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Original Research

Designing for a Sustainable Future: The Role of Animal Tracking Platforms in Fostering Environmental Awareness and Conservation

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Abstract

With the advancement of digital technology, animal tracking platforms have evolved from specialized conservation tools into dynamic interfaces that support public participation in sustainable environmental development. As concerns over biodiversity loss and ecosystem health intensify, these platforms increasingly serve as bridges between digital engagement and environmental awareness. Drawing on both user-generated content and survey data, the research adopts a mixed-method approach to explore how platform design shapes users' cognitive engagement with conservation. Latent Dirichlet Allocation (LDA) was applied to analyze social media discussions, identifying three dominant themes that reflect user concerns: tracking and conservation relevance, interface design and usability, and animal welfare and emotional connection. These themes informed the construction of three perception-based variables: perceived platform functionality, design uniqueness, and interface information design. Survey data were collected through both online and offline methods, targeting individuals familiar with animal tracking platforms. A structural equation modeling (SEM) analysis based on 395 valid responses reveals that these platform perceptions significantly influence users' subjective norms, perceived behavioral control, and behavioral attitudes, which in turn shape their intention to follow wildlife conservation information. The findings suggest that platforms emphasizing intuitive design, reliable tracking, and emotionally resonant content are more likely to foster meaningful conservation-oriented engagement. This study offers practical insights for conservation organizations and technology developers seeking to enhance user participation through responsive, value-driven digital platforms.

Keywords: animal tracking platform, wildlife conservation, user perception, latent dirichlet allocation (LDA), structural equation modeling

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Introduction

The increasing integration of digital technologies into daily life has reshaped the ways humans participate in wildlife conservation, shifting from passive observation to more interactive, data-driven, and participatory forms of engagement [1, 2]. Among various digital tools, animal tracking platforms have emerged as innovative interfaces that not only visualize animal movements in real time but also provide users with opportunities to participate in conservation-related activities through digital means [3, 4]. These platforms integrate social media features, gamified elements, and personalized content to foster user involvement and promote awareness beyond physical encounters [5, 6]. Instead of functioning solely as informational tools, animal tracking platforms are increasingly becoming participatory ecosystems that support the development of users' motivation and willingness to engage in wildlife conservation [7, 8]. Understanding the factors that influence users' intention to attend to wildlife conservation information in digital contexts is essential for optimizing platform design and promoting information-based engagement with environmental issues. This study contributes to the growing body of research on digital conservation by exploring how platform experiences shape users' cognitive attention and awareness of wildlife protection content online.

Animal tracking collars have played a significant role in monitoring wildlife, integrating various technologies such as GPS and wireless communication modules to facilitate real-time location tracking. These collars are extensively used in behavioral and ecological research, enabling researchers to remotely obtain data on animals' locations, activity patterns, and physiological states [9]. Beyond scientific research, digital platforms have expanded the functionality of animal tracking devices by enabling public participation in wildlife observation. Dionisio and colleagues demonstrated that integrating mobile applications with tracking data allows users to engage with animal activities, contributing observations and sharing insights through interactive digital platforms [10]. This participatory approach enhances user engagement by transforming wildlife monitoring from a passive process into an interactive and community-driven experience. To develop comprehensive models of animal behavior, it is essential to collect extensive datasets encompassing vocalizations, movements, and other behavioral indicators, while ensuring that wearable tracking devices minimize disruption to the animals' natural routines [11, 12]. While previous research has focused on the technical aspects of tracking collars as monitoring tools, there has been limited attention on how their design can enhance user experience and foster meaningful human-animal interaction. Addressing this gap is crucial for optimizing digital platforms to create novel and engaging ways for humans to connect with animals, ultimately reinforcing the role of tracking technologies in fostering awareness and participation.

Digital platforms have become an integral part of modern society, reshaping how individuals interact, engage, and participate in various activities. Animal tracking platforms, through their integration of multiple functionalities, serve as powerful tools for facilitating human awareness of wildlife, supporting ecological research, and enhancing conservation participation [13]. Researchers emphasize the role of digital innovation in fostering meaningful public involvement in biodiversity protection, highlighting the potential of these technologies to increase users' interest, awareness, and sense of responsibility toward conservation [14]. While previous studies have explored factors such as attitudes, social norms, and motivations, there has been relatively little focus on how digital platforms shape users' attention to and cognitive engagement with wildlife conservation information. Moreover, there remains a critical gap in understanding how animal tracking platforms impact users' conservation intentions, underscoring the need for further research in this area. Many studies have applied the Theory of Planned Behavior (TPB) to examine how attitudes, subjective norms, and perceived behavioral control shape individuals' intentions to support conservation-related actions. Research suggests that users' conservation willingness is influenced by their perceptions of meaningful interaction opportunities, trust in digital technologies, and alignment with personal or social values [15, 16]. By reframing these motivational mechanisms through the lens of information attention rather than behavioral outcomes, this study seeks to clarify how digital platform experiences can activate users' intention to cognitively engage with wildlife conservation content.

This paper develops a focused research model to examine the factors influencing users' Wildlife Conservation Information Attention Intention on animal tracking platforms. A Latent Dirichlet Allocation (LDA) topic model is first applied to analyze user-generated content to identify key themes in the public discourse surrounding these platforms. Based on the thematic insights derived from the LDA analysis, the study constructs a conceptual model to explore how platform design influences users' awareness and motivation to follow wildlife-related information. A structured questionnaire survey is then conducted to validate the model and capture users' perceptions and cognitive responses. In this study, Wildlife Conservation Information Attention Intention refers to users' willingness to pay attention to, follow, and cognitively engage with wildlife conservation-related content presented on digital platforms. It reflects a key psychological mechanism that links platform experience to users' environmental awareness and potential support for conservation efforts. The findings provide practical insights into how interface design and information presentation strategies can enhance users' sensitivity to conservation issues in digital environments. This study addresses three key questions: (1) What themes emerge from social media discussions about animal tracking

platforms? (2) How can insights from these themes inform the construction of a model for understanding users' attention to wildlife conservation information? (3) How do users' platform experiences and perceptions shape their intention to engage with such content?

