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Article

The Impact of Celebrity Endorsements on the Cryptocurrency Industry Through a Multi-Level Latent Class Analysis and Multidisciplinary Study

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Abstract: This paper aims to examine the various aspects of cryptocurrencies, from their inception to their current status in the financial market, using a multidisciplinary approach that incorporates mathematical and psychological methods to explore the factors that contribute to the success of celebrity endorsements and the potential risks associated with them. The first section of this research paper will provide an overview of cryptocurrencies, exploring their history, functionality, and impact on the global financial m arket. This will involve examining the technical details behind cryptocurrencies, such as blockchain technology, and the differences between various types of virtual assets. The research will also discuss the potential advantages and disadvantages of investing in cryptocurrencies, as well as the regulatory challenges they face. The second section of the research paper will focus on the psychological aspect of cryptocurrency investing, analyzing the connection between personality traits and the likelihood ofpurchasing a cryptocurrency based on a celebrity endorsement. This will involve investigating Howard Gardner's theory of multiple intelligences to understand the qualities that make people more susceptible toinvesting in a cryptocurrency without prior knowledge (Gardner, 1983). The third section of the research paper will delve into the mathematical side of cryptocurrency investing, examining the factors that contribute to the success of celebrity endorsements and the artificial growth of cryptocurrencies. This will involve developing software to calculate the artificial growth of a cryptocurrency over a 24-hour period and analyzing the data to understand the underlying factors driving its value. By taking a multidisciplinary approach, this research will shed light on the complexities of investing in virtual assets and help inform investors of the potential risks and benefits of investing in cryptocurrencies through qualitative and quantitative analyses and through the use of a Multi-Level Latent Class Analysis(LCA).

Keywords: cryptocurrencies; pump-and-dump schemes; fin-tech; latent class analysis; celebrity endorsements

1. Introduction

Since their introduction in 2009, cryptocurrencies have become a popular topic in the financial world andtheir value has grown significantly in recent years, attracting a diverse range of investors. With the emergence of over 10,000 different virtual currencies, the digital market has become a complex and diverse space. The attraction of making quick profits has led to an increase in new investors, but the unregulated and volatile nature of cryptocurrencies has led to skepticism among traditional financial institutions. This research paper aims to examine the various aspects of cryptocurrencies, from their inception to their current status in the financial market, using a multidisciplinary approach that incorporates mathematical and psychological methods to explore the factors that contribute to the success of celebrity endorsements and the potential risks associated with them. The first section of this research paper will provide an overview of cryptocurrencies, exploring their history, functionality, and impact on the global financial market. This will involve examining the technical details behind cryptocurrencies, such as blockchain technology, and the differences between various types of virtual assets. The research will

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also discuss the potential advantages and disadvantages of investing in cryptocurrencies, as well as the regulatory challenges they face. The second section of the research paper will focus on the psychological aspect of cryptocurrency investing, analyzing the connection between personality traits and the likelihood of purchasing a cryptocurrency based on a celebrity endorsement. This will involve investigating Howard Gardner's theory of multiple intelligences to understand the qualities that make people more susceptible to investing in a cryptocurrency without prior knowledge (Gardner, 1983). The third section of the research paper will delve into the mathematical side of cryptocurrency investing, examining the factors that contribute to the success of celebrity endorsements and the artificial growth of cryptocurrencies. This will involve developing software to calculate the artificial growth of a cryptocurrency over a 24-hour period and analyzing the data to understand the underlying factors driving its value. By taking a multidisciplinary approach, this research will shed light on the complexities of investing in virtual assets and help inform investors of the potential risks and benefits of investing in cryptocurrencies through qualitative and quantitative analyses and through the use of a Multi-Level Latent Class Analysis(LCA).

Cryptocurrencies are a decentralized, peer-to-peer system that allows for the transmission of payments across geographically dispersed parties. In contrast to traditional currencies, cryptocurrencies exist purely as digital entities and all transactions are publicly recorded in a distributed ledger, commonly referred to as a blockchain (Nakamoto, 2008). These units of cryptocurrency are generated through a process known as mining, which involves the solution of complex mathematical problems by computational devices (Nakamoto, 2008). The history of cryptocurrencies dates back to the creation of the first cryptocurrency, Bitcoin, in 2009 (Nakamoto, 2008). However, despite its initial novelty, Bitcoin was found to be riddled with a multitude of drawbacks such as high energy consumption and vulnerabilities to hacking and fraud (Swan, 2015). In 2011, the first alt-coin, Litecoin, was developed (Lee, 2011). Both Bitcoin and Litecoin operate on a Proof of Work (PoW) system, which involves competition among miners to solve mathematical puzzles and equations to validate transactions and earn cryptocurrency (Swan, 2015). The technological development of cryptocurrencies reached new heights with the introduction of a novel alt-coin, Peercoin, which operates on a Proof of Stake (PoS) system (King Nadal, 2012). PoS allows for the selection of random validators to ensure the legitimacy of transactions, with these validators being awarded cryptocurrency in return (King Nadal, 2012). Currently, in 2023, the market capitalization for all cryptocurrencies remains highly volatile, with an expected valuation of approximately 2.1 trillion dollars (CoinMarketCap, 2022).

