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DATA AND ANALYSIS FOR MARKETING DECISIONS

TOPIC:

**Relationship between followers and digital influencers in the globalization context
can lead to behavioral loyalty (BL) and buying intention (PI)**

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ABSTRACT

Through digital social media platforms, fans and celebrities can interact with one another in a number of ways. As a result, marketers and online celebrities have taken use of this chance to offer goods and services to customers and followers. By analyzing the impact of emotional engagement, cosmopolitanism, and social self-esteem on behavioral loyalty and, in turn, on buy intention, this study investigates how behavioral loyalty predicts fans' purchase intentions. It also looks at whether followers' parasocial relationships can lessen their understanding of persuasion.

About 300 Vietnamese social network users who follow online celebrities were given a survey, and quantitative modeling was used to look at the valid data. This study discovered that followers' purchase intentions are positively impacted by the behavioral loyalty that exists between followers and their digital celebrities. Furthermore, cosmopolitans did have a positive influence on the behavioral loyalty of their supporters. Besides, the statistical findings show that larger levels of parasocial relationships are positively correlated with higher levels of wishful identification, which in turn leads to higher levels of behavioral loyalty and purchase intention in that order. Lastly, people who think they have online virtual friends are more likely to acquire behavioral loyalty because they are more likely to become emotionally invested in them.

Instead of viewing online celebrities as temporary sales boosters, marketers should view them as long-term partners. Increasing behavioral loyalty and purchase intention also depends on digital celebrities and their fans having effective communication. Digital celebrities might also have a personalized fan approach to promote behavior loyalty and purchase intention.

Keyword: Parasocial relationships, Emotional engagement, Cosmopolitanism, Social self-esteem, Behavioral loyalty, Purchase intention

I. Introduction

In today's highly interconnected global marketplace, the role of digital influencers in shaping consumer behavior has become increasingly prominent. As social media platforms have become deeply embedded in the daily lives of individuals across the world, digital influencers have emerged as powerful opinion leaders capable of swaying the attitudes, beliefs, and purchasing decisions of their followers (Wiedmann & von Mettenheim, 2020). Understanding the mechanisms through which these influencer-follower relationships translate to tangible marketing outcomes, such as behavioral loyalty and purchase intention, is therefore a critical area of inquiry.

The importance of examining these relationships through the lens of globalization cannot be overstated. As the world has become more interconnected, the influence of digital influencers has transcended geographical boundaries, enabling them to build genuine connections with followers across diverse cultural and national contexts (Jimenez-Castillo & Sánchez-Fernández, 2019). This globalized digital landscape has profound implications for consumer behavior, as the strength and nature of influencer-follower relationships may vary depending on the degree of cultural and geographic proximity.

Exploring how genuine relationships between followers and digital influencers lead to behavioral loyalty and buying intentions is not only timely but essential. As influencers continue to grow their presence and impact across global markets, understanding the mechanics behind these relationships becomes pivotal for brands seeking to leverage this new form of marketing. The main topic delves into the intricacies of these relationships, examining how influencers cultivate and maintain authenticity and trust, and how these elements subsequently drive follower behavior. According to the Social Media Influencer (SMI) literature, followers who perceive their relationships with influencers as genuine are more likely to exhibit strong buying intentions and behavioral loyalty (Huang et al., 2021). This phenomenon is further accentuated in the globalization context where cultural nuances and market dynamics play critical roles in shaping consumer behavior. The global reach of influencers allows them to tap into diverse markets, thus requiring a nuanced understanding of how these relationships manifest across different cultural landscapes.

At the heart of this study is the conceptualization of a "genuine relationship" between digital

influencers and their followers. Drawing on social exchange theory and the concept of relational authenticity, a genuine relationship is defined as a reciprocal, mutually beneficial, and emotionally invested bond between the influencer and follower, characterized by high levels of trust, identification, and para-social interaction (Labrecque, 2014; Tran & Strutton, 2014). In the context of globalization, these genuine relationships may transcend geographical and cultural boundaries, as digital platforms enable the formation of communities that are not constrained by physical proximity.

Despite the burgeoning body of research on influencer marketing, there remains a significant gap in understanding the nuances of genuine follower-influencer relationships in a globalized context. Most existing studies tend to focus on the general impact of influencers on consumer behavior without delving into the depth of the relationships or considering the effects of globalization (De Veirman et al., 2017). There is a pressing need to explore how these relationships vary across different cultural contexts and how global market dynamics influence the effectiveness of influencer marketing strategies. This gap is particularly important for brands aiming to operate across borders, as they must navigate diverse consumer expectations and engagement patterns. As Chen and Lin (2018) highlight, understanding these cross-cultural differences can significantly enhance the effectiveness of marketing strategies, leading to better alignment with consumer preferences and improved brand loyalty.

To bridge this gap, the purpose of the data analysis in this study is to empirically examine how genuine relationships between followers and digital influencers contribute to behavioral loyalty and purchase intentions across different global markets. This involves a detailed analysis of follower perceptions and behaviors, drawing on both qualitative and quantitative data to uncover underlying patterns and relationships. By analyzing data from diverse cultural contexts, we aim to identify commonalities and differences in how followers perceive and engage with influencers. This approach allows us to develop a nuanced understanding of the factors driving BL and PI, providing valuable insights for brands looking to leverage influencer marketing in a globalized marketplace.

The report is structured to systematically explore these themes, starting with a comprehensive review of the literature on digital influencer marketing and its impact on consumer behavior. This review sets the stage by highlighting key theories and findings related to the constructs of authenticity, trust, emotional connection, and perceived value. Following this, the methodology section outlines the research design, data collection methods, and analytical techniques used to

investigate the relationship between followers and influencers. The results section presents the findings from the data analysis, offering detailed insights into how genuine relationships influence BL and PI across different cultural contexts. Finally, the discussion section interprets these findings in light of existing theories and research, providing a critical analysis of their implications for brands and marketers. This structured approach ensures a thorough and coherent exploration of the topic, culminating in a set of actionable recommendations for leveraging influencer marketing in a globalized world.

This study is expected to make several significant contributions to both academic research and practical marketing strategies. Academically, it advances our understanding of the complex dynamics between followers and digital influencers, particularly in the context of globalization. By integrating constructs such as authenticity, trust, emotional connection, and perceived value, the study provides a comprehensive framework for analyzing how genuine relationships influence consumer behavior. Practically, the insights gained from this research can inform the development of more effective influencer marketing strategies, helping brands to foster deeper connections with their audiences and enhance customer loyalty and purchase intentions. As highlighted by Kaplan and Haenlein (2010), such practical applications are crucial for brands seeking to navigate the increasingly competitive and globalized digital landscape. In summary, this study aims to shed light on the power of genuine influencer-follower relationships and their potential to drive meaningful consumer engagement and loyalty in a global market.

II. Hypothesis development

In the digital age, influencers have become central figures in shaping consumer behavior across the globe. This phenomenon is amplified in a globalized context where digital influencers, often termed digital celebrities (DCs), leverage their vast reach to build genuine relationships with followers. These relationships are critical in driving two key outcomes: behavioral loyalty (BL) and purchase intention (PI). This literature review examines the constructs that underpin these relationships—emotional engagement, global cosmopolitanism, social self-esteem, parasocial relationships, and wishful identification—and their respective impacts on behavioral loyalty and purchase intention.

1. Emotional Engagement (EE)

Emotional engagement is the deep affective bond that followers form with digital influencers, characterized by strong feelings of attachment and involvement with the influencer's content. This engagement is more than just passive consumption; it involves active participation and emotional responses to the influencer's narratives and lifestyle (Brodie et al., 2011). In a globalized context, emotional engagement is critical as followers from diverse cultural backgrounds connect with influencers on an emotional level, transcending geographical boundaries. The authenticity and relatability perceived by followers can foster deeper connections, leading to enhanced behavioral loyalty and an increased likelihood of following the influencer's recommendations (Bowden, 2009).

