

Systemic Change through Incentivized Efforts with Digital Platforms as Sustainability Intermediaries

Abstract

Sustainability transitions demand systemic shifts in socio-technical structures, yet existing models often overlook the role of digital platforms (DPs) as intermediaries in shaping social sustainability. This study examines how DPs facilitate social sustainability transitions by influencing user behaviors, incentivizing sustainable actions, and integrating micro-level engagement within systemic transition frameworks. Anchored in the Theory of Planned Behavior (TPB) and the Multi-Level Perspective (MLP), we propose a Behaviorally-Informed Transition Model that explains how economic and social incentives drive attitudes, intentions, and behavioral change within digital ecosystems. Using survey data from 406 users of *TrafficRewards*, an Indian digital platform that incentivizes traffic rule compliance, we test the model through confirmatory factor analysis, moderated regression, and mediation analysis. Results indicate that economic and social incentives shape attitudes toward sustainability, while variety-seeking behavior moderates the relationship between intention and engagement, underscoring the heterogeneity in digital sustainability adoption. Findings contribute to sustainability transitions theory by integrating user agency into transition pathways, demonstrating how platform-mediated behavioral shifts can scale into broader sustainability regimes. We highlight critical implications for policymakers, platform designers, and sustainability practitioners, emphasizing the need for equitable incentive structures and long-term behavioral engagement strategies to ensure digital platforms serve as enablers—rather than disruptors—of social sustainability.

Keywords: Digital Platforms, Sustainability Transitions, Social Sustainability, Multi-Level Perspective, Theory of Planned Behavior.

1. Introduction

Sustainability transitions have emerged as a defining challenge of the 21st century as societies confront escalating environmental, social, and economic crises. Traditional linear economic models and unsustainable industrial practices have led to systemic failures, including resource depletion, climate change, and social inequities (Geels, 2011; Köhler *et al.*, 2019). The United Nations (2018) reports that nearly one-third of the global population lacks access to clean water, renewable energy, and essential infrastructure, demonstrating the widening gap between sustainability imperatives and current socio-technical configurations. Concurrently, the World Economic Forum, (2022) estimates that over 80% of businesses acknowledge the necessity of sustainability-driven transformations, yet struggle with implementation due to institutional inertia, economic trade-offs, and governance complexities. Addressing these challenges requires not only technological advancements and policy shifts but also new forms of socio-technical intermediation—a role that Digital Platforms (DPs) are increasingly occupying.

DPs have redefined economic and social interactions by functioning as multi-sided ecosystems that facilitate resource exchanges, network coordination, and data-driven decision-making (Mcintyre and Srinivasan, 2017; Gawer, 2021). Their scalability, real-time data aggregation, and decentralized governance models position them as critical socio-technical actors in sustainability transitions (Yoo, Henfridsson and Lyytinen, 2010). Unlike traditional intermediaries, DPs do not merely facilitate transactions but actively structure interactions and behaviors, making them potential enablers of systemic change (George, Merrill and Schillebeeckx, 2021). While prior research has explored DPs in the context of economic efficiencies and digital governance (Parker, Van Alstyne and Choudary, 2016; Constantinides, Henfridsson and Parker, 2018), their role as sustainability intermediaries remains underexplored. This study argues that DPs function as key transition intermediaries by incentivizing sustainable behaviors, shaping user norms, and orchestrating multi-actor engagement in sustainability transitions. However, this potential is contingent on platform design, governance structures, and the alignment of incentives with long-term sustainability objectives (Kolk and Ciulli, 2020).

While much of the sustainability literature has focused on environmental concerns such as decarbonization, resource efficiency, and circular economy models (Rockström *et al.*, 2009; Smith, Voß and Grin, 2010), the dimension of social sustainability remains critically underexplored. Social sustainability encompasses equitable resource distribution, social inclusion, and behavioral well-being, yet remains overshadowed by technologically driven transition narratives (Vallance, Perkins and Dixon, 2011). Given their ability to influence user behaviors, structure social interactions, and amplify collective action, DPs present a unique opportunity to embed social sustainability principles within transition frameworks (Kolk and Ciulli, 2020). However, current sustainability transition models are insufficiently account for these micro-level behavioral shifts, necessitating an integrated framework that bridges individual agency with systemic change (Geels, 2011).

Within sustainability transitions research, user-level interactions are increasingly recognized as a fundamental mechanism for embedding sustainable practices into mainstream regimes (Elia, Margherita and Petti, 2020). DPs facilitate these interactions by enabling collaboration, knowledge exchange, and the formation of new consumption norms (Hellemans, Porter and Diriker, 2022). As multi-sided intermediaries, DPs serve as network orchestrators, connecting consumers, businesses, and institutions to disseminate sustainable behaviors at scale (Kurniawan *et al.*, 2022). Through peer-to-peer exchanges, incentive structures, and gamification techniques, platforms embed sustainability into users' decision-making processes, transforming individual actions into collective socio-technical shifts (Khalek and Chakraborty, 2023). From resource-sharing platforms to circular economy applications, these micro-level interactions accumulate into system-wide behavioral shifts, bridging niche innovations with dominant regimes (de Oliveira, da Costa-Nascimento Daniela Viegas and Teodosio and Correia, 2022). Despite this potential, existing sustainability transition models largely overlook these minute dynamics, necessitating a framework that integrates behavioral insights within transition pathways.

Given these complexities, this study examines how DPs function as transition intermediaries in social sustainability transitions, integrating behavioral insights from the Theory of Planned Behavior (TPB) (Ajzen, 1991), with systemic perspectives from the Multi-Level Perspective (MLP) (Geels, 2005). While prior research has explored the economic and technological dimensions of platforms, their role in shaping user-level sustainability behaviors within transition frameworks remains insufficiently understood (Smith, Voß and Grin, 2010). This study addresses this gap by conceptualizing DPs as micro-meso intermediaries—bridging

individual decision-making with systemic sustainability shifts. The research contributes to three key areas:

1. Advancing the literature on intermediaries by demonstrating how DPs serve as multi-scalar facilitators of sustainability transitions, influencing both institutional structures and behavioral norms.
2. Extending the MLP framework by incorporating micro-level user agency, emphasizing how individual decision-making interacts with broader transition dynamics.
3. Providing empirical insights into how incentive structures, gamification mechanisms, and social influence shape sustainable behavior adoption, informing both policymakers and platform designers.

By integrating TPB within MLP, we propose a novel Behaviorally-Informed Transition Model, where individual engagement with sustainability-oriented DPs serves as a micro-level driver of niche acceleration and regime disruption. This model explains how platform-mediated behavioral shifts scale beyond individual actions to influence sustainability transitions at a systemic level.

