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EFFECTS OF GAMIFICATION ON RETAIL INVESTORS

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Abstract: According to studies carried out by the Brazilian stock exchange, from 2019 onwards, the number of new investors, especially small ones, increased disproportionately to previous years. This flow of new investors, for the most part, uses websites and applications to make their investments, they have poorly diversified investments, assets of less than 10 thousand reais and declare their objectives: Buying their own home, supplementing their income and building reserves pensions. This investor profile, more exposed to financial losses and with reduced knowledge, is faced, in virtual media, with the use of gamification in the capital market, a practice that, through virtual elements originating from games, allows intermediary companies to induce behaviors and behavior patterns that may not be in line with the objectives of its users. This work aims to present the effects of gamification on retail investors from the perspective of radical behaviorism, using for this purpose to carry out systematic research relating reviews of empirical studies to publications made available by regulatory bodies. The results obtained demonstrate that gamification has been used to increase the profits of stockbrokers, to the detriment of the investor, through the use of psychological mechanisms that induce the investor to increase the frequency of negotiations and decisions that do not correspond to their profile. of risk, in addition, evidence was found of behavioral patterns similar to those found in betting environments, including addictive behaviors.
Keywords: Capital markets, Gamification, retail investor.

INTRODUCTION

This article aims to analyze, from the behavioral point of view of radical behaviorism, the effects of a specific aspect present in the interactions of new investors with the financial market: Gamification. When analyzing the flow of investors in the capital market, a set of legal instruments and institutions that aim to promote the efficient allocation of monetary surplus (BRASIL, [sd]), a disproportionate increase can be seen, compared to previous years, 2011 to 2018, in the number of entrants. Investigating this fact, it is possible to find in the research carried out by the Brazilian Stock Exchange (B3), a demonstration of the composition of these new market participants.

According to the study, there is an influx of retail investors, that is, small-sized investors with limited understanding of the markets (ASSOCIAÇÃO BRASILEIRA DAS ENTIDADES DOS MERCADOS FINANCEIROS E DE CAPITAIS, 2014) and, therefore, less prepared to deal with certain psychological aspects intrinsic to good investment practices. (MARKS, 2012, 2019, 2022; TON; DAO, 2014), these characteristics, present in part of new investors, indicate the existence of a gap between the skills needed by retail investors and those presented by them, something evidenced in the analysis of the average results acquired by individual investors in the practice of day trading , given that the history of all practitioners of this trading model, in the period from 2013 to 2015, reveals 97% of participants having to bear losses (DE-LOSSO; CHAGE ; GIOVANNETTI, 2019), although this section is not sufficient to understand the entire panorama of the stock market, considering that it does not include Swing traders and long-term investors, in addition to being limited to a specific period, it can, however, be considered as indicative of a problem in the system as a whole.

Failure to consider the origin of these results can, in the medium to long term, mean losses in quality of life for a large part of society's members, as amid the increase in the social security deficit (Brazil, 2020), considerations of freezing adjustments to the retirement (BRASIL, 2020) and a population that is expected to have more elderly people than young people from 2060 onwards (PROJEAÇÃO, 2022), the capital market ends up, therefore, as a path through which new generations seek to guarantee their future (ROCHA, 2022). Therefore, the need to understand how these new investors manage and interact with their finances is clear, in order to help build these paths.

This work will allow managers, advisors and other professionals in the financial field to guide their practice and serve effectively in contact with this new wave of clients, while at the same time promoting advances and rapprochement between the field of financial and behavioral studies.

To this end, the phenomenon was analyzed through the relationship between the theoretical assumptions of Skinnerian behavior analysis, the findings evidenced in the capital market and the opinion of members of the American regulatory committee, with the general objective of analyzing the relationship between gamification and its effects on the capital market, using for this the specific objectives of: verifying the main concerns of regulators regarding the topic and verifying the validity of these concerns, including how they relate to the use of gamification in the current market and, to, furthermore, investigate the behavioral effects caused by the application of gamified mechanics.