The extensive proliferation of cryptocurrencies has significantly reduced the barriers to entry for cryptocurrency development (Swan, 2015). As a result, individuals are now able to create their own cryptocurrencies with minimal effort, using pre-existing code and networks such as the Finance and Ethereum network (Swan, 2015). These advancements have allowed individuals to profit greatly at the expense of unsuspecting investors. With the creation of these cryptocurrencies, many developers seek out celebrity endorsements to promote their coin (Lohrmann, 2021). This practice leads to an artificial inflation of prices, as fans purchase the currency based on these endorsements. Once the price increases significantly, developers may sell their position in what is known as a pump-and-dump scheme (Lohrmann, 2021). These schemes are akin to rug pulls in the world of cryptocurrencies and have become increasingly prevalent, with a growing number of celebrities posting such endorsements (Lohrmann, 2021). This is a significant problem as the government has no control over the cryptocurrency industry. If similar events were to occur in the stock market, the SEC could halt the stock and punish those responsible. However, the decentralized nature of cryptocurrencies limits the government's ability to intervene (Swan, 2015). These endorsements highlight the speculative and artificial nature of the industry and further underline the need for a more reliable investment framework for cryptocurrencies (Lohrmann, 2021).

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2. Methods and Models Utilized

To conduct this study, the researcher used a multilevel latent class analysis (LCA) to identify the groups with increased susceptibility to purchase cryptocurrencies. The LCA allowed us to group individuals based on their personality types and intelligence types and analyze their purchasing behavior. The sample for this study consisted of 796 participants who were recruited through social media platforms and in the researcher's common workplaces. The participants were required to complete a questionnaire that included the Myers-Briggs Personality Type Indicator and Howard Gardner's Theory of Multiple Intelligences. The Myers-Briggs Personality Type Indicator assesses individuals based on four dichotomies: Extraversion-Introversion, Sensing-Intuition, Thinking-Feeling, and Judging-Perceiving. Each dichotomy has two possible outcomes, resulting in 16 possible personality types. Howard Gardner's Theory of Multiple Intelligences identifies eight distinct intelligence types: linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. The questionnaire also collected data on their cryptocurrency knowledge and their purchasing behavior.

The LCA was conducted using R software, and three different models were tested. The first model only included the personality types, the second model included the intelligence types, and the third model included both personality types and intelligence types. The fit of each model was assessed using various model fit indices, including the Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC). The study also utilized the poLCA package in R for the multilevel latent class analysis. This package allows for a more comprehensive and nuanced analysis of the data, as it takes into account the potential clustering of individuals within different social networks or subgroups. By incorporating poLCA, the study not only identified the overall trends and associations between personality types and cryptocurrency purchasing behaviors but also explored potential differences and variations within different subpopulations. Furthermore, poLCA allows for the estimation of both fixed and random effects within the models and provides valuable insights into the underlying mechanisms and factors that contribute to the observed relationships. This can help to identify potential moderators or mediators of the personality-cryptocurrency association and can also inform the development of more targeted interventions or strategies to address any negative consequences associated with the cryptocurrency market.

Limitations of Psychological Tests Utilized: The Myers-Briggs Type Indicator (MBTI) is a widely used personality assessment tool that is based on the theories of Carl Jung. It categorizes individuals into one of 16 personality types based on four dichotomies: extraversion (E) vs. introversion (I), sensing (S) vs. intuition (N), thinking (T) vs. feeling (F), and judging (J) vs. perceiving (P). While the MBTI has been used extensively in various contexts, it has also faced criticism and limitations, which have sparked debates over the validity and reliability of the instrument. One major limitation of the MBTI is that it is a self-report measure, which means that it relies on individuals to accurately report their own personality traits. This is problematic because individuals may not have accurate self-awareness or may respond in a socially desirable way, which can lead to biased results. In fact, some studies have found that self-reported MBTI results have low validity, as they do not consistently predict behavior or performance in real-world situations (Boyle, Saklofske, Matthews, 2015). Another criticism of the MBTI is that it oversimplifies complex human behavior and personality traits. The four dichotomies do not capture the full range of human personality, and many people may exhibit traits that do not fit neatly into one category. Moreover, the MBTI assumes that personality is fixed and stable over time, which has been challenged by research indicating that personality can change over the course of a person's life (Roberts Mroczek, 2008). Additionally, the MBTI has been criticized for lacking scientific rigor and empirical support. While it has been widely used in various settings, including corporate and educational contexts, the MBTI has not been extensively researched in terms of its reliability and validity. Some researchers have argued that the MBTI lacks empirical support, as it has not been consistently shown

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to predict job performance, academic success, or other real-world outcomes (Pittenger, 2005). Furthermore, the MBTI has been accused of promoting stereotypes and reinforcing biases. For example, the extraversion/introversion dichotomy can perpetuate the myth that extroverts are more successful and desirable than introverts, which is not supported by research (Cain, 2012). Similarly, the thinking/feeling dichotomy can perpetuate gender stereotypes, as women are often assumed to be more emotional and feeling-oriented than men (Grant, 2013).

Nevertheless, the reason for the utilization was due to the primary application of this dataset; the MBTI test was created with the intent to classify primarily students and young adults because the researcher primarily surveyed this demographic and utilized it for the data analysis, a consensus was made to investigate the MBTI test and its connection to cryptocurrency purchases.