Literature Review

In existing research on human–animal interactions, individual engagement intentions are often conceptualized through multidimensional constructs, most notably willingness to support and willingness to participate. Willingness to support typically reflects an individual's intention to endorse or contribute to animal-related initiatives, such as conservation programs, awareness campaigns, or digital platforms. In contrast, willingness to participate emphasizes the inclination to be directly involved in activities related to wildlife, including volunteering, donation, or event attendance. Researchers employ data analysis methods including correlation analysis [17], multiple regression [18], Logit models [19], and structural equation modeling (SEM) [20] to investigate influencing factors. Regarding willingness to participate, some studies use binary variables to assess public attitudes toward engagement. For instance, Cárdenas and Lew (2016) examined visitors' intentions by asking whether they would donate to projects enhancing human-wildlife coexistence, finding variations across species [21]. Lo et al. (2012) designed Likert-scale items such as "Are you willing to volunteer for wildlife interaction programs?" to measure engagement intentions from multiple perspectives [22].

In terms of willingness to support, studies commonly use the Contingent Valuation Method (CVM) [23, 24] and Choice Experiment (CE) [25, 26] to measure economic commitment to human-animal interaction initiatives. CVM simulates a market to inquire about public willingness to pay for species-specific engagement programs, such as those involving giant pandas [27] or Asian elephants [28]. Research indicates that as ecological literacy improves, public support increases significantly – for example, annual willingness to fund panda interaction projects in Sichuan rose by 127% from 2005 to 2014 [27]. The CE method, initially analyzing consumer preferences, now evaluates engagement program values and has been applied to species like red-crowned cranes [28-30].

Factors influencing engagement intentions fall into subjective psychological factors (attitudes, awareness, emotions, norms) and objective factors. Attitudes toward interaction targets and behaviors are key: Cárdenas and Lew found tourists' concern for marine species correlated with donation intentions [21], while Hanson et al. linked values to support for snow leopard programs [31]. The Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) explain how attitudes, norms, and perceived control shape intentions [32, 33]. Objective factors include past participation experiences, socioeconomic status, and demographics. For instance, marine program participation positively impacts donation willingness [21], while gender and education affect students' engagement intentions for Asian turtles [22].

In recent years, animal tracking technologies have evolved from purely scientific tools to publicly accessible digital platforms that allow non-expert users to follow wildlife movements in real time. These platforms often integrate GPS data, visualization interfaces, and mobile applications to present wildlife trajectories in an engaging and user-friendly manner. Such innovations have broadened public access to ecological data and reshaped the way individuals perceive and participate in wildlife conservation [34, 35]. Several studies have emphasized the role of interactive platform design in enhancing users' sense of involvement and ecological awareness. For example, platforms that offer personalized animal stories, real-time migration tracking, or gamified experiences are more likely to attract sustained user attention and foster conservation-related engagement [36-38]. Moreover, digital tracking tools embedded in consumer-facing products – such as wearable devices or branded animal tracking bracelets – have introduced a hybrid model that combines conservation communication with product-based digital interaction [39, 40]. Existing research also highlights the importance of interface clarity, data reliability, and emotional resonance in influencing user perceptions of such platforms. Users' trust in platform accuracy and their perceived ability to "connect with" animals through tracking visualizations have been linked to increased participation in related environmental campaigns or online conservation discourse [41-43].

However, few studies have examined users' willingness to pay attention to wildlife conservation information itself, especially in digital contexts. Given the rise of platform-mediated conservation communication, understanding how individuals form and express information attention intentions has become a critical yet underexplored area. This study aims to address this gap by focusing on Wildlife Conservation Information Attention Intention as a measurable cognitive-motivational variable shaped by digital platform experiences (Fig. 1).

Research on User Themes of Animal Tracking Bracelet Platform

Before conducting topic modeling, we implemented a systematic preprocessing procedure to enhance semantic clarity and ensure modeling quality. First, we constructed a custom stop-word list by combining a standard Chinese corpus with platform-specific filler expressions commonly found in user-generated content to remove non-informative text. To retain semantically meaningful domain-specific content, we built a term frequency–based lexicon directly from the raw corpus instead of using a fixed expert dictionary. High-frequency terms were identified