BEHAVIORAL PERSPECTIVE

To understand how this phenomenon occurs in society, it is necessary to understand the influence of the aspects that make it up on individual behavior. This problem, for radical behaviorism, occurs through the process of selection by consequences, an explanatory model that uses Skinner's theory (1953/2003, 1974/2006) which states that behavior is selected based on its consequences, increasing or reducing the frequency according to the environment and interactions with the stimuli present. In his work, the author states that the use of money as a reward in variable interval schemes, that is, when the person is not sure when they will be rewarded, predisposes the individual to greater engagement, something that occurs concomitantly with the elicitation of emotional responses, elements that are directly related to the practice of investing in the digital world through applications, websites and the potential rewards involved.

Furthermore, it is relevant to consider the environment, not only immediate, but also social and cultural, since the cultural environment acts as a selection factor, describing contingencies and establishing systems of rules, acting as an establishing operation in relation to the consequences and affecting the group so that the consequences of an individual's behavior act as stimuli for other behaviors of those included in the social environment (TODOROV, 2012). Following the same line, Frydman (2012) identifies sensitivity to peer results, demonstrating that financial results, when approached in a comparative way, act as a motivating operation for negotiation behaviors. In the same article, greater intensity of the operation is established in situations where other people's results are superior compared to when the individual has an advantage, something consistent with the increased frequency of negotiations in loss situations.

Therefore, the creation of social environments as points of interest is inferred, since in the construction of social environments it is viable to directly influence the decision-making process by defining, modifying and/or inserting contingencies that alter: the frequency of reinforcements or punishments, the interval and intensity of the consequence and the establishment of arbitrary reinforcement or punishment (RAMNERÖ *et al.,* 2019), therefore, the ability to create programmed and planned interaction environments is achieved in order to alter contingencies in a way to interfere in the decision-making process of users in accordance with the interests of the system creators.

GAMIFICATION

Gamification is the "appropriation of game elements applied in contexts, products and services not necessarily focused on games, but with the intention of promoting the individual's motivation and behavior" (DETERDING, et al., 2011, p. 1, our translation), in the case explained here, we seek to understand the effects caused by the application of this concept in the financial environment, with emphasis on its influence on small investors, given that the introduction of these elements has the possibility of interfering in the decisions of investors through the use of psychological mechanisms linked to these new components to induce specific behaviors.

This possibility was verified and applied by companies like Bunchball. Inc (2010, p.2), a company specializing in gamification software, which claims it is a "powerful new strategy for influencing and motivating groups of people". This new tactic, when used by financial intermediaries, led members of the Security and Exchange commission (SEC) to comment that, thanks to technological advances, this type of practice works to engage new investors and assist in their financial education, however, it has the risk of suggesting asset trading with greater frequency and/or risk than is appropriate for the client's profile (FLEMING, 2019). It can be seen that although there are risks associated with this new interaction model, the phenomenon is a long-term trend that can bring benefits such as the possibility of assisting in financial education through digital instruments. However, due to the lack of information, there is great concern on the part of participants in the regulatory body with what was called Digital Engagement practices (DEPs), synonymous with the gamification process and its potential implications, highlighting the urgency of further studies by disclosing that:

> To regulate the new generation of brokers efficiently it is necessary to understand the reach of DEPs in the industry and how they influence investor behavior and decision making [...] the commission sought information on different topics related to DEPs, including behavioral indicators, differential marketing, game-like features and other elements or features designed to engage the retail investor on digital platforms. (FLEMING, 2019, p.1, our translation)

Accordingly, it is not only a directly social need, but also a regulatory one, understanding the psychological aspects that permeate the subject, something enhanced by the realization of the strength that digitalization has in Brazil. (ANBIMA, 2021)

Paying attention to the current diffusion of digital media in the country, it is concluded that the Brazilian public is already dealing with the effects and consequences arising from DEPs and, therefore, needs to have knowledge about what they are being exposed to in their decision-making.

