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The Impact of Gamified Mobile Applications on Happiness Levels Based on User Data

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ABSTRACT

The rapid growth of gamified mobile applications has transformed how users engage with digital technologies, particularly in promoting positive emotional experiences. This study investigates the impact of gamified mobile applications on happiness levels based on user data. A quantitative approach was employed using survey data collected from active users of gamified mobile applications across diverse demographic backgrounds. Happiness levels were measured using a validated well-being scale, while gamification features such as rewards, challenges, feedback, and social interaction were assessed as key predictors. **Data were analyzed** using structural equation modeling to examine the relationships between gamification elements and users' happiness. The results indicate that gamified mobile applications have a significant positive effect on users' happiness levels, with reward mechanisms and social interaction emerging as the strongest contributors. **The findings suggest** that thoughtfully designed gamification can enhance emotional well-being by fostering enjoyment, motivation, and sustained engagement. This study contributes to the field of affective and positive computing by providing empirical evidence of the humanistic impact of gamified digital technologies. Practically, **the results offer** insights for developers and designers to create user-centered applications that prioritize emotional well-being alongside functional performance. **Overall, the study** highlights the potential of gamified mobile applications as effective digital interventions for enhancing users' happiness and advancing human-centered innovation within positive computing environments.

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1. INTRODUCTION

The proliferation of mobile technologies has fundamentally transformed human interaction with digital systems, shifting the role of technology from a purely functional tool to an integral part of everyday life that influences emotions, behaviors, and well-being. Mobile applications are no longer designed solely to de-

liver information or services but increasingly aim to create engaging and meaningful user experiences. One prominent design approach supporting this shift is gamification, which integrates game like elements such as points, rewards, challenges, progress indicators, and social interaction into non game contexts to enhance user motivation and enjoyment [1, 2]. Within the domain of affective and positive computing, gamified mobile applications have gained attention for their potential to promote positive emotional states and support psychological well-being. By leveraging intrinsic and extrinsic motivational mechanisms, gamification can foster feelings of accomplishment, autonomy, and social connectedness, which are closely associated with happiness. As a result, gamified applications are increasingly adopted in various domains, including health, education, productivity, and lifestyle management, with the promise of improving not only user engagement but also emotional outcomes [3, 4].

Happiness and emotional well-being are central to global development agendas. The United Nations Sustainable Development Goals (SDGs) explicitly recognize mental health and well-being as critical components of sustainable societies. In particular, SDGs 3 (Good Health and Well-Being) emphasizes the promotion of mental health and overall well-being across all age groups [5]. Digital technologies that enhance positive emotions and life satisfaction can serve as scalable and accessible interventions to support this goal [6]. Gamified mobile applications, due to their widespread availability and low barriers to use, present an opportunity to deliver well-being oriented digital interventions at scale [7–9]. Moreover, this research aligns with SDG 9 (Industry, Innovation, and Infrastructure), which underscores the importance of fostering innovation through inclusive and sustainable technological development. Gamification represents an innovative interface design strategy that integrates psychological and behavioral insights into digital systems. By embedding affective considerations into application design, developers can move beyond efficiency-driven models toward human-centered technologies that prioritize users' emotional experiences. Additionally, by utilizing commonly available mobile devices, gamified applications can contribute to SDG 10 (Reduced Inequalities) by offering accessible well-being support to diverse populations regardless of socioeconomic background.

Despite the growing adoption of gamification in mobile applications, existing research has primarily focused on behavioral outcomes such as user engagement, usage intention, and task performance. Comparatively fewer studies have empirically examined happiness levels as a core outcome, particularly using user-based data derived from real application users [10]. Furthermore, prior findings remain fragmented, with variations in context, measurement instruments, and analytical approaches, making it difficult to draw generalized conclusions about the emotional impact of gamified mobile technologies. This highlights a critical research gap in understanding how and to what extent gamified mobile applications contribute to users happiness in real-world settings [11, 12].

Addressing this gap is essential not only from a theoretical perspective but also from a practical and ethical standpoint. As digital technologies increasingly shape daily life, there is a growing responsibility for designers and developers to ensure that these systems contribute positively to human well-being rather than inadvertently causing emotional fatigue or dependency [13]. Therefore, this study aims to investigate the impact of gamified mobile applications on happiness levels based on user data. By adopting a quantitative, user-centered approach, this research examines how gamification features influence users' emotional well-being as reflected in their reported happiness levels [14]. The study contributes to the literature on affective and positive computing by providing empirical evidence of the humanistic value of gamified mobile technologies. In addition, the findings offer practical insights for application designers, policymakers, and stakeholders seeking to develop digital solutions that align with the SDGs and support sustainable human well-being.