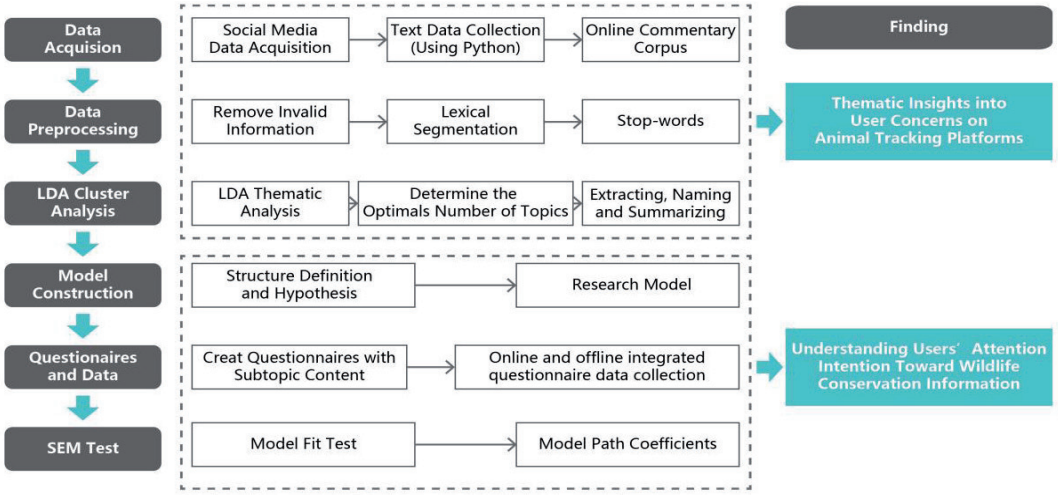

Fig. 1. Research methodology framework.

and preserved to represent the core focus of user discourse across platforms. In addition, we compiled a synonym mapping table to merge lexical variants and improve topic consistency. For example, one term was merged with another, one was unified with another, and one was aligned with another. Word segmentation was performed using Jieba in Python, with iterative refinements informed by manual inspection of sample outputs. Low-frequency words (less than 5 occurrences) and tokens shorter than two characters were filtered out to reduce noise. Throughout preprocessing, we prioritized semantic retention of meaningful user expressions. Representative terms were preserved in several major categories: (1) usability and interface experience; (2) emotional responses; and (3) ecological context. This data-driven, iterative preprocessing strategy established a strong semantic foundation for LDA modeling, ensuring the extracted topics could accurately reflect concerns around functionality, emotional perception, conservation narratives, and design quality [44, 45].

The second step employed Term Frequency-Inverse Document Frequency (TF-IDF) values for filtering. Using the CountVectorizer class from the sklearn package, words were converted into a term frequency matrix to filter out terms with excessively high frequencies or low weights. The optimized term frequency matrix was then input into the LDA topic model for thematic analysis. The model was implemented using the Latent Dirichlet Allocation module in scikit-learn, with hyperparameters set as follows: α (doc-topic prior) = 0.1, β (topic-word prior) = 0.01, and the number of iterations = 1,000 to ensure model convergence and topic stability. The optimal number of topics for this study was assessed using a combination of topic coherence (c_v score) and perplexity. As illustrated in Fig. 2, a higher coherence score indicates greater consistency among keywords within topics, while a lower perplexity suggests stronger predictive capacity and better model generalization [44, 45]. The analysis revealed that 20 topics exhibited the best coherence, with a c_v score of 0.5252, indicating that the model effectively captures the dataset's underlying structure. However, the lowest perplexity was observed with 3 topics, at 99.2847, suggesting superior generalization and reduced overfitting. Thus, a range between 10 and 20 topics is considered optimal, balancing topic coherence with model simplicity. After thorough data evaluation and research team discussions, 17 topics were selected for further study, as presented in Table 1. This selection balances the need for detailed thematic representation with practical model application.

Table 1 presents the thematic structure derived from a comprehensive analysis of animal tracking and protection systems, platform design features, user dissatisfaction, and animal emotions and health. The research content is organized into four primary domains: Tracking and Protection, Design and Features, User Dissatisfaction, and Animal Emotions and Health. Each domain encapsulates critical dimensions of platform research, offering a holistic understanding of the technological, emotional, and ethical aspects of wildlife conservation through digital platforms.

The Tracking and Protection domain focuses on the functional and operational efficacy of animal tracking systems and their role in conservation efforts. Key themes such as Animal Tracking, Ecological Protection, and Trajectory Protection underscore the platform's core objectives: monitoring animal movements, safeguarding their habitats, and analyzing behavioral and migratory patterns. For instance, Animal Location highlights the integration of real-time tracking technologies to provide precise data on animal positions, while Behavior Protection emphasizes the importance of understanding animal actions and health through data-driven insights. These themes collectively demonstrate the platform's capacity to enhance wildlife protection by combining advanced tracking capabilities with ecological conservation strategies. The Design and Features domain

Table 1. Keywords of topics from the social media platform of animal tracking bracelet.

Category	Topic Name	Top Words
Tracking and Protection	Animal Tracking	use, design, function, clarity, operation, simplicity, experience, intuitive, data, animals
	Animal Location	wild animals, tracking, protection, daily, data, function, location, visual effects, penguins, better
	Ecological Protection	animals, tracking, protection, wild animals, special, can, contribution, adoption, work
	Behavior Protection	animals, tracking, data, health, looks, feeling, trajectory, action, view, specific
	Trajectory Protection	tracking, animals, trajectory, protection, more, simple, p2, really, active, sharks
Design and Features	Feature Optimization	use, design, function, clarity, operation, simplicity, experience, intuitive, data, animals
	Green Design	green, matching, design, interface, blue, use, nature, feeling, operation, color
	Environmental Tracking	animals, tracking, use, support, wristbands, babies, barnacles, in the sea, can, blue
	Data Integration	cards, animals, whole, tracking, little bears, everyone, funny, finished, polar bears, planting
User Dissatisfaction	Tracking Failure	tracking, animals, not moved, months, disappointed, gimmick, device, bad, worst, let down
	Emotional Impact	children, negative emotions, dead animals, sadness, fear, worry, disappointment, expectation, reality
	Device Issues	device, falls off, broken, unreliable, data transmission, stability, problem, malfunction, areas
	Platform Misleading	advertising, promises, reality, misleading, expectations, money, bracelet, tracking, gimmick
Animal Emotions and Health	Animal Emotions	cute, tracking, animals, like, warmth, feeling, can, background, function, migration
	Demand Tracking	tracking, animals, hope, choice, data, hesitation, protection, like, wild animals, happiness
	Health Tracking	tracking, animals, hope, health, dolphins, none, nature, wild animals, penguins, signals
	Device Stability	tracking, animals, devices, protection, use, not, data transmission, stability, areas, stability
	Transmission Stability	tracking, animals, devices, protection, use, not, data transmission, stability, areas, stability