According to studies on gamification, it has proven to be a powerful tool for behavioral modification. Through it, behaviors can be directed, habits created and patterns developed according to the interests of those responsible for creating and implementing gamified systems. (MENEZES et al. 2014; HAMARI, KOIVISTO; SARSA, 2014; HAMARI ; KOIVISTO, 2019), for the authors, this is due to the creation of a learning environment in which certain responses are rewarded or punished according to the objectives of the creator of the system through the definition of objectives, direct feedback for achievements, establishment of narratives, rankings, levels and establishment of social communities aimed at encouraging activities focused on asset trading.

Therefore, it is clear how companies, when designating these systems, have the ability to change the way their customers interact with the products offered, increasing engagement with their services, given that all gaming systems are based on variable reinforcement schemes. (MENEZES et al. 2014), therefore, the digital means through which investors interact can be considered as an environment in which, through the search for engagement, the possibility of eliciting behavioral patterns that harm the investor is generated. For Macey and Hamari (2022), through these gamification instruments, users are exposed to reproducing patterns similar to those presented in betting, this statement is supported by Dorn et al. (2015) and his analysis of market participants, the researcher found a significant amount in the sample, 24 percent of those evaluated, using the financial market in order to obtain short-term gratification and entertainment, something that has aggravating factors due to the particularities of the means which, according to the findings of Cholíz, Marcos and Lazaro-Mateo (2019) and Macey and Hamari (2019), due to the speed of betting, accessibility and immediacy of responses, produce betting behaviors with greater intensity and potential for addition than that found in offline environments.

This means, in Brazil, that the majority of investors, people with assets of less than 10 thousand reais (B3, 2021), who seek to use this income for retirement and/or purchasing their own home (ASSOCIAÇÃO BRASILEIRA DAS ENTIDADES DOS MERCADOS FINANCEIROS E DE CAPITAIS, 2021) and which already have mostly low returns (BARBER and ODEAN, 2013) also need to be concerned about the conflict of interest of the platforms on which their investments operate. This conflict arises from the implementation of free trading, a business model in which brokers do not charge a commission on trading assets, making a profit based on the sale of the right to execute trades, something that pays according to the number of orders and, therefore, prioritizes the volume of negotiations. (CHEUNG, 2021). This model, called payment for order flow, means that, although there is the possibility of better prices, depending on the chosen market maker, the entity that buys the right to execute, the time to purchase the assets generates prices that come into conflict the guiding principle of best execution (USA, 2023). Therefore, companies find themselves with incentives to use systems that induce the greatest amount of trading possible, even if this results in financial losses for their clients, as "To increase the trading carried out by clients, securities brokers without commission has opted less for financial innovation and more for behavioral manipulation" (STUDDARD, 2021, p.1 Our translation), therefore, a system is configured in which the interests of companies and beneficiaries differ, generating a conflict of interest between both parties and establishing itself as a zero-sum system , in which maximizing profit for the user directly conflicts with maximizing business profit.

With a view to collaboration with regulatory bodies, the protection of individual investors and based on the precept that "such knowledge can help consumers make informed decisions and seek services that meet their desires and needs" (MACEY et al., p. 127, 2021, our translation) , there is a need to regulate these practices, something that requires, however, a greater understanding of how they work, as regulatory strategies that focus directly on design run the risk of not being comprehensive enough due to the difficulty of defining concepts such as gamification and behavioral design or being excessively comprehensive and hindering the development of the positive aspects of technology (LANGVARD; TIERNEY, 2022), to resolve this impasse it will be necessary to advance studies in the area and carry out more targeted research to the impacts of gamification and its mechanisms, thus providing the tools for the preparation of legislative and educational projects that protect individual investors.

METHODOLOGY

For this article, an integrative review was carried out, using the documents issued by members of regulatory committees and the theoretical assumptions about gamification as a qualitative part, seeking to identify, through documentary and bibliographic analysis, the profile of the Brazilian investor and the current concerns of regulators about of gamification. The quantitative part used the review of empirical studies on the topic, aiming to corroborate or deny previous findings through data. This model was selected due to its ability to generate a broad overview of the problem (SOUSA, et al., 2018), thus making it possible to investigate the different aspects of the problem in question. Another reason for this choice was, due to the recentness of the topic and the lack of specific articles on the subject, something that highlighted the need for greater depth on the subject.