Howard Gardner's theory of multiple intelligences (MI) revolutionized the way we conceptualize intelligence. According to his theory, intelligence is not a single, unified trait but rather a set of abilities that enable us to solve problems and adapt to different environments. Gardner identified eight distinct types of intelligence, including linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. Each of these types of intelligence is relatively independent of the others, and individuals can excel in one or more areas. However, Gardner's theory has been subject to several criticisms. One major limitation of the MI theory is that it is not supported by empirical research. While the concept of multiple intelligences has gained widespread acceptance, there is little empirical evidence to support the idea that intelligence is best understood as a collection of separate, relatively independent abilities. Moreover, studies examining the validity of Gardner's theory have found mixed results, with some studies supporting the theory and others finding little support (Kaufman Sternberg, 2010). Another criticism of the MI theory is that it is too broad and inclusive. Gardner's eight types of intelligence are relatively vague and can encompass a wide range of abilities. This has led some critics to argue that the MI theory lacks specificity and precision, making it difficult to apply in practical settings such as education. Additionally, some researchers have pointed out that some of Gardner's categories, such as naturalistic intelligence, may not actually represent distinct types of intelligence but rather a combination of other abilities (Lohman, 2005). Furthermore, the MI theory has been criticized for its lack of cultural sensitivity. Gardner's categories of intelligence are based on Western culture and may not be applicable to other cultures or contexts. For example, some cultures may place a greater emphasis on communal or spiritual intelligence, which is not explicitly recognized by the MI theory. This lack of cultural sensitivity can lead to a narrow understanding of intelligence that ignores the diverse ways in which intelligence is valued and expressed across cultures (Sternberg, 2003).

Despite these limitations, the MI theory has several positive attributes. One of the most significant strengths of the MI theory is its emphasis on the diversity of human intelligence. By recognizing that intelligence is not a single, unitary trait, the MI theory has opened up new avenues for understanding and appreciating different types of abilities. This has been particularly important in the context of education, where traditional assessments of intelligence have often focused narrowly on linguistic and logical-mathematical abilities. Moreover, the MI theory has been influential in shaping educational practice. The theory has led to the development of new teaching methods that cater to different types of intelligence, such as kinesthetic learning activities for bodily-kinesthetic learners or music-based activities for musical learners. These approaches have been successful in engaging students and promoting learning, indicating that the MI theory has practical value in educational settings (Armstrong, 2009).

In this research, the objective was to gain a comprehensive understanding of the artificial growth of cryptocurrencies by analyzing the impact of celebrity endorsements on the increase in the market capitalization of invaluable crypto- projects. To achieve this, the researcher employed a mathematical approach to calculate future models for the growth

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of virtual assets based on numerous variables related to the celebrity. The study began by compiling a list of 50 celebrities who had engaged in pump-and-dump schemes. To identify these celebrities, the researcher developed a unique software that utilized elements of a web scraper to analyze factors such as the like-to-comment ratio and average viewership time of each post. The software generated a HAR file, which was used to flag any post that met the criteria for a pump and dump scheme.

Once the list of celebrities was compiled, the researcher investigated various values, such as follower counts, and categorical variables such as hair color, political affiliation, and profession, to help stratify the celebrities and determine specific characteristics associated with a more successful endorsement. This enabled the numbers and equations generated to be viewed from a qualitative aspect and find the interplay between the psychological analysis and mathematical aspect.

Software Aspect: The researcher wrote a program written in Python to analyze the artificial growth of a cryptocurrency over a 24-hour period. To create the program, the researcher utilized a variety of Python libraries, including Pandas and NumPy, which are commonly used for data manipulation and analysis. The program was designed to collect and analyze data on the price of the cryptocurrency over a 24-hour period, including the opening price, closing price, and any fluctuations in between. To collect the data, the program utilized various data sources, including cryptocurrency exchanges and online marketplaces. The data was then processed and analyzed using a variety of statistical methods, including regression analysis and time series analysis. These methods allowed the researcher to identify trends and patterns in the data, as well as to make predictions about future price movements. One key component of the program was the use of technical indicators, such as moving averages and relative strength index (RSI), to analyze the price of the cryptocurrency. Technical indicators are mathematical calculations based on the price and/or volume of a security or asset that can provide insights into the strength and direction of the price trend. For example, the moving average is a commonly used technical indicator that calculates the average price of an asset over a specified period of time. By comparing the current price of the cryptocurrency to its moving average, the researcher could determine whether the price was trending upwards or downwards. The RSI, on the other hand, measures the strength of a security's price action by comparing its gains to its losses over a specified period of time. In addition to technical indicators, the program also utilized machine learning algorithms to analyze the data and make predictions about future price movements. The use of machine learning allowed the researcher to identify complex patterns in the data that may have been difficult to detect using traditional statistical methods.

In addition, the researcher developed a program in Python to analyze various HAR files and flag Instagram posts that indicated a potential pump-and-dump scheme for a cryptocurrency. To achieve this, the program utilized various methods to analyze the like-comment ratio and share-to-comment ratio of each post.

The program utilized a web scraper to extract data from the HAR files of Instagram posts related to the cryptocurrency in question. HAR files contain a record of all the network requests made by a browser when loading a webpage, which includes data such as HTTP headers, cookies, and response content. The program extracted relevant data from the HAR files, such as the post ID, the number of likes, comments, and shares, and the timestamps of the post and its engagement metrics. Next, the program analyzed the like-comment ratio and share-to-comment ratio of each post to determine whether it indicated a potential pump-and-dump scheme. The like-comment ratio is the ratio of the number of likes to the number of comments on a post, while the share-to-comment ratio is the ratio of the number of shares to the number of comments on a post. High like-comment and share-to-comment ratios can be indicative of a pump-and-dump scheme, as they suggest that the post is being artificially inflated by a group of coordinated buyers. To flag posts that indicated a potential pump-and-dump scheme, the program utilized statistical analysis to identify posts with like-comment and share-to-comment ratios that were significantly higher than the average

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for the account. For example, if the average like-comment ratio for an account was 3:1, a post with a ratio of 10:1 would be flagged as potentially suspicious. To further refine the analysis, the program also took into account other factors such as the timing of the post and its engagement metrics. For example, if a post received a large number of likes and comments in a short period of time, it could suggest that a coordinated buying effort was taking place. Due to the successful functionality of this program, the researcher was able to identify fifty "celebrities" who fit the quantitative values associated with promoting a worthless crypto-project.