- *H1a: Individuals' emotional engagement positively affects behavioral loyalty to digital celebrities (DCs).*

- *H1b: Individuals' emotional engagement positively affects their purchase intention.*

2. Cosmopolitanism (CM)

Cosmopolitanism reflects an individual's openness to and appreciation for diverse cultures and global experiences. Cosmopolitans are characterized by their interest in and acceptance of cultural diversity, which influences their consumption patterns and brand loyalty (Riefler & Diamantopoulos, 2009). In the realm of digital influence, cosmopolitan followers are more receptive to the varied content and global perspectives that influencers present. This global outlook can enhance both behavioral loyalty to digital celebrities who embody a cosmopolitan lifestyle and the intention to purchase products that align with these global values (Cleveland et al., 2009).

- *H2a: Global cosmopolitanism positively affects behavioral loyalty to digital celebrities (DCs).*

- *H2b: Global cosmopolitanism positively affects their purchase intention.*

3. Social Self-Esteem (SE)

Social self-esteem pertains to an individual's perception of their social worth and acceptance. This self-view can significantly influence how followers interact with digital influencers. Followers with lower social self-esteem often seek validation and identity reinforcement through their connection with influencers, which can enhance their behavioral loyalty and purchase intention (Leary & Baumeister, 2000). In the global digital sphere, individuals with lower social self-esteem may find solace and affirmation in their parasocial relationships with influencers, leading to increased loyalty and a higher propensity to act on product recommendations (Park & John, 2010).

- *H3a: Individuals' social self-esteem positively affects behavioral loyalty to digital celebrities (DCs).*

- *H3b: Individuals' social self-esteem positively affects their purchase intention.*

4. Parasocial Relationships (PR)

Parasocial relationships (PR) are one-sided, intimate bonds that followers develop with influencers, resembling real-life friendships. These relationships are nurtured through the influencer's regular, personalized content, fostering a sense of familiarity and trust (Horton & Wohl, 1956). PR plays a crucial role in a globalized digital environment as they allow followers to feel a personal connection with influencers regardless of geographic and cultural barriers. This perceived intimacy and trust can drive both behavioral loyalty and purchase intention (Giles, 2002).

- *H4a: Individuals' parasocial relationships positively affect behavioral loyalty to digital celebrities (DCs).*

- *H4b: Individuals' parasocial relationships positively affect their purchase intention.*

5. Wishful Identification (WI)

Wishful identification occurs when followers aspire to emulate or become like their favorite influencers. This aspiration is often fueled by the perceived success,

attractiveness, or lifestyle of the influencer (Hoffner & Buchanan, 2005). In a global context, wishful identification drives followers to engage more deeply with influencers and adopt behaviors or purchase products that reflect the influencers' traits or lifestyles. This identification can lead to stronger behavioral loyalty and a heightened propensity to follow the influencer's product recommendations (Moyer-Gusé, 2008).

- *H5a: Individuals' wishful identification positively affects behavioral loyalty to digital celebrities (DCs).*

- *H5b: Individuals' wishful identification positively affects their purchase intention.*

6. Behavioral Loyalty (BL) and Purchase Intention (PI)

Behavioral loyalty towards digital celebrities is exhibited through continuous and preferential engagement with their content over others. This loyalty is not only a testament to the follower's commitment but also translates into a higher likelihood of making purchases based on the influencer's recommendations (Oliver, 1999). In a globalized digital landscape, loyal followers are more likely to translate their engagement into actual buying behavior, particularly when they perceive the influencer's endorsements as genuine and aligned with their own values (Pronschinske et al., 2012).

- *H6: Followers' behavioral loyalty to digital celebrities positively impacts their purchase intention.*

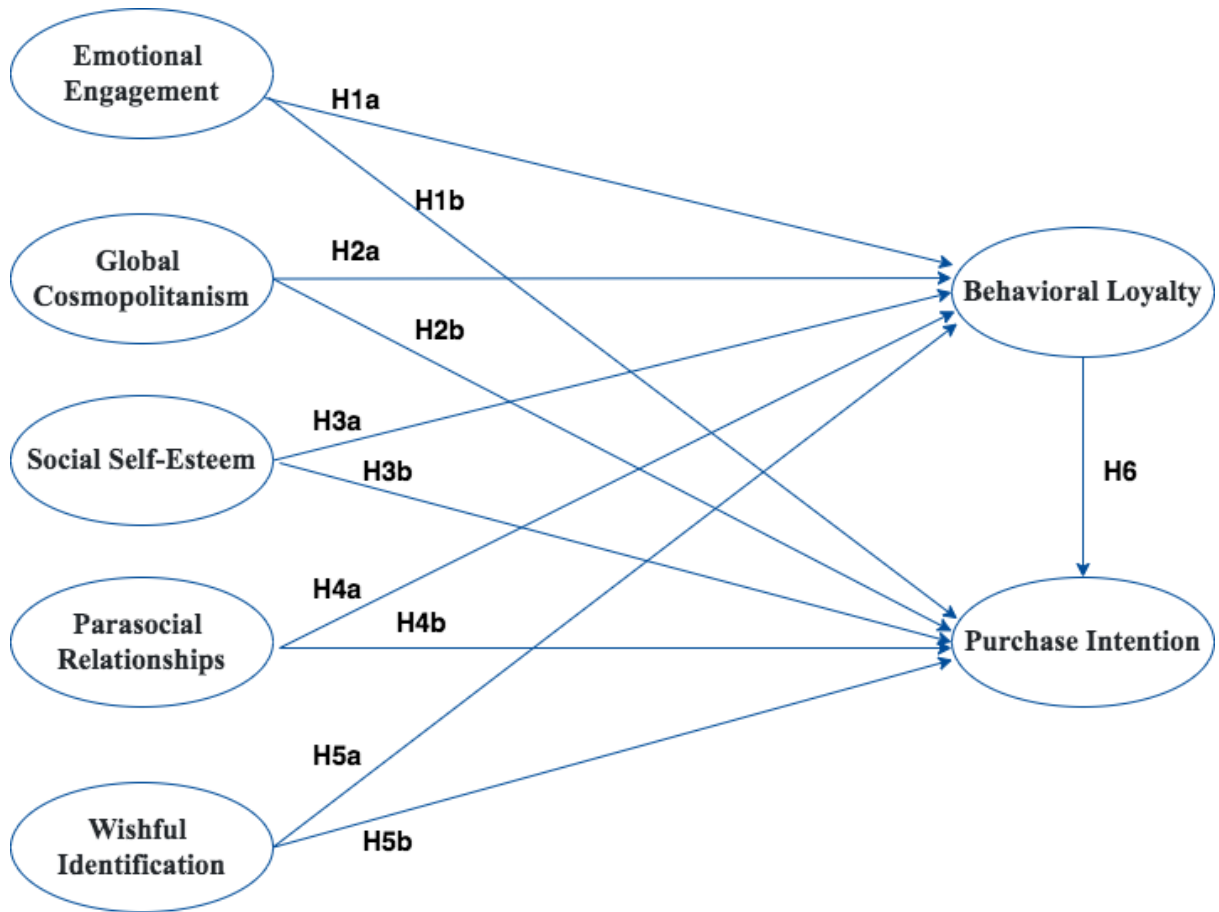


Figure 1: Research model

III. Research Design and Methodology

1. Measurement

In total, about 50 questions were developed; these included the demographic data and the key variables. With the exception of the social media interactions measure, which was developed specifically for this study, the majority of the survey items were modified from pre-validated research to improve the construct validity. Seven-point Likert scales (1 = strongly disagree to 7 = strongly agree) were used to measure parasocial relationships, emotional engagement, wishful identification, behavior loyalty, purchase intention, social self-esteem and cosmopolitanism.

2. Mechanism

In this study, SPSS was chosen as the main tool for data analysis. It has powerful statistical analysis capabilities. SPSS is the ideal tool for conducting complex statistical analyzes such as correlation, regression, and multivariate analysis. It helps understand relationships and identify key predictors in the data. This study uses SPSS for in-depth statistical analysis. It includes descriptive statistics, reliability and validity test, factor analysis, correlation, regression and artificial neural networks to validate hypotheses and explore relationships between variables.