The surveys were carried out through the government websites gov.br and Sec.gov; Studies available by the regulatory entities of the Brazilian Association of Financial and Capital Market Entities (ANBIMA) and the Brazilian Stock Exchange (B3) and Search in Databases: Capes, google scholar, Scielo and ResearchGate

The search was filtered, in all searches, to only include results in English or Portuguese, produced from 2012 onwards and which were available via open access. The keywords were used : individual investor, capital market, empirical gamification, gamification decision making and investor performance, in addition, the Boolean operator "and" (e) was used to help filter related articles; as an exclusion criterion, publications were removed in which: No direct effects on behavior were mentioned; the key words are included in the text, but do not represent a significant part of the study; Duplicate publications and individual case studies.

During the article search and selection process, article references were read through the ResearchGate platform, seeking to identify possible articles related to the topic. In this process, 3 relevant articles were identified. The complete list of articles used can be found in the table presented in appendix A. The correlated articles are grouped in the table. The filtering process carried out is illustrated in the image below.

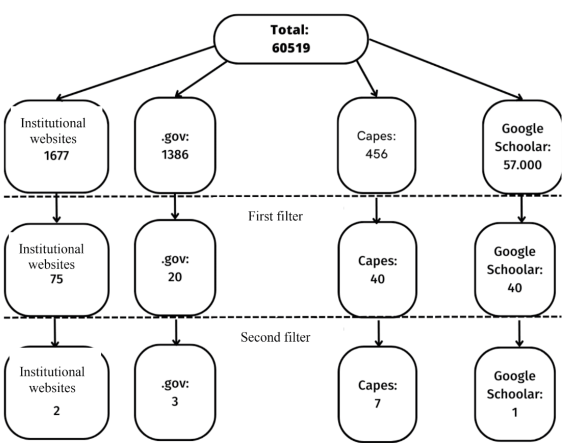

Figure 1 -Article filtering process

The analysis process was divided into two parts: Firstly, the main themes contained in the problems obtained through documentary investigation were raised, identifying the concerns and opinions officially expressed.

After the initial survey, we sought to identify gamification mechanisms that are consistent with the previous topics, subsequently carrying out a search on the behavioral basis, aiming to formulate causal hypotheses.

To verify the validity of these hypotheses, a search for empirical studies was carried out, using the findings to refute or corroborate the relationships found.

RESULTS

This study investigated the relationships between gamification and the capital market, with emphasis on assessing the validity of the concerns of market regulators, analyzing them in the light of behavioral theory and relevant research, also investigating possible effects that the application of this mechanism may have on the behavior of the average investor.

During the research process, the main concerns of regulators were found to be: The lack of general knowledge about gamification; the possibility of manipulation by brokers, creating conflicts of interest in which this technology is used to obtain profits to the detriment of consumers; the presence of incentive mechanisms to increase frequency and risk in profiles other than those appropriate to the individual objectives of clients, difficulty in regulation due to the abstract aspects of what constitutes gamification and little knowledge of its impacts on markets in a specific way.

According to the members of the committee, there is a need to investigate the effects that this type of gamification mechanism has on investors, especially those with low income, given the disproportionate exposure established, as they are, for the most part, devoid of technical qualification, retail investors are intrinsically in a relationship of substantial information asymmetry.

Having this as a basis, regulation must therefore accompany the development of new technologies, paying attention, however, to the beneficial potential present in new technologies that must not be inhibited, in view of their possible contributions, highlighting the use of the ability to engage in educational proposals. Corroborating this statement are studies by Rahman *et al.* (2018), which demonstrate greater engagement and retention of content in gamified learning environments and which illustrate, this way, the relevance of a regulatory space that organizes, but does not suffocate the industry, taking into consideration, the capacity to implement these technologies in financial education and contribution to reducing information asymmetry among market participants.

During the investigation, it was observed that most of the existing literature on the subject are recent studies, with the first article to use the terminology having been produced in 2008, (ACOSTA-MEDINA et al., 2020), however, the relevance of the concept and term, both academically and socially, increased exponentially from 2010 onwards (idem; DICHEV; DICHEVA, 2017), facts that point to the embryonic stage of the topic. Furthermore, for Rapp et al. (2019) studies are in a transition process, no longer investigating the existence of gamification, but rather expanding the field, directing studies towards increments in the definition of the topic and no longer turning to the existence of effects, but for which structures are responsible for the registered developments.