3. Results

3.1. Psychological Findings

Myers-Briggs Personality Test: According to the first level of the multilevel latent class analysis and the parameters set by the researcher within the code, the 16 different personality types can be grouped into three clusters. The first cluster includes the ISTJ, ISFJ, and ISTP types, who have a lower likelihood of purchasing a cryptocurrency with an average likelihood of purchase ranging from 0.27 to 0.35. The second cluster includes the INFP, ENTP, ESFJ, and ENFJ types, who have a moderate likelihood of purchase with an average likelihood of purchase ranging from 0.33 to 0.45. Finally, the third cluster includes the INFJ, INTJ, ISFP, INTP, ESTP, ESFP, ENFP, and ENTJ types, who have a higher likelihood of purchasing a cryptocurrency with an average likelihood of purchase ranging from 0.48 to 0.67. **(Figure 1)** Based on the parameters and output produced by level 2 of the MLLCA analysis, one of the factors is the willingness to explore new topics, as there is a positive correlation between this trait and the likelihood of purchasing a cryptocurrency ($r=0.79$, $p<0.01$). This suggests that individuals who are more open to trying new things and exploring new ideas may be more likely to invest in cryptocurrencies (Forero, Maydeu-Olivares, Gallardo-Pujol, 2009). Another personality factor that may influence cryptocurrency purchase is organization, as there is a moderate positive correlation between this trait and the likelihood of purchase ($r=0.58$, $p<0.01$). This indicates that individuals who are more organized and structured in their decision-making processes may be more likely to invest in cryptocurrencies (McCrae Costa, 1987). Additionally, individuals who are more spontaneous in their decision-making processes may be less likely to purchase cryptocurrencies, as there is a negative correlation between spontaneity and likelihood of purchase ($r=-0.92$, $p<0.01$). **(Figure 2)** This suggests that individuals who tend to make impulsive decisions may be less likely to invest in cryptocurrencies (Costa McCrae, 1992). According to the data, individuals who are fascinated by the "what if" aspect have an average likelihood of purchasing a cryptocurrency based on an endorsement and this trait is heavily associated with the most vulnerable personality types. One potential explanation for this could be that individuals who are drawn to the "what if" aspect are often open to exploring new ideas and possibilities. Cryptocurrency is a relatively new and innovative concept, and these individuals may be more likely to embrace it and see its potential value. Additionally, these individuals may be more willing to take risks and invest in something that has the potential to bring significant returns, even if it is not yet widely adopted or understood by the general public.

Howard Gardners Multi-Intelligence Model: Using an MLLCA analysis three different clusters were identified based on the mean likelihood of purchase values.

The first cluster includes bodily-kinesthetic, interpersonal, and linguistic intelligence types. Individuals with these intelligence types are more likely to purchase a cryptocurrency based on an endorsement than others. Specifically, bodily-kinesthetic intelligence has the highest mean likelihood of purchase value (0.583), followed closely by interpersonal intelligence (0.610) and linguistic intelligence (0.471). These intelligence types may be more inclined to purchase a cryptocurrency based on the endorsement of a trusted individual due to their strong social and communication skills, as well as their ability to understand and process physical movements and actions. The second cluster includes musical, naturalistic,

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and intrapersonal intelligence types. These individuals have a moderate likelihood of purchasing a cryptocurrency based on an endorsement. Musical intelligence has the highest mean likelihood of purchase value in this cluster (0.410), followed by naturalistic intelligence (0.348) and intrapersonal intelligence (0.217). Individuals with these intelligence types may be more selective in their decision to purchase a cryptocurrency based on an endorsement, as they are more introspective and attuned to their own needs and interests. The third and final cluster includes logical-mathematical and spatial intelligence types. These individuals have the lowest mean likelihood of purchase values (0.518 and 0.381, respectively). Logical-mathematical and spatial intelligence types may be less likely to purchase a cryptocurrency based on an endorsement because they are more analytical and focused on concrete data and facts. They may require more evidence and information before making a decision to invest in a cryptocurrency. **(Figure 3)** The spread of data in Level Two for each intelligence type in the table varied. Linguistic intelligence has the highest mean score for all characteristics, indicating that people with high linguistic intelligence are generally good at public speaking, have a strong sense of appreciation, and may have high educational abilities. On the other hand, logical-mathematical intelligence has the highest mean score for problem-solving ability, indicating that people with high logical-mathematical intelligence are generally good at solving problems (Gardner, 1983). **(Figure 4)**

Spatial intelligence has the highest mean score for work-life balance, indicating that people with high spatial intelligence may be good at managing their personal and professional lives (Gardner, 1983). Musical intelligence has the highest mean score for artistic abilities, indicating that people with high musical intelligence may have a natural inclination toward music, art, and writing (Gardner, 1983). Bodily-kinesthetic intelligence has high mean scores for both public speaking skills and problem-solving ability, indicating that people with high bodily-kinesthetic intelligence may be good at both physical and mental tasks (Gardner, 1983). Interpersonal intelligence has a high mean score for a sense of appreciation, indicating that people with high interpersonal intelligence may be good at recognizing and appreciating the feelings of others (Gardner, 1983). Intrapersonal intelligence has a high mean score for work-life balance, indicating that people with high intrapersonal intelligence may be good at managing their own emotions and personal life (Gardner, 1983). Finally, naturalistic intelligence has the highest mean score for educational abilities, indicating that people with high naturalistic intelligence may be good at learning about the natural world (Gardner, 1983). **(Figure 4)**