3. Data collection

The survey collects information targeting the Genz population in general and students, university students, and graduates in Vietnam. They regularly use social networks and habitually follow digital idols, including artists, actors, singers, vloggers, and streamers. This target group has high online content consumption habits, regularly interacting and participating in activities related to digital idols on social networking platforms such as Facebook, Instagram, YouTube, and TikTok. They also tend to participate in online communities and follow the advertising and promotional activities of their favorite digital idols.

In addition, the survey was designed to collect information about the target group's behavior, attitudes, and opinions toward digital idols. The questionnaire is created from short, clear question criteria. Questions are created bilingually in both English and Vietnamese. We use Google Forms to create online surveys, ensuring convenience and ease for participants. Reach the audience through social networking sites such as Facebook, Instagram Zalo, and University media channels. The online survey was additionally conducted via email and support from university media channels. The results obtained a total of 296 responses.

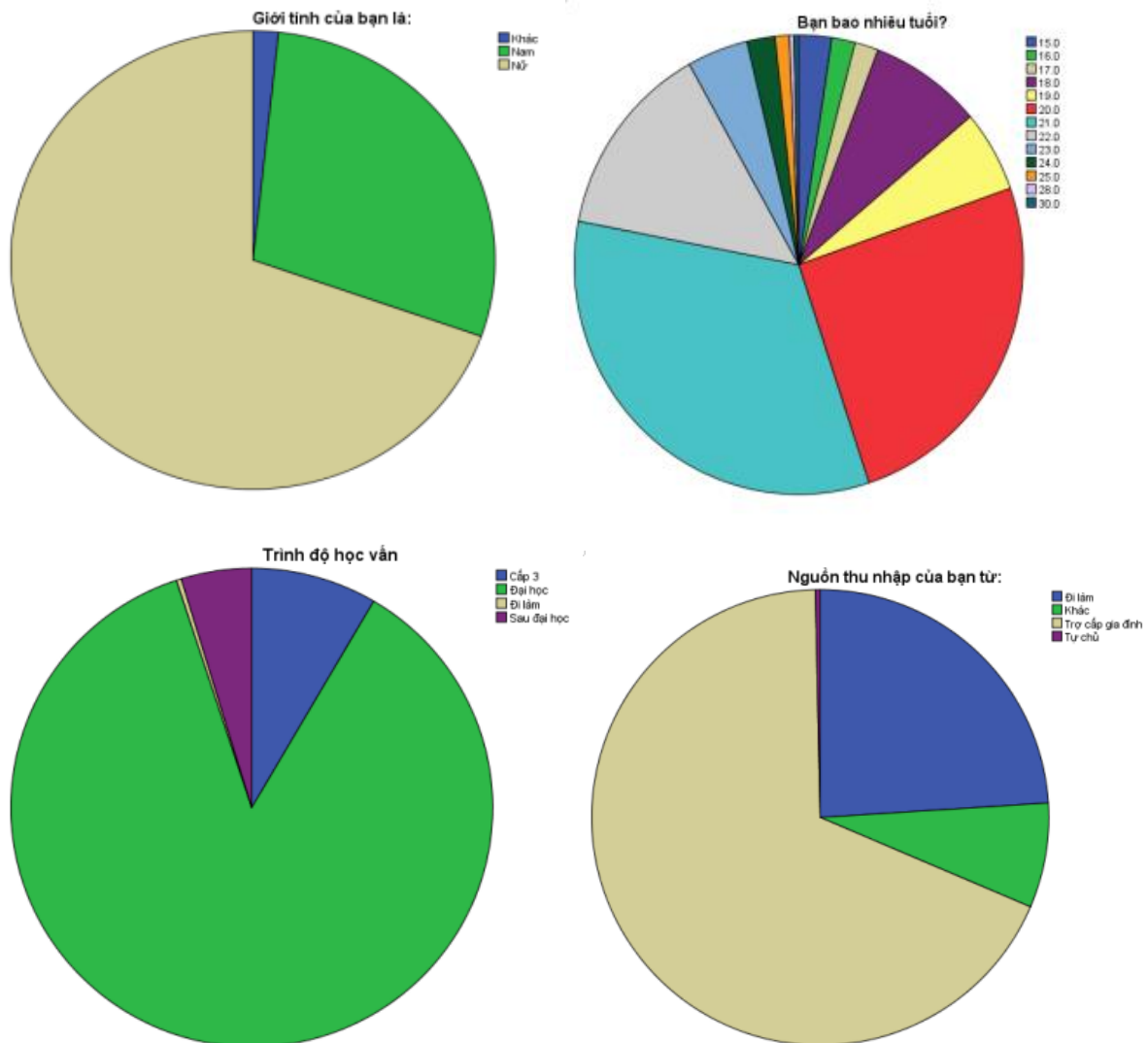
After collecting enough responses, we clean the data to remove invalid or missing responses. The data is then analyzed using tools such as Excel and SPSS to draw conclusions and interpret results.

IV. Research Results and Analyses

1. Descriptive analytics

Descriptive Statistics is an important tool in SPSS, used to summarize and describe basic

characteristics of a data set. It provides users with detailed information about variables, helping them better understand the data and make initial assessments of trends, distribution patterns, etc.



According to the chart, Gender shows three categories (male, female, and other), the majority of the respondents, are female garnering 69.6% of the total participants, males 28.7% and other is 1.7% of the participants. The result indicates that most of the respondents who engage with digital influencers and participate in the study are female. This suggests a gender-based trend in the follower demographic, which can have significant implications for understanding the dynamics of behavioral loyalty (BL) and purchase intention (PI) within the context of globalization.

Regarding the age distribution, we can see the majority of the largest color segments on the

chart belong to the age range from 18 to 25. These segments account for a significant proportion, consistent with the observation that 93.5% of participants are between the ages of 18 and 25. In particular, The colors corresponding to 20 and 23 years old are the clearest, indicating that these are the most common ages in this group.

The smaller sections, which include colors corresponding to the ages under 18 (15, 16, 17) and over 25 (28, 30), make up a very small portion of the chart. This reflects that only 5.8% of participants were under 18 years old and only 0.7% were over 25 years old.

To summarize, this pie chart shows that the majority of survey participants are young people between the ages of 18 and 25, accounting for an overwhelming proportion.

The education level of the respondents shows that 86.5% are undergraduates, 8.4% have a high school education, 4.7% are postgraduates, and 0.3% are workers.

Cumulatively, 94.9% of the respondents have a university degree or higher, while the remaining 5.1% have either a postgraduate degree or are currently working.

In terms of the source of income, 68.2% of respondents receive a family allowance, 24% are employed, 7.4% have other sources of income, and 0.3% are self-employed. This indicates that a significant portion of the respondents rely on family support or allowances.

2. Reliability and validity test, Factor Analysis

A factor analysis, as described in the multivariate analysis textbook provided in class, is an interdependence approach used to describe the structure between the variables in the study. This method offers a thorough understanding of survey data by examining every component within a correlation matrix. It allows researchers to observe potential effects of their survey on the data it generates and establishes standards for removing irrelevant or unimportant aspects, providing values for weighting factors.

Factor loadings greater than 0.60 are considered necessary for practical significance, showing the proportion of an original variable's variation that a factor accounts for. High factor loading values indicate strong correlations with the factor, as seen with values such as 0.911 in our data (Appendix 1). Eigenvalues greater than 1 indicate the significance of a factor, representing the amount of variance accounted for by a factor. Constructs like Parasocial Relationship (2.420),

Wishful Identification (2.767), Emotional Engagement (2.773), Behavior Loyalty (2.761), Purchase Intention (3.141), Social Self-Esteem (4.131), and Cosmopolitanism (3.014) exhibit high eigenvalues, highlighting their importance (Appendix 1).

The cumulative explanation is the sum of the percentage of variance accounted for by different factors, generally expected to explain 60% or greater. High cumulative explanation percentages, such as Purchase Intention (78.520%) and Cosmopolitanism (75.342%), indicate strong consistency and reliable data (Appendix 1).