2. Literature background

2.1 Digital Platforms as Intermediaries

Intermediaries, particularly transition intermediaries, play an important role in sustainability transitions by bridging actors, fostering collaboration, and enabling socio-technical change (Kivimaa, Boon, *et al.*, 2019). They act as connective agents, linking emerging niche innovations with established socio-technical regimes to facilitate systemic transformation. Their roles extend beyond simple brokerage; they orchestrate multi-actor coordination, align institutional frameworks, and structure market incentives to create momentum for sustainable transitions. Within this broader landscape of intermediation, DPs have emerged as a distinct category of intermediaries, leveraging digital infrastructures to mediate, coordinate, and accelerate sustainability-oriented interactions at an unprecedented scale (Gawer and Cusumano, 2014; De Reuver, Sørensen and Basole, 2018; Bonina *et al.*, 2021).

Research on intermediaries has traditionally focused on the roles they adopt to facilitate sustainability transitions, differentiating between purposefully created transition intermediaries and entities that engage in intermediation without explicit intent (Kanda *et al.*, 2018; Kivimaa and Martiskainen, 2018). While most DPs are designed for economic coordination rather than sustainability transitions, their influence on market dynamics, user behavior, and institutional norms positions them as powerful intermediaries capable of driving sustainability-oriented transformations (Hellemans, Porter and Diriker, 2022). Unlike conventional intermediaries, DPs do not simply facilitate transactions; they actively curate, govern, and direct interactions in ways that shape sustainability outcomes. By leveraging real-time data, gamification strategies, and algorithmic nudges, DPs influence how users adopt sustainability practices, engage in circular economy models, and participate in collaborative consumption networks (Curtis and Mont, 2020; Rana *et al.*, 2023).

Evolving Perspectives on Transition Intermediaries: Where Do DPs Fit?

Research on transition intermediaries has evolved to highlight their role in system-level transformations, moving beyond knowledge transfer to shaping shared expectations, standards, and actor coordination (Stewart and Hyysalo, 2008). Recent literature synthesizes five intermediary types: *systemic intermediaries* (driving large-scale innovation), *regime-based intermediaries* (supporting policy-driven transitions), *niche intermediaries* (emerging innovations), *process intermediaries* (coordinating sustainability projects), and *user intermediaries* (bridging end-users with sustainability solutions) (Kivimaa, Boon, *et al.*, 2019). Literature also highlights the dynamic nature of intermediation, moving beyond static classifications to consider how intermediaries evolve over different phases of a transition (Kivimaa *et al.*, 2019). Intermediaries shift from *niche experimentation* (supporting local sustainability innovations) to *system-wide stabilization* (embedding changes in policy and governance) (*ibid.*). This shift is crucial in understanding how DPs can function as sustainability intermediaries.

Given their unique characteristics, DPs do not fit neatly into any single category but rather function as *hybrid intermediaries* that span multiple roles depending on their governance model, objectives, and user engagement strategies. Some platforms operate as systemic intermediaries, enabling large-scale sustainability shifts through decentralized innovation ecosystems (e.g., mobility-sharing platforms reducing urban congestion). Others function as niche intermediaries, creating spaces for sustainability experiments and incentivizing behavior change at the micro-level (e.g., platforms rewarding sustainable mobility choices with credits or gamified incentives). However, their ability to transition from niche experiments to systemic transformations remains contingent on governance frameworks, regulatory oversight, and platform incentives (Kivimaa, Boon, *et al.*, 2019).

The Dual Role of DPs in Sustainability Transitions

While some scholars emphasize the potential of DPs to scale sustainable innovations and democratize access to green technologies (Elia, Margherita and Petti, 2020), others criticize their role in reinforcing social inequalities, monopolizing control over value creation, and exacerbating unsustainable consumption patterns (Koutsimpogiorgos, Frenken and Herrmann, 2023). The governance challenges associated with DPs—particularly issues of algorithmic transparency, platform accountability, and value distribution—remain unresolved, making their role in sustainability transitions highly contested (Hellemans, Porter and Diriker, 2022).

Despite these concerns, DPs remain one of the most influential socio-technical systems in shaping modern economic and social interactions, with the potential to act as key enablers of sustainability transitions (De Reuver, Sørensen and Basole, 2018). The scalability, network effects, and data-driven feedback mechanisms of DPs provide a unique mechanism for incentivizing sustainable behaviors, optimizing resource allocation, and aligning business objectives with environmental and social sustainability goals (Parker, Van Alstyne and Choudary, 2016).

2.2 Social Sustainability as a Systemic Challenge

Social sustainability, centered on human well-being, equity, and community resilience, remains underexplored compared to environmental and economic sustainability (Vallance, Perkins and Dixon, 2011). Despite its significance, conceptual ambiguity and measurement challenges have marginalized it in sustainability discourses (Colantonio, 2009). However, deepening social

inequalities and precarious labor conditions underscore the urgency of integrating social sustainability into mainstream sustainability transitions (Missimer, Robèrt and Broman, 2017).

Rather than focusing solely on needs provision, social sustainability emphasizes empowering individuals to meet their own needs and exercise agency (Kolk 2016). It is embedded in institutional structures, behavioral norms, and community dynamics, requiring systemic interventions rather than isolated initiatives (Eizenberg and Jabareen, 2017). However, fragmented regulations, the absence of standardized metrics, and short-term business priorities continue to hinder progress (Weingaertner and Moberg, 2014).

DPs have emerged as critical facilitators of social sustainability by democratizing access to information, fostering participatory governance, and enabling peer-to-peer interactions. Studies highlight how platforms contribute to reducing transaction costs, increasing social capital, and promoting ethical consumption behaviors (Curtis and Mont, 2020). Through gamification, incentive structures, and algorithmic governance, platforms can scale sustainable behaviors, making them financially viable and socially (Sutherland and Jarrahi, 2018).

2.3 The Multi-Level Perspective Lens

Sustainability transitions encompass long-term, structural transformations within socio-technical systems, shifting from unsustainable practices to sustainable alternatives (Markard, Raven and Truffer, 2012). Unlike incremental innovations, these transitions challenge entrenched socio-technical regimes, necessitating deep systemic reconfigurations across technological, institutional, economic, and cultural domains (Geels, 2011). Achieving such transitions requires multi-actor coordination, disruptive innovation, and governance realignment, making them complex, contested, and nonlinear processes (Köhler *et al.*, 2019). The Multi-Level Perspective (MLP) provides a dominant framework for analyzing sustainability transitions by distinguishing between three levels: (1) the *landscape level*, consisting of macro-level external pressures (e.g., climate change, regulatory shifts, socio-political movements); (2) the *regime level*, representing dominant socio-technical configurations that resist change (e.g., existing policies, infrastructures, and vested economic interests); and (3) the *niche level*, where radical innovations and alternative practices emerge, often in protected spaces (Geels, 2005).

While MLP has been instrumental in explaining how transitions unfold, critiques highlight its limited attention to micro-level user agency, behavioral dynamics, and the role of digitalization in reshaping transition pathways (Köhler *et al.*, 2019). Existing research often prioritizes institutional and technological shifts while overlooking how individual behaviors and digital ecosystems can accelerate or impede change. This paper addresses this gap by integrating user behavior, digital governance, and network-driven innovation into sustainability transition models, emphasizing how DPs facilitate micro-level transitions.