Through the identification that those associated with logical-mathematical and bodily-kinesthetic intelligence groups were the most vulnerable to the purchase of cryptocurrencies based on a celebrity endorsement, it allowed the researcher to analyze the sub-characteristics of the individuals most likely to fall for these financial schemes. Some of these characteristics showed a quite prominent connection with the purchase of worthless crypto-projects; these included people with better problem-solving skills and a weaker perceptual sense of their artistic abilities. The evidence suggested that people with strong problem-solving skills may be more likely to invest in cryptocurrencies. This may be because investing in cryptocurrencies requires a certain degree of technical knowledge and analytical thinking, which are key components of problem-solving ability. In addition, individuals with strong problem-solving skills may be more confident in their ability to analyze market trends and make informed investment decisions (Kiani, Alizadeh, Yarahmadi, 2021). On the other hand, individuals with weaker artistic abilities may also be more likely to invest in cryptocurrencies. This may be because investing in cryptocurrencies is often seen as a more logical and rational choice, rather than an emotional or creative one. In addition, individuals with weaker artistic abilities may be less interested in traditional forms of investment, such as stocks or real estate, and may be more drawn to newer and more unconventional forms of investment (Rao, 2018). When it comes to celebrity endorsements, there is evidence to suggest that they can have a significant impact on consumer behavior. For example, a study by Gupta and Gould (2019) found that celebrity endorse-

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ments can lead to increased brand awareness, positive brand image, and higher purchase intention among consumers. This may be because celebrities are often seen as trustworthy and credible sources of information, and their endorsement of a product or service can lend it a sense of legitimacy and prestige. Therefore, it is possible that individuals with strong problem-solving skills and weaker artistic abilities may be more likely to purchase a cryptocurrency based on a celebrity endorsement. They may be drawn to the logical and analytical nature of cryptocurrency investment, and may see the celebrity endorsement as a validation of their own investment decisions. In addition, the endorsement may also appeal to their sense of trust in the celebrity as a credible source of information.

3.2. Mathematical Results

The data for the overarching celebrities showcases the percentage increase in market capitalization of various cryptocurrencies as a result of the endorsement of 50 celebrities. The data has been stratified based on the increase in market capitalization over a 24-hour period and the number of social media followers of each celebrity. The equation and correlational value have been derived using the ordinary least squares (OLS) regression method. Kim Kardashian, Lionel Messi, and Luis Suarez had the highest market capitalization increase of increase of 467, 134, and 126 percent, respectively. It is noteworthy that Kim Kardashian, who has 274 million followers on social media, has the highest percentage increase in market capitalization. In contrast, Soulja Boy and Roseanne Barr saw a decrease in market capitalization by -1 and -7 percent, respectively. The correlation coefficient of 0.7505 indicates a moderate positive relationship between the number of social media followers and market capitalization increase. **(Table 1)** This suggests that the more social media followers a celebrity has, the more likely they are to affect the market capitalization of a cryptocurrency. However, it is important to note that correlation does not necessarily imply causation and that other factors may contribute to market capitalization increase.

The correlation coefficient of 0.7505 indicates a moderate positive relationship between the number of social media followers and market capitalization increase. This suggests that the more social media followers a celebrity has, the more likely they are to affect the market capitalization of a cryptocurrency. However, it is important to note that correlation does not necessarily imply causation and that other factors may contribute to market capitalization increase.

The equation derived from the data suggests that there is a positive linear relationship between social media followers and market capitalization increased. It is important to consider the limitations of this data, including the potential for confounding variables, such as market trends and news events, to influence market capitalization. Additionally, the data only focuses on the 24-hour period, which may not be representative of long-term market trends. Despite these limitations, this data can be useful in understanding the potential impact of celebrity endorsements on cryptocurrency market capitalization.

When it came to the stratification based on profession, the researcher classified celebrities into four main categories: influencers, actors, singers, and founders/athletes. We operationalized the term "influencer" as individuals whose primary role entails content creation on social media platforms such as YouTube, Twitch, TikTok, and Instagram. The findings indicate that celebrities who fall under the influencer category exhibit the highest artificial increase in market capitalization, with an average percentage increase of 73.4 percent, which is significantly higher than the value obtained for all celebrities analyzed together. The correlation coefficient between celebrity endorsement and market capitalization was found to be 0.935. The results are consistent with previous research that suggests that influencer marketing can increase brand awareness and sales (Mortimer et al., 2020). One possible explanation for the observed effect may be that individuals feel more connected to the lives of influencers, as they often share personal experiences and opinions with their followers. As a result, followers may be more likely to follow the influencer's advice, including investing in cryptocurrencies. On the other hand, we found that celebrities primarily known for their roles as actors or singers showed little artificial growth in market

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capitalization. This is consistent with previous research that suggests that celebrity endorsements in traditional media may not have a significant impact on consumer behavior (Erdogan et al., 2001). It is possible that these celebrities do not have as much influence on their fans' decision-making processes as influencers, as individuals may only engage with their content periodically, rather than on a daily basis. **(Table 2,3,4,5)**

Another aspect the researcher examined was the impact of political party affiliation on the artificial increase in market capitalization of cryptocurrencies resulting from celebrity endorsement. Celebrities were categorized based on their political party affiliation, or lack thereof, into three categories: democratic, republican, or not party affiliated. In cases where this information was not publicly available, celebrities were classified as "not party affiliated."