Cronbach's Alpha checks the internal consistency of items in a scale, with values higher than 0.70 considered acceptable and values above 0.80 considered very good. All constructs demonstrated excellent internal consistency, with Cronbach's Alpha values such as Parasocial Relationship (0.774), Wishful Identification (0.851), Emotional Engagement (0.851), Behavior Loyalty (0.846), Purchase Intention (0.904), Social Self-Esteem (0.909), and Cosmopolitanism (0.889) (Appendix 1).

All items within each construct had corrected item-total correlations well above the threshold of 0.3, ranging from 0.524 to 0.846. This suggests that each item contributes meaningfully to the overall measurement of its respective construct. In conclusion, the constructs of Parasocial Relationship, Emotional Engagement, Wishful Identification, Behavior Loyalty, Purchase Intention, Social Self-Esteem, and Cosmopolitanism are all reliable and valid. The high Cronbach's Alpha values and substantial corrected item-total correlations confirm the robustness of the measurement scales used in the study.

In conclusion, the high factor loadings, substantial eigenvalues, high cumulative explanation percentages, satisfactory item-to-total correlations, and good Cronbach's Alpha values confirm the robustness and reliability of the measurement scales used in this study. These findings are detailed in Appendix 1, ensuring that the constructs are well-measured and suitable for further research and analysis.

3. Correlation, Multiple regression

3.1. Correlation

		PR	EE	WI	BL	PI	SE	CM
PR	Pearson Correlation	1						
EE	Pearson Correlation	.734**	1					
WI	Pearson Correlation	.506**	.433**	1				
BL	Pearson Correlation	.781**	.671**	.500**	1			
PI	Pearson Correlation	.684**	.624**	.440**	.720**	1		
SE	Pearson Correlation	.365**	.380**	.447**	.386**	.447**	1	
CM	Pearson Correlation	.606**	.568**	.406**	.635**	.576**	.288**	1

Table 1: Simple Correlation Analysis

** . Correlation is significant at the 0.01 level (2-tailed)

Table 1 shows several predictor variables significantly positively correlate with behavioral loyalty and purchase intention. For behavioral loyalty, the largest correlation was obtained with PR (78.1%), followed by PI (72.0%), EE (67.1%), CM (63.5%), and WI (50.6%). The poorest correlation for behavioral loyalty was obtained with SE (38.6%). All predictor variables had positive correlations with behavioral loyalty, indicating that as these variables increase, behavioral loyalty also tends to increase. These results suggest that parasocial relationships impact behavioral loyalty the most, while self-esteem has the least.

For purchase intention, the largest correlation was obtained with BL (72.0%), followed by PR (68.4%), EE (62.4%), SE (44.7%), and WI (44.0%). The poorest correlation for purchase intention was obtained with CM (40.6%). All predictor variables had positive correlations with purchase intention, indicating that as these variables increase, purchase intention also tends to

increase. These results suggest that behavioral loyalty impacts purchase intention the most, while cosmopolitanism has the least.

3.2. Multiple regression

3.2.1. Regression based on dependent variable BL

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square change	F change	df1	df2	Sig.F Change	
1	.781 ^a	.609	.608	.93101	.609	458.347	1	294	.000	1.958
2	.807 ^b	.651	.648	.88165	.042	34.846	1	293	.000	
3	.813 ^c	.661	.657	.87021	.010	8.752	1	292	.003	
4	.817 ^d	.668	.664	.86221	.007	6.446	1	291	.012	

Table 2: Model Summary^e

- a. Predictors: (Constant), PR
- b. Predictors: (Constant), PR, CM
- c. Predictors: (Constant), PR, CM, EE
- d. Predictors: (Constant), PR, CM, EE, WI
- e. Dependent Variable: BL

From the simple correlation analysis, all of the factors had significant partial correlation with dependent variables. Among them, Cosmopolitanism (CM), Emotional Engagement (EE), Social Self-Esteem, Parasocial Relationships (PR), and Wishful Identification (WI) are selected in the model to satisfy Behavioral Loyalty (BL).

The ANOVA analysis confirmed the model's significance. The final regression equation is:

$$BL = -0.605 + 0.590PR + 0.203CM + 0.156EE + 0.098WI$$

The results show that the regression model with PR, CM, EE, and WI explains 66.8% of the variation in BL (Adjusted $R^2 = 0.664$). Among them, PR has the greatest impact on the standardized regression coefficient ($\beta = 0.496$, $p < 0.001$), followed by CM ($\beta = 0.212$, $p <$

0.001), EE ($\beta = 0.143$, $p = 0.006$), and WI ($\beta = 0.101$, $p = 0.012$). The conclusion shows that parasocial relationships and internationalism have the strongest impact on fans' behavioral loyalty, while emotional attachment and desired identification also have an influence but at a low level than.

3.2.2. Regression based on dependent variable PI

a.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin - Watson
					R Square change	F change	df 1	df2	Sig.F Change	
1	.684 ^a	.469	.467	1.13641	.469	259.168	1	294	.000	1.792
2	.717 ^b	.513	.510	1.08921	.045	27.032	1	293	.000	
3	.740 ^c	.547	.543	1.05221	.034	21.966	1	292	.000	
4	.747 ^d	.559	.552	1.04102	.011	7.315	1	291	.007	

Table 3: Model Summary^e

- Predictors:(Constant),PR
- Predictors:(Constant),PR,SE
- Predictors:(Constant),PR,SE,CM
- Predictors:(Constant),PR,SE,CM,EE
- Dependent Variable: PI

From simple correlation analysis, all factors are partially significantly correlated with the dependent variable. Among them, Parasocial Relationships (PR), Emotional Engagement (EE), Social Self-Esteem (SE), and Cosmopolitanism (CM) are selected in the model to explain Purchase Intention (PI).

ANOVA analysis confirmed the significance of the model. The final regression equation is:

$$PI = -0.323 + 0.465PR + 0.175SE + 0.203CM + 0.184EE$$

The results showed that the regression model with PR, SE, CM and EE explained 55.2% of the variation in PI (Adjusted $R^2 = 0.552$). Among them, PR has the greatest impact on the

standardized regression coefficient ($\beta = 0.373$, $p < 0.001$), CM ($\beta=0.203$, $p<0.001$), SE ($\beta=0.191$, $p<0.001$), và EE ($\beta=0.162$, $p=0.007$).

The conclusion shows that Parasocial Relationships and Cosmopolitanism have the strongest impact on customers' Purchase Intention, while Emotional Engagement and Social Self-Esteem also have an influence but to a lesser extent.

Conclude:

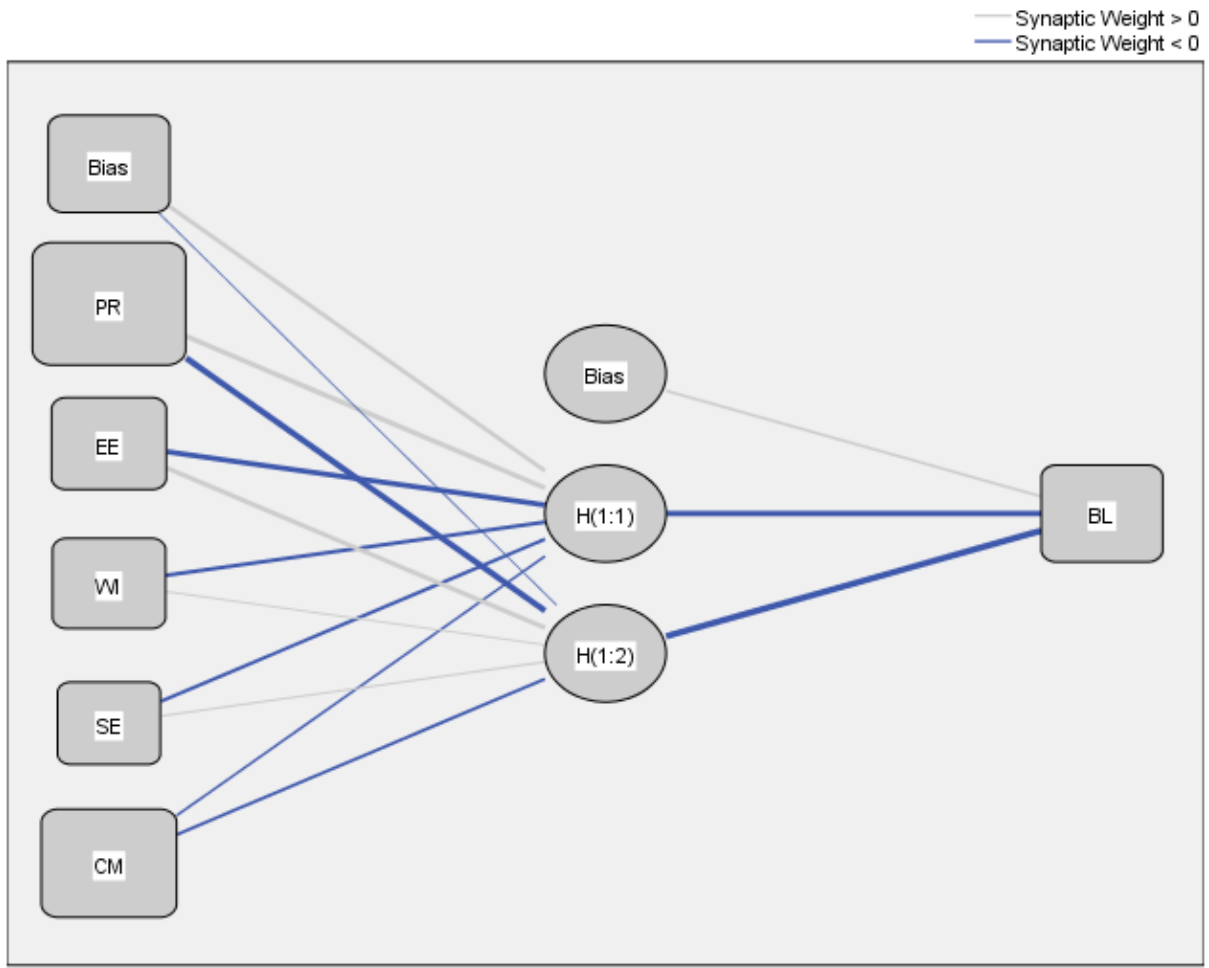
The factors Parasocial Relationship (PR), Social Self-Esteem (SE), Cosmopolitanism (CM), and Emotional Engagement (EE) all have a significant influence on both Purchase Intention (PI) and Behavioral Loyalty (BL). In particular, PR and CM have the strongest impact on both of these dependent variables. The regression model with all these factors explained 55.9% of the variation in PI and 66.8% of the variation in BL, showing the high suitability of the models and the importance of these factors for customer loyalty and purchasing behavior.

(Refer appendix 2)

4. Artificial Neural Network

In the Multilayer Perceptron (MLP) model used in SPSS, the activation functions in the hidden and output layers play an important role in determining how information is processed and transmitted through the neural network. The activation function in the hidden layers helps the network learn complex relationships, while the activation function in the output layer ensures that the network can output predictions appropriate to the type of problem to be solved. In this study, an ANN model with five input neurons, two hidden neurons and one output neuron was generated (Figure 3, Figure 4) . With the diagram presented as shown below, we can conclude that the model will be best explained in terms of the independent variables PR, EE, WI, SE and CM with no "bias" cases occurring in the model. Moreover, as shown in Figure 3 and Figure 4, the predictive relevance of the resistances was validated, as each of the input neurons are connected to four hidden neurons through the non-zero synaptic weights

4.1 Genuine relationships between followers and digital influencers can lead to behavioral loyalty (BL)



Hidden layer activation function: Hyperbolic tangent

Output layer activation function: Identity

Figure 2: The ANN model

Table 4: RMSE during training and testing processes

Neural network	Training			Testing		
	N	SSE	RMSE	N	SSE	RMSE
ANN1	205	33.026	0.401	91	12.867	0.376
ANN2	203	29.324	0.380	93	17.846	0.438
ANN3	204	36.161	0.421	92	15.376	0.409
ANN4	211	33.529	0.399	85	8.614	0.318

ANN5	194	33.356	0.415	102	18.628	0.427
ANN6	206	35.562	0.415	90	11.544	0.358
ANN7	212	38.025	0.424	84	13.200	0.396
ANN8	216	36.232	0.410	80	14.874	0.431
ANN9	207	31.186	0.388	89	12.995	0.382
ANN10	212	41.893	0.445	84	13.021	0.394
			Mean	0.4098	Mean	0.393
			SD	0.019	SD	0.037

Note: SSE = Sum Squares of Error, RMSE = Root Mean Square Error, SD = Standard Deviation.

The result of the table 4 includes 3 parts. Firstly, about consistency, ANN4 had the lowest RMSE during the test period (0.318), suggesting that it may be the best performing model in terms of generalization ability. Secondly, about variation, ANN10 has the highest RMSE during the training phase (0.445), suggesting it may be less accurate on the training data than the other models. Thirdly, about standard deviation, the relatively low standard deviation for both training (0.019) and testing (0.037) RMSE shows that RMSE values are quite consistent across different ANNs. We conclude that the ANN model has a high predictive accuracy as the mean RMSE for both training and testing are 0.4098 and 0.393 respectively.