Within the MLP framework, DPs can be conceptualized as niche-based digital ecosystems that challenge incumbent regimes by offering scalable, participatory alternatives to conventional governance structures. For instance, platforms like TrafficRewards¹ function as intermediaries between users and institutional actors, incentivizing sustainable behaviors such as compliance

¹ [TrafficRewards](#)

with traffic regulations. These platforms align with niche-regime transition dynamics by offering novel reward-based systems that promote behavioral change at the micro level while engaging with regime actors to integrate sustainable policies (Geels, 2020). The success of such platforms depends on their ability to embed niche-level innovations into broader socio-technical regimes through strategic alignment with regulatory frameworks and public-private partnerships.

3. Research Methodology

3.1 Case Selection

TrafficRewards was selected as the case study for this research as it exemplifies a hybrid sustainability intermediary that merges public-sector road safety objectives with private-sector digital engagement capabilities. Unlike purely commercial platforms, *TrafficRewards* operates at the intersection of niche innovation and regime transformation—a defining characteristic of sustainability intermediaries. This selection is particularly relevant given the increasing role of digital governance in shaping socio-technical transitions (Stehlin, Hodson and McMeekin, 2020). As a multi-level sustainability intermediary, *TrafficRewards* interacts with niche actors (early adopters of behavioral incentives), regime structures (government road safety agencies, insurance firms), and systemic change mechanisms (long-term policy shifts in traffic regulation). Studying *TrafficRewards* allows for an empirical examination of how DPs embed niche-level behavioral innovations into broader socio-technical regimes, addressing an underexplored dimension of sustainability transition research (Geels, 2020).

Unlike traditional macro-level sustainability interventions, which rely on policy instruments such as taxation and infrastructure investment, *TrafficRewards* employs real-time digital incentives to directly engage users, making a micro-level behavioral analysis essential (Hamari, Sjöklint and Ukkonen, 2016). Given that sustainability transitions depend on long-term behavioral shifts, it is crucial to examine whether platform users develop habitual pro-sustainability behaviors beyond the immediate incentive structures (Kim and Yoon, 2021; Oliveira, Barbeitos and Calado, 2022). This case offers unique empirical insights into how individual agency interacts with digital-mediated mechanisms, providing a novel theoretical contribution to the literature on sustainability transitions and digital intermediaries.

3.2 Behaviorally-Informed Transition Model

This study develops and tests a behaviorally-informed transition model (Figure 1) to examine the interplay between economic and social incentives, attitudes toward sustainability, and behavioral change within digital platforms. The model integrates the TPB (Ajzen, 1991) within the MLP (Geels, 2005) to bridge the gap between individual behavioral drivers and systemic sustainability transitions. While MLP research has traditionally focused on macro-structural transformations, recent critiques highlight its limited attention to micro-level user agency and digital mechanisms (Köhler *et al.*, 2019). This study responds to these critiques by incorporating behavioral insights into MLP, offering a novel approach to analyzing how user-level engagement with DPs can drive sustainability transitions.

The conceptual model for this study (see Figure 1) illustrates the hypothesized relationships between economic and social incentives, attitudes toward social sustainability, the intention to use DPs for social sustainability, platform usage, and behavioral change. Figure 1 presents the proposed research model, including seven hypotheses (H1–H7). The hypotheses build on existing sustainability transition and behavioural theories, integrating economic and social motivations, behavioural intentions, and platform usage dynamics.

The model explores how economic incentives and social concerns shape attitudes toward social sustainability, which in turn influence the intention to use digital platforms for social sustainability. The model further examines how intention drives behavior change and platform usage with incentives, while variety-seeking behavior plays a moderating role.

Economic Incentive & Social Concerns → Predictors of Attitude toward Social Sustainability

- Attitude toward Social Sustainability → Influences Intention to Use Digital Platforms for Social Sustainability
- Intention → Drives Behavior Change and Platform Usage with Incentives
- Variety-Seeking Behavior → Moderates relationships between Intention and Platform Usage with Incentives / Behavior Change

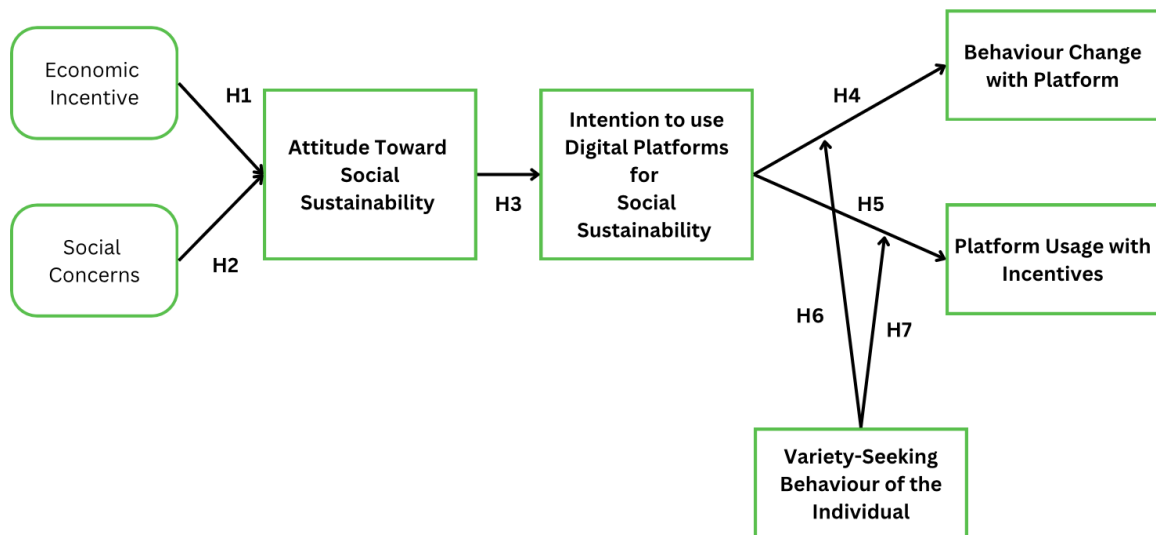


Figure 1: Behaviorally-Informed Transition Model

3.3 Hypothesis Development and Constructs

3.3.1 Economic Incentive

Economic incentives are a key driver of behavioral engagement, as they reduce perceived cost barriers and increase extrinsic motivation for sustainability-related behaviors (*Gneezy, Meier and Rey-Biel, 2011*). Within sustainability platforms, financial rewards, subsidies, and material benefits serve as external stimuli that enhance engagement in pro-environmental behaviors (*Venkatesh and Davis, 2000*). From a transition perspective, economic incentives are crucial for niche adoption—early adopters of sustainability innovations often require financial nudges

to overcome resistance to change. However, while incentives may initially drive engagement, their long-term effectiveness depends on whether they translate into intrinsic motivation, highlighting the importance of examining habit formation and sustained platform usage (Kim and Yoon, 2021).

H1. Economic incentives positively influence attitudes toward social sustainability.

Individuals are more likely to develop favourable attitudes toward sustainability when economic incentives are present, as these incentives provide immediate, tangible benefits for participation (Ajzen, 1991; Thøgersen, 1996).

