in Table 4.

Table 4: Heterotrait Monotrait Ratio

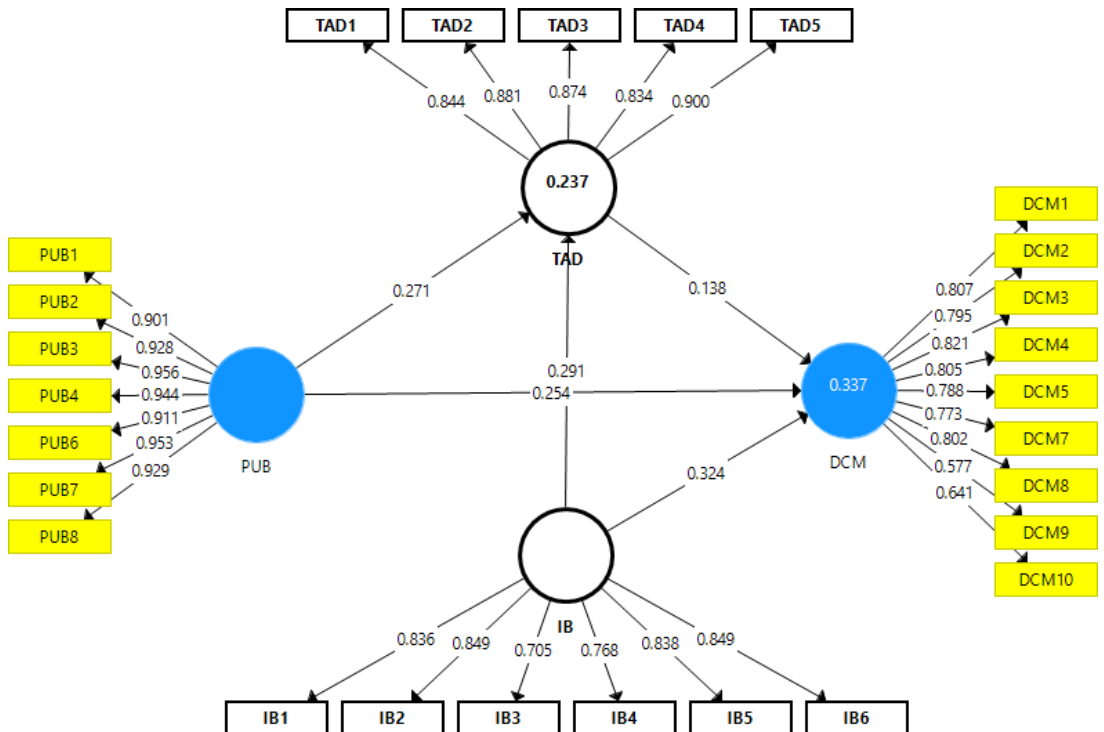|	**DCM**	**IB**	**PUB**	**TAD**
DCM				
IB	0.555			
PUB	0.499	0.527		
TAD	0.414	0.470	0.439	

Figure 3: Measurement Model Assessment

The results indicated that the investors' behavior towards technology adoption and psychological unbiasedness about technology advancement have positive relationships with the digitalization of the capital market in Indonesia and accept H1 and H2. The findings also exposed that technological advancement mediates among investors' behavior and psychological unbiasedness, and the digitalization of the capital market in Indonesia and accept H3 and H4. These values are given in Table 5.