In the articles analyzed, this change of perspective is presented in the change in the central question of studies that seek to delve deeper into specific areas, making progress in relation to empirical studies and the reconciliation and validation of theoretical constructs. This movement, however, is mainly dedicated to immediate consequences, there is a lack of longitudinal and categorical studies that explain how gamification affects individuals in the long term, which groups are most affected and why, specifics regarding their interaction within specific groups, etc. Furthermore, the distribution of investigative efforts in the field in question remains largely unexplored, due to the prioritization of other areas of study, as demonstrated by Acosta-medina et al. (2020) by highlighting in their contributions the dominance of the educational sector, representing more than 35% of the sample, while the financial sector corresponds to less than 5% of the total observed. Therefore, a gap is established between the understanding of the implications of gamified systems in the financial sector in comparison to other topics, revealing a deficiency in the pace of development of knowledge on the topic under analysis.

As a consequence, there is a disproportionality in the ratio between the growth in the use of gamified elements and the pace of production of scientific knowledge necessary to create laws that address the issue. Therefore, a gap is created between the knowledge needed by legislators to support their decision-making and what is presented to users. As a result of this lack of justification, existing laws do not cover new models of interaction, resulting in an environment prone to fraud, abusive strategies, such as those involving behavioral manipulation, and reduced operational transparency. This lack of transparency takes away from participants the ability to evaluate their participation in the gamified environment, making it difficult to assess the risks and benefits involved, thus leading to an environment in which customers have reduced autonomy and interact with these systems without being aware of their implications.

In this scenario, users are forced to trust in the good faith of corporations, as there is no legal basis, and, therefore, it is optional for organizations to communicate the use of gamified tools and their possible effects, raising doubts about the extent to which companies use gamification and how it has affected transactional processes.

Evidence was found that the phenomenon of gamification is something that has actually already existed as a practice, carried out by companies intentionally, for more than a decade. However, it is clear that this phenomenon has gained notoriety, mainly in brokerages, concomitantly with digital inclusion and the consequent adoption of the zero-commission trading model.

Given the aforementioned model, it is plausible to establish that compensation for the lack of revenue from commissions acts as an incentive for brokers to seek to induce clients to increase the number of transactions on their platforms. This perspective is corroborated, both by the statements contained in the documents and by the practices of the SEC, which initiated legal proceedings against the broker Robinhood (USA, 2020) stating the lack of transparency in the operating model, not informing the customer about the practices involved and their potential financial losses for customers. Therefore, a parallel is established between the behavioral changes of gamification, the conflict of interests generated by the order flow payment model and the development of predatory tactics, implying a profound change in the relationship between the consumer and intermediary companies and treating it is a conflict between parties who, by definition, are supposed to have consistent interests (USA, 2023). The findings portrayed in this article demonstrate aspects of this paradigm shift, reflected in the use of gamification instruments as a form of subterfuge to encourage disproportionate risk-taking and the exploitation of loopholes in regulation.

It is clear that different mechanisms are used selectively on websites and applications used for negotiations. Through these tools, the instrumentation of reinforcement and punishment tools appears in a hidden way, reward systems are evaluated as the main way of influencing behavioral patterns. In this sense, digital resources arbitrarily reward the practice of investment, changing the consequences according to corporate interests. The reproduction of visual and auditory stimuli, narrative elements and immediate feedback are not limited to the reproduction of elements brought from games, but also demonstrate to evoke related patterns and behaviors, thus inducing responses initially developed in environments with consequences limited to contexts in which the risk is of much more serious proportions. This transfer of behavior has the effect of causing inadequate or imprudent financial decisions, incurring significant and damaging losses in both the short and medium/long term depending on the model offered.