3.3.2 Social Concern

Social concern reflects an individual's perceived responsibility towards societal and environmental well-being (Cialdini, Reno and Kallgren, 1990). Prior research suggests that normative influences significantly impact pro-environmental behavior, particularly when individuals align their choices with perceived collective expectations (Schultz *et al.*, 2007).

Within sustainability transitions, social norms play a pivotal role in accelerating niche adoption by reinforcing peer accountability, moral responsibility, and community-driven behavioral shifts (Geels, 2011). DPs, acting as sustainability intermediaries, create online social environments where collective behavior can be shaped through feedback loops, peer influence, and shared incentives (Hellemans, Porter and Diriker, 2022; Kurniawan *et al.*, 2022). The integration of social sustainability within platform design can activate pro-social behaviors, strengthening users' long-term engagement with sustainability initiatives (Gifford and Nilsson, 2014).

H2. Social concerns positively influence attitudes toward social sustainability.

Individuals who exhibit heightened social and ethical awareness are more likely to develop positive attitudes toward social sustainability and engage with DPs that promote sustainable behaviours (Gifford and Nilsson, 2014).

3.3.3 Attitude towards Social Sustainability

Attitude represents an individual's evaluation of a behavior, which can be either positive or negative. It is considered a key determinant of intention in behavioral models, including the Theory of Planned Behavior (TPB) (Ajzen, 1991). Within sustainability transitions, attitudes act as a crucial cognitive mechanism that determines whether individuals are willing to engage with emerging sustainable practices (Thøgersen, 2014).

In the context of DPs, sustainability attitudes are shaped through a combination of intrinsic values (e.g., social concern, environmental awareness) and extrinsic reinforcements (e.g., economic incentives, gamification mechanisms) (Venkatesh and Davis, 2000). Research shows that positive sustainability attitudes lead to stronger engagement with digital sustainability platforms, reinforcing the importance of attitudinal alignment in long-term behavior change (Khalek and Chakraborty, 2023).

H3. Attitude towards social sustainability positively influences the Intention to use DPs for social sustainability.

When individuals develop a positive attitude toward sustainability, they are more likely to intend to use digital platforms that promote sustainable behaviors (Venkatesh and Davis, 2000).

3.3.4 Intention to Use Digital Platforms for Social Sustainability

Behavioral intention refers to an individual's motivation and willingness to perform a particular action (Ajzen, 1991). Within the context of this paper, intention is shaped by attitudes, affinity towards economic incentives and social norms, influencing whether individuals actively engage with sustainability-oriented DPs (Jacobides et al., 2018). Research suggests that strong behavioral intentions often translate into actual platform usage, particularly when digital interventions align with personal values and motivations (Gawer, 2009).

H4. *The intention to use DPs for social sustainability positively influences behavior change with the platform.*

H5. *The intention to use DPs for social sustainability positively influences platform usage with incentives.*

Individuals who intend to engage with sustainability-oriented DPs are more likely to demonstrate behavioral shifts and actively participate in incentive-based engagement mechanisms (Khalek & Chakraborty, 2023).

3.3.5 Behaviour Change with the Platform

Behaviour change refers to the adoption of new behaviours or modifications in existing behaviours in response to digital interventions (Michie, 2014). Within the sustainability context, behaviour change is often facilitated by external incentives, normative influences, and digital feedback loops. (Kivimaa, Hyysalo, et al., 2019). DPs can reinforce pro-environmental behaviors through gamification, nudges, and real-time behaviour tracking (Aboelmaged, 2021; Zhang et al., 2023)

3.3.6 Platform Usage with Incentives

Platform usage with incentives refers to user engagement with DPs that provide rewards for sustainable behaviors (Toşa et al., 2024) Incentive structures within platforms are designed to increase participation and habit formation by leveraging extrinsic motivators (ibid.) However, research suggests that long-term engagement requires a combination of intrinsic and extrinsic motivators, as reliance on incentives alone may not sustain behaviour change (Davis, 1989). Individuals with a high level of behavioral intention are more likely to actively engage with sustainability platforms when incentives are provided (Venkatesh and Davis, 2000).

3.3.7 Variety-Seeking Behavior of the Individual

Variety-seeking behavior refers to an individual's tendency to seek new experiences and novel interactions rather than remain within routine or habitual actions (Khalek and Chakraborty, 2023). Within sustainability transitions, variety-seeking can influence whether users experiment with new sustainability behaviors or disengage due to lack of novelty (Hamari, Sjöklint and Ukkonen, 2016).

From an MLP perspective, variety-seeking determines how users transition between niche experiments and mainstream adoption. Users with high variety-seeking tendencies may be early adopters of sustainability initiatives but require continuous platform innovation to maintain engagement (Geels, 2011). This implies that DPs must design evolving incentive structures to retain variety-seeking users while ensuring sustainability behaviors persist beyond the experimental phase.

H6. Variety-seeking behavior moderates the relationship between intention and platform usage with incentives.

H7. Variety-seeking behavior moderates the relationship between intention and behavior change.

3.4 Research Design

This study employs a behaviorally anchored quantitative approach to examine the mechanisms through which digital platforms influence sustainability behaviors. The study integrates the Theory of Planned Behavior (TPB) (Ajzen, 1991) with the Multi-Level Perspective (MLP) framework (Geels, 2005) to provide a holistic understanding of behavioral change within sustainability transitions. It utilizes survey-based data collection to measure key constructs and tests hypothesized relationships through moderated regression analysis. Additionally, mediation analyses are conducted to explore the indirect effects of attitude and intention and the moderating role of variety-seeking behavior. By integrating cross-sectional survey data with advanced statistical modeling, this research provides empirical insights into how DPs can facilitate social sustainability transitions. Given the emphasis on behavioral transitions, a longitudinal or experimental design could provide additional insights into sustained behavior change, but was not feasible due to platform accessibility constraints.

3.5 Sample and Data Collection

The study collected survey responses from 406 active users of *TrafficRewards*. The respondents were recruited using a stratified sampling approach to ensure diversity in terms of age, gender, and driving experience. The survey was designed based on validated measurement scales from prior studies on TPB and sustainability transitions (Nguyen and Johnson, 2020; Khalek and Chakraborty, 2023). A pre-test was conducted with 30 respondents to refine the questionnaire, ensuring clarity and reliability.

A non-probabilistic purposive sampling method was used to recruit participants through the *TrafficRewards* platform and social media channels. The target population comprised active users of the platform, ensuring relevance to the research objectives.

To collect data, a survey was carried out in the first quarter of 2024 to include users of *TrafficRewards* with whom the DP has an established database. A total of 406 valid responses were collected. The theory-informed questionnaire was divided into two parts - Part A (51 questions) and Part B (40 questions), with Part B administered at least 1-2 weeks after Part A, allowing for managing common method bias (Jordan and Troth, 2019). Part A of the survey had questions related to demographic data, dependent variables, and moderating variables. This staggered approach reduces response priming effects, ensuring more accurate assessments of behavioral change mechanisms. The research instrument was developed using validated TPB and sustainability transition constructs, ensuring theoretical robustness and empirical reliability (Khalek and Chakraborty, 2023).