Table 5. Path Analysis

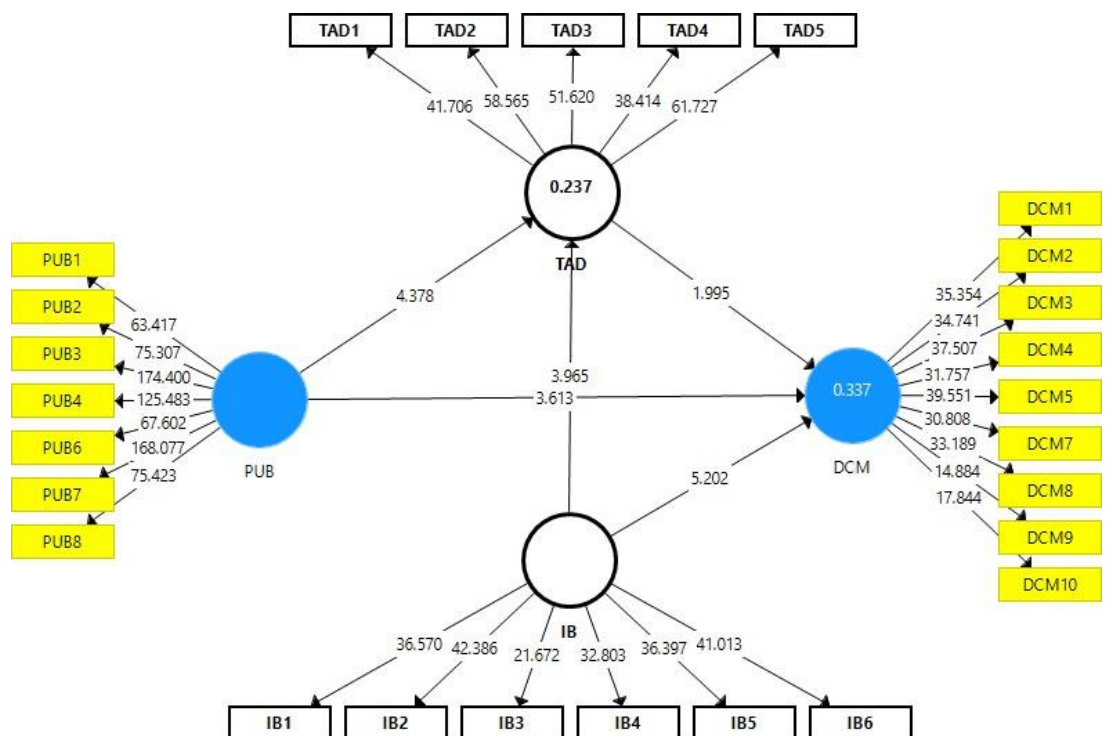| Relationships	Beta	S.D.	T Statistics	P Values
IB -> DCM	0.324	0.062	5.202	0.000
IB -> TAD	0.291	0.073	3.965	0.000
PUB -> DCM	0.254	0.070	3.613	0.000
PUB -> TAD	0.271	0.062	4.378	0.000
TAD -> DCM	0.138	0.069	1.995	0.024

Figure 4: Structural Model Assessment

5. DISCUSSIONS

The results revealed that investors' behavior has a positive association with the digitalization of the capital market. These results are in line with the past study of

Hossnofsky et al. (2019). The study posits that the performance of the capital market depends on investors' behavior when the investors have good behaviors to know about the innovations, interact with the new technologies, and acquire the skills required for running that technology. In this way, the use of technologies within the capital market increases. These results also agree with the study of Chen et al. (2022), which highlights that when investors bring positivity to their behaviors while going to adopt new technology, it becomes possible to digitalize the capital market. The results revealed that investors' psychological unbiasedness has a positive association with the digitalization of the capital market. These results are in line with the past study of H. K. Kim et al. (2021), which explains that one of the great hurdles in technology adoption is the users' biasedness. Investors who are not the subject of psychological biasedness have a wide acceptance of novel technologies. It is the source of the digitalization of the capital market. These results also agree with the study of Škare et al. (2021), which shows that when investors have the least psychological biasedness, they can think freely about the ease and usefulness of technologies. This thinking encourages the digitalization of the capital market.