examines the user interface and technical attributes of the platform, emphasizing usability, sustainability, and data integration. Themes such as Feature Optimization and Green Design reflect the platform's commitment to creating intuitive, environmentally conscious interfaces that prioritize user experience. Environmental Tracking and Data Integration further illustrate how the platform incorporates ecological factors and big data analytics to provide comprehensive monitoring of animal welfare. These themes highlight the platform's ability to balance technical sophistication with user-friendly design, ensuring seamless interaction between users and the system. The User Dissatisfaction domain addresses critical challenges and limitations identified by users, offering valuable insights into areas requiring improvement. Themes such as Tracking Failure and Device Issues reveal significant technical shortcomings, including device malfunctions, unreliable data transmission, and tracking inaccuracies. The Emotional Impact theme highlights the psychological effects on users, particularly children, when tracking data suggests potential harm or mortality to animals, leading to feelings of sadness, fear, and disappointment. Additionally, Platform Misleading critiques the discrepancy between the platform's advertised promises and its actual performance, underscoring the need for greater transparency and ethical marketing practices. These themes collectively emphasize the importance of addressing user concerns to enhance trust, satisfaction, and overall platform reliability. The Animal Emotions and Health domain explores the platform's role in monitoring the emotional and physical well-being of animals, extending beyond mere tracking functionalities. Themes such as Animal Emotions and Health Tracking emphasize the platform's potential to foster empathy and care by providing insights into animals' emotional states and health conditions. Device Stability and Transmission Stability ensure the reliability and consistency of tracking systems, enabling accurate and continuous monitoring of animal health. These themes highlight the platform's capacity to integrate technological advancements with ethical considerations, promoting a more humane approach to wildlife conservation.

Hypotheses

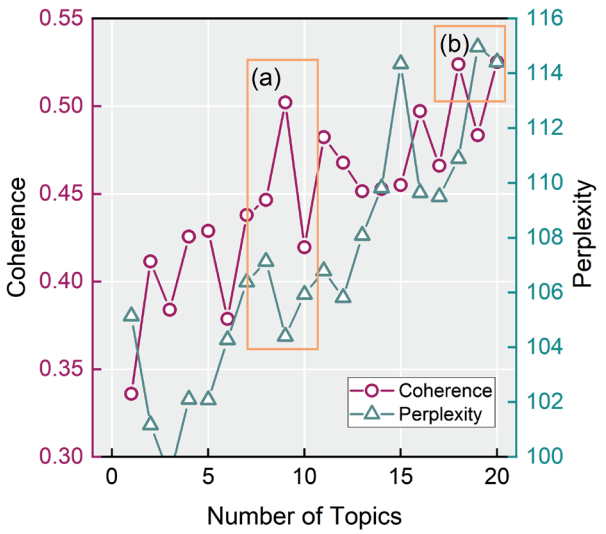

Fig. 2. The consistency line chart of perplexity for the LDA Model of social media data from the animal tracking bracelet platform.

To investigate how the design of animal tracking platforms influences users' attention to wildlife conservation information, this study adopts the Theory of Planned Behavior (TPB) as its primary theoretical framework (Fig. 3). TPB provides a structured lens through which to analyze users' attitudes, subjective norms, and perceived behavioral control, all of which shape their intention to cognitively engage with conservation-related content on digital platforms. In this context, user engagement is not defined as physical interaction with animals but as the willingness to attend to and process wildlife protection information presented through digital tracking systems. Building on topic themes extracted via LDA from social media discourse, this study identifies three key platform-related variables that may influence users' behavioral intentions: Perceived Platform Functionality, Design Uniqueness, and Interface Information Design. These variables reflect users' perceptions of the platform's technical stability, experiential distinctiveness, and clarity in presenting wildlife-related content. Within the TPB framework, these factors are hypothesized to influence user attitudes, perceived behavioral control, and subjective norms, thereby shaping their Wildlife Conservation Information Attention Intention. By integrating LDA-derived user perceptions with a TPB-based structural model, this study offers a focused approach to understanding how specific elements of platform design affect users' willingness to engage with wildlife conservation information in digital contexts. This framework not only enables a clearer operationalization of design-related influences but also provides actionable insights for optimizing platform features to foster meaningful conservation awareness.

The Theory of Planned Behavior (TPB), originally proposed by Ajzen (1991), has been widely used to explain and predict human behavioral intentions across domains, including environmental behavior, pro-social behavior, and technology adoption [46]. TPB posits that an individual's behavioral intention is the most immediate determinant of behavior. That intention is influenced by three core constructs: Attitude (ATT) toward the behavior, Subjective Norm (SN) surrounding the behavior, and Perceived Behavioral Control (PBC) over the behavior [47]. In the context of this study, we adapt TPB to investigate users' intention to cognitively engage with wildlife conservation information on digital animal tracking platforms – defined here as their Wildlife Conservation Information Attention Intention. Unlike conventional behavioral intention studies that focus on physical participation or platform usage behavior, this study conceptualizes intention as a form of cognitive engagement, specifically referring to users' willingness to seek, follow, and mentally process wildlife-related information presented through platform interfaces. This framing is particularly relevant in digital environments, where interaction is often information-based rather than physical or action-based. According to TPB, Attitude refers to users' overall evaluation of whether paying attention to wildlife conservation information is beneficial, meaningful, or enjoyable. For example, users who believe that monitoring animal movements helps protect biodiversity or raises