4.2 Real relationships between followers and digital influencers can lead to purchase intent (PI)

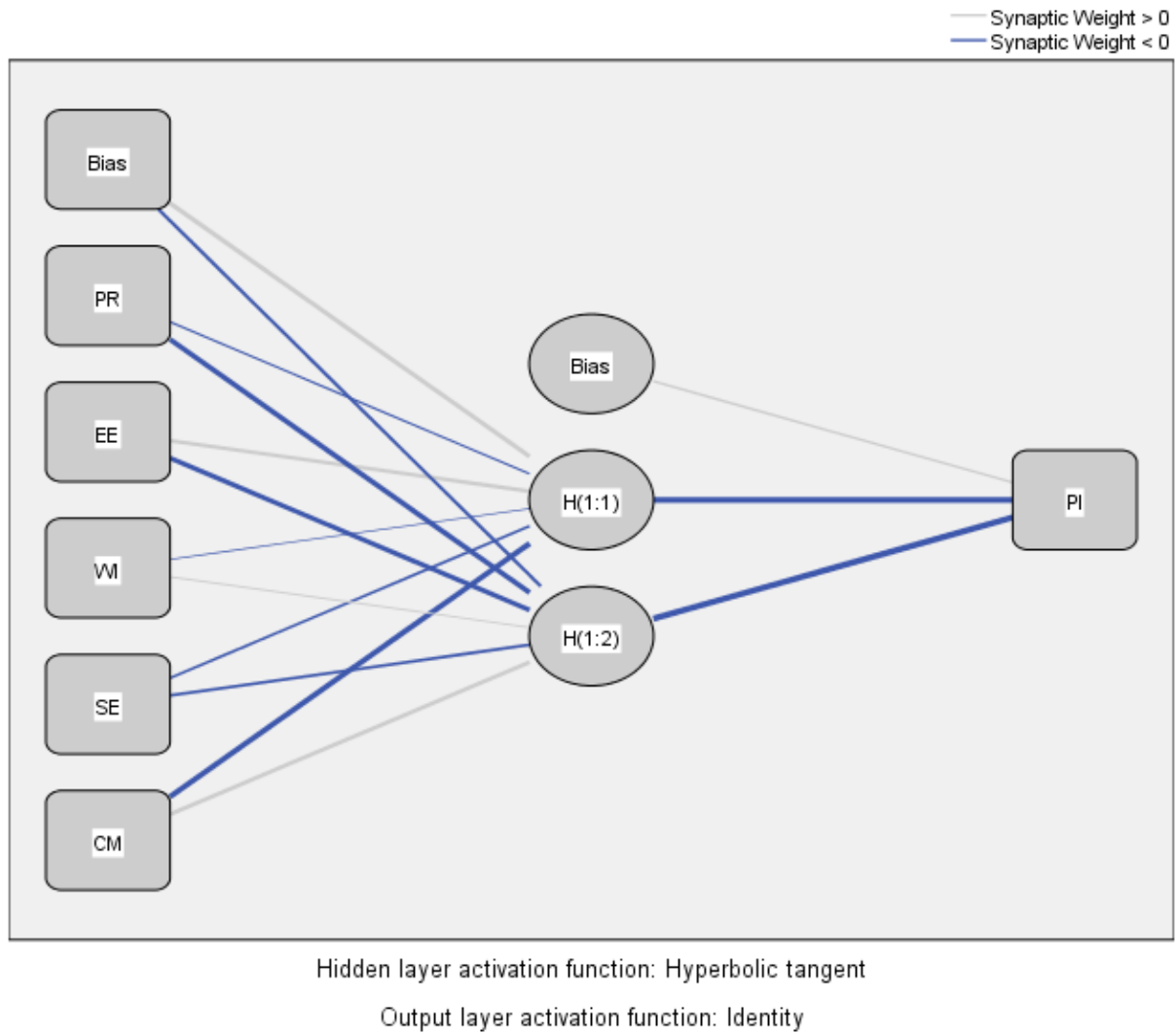


Figure 3: The ANN model

Table 5: RMSE during training and testing processes

Neural network	Training			Testing		
	N	SSE	RMSE	N	SSE	RMSE
ANN1	209	50.091	0.490	87	18.158	0.457
ANN2	198	45.753	0.481	98	14.599	0.386

ANN3	213	47.137	0.470	83	13.847	0.408
ANN4	197	41.754	0.460	99	25.412	0.507
ANN5	203	51.642	0.504	93	21.609	0.482
ANN6	207	45.655	0.470	89	20.312	0.478
ANN7	193	40.720	0.459	103	24.299	0.486
ANN8	209	45.675	0.467	87	13.276	0.391
ANN9	200	41.291	0.454	96	22.137	0.480
ANN10	202	49.500	0.495	94	16.317	0.417
			Mean		Mean	0.449
			SD		SD	0.044

Note: SSE = Sum Squares of Error, RMSE = Root Mean Square Error, SD = Standard Deviation.

The result of the table 5 includes 3 parts. Firstly, about consistency: ANN2 had the lowest RMSE during the test period (0.386), suggesting that it may be the best performing model in terms of generalization ability. Secondly, about variation: ANN5 has the highest RMSE during the training phase (0.504), suggesting it may be less accurate on the training data than the other models. Thirdly, about standard deviation, the relatively low standard deviation for RMSE in training (0.017) and slightly higher in testing (0.044) shows slight variation in RMSE values across different ANNs. We conclude that the ANN model has a high predictive accuracy as the mean RMSE for both training and testing are 0.475 and 0.449 respectively.

V. Conclusion

This research explores the impact of relationships between followers and digital influencers on behavioral loyalty (BL) and purchase intention (PI) using SPSS. The study comprehensively examines the dynamics between digital celebrities (DCs) and their followers, identifying key factors such as emotional engagement, global cosmopolitanism, social self-esteem, parasocial

relationships, and wishful identification that influence BL and PI. Emotional engagement positively influenced behavioral loyalty, consistent with the findings in (Guo, 2018; Hilvert-Bruce et al., 2018), as followers who feel connected to DCs are more loyal and likely to purchase. Global cosmopolitanism also boosts loyalty and buying intent, indicating that globally-minded followers trust DCs more. Higher social self-esteem positively impacts BL and PI (Shah and Swaminathan, 2008), with confident followers engaging more with DCs. Parasocial relationships, which are one-sided emotional connections, are strong predictors of both BL and PI. Wishful identification, where followers aspire to be like the DCs, further strengthens these effects. The study confirms that BL to DCs significantly drives PI, highlighting the need for marketers to foster these relationships through valuable interactions and culturally tailored strategies.

These findings have significant implications for digital marketing and customer engagement. Understanding follower demographics allows businesses to tailor marketing strategies effectively. Partnering with influencers who have genuine connections with their audience can deepen emotional engagement and drive PI. Personalizing content based on follower interests can enhance engagement and conversion rates. Efficient resource allocation towards high-impact areas such as influencer marketing and content creation ensures better ROI. Regularly monitoring customer feedback helps maintain high customer satisfaction and loyalty.

Future research could explore additional variables and incorporate other data sources, such as social media analytics, to provide a holistic view of the customer journey. This approach will help businesses anticipate trends and sustain growth in the digital age.

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Appendix

Appendix 1. Summary of confirmatory factor analysis

<i>Factor & Items</i>	<i>Factor Loading</i>	<i>Eigenvalue</i>	<i>Accumulative Explanation %</i>	<i>Item-to-Total Correlation</i>	<i>Cronbach's α</i>
<i>Parasocial Relationships (PR)</i>		2.420	60.497		0.774
You see the program and the products promoted by your idol as very attractive (PR1)	0.778			0.573	
If your favorite idol shows up live in another video, you will watch that video (PR2)	0.818			0.647	
You feel comfortable and trust your idol's messages on their social media (PR3)	0.797			0.601	
You think that your idol influences your taste and personality (PR4)	0.714			0.524	
<i>Wishful Identification (WI)</i>		2.767	69.182		0.851
Sometimes you wish you could be like your idol (WI1)	0.830			0.690	
You want to have a job like the idol you love (WI2)	0.862			0.734	
You want to do the things your idols do in their lives (WI3)	0.829			0.688	
You are the person you strive to be (WI4)	0.805			0.655	
<i>Emotional Engagement (EE)</i>		2.773	69.333		0.851

You quote or comment on what your idol says when they say something nice (EE1)	0.790		0.637
You are displayed on the life of the activities of the digital or regular discussion (EE2)	0.856		0.721
When participating in a live-streaming chat with an idol, you feel an emotional connection (EE3)	0.875		0.750
You can understand your idol's feelings even before they send messages (EE4)	0.808		0.660
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<i>Behavior loyalty (BL)</i>	2.761	69.021	0.846
You feel more attached to idol posts than others (BL1)	0.841		0.703
It would be challenging to be a fan of another idol (BL2)	0.796		0.641
You intend to increase the amount of time you spend watching idol posts (BL3)	0.841		0.699
You consider you are a big idol fan (BL4)	0.844		0.707
<hr/>			
<i>Purchase intention (PI)</i>	3.141	78.520	0.904
You feel interested in the products that idols recommend (PI1)	0.905		0.815
You feel confident in the quality of the products that your idol recommends (PI2)	0.886		0.783
You buy products that your idol recommends (PI3)	0.916		0.846
You buy products made specifically for PR (PI4)	0.835		0.718
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<i>Social Self-esteem (SE)</i>	4.131	68.854	0.909

You have felt a lack of people who can understand your interests (SE1)	0.763		0.667
You often feel isolated in social situations (SE2)	0.848		0.778
You worry about whether you are perceived as a success or a failure in society (SE3)	0.859		0.782
You are worried about what people think about you as a fan (SE4)	0.869		0.795
You feel anxious about the impression you are making (SE5)	0.835		0.750
You worry about looking like an idle person (SE6)	0.800		0.711
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<i>Cosmopolitanism (CM)</i>	3.014	75.342	0.889
You are interested in learning about the people and culture of the country (CM1)	0.873		0.703
You like to go to restaurants that serve traditional and famous dishes (CM2)	0.872		0.641
You tend to make friends and communicate with people who come from your idol's country (CM3)	0.857		0.699
If you have a chance to travel, you would probably choose the country (CM4)	0.870		0.707
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Note: FL = factor loading > 0.6, eigenvalue > 1, item-to-coeff > 0.5, communality > 0.5, cronbach's alpha > 0.6

The construct "PR, EE, WI, BL, PI, SE, CM" was measured using four items, each designed to capture different aspects of the relationship individuals have with their idols. The reliability and validity of this construct were assessed using factor loadings, eigenvalues, cumulative explanation percentages, item-to-total correlations, and Cronbach's Alpha.

