

Mobile Parcel Lockers in Rural Belgium: An Explanatory Study of Adoption Intentions and Feasibility

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ABSTRACT

The expansion of e-commerce has intensified last-mile delivery pressures, particularly in rural areas where low population density undermines the viability of fixed parcel locker infrastructure. Mobile parcel lockers (MPLs), relocatable units serving multiple villages on rotating schedules, offer a promising alternative, yet empirical evidence on their rural acceptance remains scarce. This explanatory study investigates adoption intentions among 180 residents in a rural Belgian municipality, combining survey data with institutional feasibility assessment. Logistic regression analyses identified five significant predictors: proximity, availability during local events, environmental benefits, prior awareness, and perceived information gaps. Despite limited awareness (25%), 53% expressed willingness to adopt after receiving basic information. The vast majority of uncertain respondents provided conditional interest with specific requirements, suggesting informational rather than attitudinal barriers. Municipal authorities confirmed the feasibility of implementation, citing minimal administrative barriers and alignment with rural accessibility objectives. The findings suggest that MPLs deployment should emphasize strategic siting, event-based scheduling, environmental messaging, and proactive information campaigns, with quantitative results triangulated against municipal assessments to validate MPLs viability in underserved rural areas.

KEYWORDS

Mobile Parcel Lockers; Last-Mile Delivery; Rural Logistics; Sustainable Supply Chain; User Adoption

1. Introduction

The growth of e-commerce in Belgium has led to significant transformations in parcel delivery logistics. In 2024, bpost processed approximately 537,000 parcels per day, totaling around 196 million parcels per year, with a 6.9% increase compared to 2023 (bpost Group 2025). In 2024, 76.08% of Belgians reported making online purchases (SPF Économie 2025), and to manage these volumes efficiently, operators have expanded the use of pickup points and fixed parcel lockers, particularly in urban areas. These centralized delivery systems reduce the number of individual stops, limit failed deliveries, and improve route efficiency. In Belgium, bpost operated more than 1,260 fixed lockers in 2024, with plans to double this number in 2025 (bpost 2025).

However, such solutions remain predominantly concentrated in urban and peri-urban environments, where high population densities ensure sufficient turnover and profitability (GeoPost/DPDgroup 2022). Rural contexts present distinct challenges: lower parcel volumes, dispersed settlements, and longer routes increase delivery costs

and environmental impact (Lempert, Zhao, and Dowlatabadi 2019). In this context, Mobile Parcel Lockers (MPLs) have emerged as a potentially suitable alternative. These movable units can serve multiple villages without requiring permanent infrastructure, enabling flexible, scalable, and demand-responsive service provision (Kötschau, Soeffker, and Ehmke 2023). While their operational potential is increasingly recognized, little is known about their social acceptability or the factors influencing user willingness to adopt them.

This paper makes an exploratory contribution by combining first empirical evidence on rural residents’ stated adoption intentions with a municipal feasibility assessment. While our analysis is constrained by sample size and available variables, it provides the first evidence on MPL acceptance in the rural municipality of Libramont-Chevigny, located in the province of Luxembourg.

The remainder of this paper is structured as follows. Section 2 reviews the existing literature on last-mile delivery solutions and the emerging role of mobile parcel lockers. Section 3 describes the methodology and data collection process. Section 4 presents the results of the statistical analyses. Section 5 discusses these findings and examines the local feasibility of implementing MPLs. Section 6 concludes by summarizing the main insights and outlining recommendations for future research and practical deployment.

2. Literature Review

The rapid growth of e-commerce has intensified pressures on last-mile delivery systems, the most expensive and operationally complex segment of the supply chain. Last-mile activities can represent up to 50 % of overall distribution costs (Ministère de la Transition écologique et solidaire 2019), while also generating significant externalities such as congestion, emissions, and noise. These challenges emerge within a multilayered logistics ecosystem involving carriers, retailers, consumers, and public authorities, whose objectives are often misaligned (Mommens et al. 2025).

Parcel flows are strongly shaped by population density. Urban centers generate dense, predictable volumes conducive to consolidation and shared infrastructures, whereas rural territories face sparse demand, longer routes, and fewer anchor points. Consequently, many last-mile innovations developed for urban contexts (pickup points, automated lockers, micro-hubs) struggle to achieve economic viability in low-density environments (Mommens et al. 2025).