The analysis revealed that celebrities who were not publicly affiliated with a political party exhibited the highest average increase in market capitalization, with an average percentage increase of 70.11 percent, and a correlation coefficient of 0.96. **(Table 8)** On the other hand, celebrities publicly affiliated with the Democratic party exhibited an average artificial increase of 22.7 percent in market capitalization, with a correlation coefficient of 0.49. **(Table 6)** In contrast, celebrities associated with the Republican party had an average increase of 41.6 percent in the cryptocurrencies they endorsed, but with a negative correlation coefficient of -0.12. **(Table 7)** These findings suggest that political party affiliation may have an impact on the degree of artificial increase in market capitalization resulting from celebrity endorsement. It is important to note that outliers in the data can impact the overall results. In this study, the researcher observed that the Republican party had a few outliers, which ultimately impacted the correlation coefficient and decreased the average increase in market capitalization. Our findings are in line with previous research that has examined the impact of celebrity endorsement on consumer behavior. For instance, a study by Erdogan et al. (2001) found that celebrity endorsement in traditional media may not have a significant impact on consumer behavior. This data suggests that political party affiliation may play a role in the degree of artificial increase in market capitalization resulting from celebrity endorsement. However, further research is needed to fully understand the underlying mechanisms and potential limitations of these findings.

The last stratification examined the impact of celebrity endorsement on the artificial increase in market capitalization of cryptocurrencies, stratified by the celebrities' race. The sample included a classification into three racial categories: White, African American, and Asian/Pacific Islander. Mixed-race celebrities were assigned to multiple strata to avoid data bias.

The results revealed that White celebrities had the highest average increase in market capitalization, with a mean of 47.9 percent and a correlation coefficient of 0.92. **(Table 9)** This finding is in line with previous research suggesting that White individuals generally have greater social and economic advantages than individuals of color (Williams, 2018). Moreover, the cultural significance of cryptocurrency, which is often associated with libertarian values, may attract individuals with more conservative attitudes, who are more likely to be White (Furnham Smyth, 2018). In contrast, African American celebrities showed a lower average artificial gain in market capitalization, with a mean of 25.7 percent and a correlation coefficient of 0.13. **(Table 10)** This finding may be explained by the historical and ongoing racial disparities in wealth and economic opportunities faced by African Americans, which limit their ability to invest in cryptocurrency (Darity Jr et al., 2018). Additionally, the limited representation of African American individuals in the cryptocurrency industry may contribute to their lower impact on market capitalization. Finally, Asian/Pacific Islander celebrities had an average artificial gain in market capitalization of 48 percent and a correlation coefficient of 0.71. **(Table 11)** This finding suggests that individuals of Asian/Pacific Islander descent may have a greater interest in and familiarity with cryptocurrency, given the prevalence of cryptocurrency trading and mining in Asian countries (Kwon, 2021).

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3.3. Figures, Tables and Schemes

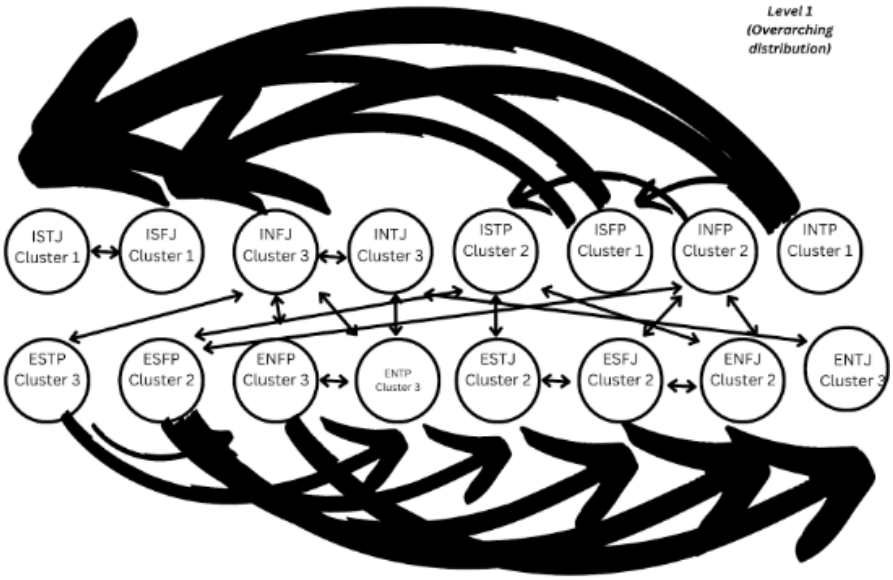

Figure 1. Level One of the MLLCA Analysis for the MBTI Distribution (N=796) Showcases the connection of the various Myers-Briggs personality groups based on the determination of the likelihood of purchasing a cryptocurrency based on celebrity endorsements.