These concerns are consistent with the theoretical findings about gamification which, according to the studies covered, has the capacity to influence the decision-making process, making it possible to make a relationship between the model present in the financial market with that used in betting systems. In this parallel, we can see the presence of similarities such as the use of reward systems, immediate feedback and financial incentives to change the behavior of individuals, this structure of betting games, in accordance with the extensive literature, acts of in order to maximize behaviors that often go directly in the opposite direction to the financial objectives of its participants and that have a high potential for additivity, having a direct interest in increasing the irrationality of bettors and therefore making explicit the reasons for fears about the approach between business models.

Evidence of this approach was found, not only in business practices, but also in the way users see negotiations themselves. An increase in the participation of retail investors can be seen, simultaneously with the facilitation of access to the financial market and, in addition, a new function obtained: the search for entertainment. This search illustrates, however, the importance of distinguishing between market participants who are willing to take more risks, whether for entertainment or greater tolerance for losses, from those who are being exposed to these risks without the consent or awareness of their vulnerability.

The questions presented also have the peculiarity of being relationships established based on specific gamification definitions, developed over the last 10 years. These definitions were important for defining the topic and preparing the studies, however, due to the recent nature of the topic and the constant evolution of concepts relevant to what constitutes gamification, it is still necessary to define, in a legal way, what constitutes a gamified element, operationalizing the concept for the application of rules and limits.

This definition, however, requires greater maturity in the studies, since few in-depth studies were found in the sample and a limited database, as a consequence, much of the knowledge produced is centralized in some authors of importance to the field, which from a legal point of view, it raises questions regarding the conceptual definition, considering the possibility of the point of view of these authors and their biases influencing the definition of these concepts. Therefore, there is a need to minimize this risk by expanding the topic and including contributions from different perspectives, testing the validity of existing assumptions, corroborating existing definitions or developing improvements to current definitions.

The use of empirical studies confirms the results presented, making it possible to survey the use of gamification as an engagement factor by several companies and demonstrating the potential of this model in changing the frequency of different behaviors. In this sense, the theoretical assumptions regarding the effects of gamified systems were found to be in accordance with what was observed in empirical studies, validating the applicability of the theories addressed and strengthening the credibility of the existing literature. It is worth highlighting, however, that there is a convergence between literature and field studies in a broad way, covering both positive aspects, such as improvements in learning processes, and negative aspects, such as behavioral manipulation. Thus demonstrating the complexity of the topic and the nuances present and exposing the need for contextual analyses, which identify the purpose of use, its implementation and effects in each scope in a specific way, thus identifying the particular configurations of each system.

Furthermore, during the research it was found that there was a low number of articles and studies that directly deal with the consequences of implementing gamification in the financial market, with the majority being studies on gamification in a generalized scope and in specific situations not directly related to the capital markets. This gap in research indicates a lack of in-depth investigation into the effects on the financial market, requiring a multidisciplinary approach to fully understand the phenomenon. Given the potential presented by gamification to influence decision-making and the implicit consequences, it is important to carry out joint studies, including economics, behavioral finance and game design, thus aiming to understand the different elements that make up gamification.

The use of the methodology delimited in this article did not reveal publications that referred to the long-term effects or extended effects of the use of gamification, such as the possible generalization of induced behaviors. In the same vein, there is a lack of research that verifies the level of knowledge of the population and users on the topic, making it imperative to go deeper into these issues and carry out longitudinal field research to substantiate the issues in focus.

CONCLUSION

The interaction of retail investors goes through technological changes and the development of new relational models with the capital market. These new interactions involve psychological aspects that can serve as guidance for understanding these interactions. With this as a basis, this article found evidence that at the moment, intermediary institutions are using gamification to make a profit, even if to the detriment of their clients' interests, through the zero-commission model. As a consequence, revenue generation models consider incentivizing risky behaviors by taking into consideration, incentives similar to those found in risky gaming environments.

Having this as a basis, the need for more investigative research and dissemination actions on the topic is established. The relative low number of articles on these influences is due to a) recent changes in the means of interaction with the markets and b) the profile of the new investor who, unlike previous years, has a greater participation of investors with reduced or no technical knowledge, something that makes them vulnerable to possible manipulations. This new scenario faces the difficulties of a lack of regulation, resulting from the lack of in-depth investigations on the topic and the centralization of concepts around authors, with the studies of Hamari, Macey and Kovisto as the main representatives.