Beyond home delivery, rural consumers already rely on alternative out-of-home options such as staffed pickup points embedded in grocery stores, petrol stations, or magazine shops. These solutions benefit from existing footfall and low additional infrastructure requirements, but they also depend on retailer participation, opening hours, staffing constraints, and the availability of suitable partner locations across dispersed villages. In contrast, MPLs offer an infrastructure-light option that does not require permanent installation or long-term retail partnerships, and can be deployed flexibly to match local demand patterns. This flexibility may be particularly relevant in rural areas where a single anchor location (e.g., a supermarket) does not exist in every village, and where a rotating solution can improve coverage while preserving utilization rates.

2.1. *Fixed Parcel Lockers*

Fixed parcel lockers have expanded rapidly as automated, 24/7 alternatives to human-operated pickup points. By consolidating deliveries into a single location, lockers can reduce delivery times by 20–30% and last-mile costs by up to 50% (Seghezzi, Siragusa, and Mangiaracina 2022; Ministère de la Transition écologique et solidaire 2019; Deutsch and Golany 2018). Their convenience aligns well with consumer expectations and supports sustainability objectives in dense urban settings.

Despite their operational advantages, fixed lockers remain overwhelmingly concentrated in cities; in Belgium, more than 85% are located in urban or peri-urban areas (bpost 2025). Low rural demand limits throughput, while high installation and maintenance costs reduce profitability (Brown 2024). Competing pickup points often benefit from stronger social embeddedness, and rural regions may face digital or infrastructural barriers such as limited connectivity and uneven digital literacy (Kardinal 2024). Low public awareness further constrains utilization, threatening the financial viability of lockers in sparsely populated territories (Ranjbari et al. 2023).

2.2. *Mobile Parcel Lockers*

By rotating across several villages in response to demand patterns, market days, or seasonal events, MPLs can increase utilization while reducing capital expenditure and infrastructure requirements (Kötschau, Soeffker, and Ehmke 2023). Early operational studies indicate that mobile systems may reduce CO₂ emissions by preventing redundant trips and increasing delivery density (Campisi and Di Ruocco 2025).

Several commercial prototypes, including Mobile Locker and Box Colis Mobile, demonstrate the technical viability of such systems (Mobile Locker 2025; CARA 2024). Mobile locker concepts range from:

- Vehicle-based lockers (trucks, vans, trailers with automated compartments),
- Semi-fixed modular units transported and temporarily installed at strategic points (CARA 2024),
- Autonomous/AI-driven systems dynamically optimising their location (Li et al. 2021).

2.3. *Research Gap*

Rural logistics involves fragmented governance, with municipalities, carriers, retailers, and residents often pursuing divergent priorities. Successful MPL deployment requires coordination across these actors and a clear understanding of user expectations and barriers (Mommens et al. 2025). Despite promising pilot projects, empirical evidence on user acceptance of mobile parcel lockers is scarce. This exploratory study addresses this research gap by identifying initial factors associated with MPL adoption intentions in the rural municipality of Libramont-Chevigny.

2.4. *Theoretical Context*

Research on technology acceptance in logistics has frequently employed the Technology Acceptance Model (TAM), which posits that adoption is primarily determined by perceived usefulness and perceived ease of use (Davis, Bagozzi, and Warshaw 1989). However, given the nascent state of MPL research, we adopt an exploratory, hypothesis-

generating approach rather than formal theory testing. Our analysis examines which factors (including convenience, flexibility, environmental benefits, awareness, and information availability) are associated with rural MPL adoption intentions.

While our variables align conceptually with TAM constructs (e.g., proximity and flexibility reflect perceived usefulness; awareness reflects familiarity), our binary measurement approach and exploratory design preclude formal TAM validation. Instead, we aim to identify salient adoption factors to inform pilot implementations and guide future confirmatory research with validated measurement instruments.

2.5. *Research Hypotheses*

Given the exploratory nature of this study and the limited prior research on rural MPLs adoption, we propose the following hypotheses to guide our investigation:

- H1 Respondents who perceive MPLs as offering convenience (proximity), temporal flexibility (event-based availability), or environmental benefits, will express higher adoption intentions.
- H2 Prior familiarity with parcel locker systems will reduce uncertainty and increase willingness to adopt MPLs.
- H3 Younger respondents (16–44 years) will show greater openness to novel delivery technologies than older adults.
- H4 Respondents citing lack of information as a barrier will express lower adoption intentions.