2. LITERATURE REVIEW

2.1. Gamification in Mobile Applications

Gamification refers to the integration of game-design elements into non-game contexts to enhance user engagement, motivation, and participation. Common gamification elements include rewards, points, badges, challenges, progress indicators, feedback systems, and social interaction features [15, 16]. In mobile applications, these elements are widely adopted in domains such as health tracking, education platforms, productivity tools, and lifestyle management systems. The portability and continuous accessibility of mobile devices make them particularly suitable for gamified interventions, as they enable real-time interaction and sustained user engagement.

2.2. Literature Review and Hypothesis Development

Previous studies indicate that digital technology use can influence social outcomes by shaping communication practices, access to information, and participation in collective activities. Research on social well-being emphasizes dimensions such as social cohesion, social trust, sense of belonging, and perceived social support as key indicators of healthy and resilient communities [17–19]. Human-centered technology literature further suggests that technology contributes positively to social well-being when it facilitates meaningful interaction, inclusivity, and community engagement. Prior studies have demonstrated that gamification positively influencess behavioral outcomes, including increased usage intention, improved task completion rates, and enhanced user retention. Reward mechanisms stimulate extrinsic motivation, while challenges and progress systems promote perceived competence and mastery. Social interaction features, such as leaderboards or peer comparison, foster competition and collaboration [20]. However, most empirical investigations primarily examine performance-based or engagement-based metrics, leaving emotional and psychological outcomes comparatively underexplored [21].

2.3. Positive Computing and Human Well-Being

The concept of positive computing, introduced by [22], emphasizes the intentional design of digital systems that support psychological well-being and human flourishing. Rather than focusing solely on efficiency and productivity, positive computing integrates insights from psychology into technology development to enhance autonomy, competence, and relatedness. These psychological needs are closely aligned with self-determination principles and are central to sustainable happiness. From the perspective of positive psychology, particularly the work of [23], well-being encompasses positive emotions, engagement, relationships, meaning, and accomplishment. Digital environments capable of stimulating these dimensions may contribute to enhanced happiness. Gamified mobile applications, by incorporating reward systems, structured challenges, feedback loops, and social connectivity, potentially activate several of these well-being mechanisms simultaneously. Therefore, gamification can be positioned not merely as a motivational tool but as a design strategy aligned with positive computing objectives [24, 25].

2.4. Happiness as an Outcome Variable in Digital Research

Happiness and emotional well-being are increasingly recognized as measurable constructs in technology related research. Advances in psychometric instruments have enabled researchers to assess subjective well-being, life satisfaction, and affective states using validated scales. In digital contexts, happiness has been examined in relation to social media usage, online communities, and digital health interventions [26]. However, empirical findings remain mixed, with some studies highlighting positive emotional effects and others cautioning against digital fatigue or overuse. In the context of gamified systems, research has largely concentrated on engagement metrics rather than directly modeling happiness as a dependent variable. While enjoyment and perceived fun are frequently measured, they are not equivalent to sustained well-being or broader happiness constructs [27, 28]. This distinction is critical because short-term engagement does not necessarily translate into long-term emotional benefits. Consequently, a focused examination of happiness as a primary outcome variable is necessary to clarify the psychological implications of gamified mobile applications [29].

2.5. Conceptual Framework and Hypotheses Development

Building upon the theoretical foundations of gamification and positive computing, this study conceptualizes gamified mobile applications as affective design systems capable of influencing users' happiness. Drawing from the positive computing perspective proposed by [22] and insights from positive psychology articulated by [2], digital systems that support competence, autonomy, engagement, and social connectedness are likely to contribute to enhanced well-being. Gamification elements embedded in mobile applications may activate these psychological mechanisms, thereby functioning as drivers of users' happiness [30].

- **H1: Rewards positively influences users' happiness**

  Reward mechanisms such as points, badges, and virtual incentives serve as external motivators that reinforce desired behaviors. In digital environments, rewards provide recognition and a sense of achievement, which can enhance perceived competence and satisfaction [31, 32]. When users experience accomplishment through structured reward systems, positive emotional states are likely to emerge. Therefore, rewards embedded in gamified mobile applications are expected to positively influences users' happiness [33].