The difficulty of regulating impartially means that the current scenario is characterized by a lack of transparency on the part of institutions and the lack of appropriate regulation on the part of regulatory bodies, something that is also due, in part, to low knowledge among the general public. about the topic and its effects. According to the issues presented, greater investment is needed in research in the field of behavioral economics and in disseminating the topic.

Those responsible for regulation, when identifying these changes, are concerned about the current use of gamification, it is worth highlighting, therefore, the way in which these desires have presented themselves in a legitimate way, finding significant basis in literature and field studies and demonstrating that the risks considered, they not only exist but are also already implemented in applications and websites, therefore providing vital incentives for the production of knowledge on the topic, aiming to avoid negative effects on individuals and the economy as a whole.

In this sense, it is important to highlight that gamification, in itself, is not necessarily negative. Positive factors include the use of gamification as a mechanism for engaging in financial education, the democratization of investment processes and the increase in lower-income investors in the market. The use of this type of tool has the ability to qualify new investors and to increase the historically low savings habits of the Brazilian population, thus contributing to the reduction of financial stress, wealth growth, generation of transgenerational wealth and a retirement with greater spending capacity. It is up to competent bodies such as the National Treasury to use the positive potential identified to assist in the development of healthier financial habits that benefit citizens. In fact, many companies have used these instruments in an ethical and responsible manner, encouraging desirable behaviors and helping their users to achieve their goals. However, it is necessary to be aware of the potential for abuse and manipulation presented, especially since, when dealing with the financial sector, the consequences of individuals' choices lead to significant implications.

Therefore, a more in-depth debate is necessary regarding the ethical and regulatory limits for the use of gamification in financial contexts, in order to guarantee the protection of users' interests, guaranteeing the personal agency of users of digital investment platforms, respecting them. if and applying the risk definitions established by previous regulations by the CVM.

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APPENDIX A – LIST OF ARTICLES

Research project:
Table 1 – Systematic search (Capes, Google scholar, Gov.)

2022

Key words	Number of articles	Timetable	Date	Articles
Individual investor	• 50	• 18	02/10/2022	B.3 – Individuals: An analysis of the evolution of investors at B3. São Paulo, August 11, 201. Using the data made available by the company, it was possible to create a reliable profile for the Brazilian investor.
Investor x-ray	• 1627	• 18	01/10/2022	B.2 – Brazilian Association of financial and capital markets entities. X-ray of the Brazilian investor. The study carried out by the company completes the data presented in article 1, providing data on investor interaction models.
Capital Markets	• 1275	• 21hrs	• 20/09/2022	3 – Brazil. Ministry of Economy. Secretariat of economic policy. Article selected to provide the definition used by the Brazilian government for capital markets.
Comments gamification	• 111	• 22hrs	• 21/09/2022	34 – Suddard C. – Explanation of how the fee-free commission works.
Gamification and behaviorism	• 1	• 21hrs	• 20/09/2022	6 – Mezenes. Gamification based on a behaviorist approach. The work was used due to its presentation of the behavioral perspective on the topic.
Gamification Empirical	• 278	• 20hrs	• 25/09/2022	7 – A literature review of empirical studies on gamification 8 – The definition. New Media and Society. Article selected due to talking about the behavioral patterns found in article 6.
Gamification Decision Making	• 177	• 22hrs	• 29/09/2022	9 – MACEY – A definition – New Media and Society. 10 - This Research contributed to the Project by providing quantitative dat on betting behavior in a virtual environment. 11- MACEY. Relevant work that complements the findings in articles and 9 by investigating behavior and betting in a digital environment. 12 – MACEY. It complements articles 8, 9 and 10, through th investigation of digital betting activities in other environments.
Investor performance	• 57.000	• 12hrs	• 30/09/2022	13 – BARBER – The article was used to contribute quantitative data on the performance of retail investors.

Caption:

survey carried out via the institution's own website

Survey conducted via.GOV

Research carried out via CAPES

Search conducted via google Schoolar