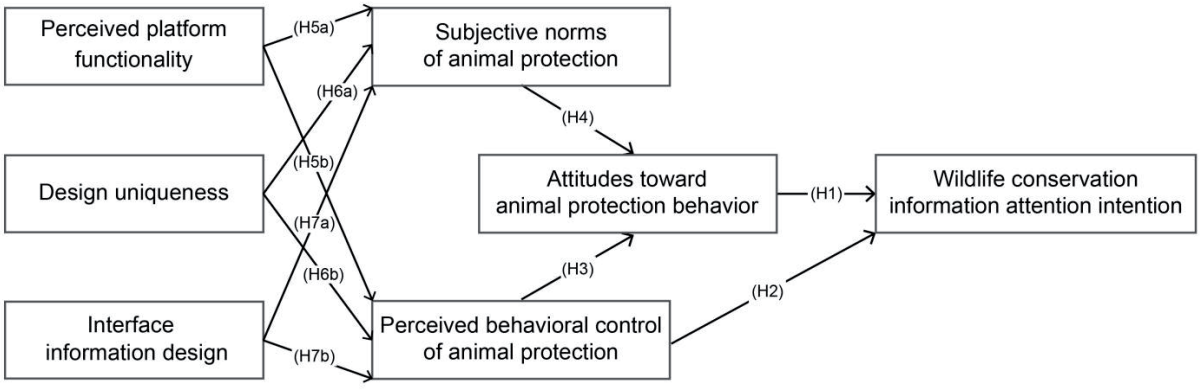

Fig. 3. Research model.

ecological awareness may develop positive attitudes toward such information. Subjective Norm refers to perceived social pressure to attend to wildlife content. In the digital context, this includes social expectations from peers, influencers, online communities, or environmental campaigns that encourage individuals to engage with wildlife conservation narratives. Perceived Behavioral Control reflects the extent to which users feel capable of accessing and understanding conservation-related information through digital tools. This includes technological self-efficacy, time availability, and the perceived clarity or complexity of the interface.

To further investigate the design-driven antecedents of key TPB constructs, we introduce three platform-related variables derived from topic modeling of user discourse: Perceived Platform Functionality refers to users' perceptions of the technical soundness and operational reliability of the platform's core features, such as real-time tracking, sensor stability, and data integration. A technically robust platform reduces operational uncertainty and enhances users' sense of control, thereby directly strengthening perceived behavioral control (PBC) [48, 49]. Additionally, when a platform consistently delivers accurate and credible content, it fosters trust and normative alignment, reinforcing subjective norms (SN) by signaling that participation is socially accepted and institutionally supported [50].

Design Uniqueness captures users' perceptions of creativity, innovation, and distinctiveness in the platform's visual and interaction design. While not traditionally emphasized in TPB, recent work in emotional design and social signaling theory suggests that novel or emotionally resonant digital environments not only promote positive attitudes (ATT) toward the content but also serve as social cues that influence subjective norms (SN) [51, 52]. When users encounter aesthetically appealing or non-generic platforms, they may infer social value and cultural relevance, which encourages alignment with perceived peer expectations and enhances normative pressure. Interface Information Design refers to the clarity, visual accessibility, and structural coherence with which the platform presents complex ecological or tracking data. Well-structured interfaces reduce cognitive load and facilitate user comprehension, thereby improving perceived behavioral control (PBC) [53]. Moreover, intuitive data visualizations can shape users' attitudes toward the platform's educational value and foster subjective norms by increasing the shareability and perceived legitimacy of conservation knowledge [54, 55].

Each of these design-oriented variables is hypothesized to influence the TPB constructs (ATT, SN, PBC), which in turn shape users' intention to attend to wildlife conservation information. This extended TPB model thus allows for a detailed explanation of how digital design elements translate into psychological factors that drive conservation-related attention behaviors. By employing this theoretical approach, the study contributes to the growing body of work on information-based engagement in environmental digital platforms, offering insights not only into how users process wildlife-related content but also into how thoughtful platform design can reinforce conservation communication goals [56-58].

Based on the discussion of the research above, we propose the following hypotheses:

H1: Animal Tracking Application Platform Behavior positively influences Intention to Engage with Animals

H2: Perceived Behavioral Control related to Animal Interaction positively influences Intention to Engage with Animals

H3: Perceived Behavioral Control related to Animal Protection positively influences Animal Tracking Application Platform Behavior

H4: Subjective Norms related to Animal Protection positively influence Animal Tracking Application Platform Behavior

H5a: Perceived Platform Functionality positively influences Subjective Norms of Animal Protection

H5b: Perceived Platform Functionality positively influences Perceived Behavioral Control of Animal Protection

H6a: Design Uniqueness positively influences Subjective Norms of Animal Protection

H6b: Design Uniqueness positively influences Perceived Behavioral Control of Animal Protection

H7a: Interface Information Design positively influences Subjective Norms of Animal Protection

H7b: Interface Information Design positively influences Perceived Behavioral Control of Animal Protection