4. Results of Analysis

The collected data were analyzed using Confirmatory Factor Analysis (CFA) to assess construct validity. Additionally, moderated regression analysis, and mediation analysis was conducted to test for interaction effects, specifically whether platform incentives moderated the relationship between attitudes and behavioral intention.

4.1 Reliability Analysis

<i>Reliability</i>		
	Coefficient ω	Coefficient α
Intention to Use Digital Platforms for Social Sustainability	0.809	0.768
Platform usage With Incentives	0.846	0.850
Variety-Seeking Behavior of the Individual	0.729	0.727
Behaviour Change With Platform	0.872	0.873
Attitude towards Social Sustainability	0.840	0.839
total	0.948	0.951

Figure 2: Reliability Analysis

To assess the internal consistency of the measurement scales, both McDonald's Omega (ω) and Cronbach's Alpha (α) coefficients were examined. The results indicate strong reliability across all constructs, with values exceeding the commonly accepted threshold of 0.70 (Nunnally and Bernstein, 1994). The results of the reliability analysis can be seen in Figure 2.

At the construct level, intention ($\omega = 0.809$, $\alpha = 0.768$), platform usage with incentives ($\omega = 0.846$, $\alpha = 0.850$), variety-seeking behavior ($\omega = 0.729$, $\alpha = 0.727$), social sustainability behavior ($\omega = 0.872$, $\alpha = 0.873$), and attitude toward social sustainability ($\omega = 0.840$, $\alpha = 0.839$) all demonstrate satisfactory internal reliability. Notably, variety-seeking behavior shows the lowest reliability ($\omega = 0.729$, $\alpha = 0.727$), though still within acceptable limits, suggesting that while the construct is internally consistent.

The overall reliability of the scale is high ($\omega = 0.948$, $\alpha = 0.951$), confirming the strong coherence of the measurement model. While Cronbach's alpha is widely used, McDonald's Omega provides a more robust estimate of reliability by accounting for factor loadings and measurement (Dunn, Baguley and Brunsden, 2014). The near-identical values of ω and α suggest that the constructs exhibit unidimensionality, further supporting the validity of the scale structure.

4.2 Confirmatory Factor Analysis (CFA)

Model fit ▼

Chi-square test

Model	χ^2	df	p
Baseline model	5622.411	300	
Factor model	700.447	265	< .001

Note. The estimator is ML.

Additional fit measures ▼

Fit indices

Index	Value
Comparative Fit Index (CFI)	0.918
Tucker–Lewis Index (TLI)	0.907
Bentler–Bonett Non-normed Fit Index (NNFI)	0.907
Bentler–Bonett Normed Fit Index (NFI)	0.875
Parsimony Normed Fit Index (PNFI)	0.773
Bollen's Relative Fit Index (RFI)	0.859
Bollen's Incremental Fit Index (IFI)	0.919
Relative Noncentrality Index (RNI)	0.918

Information criteria ▼

	Value
Log-likelihood	−17181.773
Number of free parameters	85,000
Akaike (AIC)	34533.546
Bayesian (BIC)	34874.086
Sample-size adjusted Bayesian (SSABIC)	34604.369

Other fit measures

Metric	Value
Root mean square error of approximation (RMSEA)	0.064
RMSEA 90% CI lower bound	0.058
RMSEA 90% CI upper bound	0.069
RMSEA p-value	5.973×10^{-5}
Standardized root mean square residual (SRMR)	0.042
Hoelter's critical N ($\alpha = .05$)	177.190
Hoelter's critical N ($\alpha = .01$)	187.338
Goodness of fit index (GFI)	0.956
McDonald fit index (MFI)	0.585
Expected cross validation index (ECVI)	2.144

Figure 3: Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) demonstrated an acceptable model fit, supporting the validity of the measurement model. The Comparative Fit Index (CFI) = 0.918 and Tucker–Lewis Index (TLI) = 0.907 exceeded the recommended threshold of 0.90 (Hu and Bentler, 1999), indicating a good fit between the hypothesized model and the data. Additionally, the Root Mean Square Error of Approximation (RMSEA) = 0.064 fell within the acceptable range of ≤ 0.08 (Browne and Cudeck, 1992) with a 90% confidence interval [0.058, 0.069], suggesting minimal model misfit. Given these fit indices, the factor structure adequately represents the underlying construct relationships, justifying its use in subsequent hypothesis testing.

4.3 Moderated Regression Analysis

Linear Regression: Moderated (BC M1) ▼

Model Summary – Mean Cent BC M1

Model	R	R ²	Adjusted R ²	RMSE	R ² Change	F Change	df1	df2	p
M ₀	0.000	0.000	0.000	0.234	0.000		0	405	
M ₁	0.787	0.619	0.616	0.145	0.619	217.938	3	402	< .001
M ₂	0.795	0.632	0.628	0.143	0.012	13.438	1	401	< .001

Note. M₁ includes Mean Cent_ATT M1, Mean_Cent_INT, Mean Cent_VS

Note. M₂ includes Mean Cent_ATT M1, Mean_Cent_INT, Mean Cent_VS, Mean_Cent_INT:Mean Cent_VS

ANOVA ▼

Model		Sum of Squares	df	Mean Square	F	p
M ₁	Regression	13.764	3	4.588	217.938	< .001
	Residual	8.463	402	0.021		
	Total	22.228	405			
M ₂	Regression	14.039	4	3.510	171.870	< .001
	Residual	8.189	401	0.020		
	Total	22.228	405			

Note. M₁ includes Mean Cent_ATT M1, Mean_Cent_INT, Mean Cent_VS

Note. M₂ includes Mean Cent_ATT M1, Mean_Cent_INT, Mean Cent_VS, Mean_Cent_INT:Mean Cent_VS

Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics	
							Tolerance	VIF
M ₀	(Intercept)	1.000	0.012		85.988	< .001		
M ₁	(Intercept)	0.196	0.033		5.952	< .001		
	Mean Cent_ATT M1	0.352	0.044	0.351	7.987	< .001	0.491	2.036
	Mean_Cent_INT	0.239	0.041	0.276	5.892	< .001	0.431	2.320
	Mean_Cent_VS	0.213	0.036	0.265	5.926	< .001	0.472	2.117
M ₂	(Intercept)	0.652	0.129		5.068	< .001		
	Mean Cent_ATT M1	0.307	0.045	0.305	6.783	< .001	0.454	2.203
	Mean_Cent_INT	-0.226	0.133	-0.262	-1.702	0.090	0.039	25.773
	Mean_Cent_VS	-0.196	0.117	-0.244	-1.675	0.095	0.043	23.169
	Mean_Cent_INT * Mean_Cent_VS	0.440	0.120	1.002	3.666	< .001	0.012	81.362

Descriptives

	N	Mean	SD	SE
Mean Cent BC M1	406	1.000	0.234	0.012
Mean Cent_ATT M1	406	1.000	0.233	0.012
Mean_Cent_INT	406	0.998	0.271	0.013
Mean_Cent_VS	406	1.001	0.291	0.014

Figure 4: Moderated Regression Analysis on Behaviour Change

The moderated regression analysis examined the impact of attitude toward social sustainability (ATT M1), intention to use DPs (INT) and variety-seeking behaviour (VS) on behaviour change (BC M1) with the platform. Results indicate that attitude ($\beta = 0.351$, $p < 0.001$), intention ($\beta = 0.276$, $p < 0.001$), and variety-seeking behavior ($\beta = 0.265$, $p < 0.001$) all significantly predict behavior change. Importantly, variety-seeking behavior moderates the relationship between intention and behavior change ($\beta = 1.002$, $p < 0.001$), suggesting that users with higher variety-seeking tendencies exhibit stronger behavioral shifts when engaging with the platform. The interaction model explains 63.2% of the variance ($\Delta R^2 = 0.012$, $p < 0.001$), reinforcing the notion that personality traits shape user responsiveness to digital sustainability initiatives.