The results revealed that technological advancement is a significant mediator between investors' behavior and the digitalization of the capital market. These results are in line with the past study of Estrin et al. (2022), which claims that the positivity in investors' behavior about the usefulness and adoption of technologies encourages them to move towards technological advancement and this technological advancement leads to the digitalization of the capital market. These results also agree with the study of J. Wang et al. (2019), which states that technological advancement in a country is triggered by users' positive behaviors. Investors with positive behavior enhance technological advancement, which further assures the digitalization of the capital market. The results revealed that technological advancement is a significant mediator between investors' psychological unbiasedness and the digitalization of the capital market. These results are in line with the past study of Ricci et al. (2020). This literary workout states that the investors' psychological unbiasedness improves perception about technology use, and this allows technological advancement and, thereby, encourages the digitalization of the capital market. These results also agree with the study of Zaborovskaia et al. (2020), which highlights that investors' psychological unbiasedness motivates them to the adoption of technologies and encourages them to move towards technological advancement and this technological advancement leads to the digitalization of the capital market.

6. THEORETICAL IMPLICATIONS

The current study has guidelines for academics because it has a significant contribution to the literature. The study analyzes the influences of investors' behavior and psychological unbiasedness on the digitalization of the capital market. The previous literature has a discussion about the impacts of investors' behavior and psychological

unbiasedness on the digitalization of the capital market. But a single study has discussed the role of either the investors' behavior or the investors' psychological unbiasedness in the digitalization of the capital market. With the simultaneous analysis of these factors' relationship, the current study adds to the literature. One major contribution is to explore the mediating impacts of technological advancement between investors' behavior and psychological unbiasedness and the digitalization of the capital market. This study extends the literature in the sense that it analyzes investors' behavior and psychological unbiasedness role in the digitalization of the capital market for Indonesia.

EMPIRICAL IMPLICATIONS

This study has considerable significance to emerging economies like Indonesia. It addresses the critical issue of the economy in the contemporary era, which is the digitalization of the capital market. This study throws light on the ways to promote digitalization in the capital market that is a source of finance and its circulation. The study guides the economists and actors of the capital market in that they must struggle to develop positivity in investors' behavior towards different types of technology designed for communication, information and data management, and financial administration. This would be helpful in the digitalization of the capital market. It also suggests that psychological unbiasedness must be developed in investors to enhance the digitalization of the capital market. The study guides the policymakers in establishing policies related to the digitalization of the capital market by promoting the investors' behavior and psychological unbiasedness towards technology adoption. Furthermore, the study conveys that the policymakers and regulators should motivate the investors for positive behavior and psychological unbiasedness to promote technological advancement and digitalization of the capital market.

7. CONCLUSION

The objective of the study was to explore the influences of investors' behavior and psychological unbiasedness on the digitalization of the capital market. It was also to check what the role of technological advancement is in the association between investors' behavior, psychological unbiasedness, and digitalization of the capital market. The authors collected information on investors' behavior, investors' psychological unbiasedness, technological advancement, and digitalization of the capital market in Indonesia. They inferred that investors' behavior and psychological unbiasedness positively influence the digitalization of the capital market. The results showed that when the investors adopt a positive behavior toward the selection and use of modern technologies in order to perform their functions and achieve goals, the use of digital technologies increases within the capital market. The results also indicated that the investors have psychological unbiasedness, not only sticking to typical techniques of communication, information management, and financial management. But they are ready to accept novel technologies, and the actual adoption of technologies enhances the

digitalization of the capital market. The results highlighted that technological advancement mediates the relationship between investors' behavior and psychological unbiasedness and the digitalization of the capital market. When the investors have positive behavior and psychological unbiasedness, there is demand and encouragement for technological advancements. The increasing technological advancements encourage the digitalization of the capital market.

8. LIMITATIONS

There are some limitations still associated with the current study. These limitations are likely to be removed in future literature, and the same study can be improved. This study examines only two factors, investors' behavior and psychological unbiasedness, which influence the digitalization of the capital market. As a result, the study is limited, and it is recommended that scholars they must explore more factors that have an influence on the digitalization of the capital market. Moreover, the results about the relationship of investors' behavior and psychological unbiasedness to the digitalization of the capital market are not general because the data were collected from the Indonesian capital market alone. In the future, authors must collect information about different economies for more valid and general results.

9. ACKNOWLEDGEMENT

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