Materials and Methods

Fig. 4 illustrates the interface and user feedback of the Fahlo animal tracking bracelet. Fahlo was selected as the study platform due to its distinctive combination of product interaction, real-time tracking, and conservation storytelling. It engages users by linking wearable devices to specific animals and providing visualized movement data. User comments highlight both the technical performance and emotional value of the platform, making it a representative case for studying how design features influence conservation attention. The data collection process was designed to examine the impact of animal tracking platform designs on users' willingness to engage in animal protection activities. The study employed an online survey targeting individuals who have experience with or are familiar with animal tracking platforms. A purposive sampling strategy was utilized, considering factors such as age, gender, education level, and involvement in animal protection. The survey was disseminated via social media, animal welfare organizations, and online forums dedicated to animal protection topics. Prior to the main survey deployment, a pilot test involving 30 participants was conducted to enhance the questionnaire's

Fig. 4. User engagement and feedback on the animal tracking bracelet platform.

clarity and effectiveness. The finalized questionnaire comprised Likert-scale and multiple-choice questions focused on platform design elements – such as ease of use, uniqueness, and interface – and user perceptions regarding their role in animal protection. The survey was open for a two-week period, during which periodic reminders were sent to boost participation rates. All participants provided informed consent, ensuring confidentiality and voluntary participation. All participants were fully informed about the purpose and content of the study and provided informed consent prior to participation. Ultimately, 488 valid responses were obtained. The data were then analyzed using statistical techniques, including descriptive statistics and regression analysis, to investigate the relationship between platform design features and users' intentions to participate in animal protection.

The data were collected between March 15 and March 28, 2025, through a combination of online distribution and offline outreach. After removing incomplete responses and filtering out participants who had no experience using animal tracking platforms, a total of 395 valid responses were retained for analysis.

Table 2 presents the demographic characteristics of the respondents and their willingness to pay attention to wildlife conservation information. The sample included participants across four age groups, with the majority aged 21-25 years (43.81%), followed by 26-30 years (26.07%), 16-20 years (22.58%), and a smaller proportion aged 31-35 years (7.54%). In terms of gender, 53.54% of respondents were female and 46.46% were male. Educationally, nearly half of the respondents (49.89%) held a Bachelor's degree, while 21.14% had completed a graduate degree, and the remainder (28.73%) held either vocational or high school

Table 2. Demographic characteristics of the 395 valid respondents and their wildlife conservation information attention intention.

Demographic Variable	Categories	Frequency	Percentage (%)
Age	16-20 years	84	22.58
	21-25 years	163	43.81
	26-30 years	97	26.07
	31-35 years	28	7.54
Gender	Male	173	46.46
	Female	222	53.54
Educational Level	High School	31	8.32
	Vocational Degree	76	20.41
	Bachelor's Degree	186	49.89
	Graduate Degree	79	21.14
Frequency of Using Animal Tracking Platforms	Occasionally (1-2 times/ month)	139	35.19
	Frequently (1-2 times/week)	168	42.53
	Very Frequently (3+ times/week)	88	22.28
Willingness to Pay Attention to Wildlife Conservation Information	Not Willing	22	5.57
	Somewhat Willing	94	23.8
	Neutral	147	37.21
	Very Willing	132	33.42

Table 3. KMO and Bartlett's inspection.

KMO		0.911
Bartlett's sphericity	Spherical test	7896.641
	df-value	378
	p-value	0

qualifications. Regarding platform usage frequency, 42.53% of respondents reported using animal tracking platforms frequently (1-2 times/week), 22.28% used them very frequently (3+ times/week), and 35.19% used them occasionally (1-2 times/month).

When assessing their Wildlife Conservation Information Attention Intention, 33.42% of respondents reported being very willing, 37.21% were neutral, and 23.80% were somewhat willing, while only 5.57% expressed that they were not willing. These findings suggest that most respondents showed a moderate to high level of cognitive engagement with wildlife conservation content in the context of digital tracking platforms.

Results

As shown in Table 3, the Kaiser-Meyer-Olkin (KMO) value is 0.911, indicating excellent sampling adequacy for conducting factor analysis. Bartlett's test of sphericity yielded a chi-square value of 7896.641 with 378 degrees of freedom and a p-value of 0.000, confirming that the correlation matrix is significantly different from the identity matrix and that the data are suitable for exploratory and confirmatory factor analysis [59, 60]. These analyses were conducted using SPSS 26.0.

Table 4 presents the fit indices of the structural model, confirming a strong model-data fit. The Chi-square/df ratio was 1.930, well below the recommended threshold of 3, suggesting a balanced and parsimonious model structure. The RMSEA value is 0.049, which is within the acceptable limit (<0.06), indicating a good approximation to the population covariance structure. All other indices – including NFI (0.919), IFI (0.959), CFI (0.959), and TLI (0.955) – exceed the standard cutoff of 0.90, further validating the robustness and adequacy of the model fit. These results demonstrate that the measurement model is well-calibrated, providing a reliable basis for subsequent hypothesis testing [61, 62]. These fit indices were calculated using AMOS 24.0.

The reliability and validity of the measurement model were evaluated using Cronbach's Alpha (α), Average Variance Extracted (AVE), and Composite Reliability (CR). As shown in Table 5, all Cronbach's Alpha coefficients exceed the recommended threshold of 0.70, ranging from 0.859 to 0.929, which indicates a high level of internal consistency across all constructs. The AVE values range from 0.606 to 0.766, confirming satisfactory convergent validity, as each construct explains more than 50% of the variance in its indicators. Meanwhile, the CR values range from 0.860 to 0.929, also exceeding the threshold of 0.70, which supports the composite reliability of each latent variable. Among all constructs, Design Uniqueness (DU)

Table 4. The values of fit indices.

Fit indices	Chi-square/df	RMSEA	NFI	IFI	CFI	TLI
Actual	1.930	0.049	0.919	0.959	0.959	0.955
Recommended	<3	<0.06	>0.90	>0.90	>0.90	>0.90

Table 5. Reliability and validity analysis of the research questionnaire.