Parasocial Relationship (PR)

The construct "Parasocial Relationship" was measured using four items. The factor loadings ranged from 0.714 to 0.818, indicating strong correlations with the construct. The eigenvalue was 2.420, with a cumulative explanation percentage of 60.497%, showing substantial and meaningful contribution. Item-to-total correlations ranged from 0.524 to 0.647, suggesting consistency across the items. Cronbach's Alpha was 0.774, reflecting good internal consistency. These results confirm that the Parasocial Relationship construct is reliably and validly measured.

Emotional Engagement (EE)

In our study, the construct "Emotional Engagement" was assessed using four items. The factor loadings ranged from 0.790 to 0.875, indicating strong correlations with the construct. The eigenvalue was 2.773, with a cumulative explanation percentage of 69.333%, indicating substantial contribution. Item-to-total correlations ranged from 0.637 to 0.750, suggesting consistency. Cronbach's Alpha was 0.851, reflecting excellent internal consistency. These results confirm that the Emotional Engagement construct is reliably and validly measured.

Wishful Identification (WI)

In this study, the construct "Wishful Identification" was measured using four items. The factor loadings ranged from 0.805 to 0.862, indicating strong correlations with the construct. The eigenvalue was 2.767, with a cumulative explanation percentage of 69.182%, indicating substantial contribution. Item-to-total correlations ranged from 0.655 to 0.734, suggesting consistency. Cronbach's Alpha was 0.851, reflecting excellent internal consistency. These results confirm that the Wishful Identification construct is reliably and validly measured.

Behavior Loyalty (BL)

The construct "Behavior Loyalty" was measured using four items in this study. The factor loadings ranged from 0.796 to 0.844, indicating strong correlations with the construct. The eigenvalue was 2.761, with a cumulative explanation percentage of 69.021%, indicating substantial contribution. Item-to-total correlations ranged from 0.641 to 0.707, suggesting

consistency. Cronbach's Alpha was 0.846, reflecting excellent internal consistency. These results confirm that the Behavior Loyalty construct is reliably and validly measured.

Purchase Intention (PI)

The construct "Purchase Intention" was measured using four items. The factor loadings ranged from 0.835 to 0.916, indicating strong correlations with the construct. The eigenvalue was 3.141, with a cumulative explanation percentage of 78.520%, indicating substantial contribution. Item-to-total correlations ranged from 0.718 to 0.846, suggesting consistency. Cronbach's Alpha was 0.904, reflecting excellent internal consistency. These results confirm that the Purchase Intention construct is reliably and validly measured.

Social Self-Esteem (SE)

The construct "Social Self-Esteem" was measured using six items. The factor loadings ranged from 0.763 to 0.869 (with SE4 deleted), indicating strong correlations with the construct. The eigenvalue was 4.131, with a cumulative explanation percentage of 68.854%, indicating substantial contribution. Item-to-total correlations ranged from 0.667 to 0.795, suggesting consistency. Cronbach's Alpha was 0.909, reflecting excellent internal consistency. These results confirm that the Social Self-Esteem construct is reliably and validly measured.

Cosmopolitanism (CM)

The construct "Cosmopolitanism" was measured using four items. The factor loadings ranged from 0.857 to 0.873, indicating strong correlations with the construct. The eigenvalue was 3.014, with a cumulative explanation percentage of 75.342%, indicating substantial contribution. Item-to-total correlations ranged from 0.641 to 0.707, suggesting consistency. Cronbach's Alpha was 0.889, reflecting excellent internal consistency. These results confirm that the Cosmopolitanism construct is reliably and validly measured.

In conclusion, the analysis of the Parasocial Relationship construct shows that the items used are both reliable and valid. The strong factor loadings, substantial eigenvalue, high cumulative explanation percentage, satisfactory item-to-total correlations, and good Cronbach's Alpha all indicate that the construct is well-measured by the items included in the scale. This provides confidence in the use of this construct for further research and analysis.

Appendix 2. Multiple Regression

1. Regression based on dependent variable BL

The variables include: Behavioral loyalty (BL): dependent variable; Cosmopolitanism (CM), Emotional engagement (EE), Self-esteem (SE), Parasocial relationship (PR), and Wishful identification - WI) is the independent variable. The purpose of using regression analysis in this study is to identify the key factors that influence fans' behavioral loyalty to online celebrity recommendations. Specifically, regression analysis helps to identify and quantify the relationship between the independent variables (CM, EE, SE, PR, WI) and the dependent variable (BL). The analysis results will provide important information to help online marketers and social media stars better understand how to effectively engage with their audiences. This will not only help increase fan loyalty but also improve the effectiveness of marketing strategies, encouraging loyalty to the products and services they recommend.

Analysis table Model summary

The Model Summary table provides goodness-of-fit indices for four different regression models.

- Model 1: Includes only the Parasocial Relationship (PR) factor. Index $R^2 = 0.609$ shows that the model explains 60.9% of the variation in Behavioral Loyalty (BL). Adjusted R^2 value = 0.608 is similar, confirming the suitability of the model. The standard error of the estimate is 0.93101.
- Model 2: Includes PR and Internationalism (CM). $R^2 = 0.651$, meaning the model explains 65.1% of the variation in BL, an increase of 4.2% compared to model 1. Adjusted R^2 and the standard error drops to 0.88165.
- Model 3: Includes PR, CM and Emotional Engagement (EE). $R^2 = 0.661$, meaning the model explains 66.1% of the variation in BL, a slight increase of 1% compared to model 2. Adjusted $R^2 = 0.657$ and the standard error decreases further to 0.87021.
- Model 4: Includes PR, CM, EE and Desire Identification (WI). $R^2 = 0.668$, meaning the model explains 66.8% of the variation in BL, an increase of 0.7% compared to model 3. Adjusted $R^2 = 0.664$ and the standard error drops to 0.86221.

From the above results, we see that adding the variables CM, EE, and WI to the model all help increase the model's explanatory power, with PR and CM having the greatest influence.

Analysis table ANOVA

	Sum of	df	Mean	F	Sig.
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Model		squares		Square		
1	Regression	397.287	1	397.287	458.347	.000 ^b
	Residual Total	254.834	294	.867		
		652.122	295			
2	Regression	424.373	2	212.186	272.979	.000 ^c
	Residual Total	227.749	293	.777		
		652.122	295			
3	Regression	431.000	3	143.667	189.718	.000 ^d
	Residual Total	221.121	292	.757		
		652.122	295			
4	Regression	435.792	4	108.948	146.554	.000 ^e
	Residual Total	216.330	291	.743		
		652.122	295			

Table 6: ANOVA^a

- Dependent Variable: BL
- Predictors: (Constant),PR
- Predictors: (Constant),PR,CM
- Predictors: (Constant),PR,CM,EE
- Predictors: (Constant),PR,CM,EE,WI

The ANOVA table tests the appropriateness of each regression model through the F index and p value (Sig.)

- Model 1: F index = 458.347 and Sig. = 0.000, showing that the model is highly statistically significant, meaning that PR has a significant influence on BL.
- Model 2: F index = 272.979 and Sig. = 0.000, further confirming that both PR and CM have a significant influence on BL.
- Model 3: F index = 189.718 and Sig. = 0.000, showing that adding EE to the model still retains high statistical significance.
- Model 4: F index = 146.554 and Sig. = 0.000, confirming that adding WI to the model is also statistically significant.

All models have p values < 0.001, confirming that the added factors increase the fit of the model.