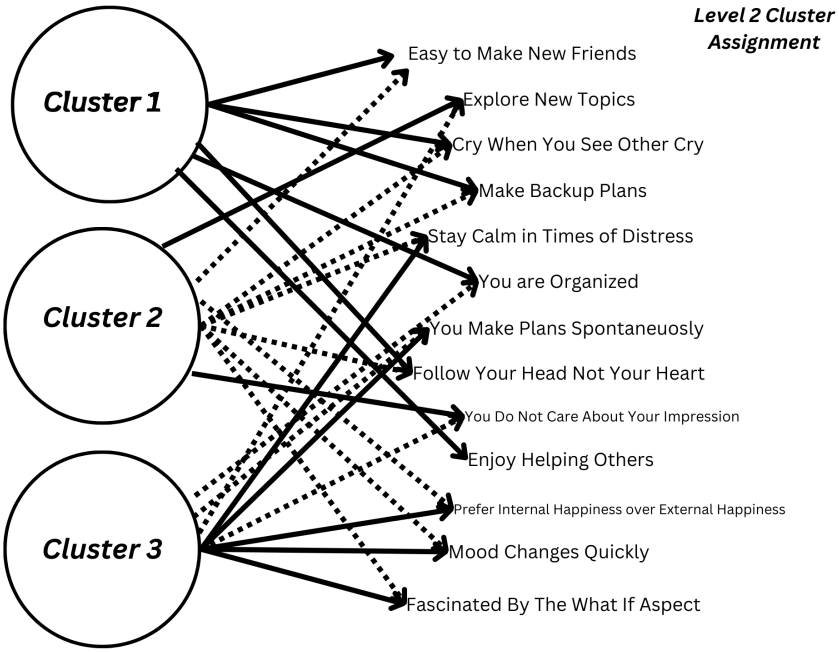

Figure 2. Level Two of the MLLCA Analysis for the MBTI Distribution (N=796) Showcases the connection of the various Myers-Briggs sub-characteristics (indicators) based on the determination of the likelihood of purchasing a cryptocurrency based on celebrity endorsements.

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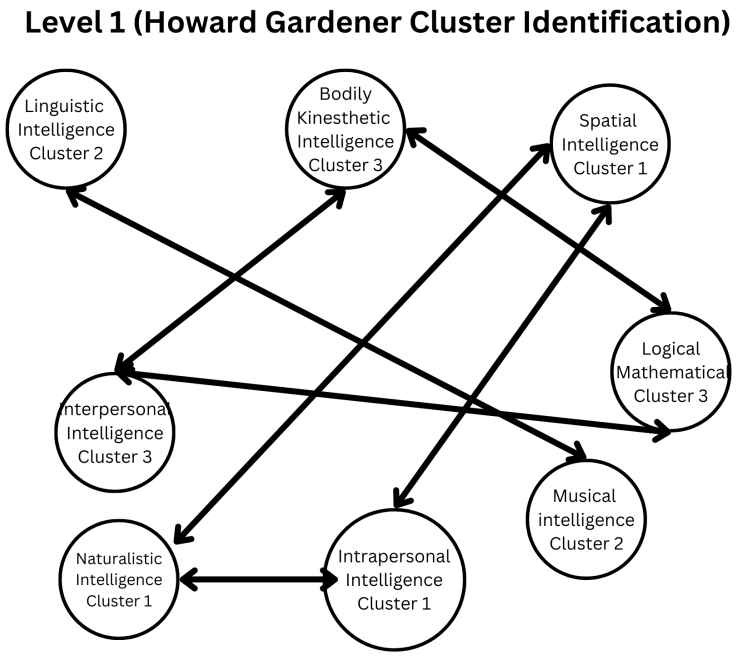

Figure 3. Level One of the MLLCA Analysis for the HGMI classification (N=796) Showcases the connection of the various intelligence groups based on the determination of the likelihood of purchasing a cryptocurrency based on celebrity endorsements.

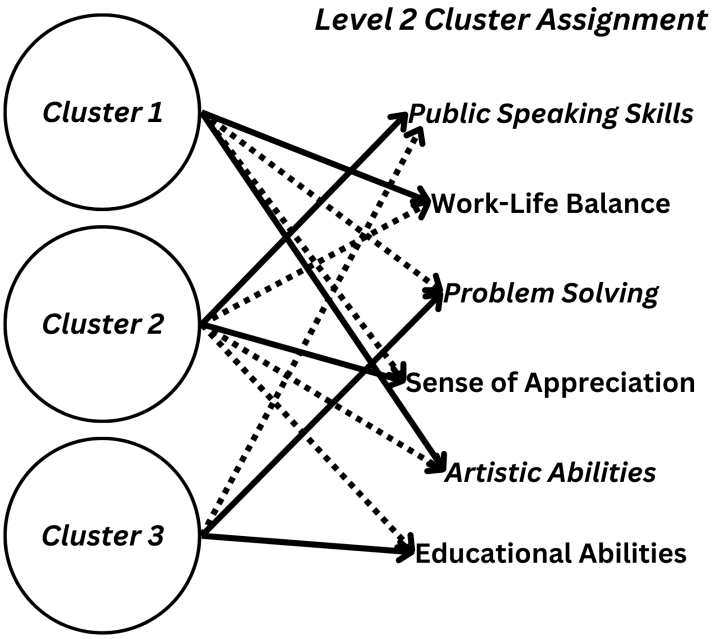

Figure 4. Level Two of the MLLCA Analysis for the HGMI classification (N=796) Showcases the connection of the various sub-characteristics associated with the intelligence groups based on the determination of the likelihood of purchasing a cryptocurrency based on celebrity endorsements.

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Table 1. R-Coefficent and futuristic model for artificial growth of market capitilization based on current trends (No Stratification).

Correlation	Equation
0.7504513587	y=1161266+59276172.09x

[1] No Stratification.

Table 2. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on profession).

Correlation	Equation
0.935862674	y=-6147537.303+55443727.85x

[1] Celebrities Primarily Identified as a Influencer.

Table 3. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on profession).

Correlation	Equation
0.2089727333	y=15609647.81+6491134.58x

[1] Celebrities Primarily Identified as a Actor.

Table 4. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on profession).

Correlation	Equation
0.1472949273	y=14575519.83+4956590.969x

[1] Celebrities Primarily Identified as a Singer.

Table 5. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on profession).

Correlation	Equation
0.5832521556	y=-8747244.596+91246213.75

[1] Celebrities Primarily Identified as a Founder/Athlete.

Table 6. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on public political affiliation).

Correlation	Equation
0.4921513636	y=4912821.721+13858361.56x

[1] Celebrities Publicly Associated with the Democratic Party.