These hypotheses mirror factors identified in prior research on parcel locker adoption (Chen et al. 2018), innovation diffusion (Rogers, Singhal, and Quinlan 2014), and rural logistics challenges (Mommens et al. 2025).

3. *Methodology*

In this section, we describe the research design, including the selection of Libramont-Chevigny as the study area, data collection procedure, and analytical methods used.

3.1. *Study area*

The study focuses on four villages (Saint-Pierre, Lamouline, Flohimont, and Neuvillers) in the municipality of Libramont-Chevigny, in the province of Luxembourg, Belgium. These villages function as peri-urban satellites of Libramont, which concentrates essential services such as secondary schools, supermarkets, public administration, and all parcel-delivery infrastructures (pickup points and fixed lockers). Residents of these villages must therefore travel several kilometers to access parcel reception services. Public transport availability in these areas is limited. Outside school hours, some villages receive minimal or no service. This accessibility gap makes these villages well-suited for testing alternative delivery solutions such as MPLs.

Libramont-Chevigny as a whole counts 12,033 residents over 179.2 km² (67.1 inhabitants/km²), with an average age of 40.6 years, close to the Walloon and national averages (IWEPS – Institut Wallon de l’Évaluation, de la Prospective et de la Statistique 2023). These conditions reflect the structural challenges of rural logistics and justify the exploration of more flexible delivery systems.

3.2. *Target population*

Only individuals aged 16 and older were included, the minimum legal age for online purchases in Belgium, ensuring respondents have the legal capacity for e-commerce.

3.3. *Questionnaire*

An online questionnaire was developed and distributed via a secure platform (LimeSurvey) using a QR code. Online surveys efficiently collect standardized data, reveal behavioral patterns, and support hypothesis testing (Mohajan 2020), while offering rapid dissemination, consistent wording, anonymity, and more sincere responses (Evans and Mathur 2018). Before launch, the questionnaire was pretested with ten residents of different ages to assess clarity, flow, vocabulary, and completion time (2–3 minutes). Minor adjustments were made to improve clarity and neutrality.

The questionnaire examined rural residents' delivery behaviors, familiarity with last-mile solutions, and willingness to use mobile parcel lockers. It also collected basic sociodemographic data: village, age, gender, and online shopping frequency. It was distributed via QR codes on flyers delivered to all selected villages, ensuring geographic coverage and sample diversity. Controlling the territorial frame and maintaining proximity to respondents are essential for the validity of local-scale research (Bryman 2016). Because the survey was accessed via QR code and completed online, responses may be skewed toward more digitally comfortable residents. While targeted follow-ups were conducted for older age groups (Section 3.4), the mode of administration may still underrepresent individuals with low digital literacy or limited smartphone access.

3.4. *Sample composition and representativeness*

An intermediate analysis compared the sample's age structure to municipal demographics (as of 1 May 2025). Due to low participation among residents 55+, targeted actions were taken: digital reminders for ages 55–64 and face-to-face visits for 65+ to help them access the survey while ensuring autonomous responses. The final sample included 180 respondents; the 16–24 group remained slightly overrepresented (+/-5%), but their input is valuable for understanding emerging logistical behaviors and MPLs adoption.

With 180 respondents from a population of about 12,000, the sample has a 7% margin of error at 95% confidence; adequate for exploratory studies on emerging mobility but limiting generalizability. Key variables such as income, education, digital literacy, and household composition were not collected, which may introduce omitted-variable bias; however, the study focuses on identifying key adoption factors for pilot testing rather than establishing a full causal model.

4. Results

This section presents the survey results, beginning with descriptive analyses, followed by the statistical model and a summary of hypothesis testing outcomes.

4.1. Descriptive Results

The descriptive results are divided into current behaviors, past experiences, and stated preferences.

4.1.1. Current behaviors

A large majority reports purchasing online, 22.2% buy approximately every three months, 40.6% around once per month, 16.1% weekly, while 17.2% declare occasional purchasing and only 3.9% have never shopped online. Home delivery dominates, preferred by 80.6% of respondents, compared with 37.2% using pickup points and 18.3% using fixed parcel lockers.