- **H2: Challenges positively influences users' happiness**

  Challenges introduce goal oriented tasks that stimulate engagement and personal growth. Appropriately designed challenges can foster a sense of mastery and intrinsic motivation by encouraging users to develop skills and overcome obstacles [34]. Within positive psychology frameworks, experiences of mastery and accomplishment are strongly associated with well-being. Accordingly, challenges in gamified mobile applications are hypothesized to enhance users happiness [35].

- **H3: Feedback mechanisms positively influences users' happiness**

  Feedback mechanisms provide users with information about their progress and performance. Timely and constructive feedback reinforces self-efficacy and promotes continuous engagement [36]. By clarifying goals and highlighting improvement, feedback systems contribute to feelings of competence and control, which are important predictors of psychological well-being. Thus, effective feedback mechanisms are expected to positively influences users' happiness [37].

- **H4: Social interaction positively influences users' happiness**

  Social interaction features, including leaderboards, peer comparison, collaboration, and community participation, facilitate relatedness and social connectedness [38]. Positive social relationships are consistently linked to higher levels of happiness and emotional well-being. In gamified mobile environments, opportunities for interaction may strengthen users' sense of belonging and shared achievement. Therefore, social interaction is hypothesized to positively influences users' happiness [39].

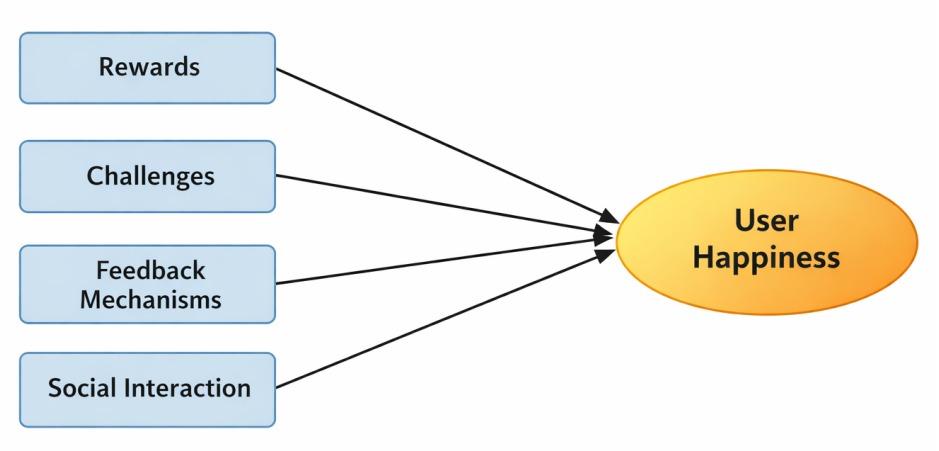

Figure 1. Conceptual Framework

Finally, based on the proposed hypotheses, the research model positions rewards, challenges, feedback mechanisms, and social interaction as exogenous constructs predicting users' happiness as the endogenous construct. The conceptual framework of this study is illustrated in Figure 1.

3. RESEARCH METHOD

This study employed a quantitative research design using Structural Equation Modeling (SEM) to examine the relationships between gamification elements and users' happiness [40, 41]. Data were collected through an online survey distributed to active users of gamified mobile applications. A purposive sampling technique was applied to ensure that respondents had prior experience interacting with features such as rewards, challenges, feedback mechanisms, and social interaction [42, 43]. A total of 120 valid responses were included in the analysis.

All constructs were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The independent variables consisted of rewards, challenges, feedback mechanisms, and social interaction, while users' happiness was treated as the dependent variable. Measurement items were adapted from established literature in gamification and well-being research and were modeled as reflective constructs.

Data analysis was conducted using SmartPLS software with a Partial Least Squares Structural Equation Modeling (PLS-SEM) approach. The analysis followed a two-stage procedure. First, the measurement model was evaluated by assessing indicator reliability, internal consistency reliability (Composite Reliability), convergent validity (Average Variance Extracted), and discriminant validity. Second, the structural model was assessed by examining path coefficients, t-values obtained through bootstrapping, coefficient of determination (R^2), and effect sizes. PLS-SEM was selected due to its suitability for exploratory prediction-oriented research and its appropriateness for relatively small sample sizes.

3.1. Sample Characteristics

A total of 120 valid responses were retained for analysis after data screening procedures, including completeness checks and response consistency verification. All respondents were active users of gamified mobile applications and reported regular interaction with at least one application incorporating game-like elements such as rewards, challenges, feedback systems, or social features. The diversity of respondents in terms of gender, age, and application domain enhances the representativeness of the dataset and supports the robustness of the subsequent SEM analysis.