Table 7. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on public political affiliation).

Correlation	Equation
-0.1284948844	y=18043646.23-4486395.739x

[1] Celebrities Publicly Associated with the Republican Party.

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Table 8. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on public political affiliation).

Correlation	Equation
0.9643190837	y=3585422.126+57185658.7x

[1] Celebrities Not Publicly Associated with a Party. Skewed values due to inadequate number of participants who fit into this stratification.

Table 9. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on race).

Correlation	Equation
0.9244402331	y=-4799980.385+53180367.5x

[1] White

Table 10. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on race).

Correlation	Equation
0.1033159783	y=14898964.91+10090612.91x

[1] African American

Table 11. R-Coefficient and futuristic model for artificial growth of market capitalization based on current trends (stratification based on race).

Correlation	Equation
0.71778023053	y=-18477758.17+136528195.8x

[1] Asian and Pacific Islander

4. Discussion and Implications

The research paper presented offers a comprehensive analysis of the various aspects of cryptocurrencies, focusing on their technical details, potential advantages and disadvantages, and the psychological and mathematical factors that influence their success. By taking a multidisciplinary approach, the study shed light on the complexities of investing in virtual assets and help inform investors of the potential risks and benefits of investing in cryptocurrencies.

One of the key contributions of this study is its analysis of the impact of celebrity endorsements on the cryptocurrency market. The practice of using celebrity endorsements to promote cryptocurrencies has become increasingly prevalent, leading to artificial inflation of prices and the potential for pump-and-dump schemes. This highlights the speculative and artificial nature of the cryptocurrency industry and underscores the need for a more reliable investment framework for cryptocurrencies. This issue is particularly relevant given the decentralized nature of cryptocurrencies, which limits the government's ability to intervene and protect investors. Another important contribution of the study is its exploration of the psychological factors that influence cryptocurrency investing. By analyzing the connection between personality and intelligence traits and the likelihood of purchasing a cryptocurrency based on a celebrity endorsement, the study provides insights into the qualities that make people more susceptible to investing in a cryptocurrency without prior knowledge. This could help inform the development of educational initiatives and investment strategies aimed at mitigating the potential risks of cryptocurrency investing. In addition to these contributions, the study also provides a thorough overview of the history, functionality, and impact of cryptocurrencies on the global financial market. This

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includes an analysis of the technical details behind cryptocurrencies, such as block chain technology, and the differences between various types of virtual assets. The study also examines the potential advantages and disadvantages of investing in cryptocurrencies, as well as the regulatory challenges they face. Block-chain technology, which underpins many cryptocurrencies, has been hailed as a revolutionary tool for securing and verifying transactions in a decentralized and transparent manner (Swan, 2015). This technology has the potential to disrupt various industries, including finance, healthcare, and supply chain management (Nakamoto, 2008). As such, the future of cryptocurrencies appears to be bright, with numerous opportunities for growth and innovation.

One of the most significant challenges facing cryptocurrencies is scalability. The current blockchain infrastructure used by most cryptocurrencies is limited in terms of the number of transactions it can handle per second (Swan, 2015). This bottleneck has led to slower transaction times and higher fees, making cryptocurrencies less practical for everyday use. However, advancements in blockchain technology, such as the development of Layer 2 solutions, promise to increase the scalability and efficiency of cryptocurrencies (Wang et al., 2021). Another area of growth for cryptocurrencies is in the development of decentralized finance (DeFi) applications. DeFi refers to a set of financial applications that operate on a decentralized blockchain network, allowing for peer-to-peer lending, borrowing, and trading without intermediaries (Hens Tuckett, 2021). These applications have the potential to increase financial inclusion and accessibility by providing banking services to individuals who may not have access to traditional financial institutions (Hens Tuckett, 2021). The DeFi industry has been growing rapidly in recent years, with the total value locked in DeFi protocols reaching over 100 billion in early 2022 (DeFi Pulse, 2022). In addition to DeFi, cryptocurrencies also have potential applications in other industries such as healthcare and supply chain management. Blockchain technology can be used to create tamper-proof and secure medical records, allowing for greater transparency and privacy in the healthcare industry (Swan, 2015). Cryptocurrencies can also be used to track and verify the authenticity of products in the supply chain, reducing the risk of fraud and counterfeiting (Swan, 2015).

However, despite the potential benefits of cryptocurrencies, there are also significant risks and challenges associated with their use. One of the primary concerns is the lack of regulation in the cryptocurrency industry. This has led to a proliferation of fraudulent schemes and scams, such as pump-and-dump schemes and initial coin offerings (ICOs) (Lohrmann, 2021). Additionally, cryptocurrencies are often used for illicit activities such as money laundering and terrorist financing (Kshetri, 2018). The anonymity and decentralization of cryptocurrencies make it difficult for law enforcement agencies to track and trace these activities (Kshetri, 2018). The future of cryptocurrencies appears to be promising, with opportunities for growth and innovation in various industries. However, there are also significant risks and challenges associated with their use, such as scalability, regulation, and illicit activities. As the cryptocurrency industry continues to evolve, it will be essential to address these challenges and create a more reliable investment framework for cryptocurrencies.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Conflicts of Interest: Rushil Shah states he no conflict of intrest.

Abbreviations

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The following abbreviations are used in this manuscript:

LCA	Latent Class Analysis
MLLCA	Multi-Level Latent Class Analysis
BIC	Bayesian Information Criterion
AIC	Akaike Information Criterion
MBTI	Myers-Briggs Type Indicator
HGMI	Howard-Gardner's Multiple Intelligence Model

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