Dimension	Measurement Item	Factor loading	α	AVE	CR
Perceived platform functionality (PPF)	The platform provides stable and reliable tracking of wildlife in real time.	0.757	0.873	0.632	0.873
	I believe the platform's core tracking functions operate smoothly and without major issues.	0.774			
	The platform accurately presents animal movement and location data.	0.805			
	Overall, the platform performs well in terms of basic functionality and technical responsiveness.	0.842			
Design Uniqueness (DU)	You find the design of the animal tracking platform innovative and distinct.	0.888	0.929	0.766	0.929
	You think the platform's design enhances its appeal for animal protection purposes.	0.886			
	You believe the unique design of the platform sets it apart from other similar tools.	0.846			
	You feel the distinctive features of the platform improve its effectiveness in achieving animal protection goals.	0.881			
Interface information design (IID)	The platform presents wildlife-related information clearly and understandably.	0.85	0.859	0.606	0.860
	The layout and structure of the interface make it easy for me to find the information I need.	0.769			
	Visual elements (e.g., icons, maps, and colors) enhance my understanding of the content.	0.755			
	The design of the platform helps me focus on key conservation information without distraction.	0.734			
Subjective Norms (APSN)	You believe that using an animal tracking platform is important for animal protection.	0.816	0.900	0.672	0.891
	You are willing to support animal protection by using an animal tracking platform.	0.845			
	You think an animal tracking platform can enhance animal protection efforts.	0.786			
	You feel influenced by others' opinions on social media or the internet to use an animal tracking platform.	0.831			
Behavioral Attitudes (APBA)	You can regularly review the data provided by an animal tracking platform and take actions accordingly.	0.893	0.911	0.753	0.924
	You think the platform increases your willingness to take concrete actions for animal protection.	0.838			
	You believe the platform enables you to protect animals more effectively.	0.87			
	You adjust your lifestyle habits based on the information provided by the platform to reduce negative impacts on animals' habitats.	0.87			
Perceived Behavioral Control (APBC)	You believe the animal tracking platform is easy to use and feasible for animal protection.	0.913	0.929	0.706	0.905
	You will persist in using the platform for animal protection even with limited resources.	0.788			
	You feel comfortable using the animal tracking platform without feeling restricted.	0.833			
	You think you have enough resources and skills to fully utilize the platform to achieve protection goals.	0.822			
Wildlife Conservation Information Attention Intention (WCAI)	I intend to follow wildlife conservation-related content on this platform.	0.831	0.901	0.689	0.899
	I am willing to pay more attention to updates about wildlife protection shared here.	0.819			
	I plan to stay informed about animals' status and conservation efforts through this platform.	0.821			
	I am interested in regularly viewing animal tracking and protection information provided online.	0.85			

shows the highest reliability and validity (α = 0.929, AVE = 0.766, CR = 0.929), indicating strong internal coherence in the measurement of perceived innovation and distinctiveness. The outcome variable, Wildlife Conservation Information Attention Intention (WCAI), also performs well (α = 0.901, AVE = 0.689, CR = 0.899), confirming its psychometric strength as a predictive construct for user attention in digital conservation contexts. Overall, the results demonstrate that the measurement items are both reliable and valid, providing a robust foundation for subsequent hypothesis testing and structural model analysis [63-69]. All reliability and validity analyses were conducted using SPSS 26.0.

As shown in Table 6, the standardized regression weights confirm the hypothesized relationships between platform design factors and users' Wildlife Conservation Information Attention Intention (WCAI). All path coefficients are statistically significant, supporting the robustness of the proposed structural model. Among the exogenous variables, Perceived Platform Functionality (PPF) significantly influences both Subjective Norms (APSN) (β = 0.404, p<0.001) and Perceived Behavioral Control (APBC) (β = 0.172, p<0.001). Similarly, Design Uniqueness (DU) shows a strong positive impact on APSN (β = 0.320, p<0.001) and APBC (β = 0.463, p = 0.021), indicating that users perceive platforms with distinctive design elements as more socially endorsed and easier to use. Interface Information Design (IID) also has significant effects on both APSN (β = 0.190, p<0.001) and APBC (β = 0.183, p = 0.004), highlighting the role of information clarity in shaping social and control-related perceptions. Further, Subjective Norms (APSN) and Perceived Behavioral Control (APBC) both positively influence Behavioral Attitudes (APBA), with APSN having a slightly stronger effect (β = 0.398 vs. β = 0.277, both p<0.001). This suggests that perceived social expectations and individual confidence both contribute to forming favorable attitudes toward engaging with wildlife information. Lastly, users' intention to pay attention to wildlife conservation information (WCAI) is significantly predicted by both APBA (β = 0.255, p<0.001) and APBC (β = 0.306, p<0.001), confirming that users' internal evaluations and perceived control are key drivers of attention-based engagement behavior on digital platforms. These fit indices were calculated using AMOS 24.0.

These findings demonstrate that platform design variables indirectly influence user intention by shaping social norms, control beliefs, and behavioral attitudes. A platform that performs reliably, offers distinct and emotionally resonant design features, and communicates information clearly can foster more favorable perceptions, ultimately enhancing users' willingness to engage with wildlife conservation content in digital environments.

Discussion

This study employs Latent Dirichlet Allocation (LDA) topic modeling to analyze user discussions on social media regarding animal tracking platforms, identifying three prominent thematic domains: "Tracking and Conservation", "Design and Features", and "Animal Emotions and Health". These themes reveal not only users' primary concerns about such platforms but also their integrated expectations in terms of technological reliability, user experience, and ethical values.