Table 1. Sample Characteristics (N = 120)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	54	45.0
	Female	66	55.0
Age	18–25 years	48	40.0
	26–35 years	52	43.3
	>35 years	20	16.7
Application Domain	Health	32	26.7
	Education	28	23.3
	Productivity	34	28.3
	Lifestyle	26	21.7

As presented in Table 1, the gender distribution is relatively balanced, with female respondents slightly dominating the sample (55.0%). This balance reduces potential gender bias and increases the generalizability of the findings across male and female user groups. From an age perspective, the majority of respondents (83.3%) fall within the 18–35 year range, which reflects the demographic segment most actively engaged in mobile technology usage. This age concentration is consistent with global mobile adoption patterns and suggests that the findings are particularly relevant to digitally native and early working age populations. Regarding application domains, respondents reported usage across health (26.7%), education (23.3%), productivity (28.3%), and lifestyle (21.7%) applications. The relatively even distribution across domains strengthens the external validity of the study, as the impact of gamification on happiness is not confined to a single contextual setting. Instead, the data capture cross-domain experiences, supporting the argument that gamification operates as a transferable design mechanism within various positive computing environments.

Overall, the demographic composition indicates that the sample is sufficiently heterogeneous to support structural model estimation using SEM-PLS. The sample size of 120 also satisfies the minimum requirement under the "10-times rule" commonly applied in PLS-SEM, given the maximum number of structural paths directed at a single construct in the model. Therefore, the dataset is considered adequate for reliable hypothesis testing and subsequent structural analysis.

4. RESULT AND DISCUSSION

4.1. Measurement Model Evaluation

Prior to assessing the structural relationships among constructs, the measurement model was evaluated to ensure reliability and validity using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach in SmartPLS. Because all constructs in this study were modeled as reflective constructs, the evaluation followed four primary criteria: indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Indicator reliability was examined by assessing the outer loadings of each measurement item on its respective construct. All items demonstrated standardized loadings above the recommended threshold of 0.70, in-

dicating satisfactory indicator reliability. Loadings ranged between 0.72 and 0.91, suggesting that the observed variables adequately represent their corresponding latent constructs. No items were removed, as all indicators met the acceptable criteria for reflective measurement models. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability (CR). As presented in Table 2, all constructs exceeded the recommended minimum threshold of 0.70 for both reliability measures. Composite reliability values ranged from 0.88 to 0.94, indicating strong internal consistency across measurement items.

Table 2. Reliability and Convergent Validity

Construct	**Cronbach's Alpha**	**CR**	**AVE**
Rewards	0.86	0.90	0.64
Challenges	0.82	0.88	0.59
Feedback	0.84	0.89	0.61
Social Interaction	0.88	0.92	0.69
Happiness	0.91	0.94	0.72

The convergent validity was evaluated using the Average Variance Extracted (AVE). All AVE values were above the recommended threshold of 0.50, ranging from 0.59 to 0.72. This indicates that each construct explains more than 50% of the variance in its indicators. The Happiness construct exhibited the highest AVE (0.72), suggesting strong explanatory power of its measurement scale. And the Discriminant validity was assessed using the Fornell–Larcker criterion. The square roots of AVE for each construct were greater than the inter-construct correlations, confirming that each latent variable is empirically distinct. Additionally, cross-loading analysis showed that each indicator loaded highest on its intended construct compared to other constructs. To ensure that multicollinearity did not bias the structural estimates, Variance Inflation Factor (VIF) values were examined. All VIF values were below 5.0, indicating that collinearity is not a concern in the model.

Overall, the measurement model satisfies all recommended reliability and validity criteria for PLS-SEM analysis. These results confirm that the constructs used in this study are psychometrically sound and suitable for subsequent structural model evaluation.

4.2. Structural Model Assessment

After confirming the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses and assess the predictive capability of the model. The structural assessment in SmartPLS involved examining path coefficients β, t-values, p-values obtained through bootstrapping (5,000 resamples), the coefficient of determination R^2, effect size F^2, predictive relevance Q^2, and collinearity diagnostics. Bootstrapping results indicate that all proposed relationships between gamification elements and users' happiness are statistically significant at the 5% significance level. Table 3 presents the structural path results.