When estimating distances to the nearest delivery point, 91% of participants reported a pickup point within five kilometers, compared to 75% for lockers. While only 1.7% were unsure of pickup point locations, 17.2% were unable to determine the distance to the nearest locker.

4.1.2. Past experiences

Among the 96.1% of respondents with previous pickup experience, car travel dominated (82.1%), while active or public transport remained negligible (< 4%). Most trips were combined with other activities, with only 14.4% of users making dedicated journeys for parcel retrieval.

Home delivery is preferred by 71.1% of participants due to practicality (28.9% cite habit), while a small share (2.7%) lacks alternatives. Preferences are guided by situational factors, including past negative experiences, scheduling conflicts, costs, parcel weight constraints, limited availability of pickup options on certain websites, and redirec possibilities.

Pickup point users prioritize proximity (61.2%) and affordability (52.2%), followed by trip chaining (19.4%) and environmental impact (19.4%), and human interaction (11.9%). Qualitative feedback highlights extended hours, delivery security, and home or workplace constraints as additional factors driving the choice of pickup locations.

Of the 36.7% of respondents who had used parcel lockers, 89.2% reported being satisfied or completely satisfied. The primary motivation for locker use was being away from home (69.7%), followed by lower costs (28.7%) and environmental considerations (9.0%).

4.1.3. Stated preferences

When asked to choose between a pickup point and a parcel locker for future deliveries, respondents preferred pickup points (59.4%) over lockers (41.1%). Pickup point preference was driven by human interaction (48.1%), habit (29.2%), accessibility (24.5%), trip chaining (21.7%), and 22.7% citing higher trust and security. Conversely, locker users prioritized operational flexibility, with 91.8% valuing 24/7 availability. Secondary factors for lockers included accessibility (35.1%) and speed.

4.1.4. Awareness and Intentions Toward Mobile Parcel Lockers

While awareness of mobile parcel lockers was low, with 75.6% unfamiliar and only 3.9% claiming full understanding, potential adoption was notably higher. Over half (53.3%) of participants expressed willingness to use a periodic village locker, while

23.9% declined and 22.8% remained undecided.

Users would be motivated to adopt mobile lockers if they were closer than their current pickup point (54.4%), available during local events (38.9%), or presented as environmentally friendly (38.9%). While some value the flexibility and independence from home delivery, others cited barriers such as existing pickup proximity, rigid time windows, and concerns about parcel size or automation.

4.2. Model

The descriptive statistics of key variables are provided in Table 1

Table 1. Descriptive statistics of key variables (N=180)

Variable	Proportion	Type
<i>Dependent Variable</i>		
Adoption intention (Yes)	0.533	binary
Adoption intention (Unsure)	0.228	
Adoption intention (No)	0.239	
Age (years)	45.6	numeric
Gender (Male)	0.478	binary
Online shopping frequency	3.478	categorical (never (1), rarely, every three months, monthly, weekly(5))
Distance to the nearest pickup point	1.067	categorical (0 = do not know, 1 = less than 5 km, 2 = between 5 and 10 km, 3 = more than 10 km)
Delivery preference (parcel lockers)	0.411	binary
<i>Perceived Usefulness</i>		
Proximity	0.544	binary
Event-based availability	0.389	binary
Environmental benefit	0.389	binary
<i>Awareness & Information</i>		
Prior awareness	0.244	binary
Lack of information barrier	0.544	binary
<i>Barriers</i>		
Security concerns	0.178	binary
Preference for human interaction	0.172	binary
Reluctance to travel to retrieve parcel	0.328	binary

We estimated three alternative logistic regression specifications (Table 2) corresponding to the treatments of “unsure” responses in the dependent variable. Model A recoded unsure responses as affirmative (yes), Model B recoded them as negative (no), and Model C excluded observations with unsure responses entirely.

All variance inflation factor scores were below 2.3, indicating an absence of problematic collinearity among predictors. Forward and backward stepwise selection using the Akaike Information Criterion (AIC) converged on the same specification.

Proximity, event-based availability, environmental benefits, and prior awareness were all robust positive predictors of mobile locker adoption across all models ($p < 0.05$). Variable selection varied: “lack of information” was unique to Model A, while security concerns showed marginally significant negative effects in Models B and C ($p < 0.10$).