Linear Regression: Moderated (PUI M1)

Model Summary – Mean Cent_ PU

Model	R	R ²	Adjusted R ²	RMSE	R ² Change	F Change	df1	df2	p
M ₀	0.000	0.000	0.000	0.229	0.000		0	405	
M ₁	0.820	0.673	0.670	0.132	0.673	275.196	3	402	< .001
M ₂	0.826	0.682	0.679	0.130	0.009	11.686	1	401	< .001

Note. M₁ includes Mean_Cent_INT, Mean Cent_VS, Mean Cent_ATT M1

Note. M₂ includes Mean_Cent_INT, Mean Cent_VS, Mean Cent_ATT M1, Mean_Cent_INT:Mean Cent_VS

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
M ₁	Regression	14.343	3	4.781	275.196	< .001
	Residual	6.984	402	0.017		
	Total	21.327	405			
M ₂	Regression	14.540	4	3.635	214.805	< .001
	Residual	6.786	401	0.017		
	Total	21.327	405			

Note. M₁ includes Mean_Cent_INT, Mean Cent_VS, Mean Cent_ATT M1

Note. M₂ includes Mean_Cent_INT, Mean Cent_VS, Mean Cent_ATT M1, Mean_Cent_INT:Mean Cent_VS

Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics	
							Tolerance	VIF
M ₀	(Intercept)	1.001	0.011		87.926	< .001		
M ₁	(Intercept)	0.190	0.030		6.379	< .001		
	Mean_Cent_INT	0.251	0.037	0.296	6.811	< .001	0.431	2.320
	Mean Cent_VS	0.255	0.033	0.324	7.808	< .001	0.472	2.117
	Mean Cent_ATT M1	0.305	0.040	0.310	7.614	< .001	0.491	2.036
M ₂	(Intercept)	0.578	0.117		4.934	< .001		
	Mean_Cent_INT	-0.144	0.121	-0.170	-1.190	0.235	0.039	25.773
	Mean Cent_VS	-0.093	0.107	-0.118	-0.867	0.387	0.043	23.169
	Mean Cent_ATT M1	0.266	0.041	0.271	6.471	< .001	0.454	2.203
	Mean_Cent_INT * Mean Cent_VS	0.374	0.109	0.869	3.418	< .001	0.012	81.362

Descriptives

	N	Mean	SD	SE
Mean Cent_ PU	406	1.001	0.229	0.011
Mean_Cent_INT	406	0.998	0.271	0.013
Mean Cent_VS	406	1.001	0.291	0.014
Mean Cent_ATT M1	406	1.000	0.233	0.012

Figure 5: Moderated Regression Analysis on Platform Usage with Incentives

On the other hand the results for on platform usage with incentives (PUI M1) indicate that intention ($\beta = 0.296$, $p < 0.001$), variety-seeking behavior ($\beta = 0.324$, $p < 0.001$), and attitude toward social sustainability ($\beta = 0.310$, $p < 0.001$) significantly predict engagement with incentive-based digital platforms. Importantly, variety-seeking behavior moderates the relationship between intention and platform usage ($\beta = 0.869$, $p < 0.001$), suggesting that users with higher variety-seeking tendencies are more likely to engage with platform incentives. The interaction model explains 68.2% of the variance ($\Delta R^2 = 0.009$, $p < 0.001$), reinforcing the notion that personality traits influence digital sustainability engagement. These findings contribute to the Theory of Planned Behavior (TPB) and digital incentive-based marketing strategies.

The moderated regression analysis further emphasizes the critical role of variety-seeking behaviour in shaping digital sustainability engagement. The significant interaction effect confirms that individuals with higher variety-seeking tendencies are more likely to act on their behavioural intentions, strengthening the intention-behaviour relationship for both behaviour change and platform usage with incentives. Conversely, intention alone was not as strong a predictor of behavior change for individuals with low variety-seeking tendencies, suggesting

that additional habit-forming mechanisms or long-term commitment strategies may be necessary to sustain engagement. This aligns with prior research on personality-driven differences in digital engagement and sustainability behaviors (Toşa *et al.*, 2024).

The findings of this study offer significant insights into the TPB, extending it for social sustainability constructs and the role of individual differences in shaping engagement with sustainability-oriented DPs. The results indicate that intention to use DPs for social sustainability is a strong predictor of both behavioral change ($\beta = 0.276$, $p < 0.001$) and platform usage with incentives ($\beta = 0.296$, $p < 0.001$). These findings align with (Ajzen, 1991) TPB framework, reinforcing that individuals with higher behavioral intentions are more likely to engage with sustainability-oriented digital interventions. However, the introduction of variety-seeking behaviour as a moderator reveals critical boundary conditions, highlighting heterogeneity in user engagement patterns.

4.4 The Moderating Role of Variety-Seeking Behavior

The study extends prior research by demonstrating that variety-seeking behaviour significantly moderates the relationship between behavioural intention and both behaviour change ($\beta = 1.002$, $p < 0.001$) and platform usage with incentives ($\beta = 0.869$, $p < 0.001$). This suggests that users with higher exploratory tendencies are more likely to translate their sustainability-related intentions into meaningful behavioural shifts and engagement with platform incentives. These findings contribute to consumer behaviour theories (Van Trijp and Steenkamp, 1992) by illustrating that variety-seeking is not merely a product-related preference but also an important driver of digital engagement and behavioural adaptation.

The relative strength of the moderation effect in behaviour change ($\beta = 1.002$) compared to platform engagement ($\beta = 0.869$) further suggests that variety-seeking individuals exhibit a greater propensity to alter their behaviour in response to digital interventions rather than simply engage with platform incentives. This distinction is critical for platform designers and policymakers seeking to promote long-term behavioural change rather than short-term engagement with reward structures.

4.5 The Role of Attitude Toward Social Sustainability

Consistent with TPB, attitude toward social sustainability significantly predicts both behavior change ($\beta = 0.351$, $p < 0.001$) and platform usage with incentives ($\beta = 0.310$, $p < 0.001$). This underscores the importance of pre-existing pro-sustainability beliefs in shaping digital engagement. However, the slightly stronger effect of attitude on behavioural change relative to platform usage suggests that cognitive alignment with sustainability goals is more influential in shaping actual behaviour than in engaging with incentive-based mechanisms. These findings align with prior research in behavioural economics and DP engagement, emphasizing that extrinsic motivators (e.g., incentives) may be effective in driving engagement but are less likely to sustain long-term behavioural shifts without intrinsic attitudinal alignment (Allison *et al.*, 2015; Oliveira, Barbeitos and Calado, 2022).