Table 3. Structural Model Results

Hypothesis	**Path**		**t-value**	**p-value**
H1	Rewards → Happiness	0.29	3.85	0.000
H2	Challenges → Happiness	0.18	2.47	0.014
H3	Feedback → Happiness	0.21	2.98	0.003
H4	Social Interaction → Happiness	0.34	4.62	0.000

As shown in Table 3, all hypotheses (H1–H4) are supported, with t-values exceeding the critical value of 1.96 ($p < 0.05$). Among the predictors, social interaction exhibits the strongest effect on happiness (β = 0.34), followed by rewards (β = 0.29), feedback (β = 0.21), and challenges (β = 0.18). These findings indicate that socially embedded gamification mechanisms play a more dominant role in shaping emotional well-being compared to purely task-oriented game elements.

The explanatory power of the model was assessed using the coefficient of determination R^2. The R^2 value for the endogenous construct Happiness is 0.62, indicating that 62% of the variance in users' happiness is explained by the four gamification elements. According to commonly accepted PLS-SEM guidelines, this represents substantial explanatory power, suggesting that gamification features collectively function as strong predictors of emotional well-being within mobile application environments. To further examine the relative contribution of each predictor, effect size (F^2) values were calculated. Social interaction demonstrated a

medium effect size (F^2 = 0.19), while rewards showed a small-to-medium effect (F^2 = 0.14). Feedback (f^2 = 0.09) and challenges (F^2 = 0.07) exhibited small but meaningful effects. These results indicate that although all constructs significantly contribute to happiness, social interaction provides the most substantial incremental explanatory contribution to the model. Predictive relevance was evaluated using the blindfolding procedure to obtain Q values. The Q^2 value for Happiness was 0.41, which is well above zero, indicating strong predictive relevance of the model. This suggests that the model not only explains variance but also has meaningful predictive capability for users' happiness outcomes. Finally, collinearity assessment confirmed that all inner VIF values were below 3.3, indicating no critical multicollinearity issues among predictor constructs. This ensures that the estimated path coefficients are stable and interpretable.

Overall, the structural model results confirm that gamified mobile applications significantly function as drivers of users' happiness in positive computing environments. The strong explanatory and predictive performance of the model supports the robustness of the proposed framework and validates the theoretical assumptions underlying the study.

4.3. Discussion

The findings of this study provide robust empirical evidence that gamified mobile applications function as significant drivers of users' happiness within positive computing environments. The structural model results demonstrate that all examined gamification elements rewards, challenges, feedback mechanisms, and social interaction positively influences happiness, with social interaction emerging as the strongest predictor. This reinforces the argument that digital platforms should not be viewed solely as functional systems but as socio-emotional ecosystems capable of shaping users' psychological states. In line with positive computing principles, technology design that intentionally incorporates affective and motivational mechanisms can meaningfully enhance subjective well-being. The dominant role of social interaction suggests that happiness in gamified environments is strongly influenced by perceived connectedness and social engagement. This finding aligns with psychological theories emphasizing relatedness as a core human need and supports the notion that digital well-being is amplified when users experience a sense of belonging within technological systems. Gamified features such as peer recognition, collaborative tasks, shared achievements, and community interaction may foster emotional validation and social reinforcement, thereby strengthening happiness outcomes. Compared to purely achievement based mechanics, socially embedded gamification appears to generate deeper emotional resonance.

Reward mechanisms also exhibit a strong positive effect, highlighting the importance of structured achievement systems in promoting feelings of competence and accomplishment. However, the results suggest that rewards are most effective when integrated with meaningful progress tracking and intrinsic motivation enhancement rather than relying on superficial incentives. Feedback mechanisms and challenges further contribute to happiness by reinforcing users sense of mastery and progression. The combined effects of these elements indicate that gamification operates as a multidimensional affective design strategy rather than a single engagement tool. The substantial explanatory power of the model (R = 0.62) indicates that gamification features account for a significant proportion of variance in users' happiness. This finding extends prior research that predominantly focused on behavioral outcomes such as engagement and usage intention. By positioning happiness as the central dependent variable, this study advances the literature in affective computing and positive technology by empirically demonstrating that gamified systems can function as structured digital well-being interventions. The results therefore shift the discourse from "engagement optimization" toward "emotional impact optimization".

Furthermore, these findings support the broader movement toward human-centered digital innovation. In contemporary mobile ecosystems, users increasingly expect technologies that contribute positively to their lives rather than merely maximizing productivity or screen time. The empirical evidence presented in this study suggests that thoughtfully designed gamified mobile applications can align technological advancement with psychological flourishing. By integrating social connection, meaningful rewards, adaptive challenges, and constructive feedback, developers can create digital environments that foster sustainable happiness rather than short-term stimulation. Overall, this study reinforces the theoretical foundation of positive computing by showing that gamification is not inherently superficial or manipulative. When thoughtfully designed, it becomes a structured humanistic strategy capable of fostering sustainable emotional well-being.