Analysis table Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std.Error	Beta		
1	(Constant)	-.016	.223		-.074	.941
	PR	.929	.043	.781	21.409	.000
2	(Constant)	-.324	.218		-1.486	.138
	PR	.744	.052	.625	14.410	.000
	CM	.244	.041	.256	5.903	.000
3	(Constant)	-.471	.221		-2.135	.034
	PR	.632	.063	.531	9.964	.000
	CM	.216	.042	.226	5.147	.000
	EE	.166	.056	.153	2.958	.003
4	(Constant)	-.605	.225		-2.690	.008
	PR	.590	.065	.496	9.074	.000
	CM	.203	.042	.212	4.835	.000
	EE	.156	.056	.143	2.790	.006
	WI	.098	.039	.101	2.539	.012

Table 7: Coefficients^a

The Coefficients table provides the regression coefficients (B), standard errors (Std. Error), standardized coefficients (Beta), and t values and significance levels (Sig.).

- Model 1: PR has coefficient B = 0.929 and Beta = 0.781, with t value = 21.409 and Sig. = 0.000. This shows that PR has a very strong and statistically significant influence on BL.
- Model 2: PR has B = 0.744 and Beta = 0.625, t = 14.410, Sig. = 0.000. CM has B = 0.244 and Beta = 0.256, t = 5.903, Sig. = 0.000. This shows that both PR and CM have a strong and significant influence on BL.
- Model 3: PR has B = 0.632 and Beta = 0.531, t = 9.964, Sig. = 0.000. CM has B = 0.216 and Beta = 0.226, t = 5.147, Sig. = 0.000. EE has B = 0.166 and Beta = 0.153, t = 2.958,

Sig. = 0.003. Adding EE to the model shows that EE also has a significant influence on BL.

- Model 4: PR has $B = 0.590$ and $Beta = 0.496$, $t = 9.074$, Sig. = 0.000. CM has $B = 0.203$ and $Beta = 0.212$, $t = 4.835$, Sig. = 0.000. EE has $B = 0.156$ and $Beta = 0.143$, $t = 2.790$, Sig. = 0.006. WI has $B = 0.098$ and $Beta = 0.101$, $t = 2.539$, Sig. = 0.012. This confirms that WI also has a significant effect on BL when added to the model.

Conclude

Summarized from the three tables of results, the factors PR, CM, EE and WI all have a significant influence on Behavioral Loyalty (BL). In particular, PR and CM have the strongest impact. The regression model with all these factors explained 66.8% of the variation in BL, showing high suitability of the model.

2. Regression based on dependent variable PI

Table Model summary:

Model 1: Only includes the Parasocial Relationship (PR) factor. Index $R^2 = 0.469$ shows that this model explains 46.9% of the variation in Purchase Intention (PI). Adjusted $R^2 = 0.467$ is similar, confirming the suitability of the model. The standard deviation of the estimate (Standard Error) is 1.13641.

Model 2: Includes PR and Social Self-Esteem (SE) $R^2 = 0.513$, meaning this model explains 51.3% of the variation in PI, an increase of 4.4% compared to model 1. Adjusted $R^2 = 0.510$ and the standard deviation drops to 1.08921.

Model 3: Includes PR, SE and Cosmopolitanism (CM). $R^2 = 0.547$, meaning this model explains 54.7% of the variation in PI, an increase of 3.4% compared to model 2. Adjusted $R^2 = 0.543$ and the standard deviation drops to 1.05221.

Model 4: Includes PR, SE, CM and Emotional Engagement (EE). $R^2 = 0.559$, meaning this model explains 55.9% of the variation in PI, an increase of 1.2% compared to model 3. Adjusted $R^2 = 0.552$ and the standard deviation drops to 1.04102.

The above results show that adding the variables SE, CM, and EE to the model all help enhance the model's explanatory power, in which PR and CM have the greatest influence.

Model		Sum of squares	df	Mean Square	F	Sig.
1	Regression	334.696	1	334.696	259.168	.000 ^b
	Residual Total	379.679	294	1.291		
		714.375	295			
2	Regression	366.767	2	183.383	154.574	.000 ^c
	Residual Total	347.609	293	1.186		
		714.375	295			
3	Regression	391.086	3	130.362	117.745	.000 ^d
	Residual Total	323.289	292	1.107		
		714.375	295			
4	Regression	399.014	4	99.753	92.047	.000 ^e
	Residual Total	315.362	291	1.084		
		714.375	295			

Table 8: ANOVA^a

- a. Dependent Variable: PI
- b. Predictors: (Constant),PR
- c. Predictors: (Constant),PR,SE
- d. Predictors: (Constant),PR,SE,CM
- e. Predictors: (Constant),PR,SE,CM,EE

The ANOVA table tests the appropriateness of the regression models by analyzing variance.

Model 1: The sum of squares of the regression is 334,696 and of the residuals is 379,679, for a total of 714,375. The F value is 259.168 with p-value < .001, showing that the model has high statistical significance when only the PR variable is included.

Model 2: The sum of squares of the regression increases to 366,767 when SE is added to the model, while the residual decreases to 347,609. The F value is 154.574 with p-value < .001, confirming the model fit with both PR and SE.

Model 3: When adding CM to the model, the sum of squares of the regression increases to 391,086 and the residual decreases to 323,289. The F value is 117.745 with p-value < .001, showing that the model is statistically significant when CM is added.

Model 4: The sum of squares of the regression continues to increase to 399,014 when adding EE to the model, and the residual decreases to 315,362. The F value is 92.047 with p-value < .001, confirming the model's fit with all independent variables PR, SE, CM, and EE.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std.Error	Beta		
1	(Constant)	.333	.273		1.222	.233
	PR	.852	.053	.684	16.099	.000
2	(Constant)	.097	.265			.716
	PR	.749	.055	.601	.601	.000
	CM	.209	.040	.228	.228	.000
3	(Constant)	-.177	.263			.501
	PR	.582	.064	.467	.467	.000
	CM	.192	.039	.209	.209	.000
	EE	.232	.050	.233	.233	.000
4	(Constant)	-.323	.266			.224
	PR	.465	.076	.373	.373	.000
	CM	.175	.039	.191	.191	.000
	EE	.203	.050	.203	.203	.000
	WI	.184	.068	.162	.162	.007

Table 9: Coefficients^a

Model 1: The unstandardized coefficient (B) of PR is 0.852 with a standard deviation of 0.053, showing that PR has a significant influence on PI ($t = 16.099$, $p < .001$). Normalization coefficient (β) of PR is 0.684, which is the strongest influencing coefficient in this model.

Model 2: When adding SE, the coefficient B of PR decreases to 0.749 and that of SE is 0.209. Both variables had a significant influence on PI at $p < .001$. Normalization coefficient (β) of PR is 0.601 and that of SE is 0.228.

Model 3: Adding CM to the model, the coefficient B of PR continues to decrease to 0.582, SE is 0.192 and CM is 0.232. All three variables were statistically significant ($p < .001$). Normalization coefficient (β) of PR is 0.467, of SE is 0.209 and of CM is 0.233.

Model 4: When adding EE, the coefficient B of PR decreases to 0.465, SE to 0.175, CM to 0.203 and EE to 0.184. All variables were statistically significant ($p < .001$) except EE ($p = .007$). Normalization coefficient (β) of PR is 0.373, of SE is 0.191, of CM is 0.203 and of EE is 0.162.

Conclude

Summarizing from the three result tables, the factors Parasocial Relationship (PR), Social Self-Esteem (SE), Cosmopolitanism (CM), and Emotional Engagement (EE) all have a significant influence on Purchase Intention (PI). In particular, PR and CM have the strongest impact. The regression model with all these factors explained 55.9% of the variation in PI, showing high model fit.

CONTRIBUTION

No.	Student Name Student Code	Tasks	Contribution
1	Nguyễn Thị Ngọc Lan 20070943	Measurement Mechanism	16.67%
2	Hoàng Thị Lan 20070942	Multiple regression Conclusion	16.67%
3	Lê Thị Huyền Trang 20070992	Introduction Hypothesis development Descriptive analysis	16.67%

4	Nguyễn Đức Hùng 19071569	Abstract Artificial Neural Network	16.67%
5	Phí Hải Việt 20071000	Reliability and validity Factor analysis	16.67%
6	Vũ Diệu Huyền 20070938	Data collection Correlation	16.67%