4.6 Predictive Power of the Model

The variance explained by both models is substantial (behavior change: $R^2 = 63.2\%$, platform usage: $R^2 = 68.2\%$), indicating that the TPB framework, along with individual personality traits, provides a robust explanatory mechanism for sustainability-oriented DP engagement.

While the inclusion of variety-seeking behavior as a moderator yields a statistically significant improvement in model fit ($\Delta R^2 = 0.012$ for behavior change, $\Delta R^2 = 0.009$ for platform usage, $p < 0.001$), the relatively small incremental variance explained suggests that the primary drivers of engagement remain attitude and intention. This reinforces the centrality of TPB constructs while highlighting the importance of accounting for individual differences in digital sustainability interventions.

4.7 Mediation Analysis

Mediation Analysis ▼

Parameter estimates ▼

Direct effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
Mean Cent_ATT M1	→ Mean Cent_BC M1	1.504	0.187	8.026	< .001	1.054	1.995
Mean_Cent_INT	→ Mean Cent_BC M1	1.019	0.172	5.921	< .001	0.620	1.435
Mean Cent_ATT M1	→ Mean_Cent_PU	1.330	0.174	7.651	< .001	0.899	1.815
Mean_Cent_INT	→ Mean_Cent_PU	1.093	0.160	6.845	< .001	0.690	1.489

Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals, ML estimator.

Indirect effects ▼

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
Mean Cent_ATT M1	→ Mean_Cent_VS → Mean Cent_BC M1	0.353	0.079	4.458	< .001	0.195	0.580
Mean_Cent_INT	→ Mean_Cent_VS → Mean Cent_BC M1	0.470	0.091	5.168	< .001	0.269	0.715
Mean Cent_ATT M1	→ Mean_Cent_VS → Mean_Cent_PU	0.432	0.085	5.105	< .001	0.259	0.657
Mean_Cent_INT	→ Mean_Cent_VS → Mean_Cent_PU	0.575	0.092	6.265	< .001	0.385	0.799

Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals, ML estimator.

Total effects

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
Mean Cent_ATT M1	→ Mean Cent_BC M1	1.857	0.185	10.020	< .001	1.370	2.362
Mean_Cent_INT	→ Mean Cent_BC M1	1.490	0.160	9.339	< .001	1.067	1.889
Mean Cent_ATT M1	→ Mean_Cent_PU	1.761	0.177	9.956	< .001	1.281	2.279
Mean_Cent_INT	→ Mean_Cent_PU	1.668	0.152	10.954	< .001	1.225	2.075

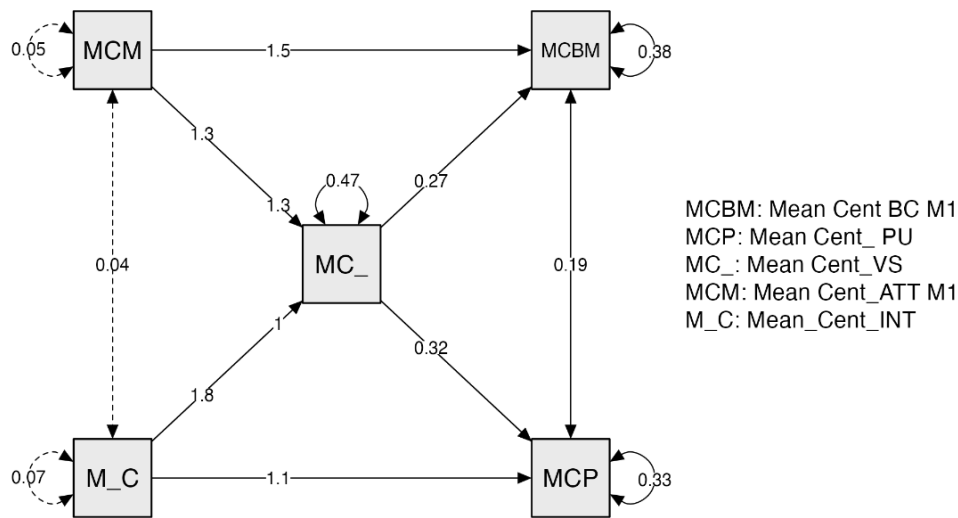
Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals, ML estimator.

Path coefficients

						95% Confidence Interval	
		Estimate	Std. Error	z-value	p	Lower	Upper
Mean_Cent_VS	→ Mean Cent_BC M1	0.265	0.045	5.955	< .001	0.162	0.378
Mean Cent_ATT M1	→ Mean Cent_BC M1	1.504	0.187	8.026	< .001	1.054	1.995
Mean_Cent_INT	→ Mean Cent_BC M1	1.019	0.172	5.921	< .001	0.620	1.435
Mean_Cent_VS	→ Mean_Cent_PU	0.324	0.041	7.847	< .001	0.231	0.423
Mean Cent_ATT M1	→ Mean_Cent_PU	1.330	0.174	7.651	< .001	0.899	1.815
Mean_Cent_INT	→ Mean_Cent_PU	1.093	0.160	6.845	< .001	0.690	1.489
Mean Cent_ATT M1	→ Mean_Cent_VS	1.331	0.198	6.723	< .001	0.881	1.819
Mean_Cent_INT	→ Mean_Cent_VS	1.772	0.170	10.403	< .001	1.362	2.166

Note. Delta method standard errors, bias-corrected percentile bootstrap confidence intervals, ML estimator.

Path plot



The inclusion of variety-seeking behavior as a mediator provides novel insights into individual differences in DP engagement. The mediation analysis reveals that variety-seeking significantly mediates the effects of attitude and intention on both behaviour change and platform usage with incentives suggesting that users with higher variety-seeking tendencies are more likely to translate their sustainability-related attitudes and intentions into concrete behavioral engagement.

Notably, the mediation effects are stronger for INT than for ATT M1, particularly in the case of platform engagement (PU):

- ATT M1 → VS → BC ($\beta = 0.353$, $p < 0.001$)
- INT → VS → BC ($\beta = 0.470$, $p < 0.001$)
- ATT M1 → VS → PU ($\beta = 0.432$, $p < 0.001$)
- INT → VS → PU ($\beta = 0.575$, $p < 0.001$)

This finding is significant as it suggests that while attitude directly shapes behavioral change, variety-seeking behavior enhances the likelihood of intention translating into engagement. These results align with consumer behavior research (Van Trijp & Steenkamp, 1992), which suggests that variety-seekers exhibit a greater propensity to engage with novel experiences and incentive-driven mechanisms. Furthermore, the fact that variety-seeking mediates both BC and PU but exhibits a stronger mediation effect for PU ($\beta = 0.575$) than BC ($\beta = 0.470$) suggests that variety-seekers are more responsive to incentive-based interventions than fundamental behavioral shifts.