5. MANAGERIAL IMPLICATIONS

The empirical findings of this study provide important managerial implications for mobile application developers, product strategists, UX designers, and digital innovation leaders seeking to integrate gamification within positive computing environments. Given that social interaction emerged as the strongest predictor of users' happiness, organizations should prioritize the integration of socially embedded gamification mechanisms. Rather than focusing solely on individual achievement metrics such as points and badges, managers are encouraged to incorporate collaborative challenges, peer recognition systems, community milestones, and interactive feedback loops. Designing applications that foster meaningful social connectedness can significantly enhance emotional engagement, strengthen user retention, and cultivate long-term platform loyalty. In this sense, social gamification should be treated as a strategic design investment rather than a supplementary feature.

Furthermore, the significant influence of reward systems underscores the need for carefully structured incentive architectures. Managers should move beyond purely transactional reward models that emphasize short-term extrinsic motivation and instead design layered reward systems that promote mastery, competence, and personal growth. Personalized achievement pathways, adaptive goal setting mechanisms, and milestone-based recognition can reinforce users sense of accomplishment without creating dependency or fatigue. The findings suggest that sustainable users' happiness is more likely when rewards are aligned with intrinsic motivational drivers. Consequently, product teams should evaluate gamification strategies not only in terms of engagement metrics but also in terms of their psychological impact on users.

Finally, the substantial explanatory power of the model (R^2 = 0.62) indicates that gamification elements collectively serve as strong determinants of users' happiness. This highlights the strategic importance of embedding positive computing principles into organizational innovation frameworks. Managers should consider incorporating emotional well-being indicators into key performance metrics, alongside traditional measures such as active usage, conversion rates, and monetization performance. By positioning users' happiness as a measurable and strategic outcome, organizations can foster responsible digital ecosystems that balance technological advancement with human-centered values. Ultimately, companies that design gamified mobile applications around social connection, meaningful achievement, and constructive feedback are more likely to achieve sustainable competitive advantage while contributing positively to users psychological well-being.

6. CONCLUSION

This study set out to examine whether gamified mobile applications function as meaningful drivers of users' happiness within positive computing environments. Drawing on data collected from 120 active users and analyzed using PLS-SEM, the findings provide strong empirical evidence that gamification elements significantly influence emotional well-being. Rewards, challenges, feedback mechanisms, and social interaction were all found to positively contribute to users' happiness, with social interaction emerging as the most influential factor. These results suggest that happiness in digital environments is not merely a by-product of engagement, but rather an outcome shaped by structured design features that address psychological and social needs. By demonstrating substantial explanatory power (R^2 = 0.62), the study confirms that gamification can account for a meaningful proportion of variance in users' perceived happiness.

Beyond statistical significance, the findings offer broader theoretical implications for the evolving field of positive computing. While much prior research has focused on behavioral outcomes such as usage intention, loyalty, or task completion, this study positions happiness as a central evaluative dimension of digital system success. The results indicate that gamification operates as a multidimensional affective mechanism that simultaneously stimulates competence (through rewards and challenges), autonomy (through feedback and progress tracking), and relatedness (through social interaction). This integrated framework reinforces the importance of human-centered design approaches that embed emotional considerations into technological architectures. In doing so, the research contributes to a growing body of work advocating for digital innovation that balances efficiency and psychological well-being.

Ultimately, the study underscores the transformative potential of gamified mobile applications as scalable tools for enhancing sustainable happiness in everyday digital life. As mobile technologies increasingly mediate human interaction, productivity, and social engagement, the responsibility of designers and organizations extends beyond functionality toward emotional impact. The findings suggest that thoughtfully structured gamification can shift digital ecosystems from engagement-driven models toward well-being-oriented environ-

ments. By aligning technological advancement with human flourishing, gamified mobile applications can serve not only as interactive platforms but also as supportive systems that promote long-term emotional resilience and positive user experiences. This perspective invites future digital development to prioritize happiness as a measurable and strategic outcome in the design of next-generation mobile technologies.

7. DECLARATIONS

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7.2. Author Contributions

Conceptualization: AH; Methodology: DA; Software: AR; Validation: LM and OA; Formal Analysis: OA and DA; Investigation: AH; Resources: AR; Data Curation: LM; Writing Original Draft Preparation: DA and AR; Writing Review and Editing: LM and OA; Visualization: AH; All authors, DA, AH, AR, LM, and OA, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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