The "Tracking and Conservation" theme reflects users' demand for scientific rigor and data reliability. Rather than passive observation, users expect platforms to provide real-time, research-supported data on animal migration and behavior. This aligns with prior studies highlighting the role of digital tools in enabling data-driven conservation but suggests a growing public expectation for transparent and credible ecological impact. The "Design and Features" theme indicates that users evaluate platforms not only for functionality but also for symbolic and aesthetic value. Compared

Table 6. Standardized regression weights for testing hypotheses.

			Estimate	S.E.	C.R.	P	β
APSN	<---	PPF	0.426	0.057	7.415	***	0.404
APBC	<---	PPF	0.221	0.064	3.472	***	0.172
APSN	<---	DU	0.27	0.042	6.411	***	0.32
APBC	<---	DU	0.475	0.051	9.266	0.011	0.463
APSN	<---	IID	0.177	0.047	3.753	***	0.19
APBC	<---	IID	0.207	0.056	3.671	0.004	0.183
APBA	<---	APSN	0.464	0.062	7.541	***	0.398
APBA	<---	APBC	0.265	0.048	5.514	***	0.277
WCAI	<---	APBA	0.247	0.054	4.575	***	0.255
WCAI	<---	APBC	0.283	0.052	5.465	***	0.306

to earlier studies that emphasize usability alone, our findings show that design uniqueness and environmental alignment can significantly shape conservation-related attitudes. The "Animal Emotions and Health" theme marks a shift in user focus from species survival to individual animal welfare. While previous work has mostly addressed biodiversity outcomes, our findings underscore users' rising concern for emotional expression and humane treatment, revealing a more empathetic engagement with conservation. Together, these themes outline a psychological path that starts from functional trust, proceeds through aesthetic identification, and culminates in emotional resonance. This structure provides both theoretical grounding for the selection of platform perception variables and empirical justification for the TPB-based structural model proposed in this study. It also expands existing research by emphasizing the emotional and symbolic dimensions of digital conservation platforms.

The results of the structural equation model further reveal the internal mechanisms linking platform design and users' conservation-related cognition. A key finding of this study is that users' perceptions of platform functionality, design uniqueness, and interface information design do not directly influence their intention to pay attention to wildlife conservation. Instead, these perceptions exert an indirect effect by enhancing users' subjective norms, perceived behavioral control, and behavioral attitudes. This suggests that in digital environments, users are not inherently motivated by design alone, but by the extent to which platforms activate a sense of social responsibility ("I should care") and behavioral efficacy ("I can contribute"), leading to deeper conservation engagement. To translate these findings into practical applications, several optimization directions are proposed. From a platform design perspective, developers should focus not only on technical functionality but also on integrating socially resonant elements – such as visual cues, user testimonials, or cause-related campaigns – that reinforce social norms and shared conservation values. In terms of user experience, simplifying interface complexity and enhancing data transparency can boost user's perceived behavioral control, making engagement feel more achievable and meaningful. From a policy perspective, environmental agencies and conservation organizations can collaborate with digital platforms to co-develop standardized conservation communication protocols, thereby improving credibility and cross-platform synergy. Finally, user feedback mechanisms should be prioritized: enabling users to share experiences, ask questions, or contribute data (e.g., animal sightings or tracking logs) can foster a participatory sense of ownership and social connection. By addressing platform optimization, participatory structures, and institutional collaboration, this study offers concrete suggestions for transforming digital wildlife tracking platforms from passive content providers into active facilitators of conservation awareness and engagement.

Limitations and Future Research Perspectives

While this study provides valuable insights into the role of platform perceptions in shaping users' conservation-related attention, it also has certain methodological limitations. First, the survey data were collected primarily from users in China, which may limit the generalizability of the findings due to regional platform usage habits and cultural differences. Future research could extend the sample to a global context to enable cross-cultural validation of the model and enhance its explanatory power.

In addition, the identification of user concerns was based on LDA topic modeling applied to social media discussions. Although this method effectively captures dominant discourse themes, it remains an exploratory text-based approach. Future studies may incorporate more diverse data sources, such as semantic-level content analysis or platform usage logs, to improve the precision and depth of user perception modeling.

Finally, this study does not examine users' attention to specific animal species. Due to the general nature of both the questionnaire and social media data, species-level differentiation was not possible. Future research may explore this dimension by integrating content filters or species-tagged platform data to better understand how users engage with different conservation targets.

Conclusions

This study investigated how the design and functionality of animal tracking platforms influence users' willingness to pay attention to wildlife conservation information in digital contexts. By combining topic modeling and user survey analysis, the research identified both the key concerns expressed in social media discourse and the platform features that shape user engagement. The findings show that users are primarily concerned with three aspects of animal tracking platforms: tracking performance and conservation relevance, the uniqueness and appeal of platform design, and the ability to access clear and meaningful information – particularly regarding animal health and well-being. These dimensions were found to indirectly influence users' conservation attention through their impact on social and psychological perceptions, including social expectations, personal confidence, and positive attitudes. This research highlights the importance of aligning platform features not only with technical performance standards but also with users' informational needs and value expectations. Platforms that are well-designed, intuitive to use, and emotionally resonant can better support public interest in wildlife issues and encourage more sustained digital engagement with conservation topics.

Author Contributions

Conceptualization, C.Y. and S.W.; methodology, C.Y. and S.W.; resources, C.Y.; data curation, C.Y. and S.W.; writing-original draft preparation, C.Y. and S.W.; writing-review and editing, S.W. and C.Y.; visualization, C.Y.; supervision, S.W.; funding acquisition, C.Y. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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