5. Discussion

This study examined how DPs act as intermediaries in sustainability transitions, with a particular focus on social sustainability. By integrating the TPB into the MLP framework, this research extends sustainability transition studies by incorporating behavioral insights at the micro level.

The findings highlight the importance of individual agency in transition processes, particularly through the role of incentives, attitudes, and social norms in driving engagement with DPs. This has significant implications for how niche innovations, like TrafficRewards, interact with dominant socio-technical regimes.

5.1 Theoretical Contributions

This study contributes to sustainability transitions literature in three key ways.

First, it extends the MLP framework by explicitly integrating user-level behavioral mechanisms into sustainability transitions. While traditional MLP research focuses on macro-level landscape pressures and regime shifts, our study demonstrates that micro-level user behaviors, mediated through DPs, can accelerate or hinder systemic change. The evidence suggests that bottom-up behavioral adoption within niche innovations is critical for their eventual scaling into dominant regimes. This addresses a longstanding critique of MLP, which has been criticized for overlooking user agency and micro-level behavioral influences (*Köhler et al., 2019*)

Second, our research enhances TPB by incorporating digital engagement mechanisms into behavioral change models. TPB has been extensively applied in sustainability research (Ajzen, 1991) but few studies examine how DPs shape behavioral intentions through gamification, incentives, and real-time feedback loops. Our findings confirm that economic and social incentives influence sustainability attitudes, but also reveal that variety-seeking behavior moderates engagement, introducing personality-driven variability in sustainable decision-making. This provides new theoretical insights into the intersection of behavioral economics and digital sustainability transitions.

Third, we position DPs as a distinct category of sustainability intermediaries. Unlike traditional intermediaries (e.g., government agencies, NGOs), DPs operate at multiple levels of the MLP framework simultaneously—engaging with users at the niche level, coordinating with regulatory regimes, and responding to broader landscape pressures (e.g., policy shifts, technological advances). This aligns with recent calls to conceptualize intermediaries not just as passive facilitators but as active agents shaping transition trajectories. Our study provides empirical evidence of how DPs influence systemic change through user-driven sustainability engagement.

5.2 Digital Platforms as Sustainability Intermediaries

Our findings emphasize that DPs are not merely transactional facilitators but active sustainability intermediaries, capable of shaping market dynamics and social norms.

TrafficRewards exemplifies this role by embedding sustainability incentives into user interactions, thereby aligning individual behavioral choices with broader policy goals.

However, our results also highlight potential risks associated with DP-mediated sustainability transitions. While incentives can effectively drive short-term behavioral shifts, they may not lead to lasting intrinsic motivation for sustainability. The findings indicate that attitude towards sustainability remains a stronger predictor of long-term behavior than incentives alone, suggesting that DPs must balance extrinsic rewards with mechanisms that cultivate intrinsic motivation (e.g., social recognition, gamification, community engagement).

Moreover, our study emphasizes the challenges of DP governance. Although DPs offer scalability and real-time behavioral tracking, their reliance on data-driven engagement strategies raises concerns about equity, accessibility, and unintended biases. If sustainability incentives disproportionately benefit certain user groups while excluding others (e.g., low-income individuals with limited access to digital technologies), platforms risk exacerbating existing inequalities rather than addressing them.

Thus, we argue that the design of sustainability-oriented DPs must incorporate fairness, inclusivity, and long-term engagement strategies, rather than relying solely on economic incentives. Future research should examine how different governance models influence the effectiveness of DP-mediated sustainability transitions.

5.3 Managerial and Policy Implications

Several practical lessons emerge from this study for both platform developers and policymakers aiming to DPs for sustainability. First, designing effective incentive structures is crucial. Perceived fairness in rewards significantly influences user participation. Our findings echo this, suggesting that transparent and equitable incentives can sustain engagement and foster lasting behavioral changes (Ting, 2013). Equally important is enhancing usability. demonstrated that ease of use plays a pivotal role in technology adoption, a conclusion supported by our results (Venkatesh and Davis, 2000). Simplifying platform interfaces and ensuring intuitive user experiences can lower participation barriers, encouraging broader adoption of sustainability-oriented behaviors. Community engagement is another essential factor. Platforms that facilitate peer-to-peer interactions and foster a sense of community can drive the diffusion of pro-social norms. By enabling collaboration and offering social recognition, platforms can enhance user motivation and collective action, whilst emphasizing the role of community-building features in promoting sustainable consumption (Piscicelli, Ludden and Cooper, 2018).

This study highlights the urgent need for policymakers to integrate DPs into sustainability transition strategies, recognizing their scalability and behavioral influence as critical assets in driving systemic change. Regulatory frameworks should incentivize sustainability-oriented platform interventions, aligning market-driven innovation with long-term policy goals. Policies should encourage public-private collaborations, offering financial incentives for sustainability-driven platform initiatives while establishing clear governance mechanisms to ensure data transparency, algorithmic fairness, and consumer protection. Addressing digital exclusion and ethical concerns is crucial, necessitating policies that ensure equitable access to sustainability-driven digital services. Cross-sectoral dialogue among policymakers, industry leaders, and academia should facilitate adaptive policy experimentation, ensuring that governance structures evolve in tandem with technological innovations. Ultimately, a balanced policy

framework that integrates innovation with ethical safeguards is essential to harness the full potential of digital platforms in driving meaningful sustainability transitions.

5.4 Limitations and Future Research

While this study provides valuable insights, it has certain limitations. The geographic scope is limited to India, and the findings may not be directly generalizable to other contexts. Future research should explore similar platforms in different cultural and regulatory environments to validate and extend these findings. Additionally, the reliance on self-reported data introduces the potential for response bias. Longitudinal studies tracking user behaviour over time could offer more robust evidence of the long-term impact of DPs on sustainability transitions. Exploring other theoretical frameworks, such as the Value-Belief-Norm (VBN) theory, could also provide deeper insights into the normative and moral drivers of user behavior.

6. Conclusion

The increasing prominence of DPs offers a transformative opportunity to reshape traditional socio-technical systems towards more sustainable models. This study highlights that fostering individual behavioral change is paramount for achieving social sustainability. While prior research has examined various determinants of sustainable behavior, this study uniquely focuses on the critical role of incentives and fairness in driving user engagement on digital platforms, specifically through the case of TrafficRewards and for social sustainability.

This research contributes to the growing body of literature on sustainability transitions by extending TPB into the platform economy and providing a nuanced understanding of how DPs can foster pro-social norms. Moreover, it offers fresh insights into the role of niche innovations in sustainability transitions, highlighting the capacity of platforms to serve as intermediaries between experimental innovations and established socio-technical regimes.

In conclusion, DPs possess significant potential to drive sustainability transitions by aligning user engagement with broader sustainability objectives. Future research should continue exploring the intersection of user behavior, digital innovation, and sustainability, while policymakers should support these efforts by fostering environments conducive to scaling such niche innovations. With sustained research and strategic policy interventions, platforms like TrafficRewards could play a crucial role in building more equitable and sustainable societies.

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