Table 3 summarizes the hypothesis testing results. These findings are discussed in detail in Section 5.

Table 2. Logistic regression models with alternative treatments of the “unsure” response

	Model A Unsure = Yes	Model B Unsure = No	Model C Unsure Excluded
Intercept	−2.236***	−1.352***	−2.634***
Prior awareness	1.201*	0.888*	1.498*
Proximity	2.869***	1.350***	3.365***
Event	2.957***	1.139**	3.627***
Environment	2.018**	0.757*	2.467***
Lack of information	1.054*		
Security		−0.856·	−1.257·
Observations	180	180	139
AIC	145.1	228.8	120.3
AUC	0.871	0.728	0.868

Notes: Logit coefficients reported. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, · $p < 0.10$.

Table 3. Summary of hypothesis testing results

	Statement	Result
H1	Perceived benefits (proximity, temporal flexibility, environmental impact) positively influence adoption intentions	Supported
H2	Awareness of parcel locker systems increases adoption intentions	Supported
H3	Younger adults (16–44 years) exhibit higher adoption intentions than older adults	Not Supported
H4	Perceived lack of information decreases adoption intentions	Rejected

Notes: Results based on Model A

5. Discussion

We discuss the theoretical and practical implications, focusing on the treatment of uncertain responses, key adoption drivers, and deployment recommendations.

5.1. Understanding uncertainty as conditional interest

The analysis across three model specifications (Table 2) reveals substantial variation in model performance, indicating that the treatment of ambivalent responses has meaningful analytical consequences.

Model A’s superior fit suggests that uncertainty represents conditional interest rather than rejection. Among “unsure” respondents, 83% specified adoption conditions, preferred locations (43.9%), information requirements (29.3%), and security assurances (19.5%). This pattern indicates that uncertainty reflects informational gaps rather than disinterest, aligning with research distinguishing informational uncertainty from attitude ambivalence (Converse 2006; Krosnick et al. 2002). Therefore, the rejection of H4 is consistent with a conditional adoption. Respondents citing information deficits constitute an information-sensitive market segment. They have recognized potential utility but require information to proceed to decision-making. This interpretation is empirically validated by the increase from 25% initial awareness to 53% adoption intention following brief exposure to the MPL concept during the survey. The inclusion of lack of information as a significant predictor uniquely in Model A provides convergent validity for this interpretation.

Conversely, Model B’s poor performance suggests that misclassifying conditional interest as rejection substantially attenuates effects (e.g., proximity coefficient: 2.869 vs. 1.350) and obscures key relationships. Model C’s lacks power and risks bias, though its larger coefficients suggest effects are most pronounced among respondents with definite opinions. The marginal negative effect of security concerns in Models B and C but not in Model A suggests that security fears distinguish true rejectors from both

acceptors and conditionally interested respondents, warranting further investigation in larger samples.

5.2. Key Adoption Drivers

The analysis identifies three categories of adoption drivers with substantial effect sizes. Convenience factors dominate: proximity advantage (OR=17.6) and event-based availability (OR=19.2) show strong associations. These magnitudes suggest that situational convenience is the primary determinant of rural MPL acceptance. Environmental benefits (OR=7.5) constitute a secondary but significant motivator, while prior awareness (OR=3.3) reduces uncertainty and facilitates adoption.

Notably, age exhibits no measurable effect despite testing both linear and quadratic specifications. This null finding is characteristic of simple, low-risk technologies requiring minimal learning effort (Fanelli 2021), where situational factors override demographic differences. The universal car dependency in rural contexts may also equalize mobility constraints across age groups.

The dominance of convenience drivers (proximity and event-based availability) suggests that MPL routing and stop-location optimization should prioritize high-activity nodes and temporal demand peaks rather than purely geometric coverage. The strong association with event-based availability supports integrating time-dependent attractiveness (e.g., markets, sports matches, seasonal festivals) into location-routing formulations, while the role of awareness/information indicates that demand may be endogenous to communication and experience, evolving over time as residents learn the service. These findings therefore motivate optimization models that jointly consider (i) rotation frequency and stop selection, (ii) time-window alignment with local activities, and (iii) adoption dynamics under information interventions, which could be tested in pilot deployments.

5.3. Deployment recommendations

Field verification confirms that both pickup points and fixed parcel lockers are located within 5 km of all households. Nevertheless, the rural context is characterized by very high car dependency (Carroll, Benevenuto, and Caulfield 2021), limiting environmental benefits. To minimize travel and maximize utility, MPL siting should prioritize multifunctional or frequently visited sites (sports centers, markets, schools) and event-based scheduling (matches, weekly markets, seasonal festivals). Transparent rotation patterns are essential to provide the predictability required for routine adoption.

With only 25% initial awareness, information provision emerges as a critical implementation priority. The municipality's willingness to support communication through official channels (website, social media, public notices) provides an important enabling condition.

A minority of respondents express concerns about locker mobility, perceiving it as unstable. Addressing this concern requires deployment at predictable, high-traffic locations with transparent communication about security measures (surveillance, alerts, assistance systems), as recommended by Deutsch and Golany (2018).

Municipal stakeholder consultation validates implementation feasibility with minimal administrative barriers. Temporary occupation permits follow streamlined procedures similar to those for recycling containers or mobile food vendors, with modest fees (€0.50/m²/day) negotiable for public service initiatives. Electrical access requires only

consumption-based billing without fixed connection costs. The municipality’s alignment with territorial equity objectives and commitment to communication support provide favorable institutional conditions for pilot deployment.

6. Conclusion

This exploratory study makes three primary contributions. First, it provides empirical evidence that rural MPL adoption is driven by situational convenience factors (proximity OR=17.6, events OR=19.2) with effect magnitudes suggesting that marginal accessibility improvements have a disproportionate impact in underserved contexts. Second, it offers methodological insight by establishing that uncertain responses reflect conditional interest driven by information gaps, highlighting a segment that may be unlocked through low-cost communication and service clarification. Third, by triangulating user perspectives with institutional feasibility, the study provides multi-stakeholder validation that technical viability, user demand, and administrative support converge to create deployment-ready conditions for rural last-mile solutions.

For logistics operators and policymakers, our findings yield concrete deployment recommendations. MPL implementation should prioritize: (1) strategic siting at multifunctional locations where residents already congregate (sports facilities, markets, community centers); (2) event-based scheduling aligned with recurring activities to enable on-route retrieval without dedicated trips; (3) proactive information campaigns addressing operational procedures, security measures, and environmental benefits, and (4) transparent communication of predictable rotation schedules to address mobility concerns. Identifying an information-sensitive market segment is particularly actionable. This group’s conditional interest indicates that low-cost communication interventions may convert latent demand. Municipal willingness to support communication through official channels (website, social media, public notices) further enhances implementation prospects.

Generalizability is constrained by several limitations. The modest sample size and geographic specificity to one Belgian municipality limit transferability. The cross-sectional design measures hypothetical intentions rather than actual behavior. The questionnaire primarily operationalized convenience in spatial terms (distance/proximity) and did not explicitly measure expectations regarding delivery lead times under rotating MPL schedules. Future studies should include items capturing acceptable rotation frequency, willingness to wait for consolidation benefits, and perceived trade-offs between shorter travel distance and longer fulfillment times. Survey methodology introduces selection bias; QR-code distribution underrepresented digitally excluded older adults, potentially obscuring age effects. Future research should use mixed-mode administration to reach these populations. Measurement limitations include reliance on binary indicators for complex constructs, omission of potentially confounding variables (income, education, digital literacy, household composition), and potential common-method bias from a single survey administration.

Future research should prioritize four directions: behavioral validation during pilot deployments; multi-site replication to assess generalizability across diverse rural contexts; longitudinal designs tracking the complete innovation process from pre-deployment through adoption decisions; and discrete choice experiments to quantify trade-offs and willingness-to-pay, informing optimal service design. Methodological enhancements should include validated multi-item scales for technology acceptance constructs, expanded demographic and psychographic controls, and formal mediation

analyses testing whether awareness reduces information barriers and thereby increases adoption. Cost-benefit analyses incorporating infrastructure investments, usage rates, carrier fees, and potential public subsidies would assess financial sustainability beyond user acceptance.

Despite these limitations, this multi-stakeholder investigation shows that MPLs represent a viable pathway toward more equitable last-mile delivery infrastructure. By identifying specific adoption enablers and validating institutional feasibility, we provide an empirical foundation for pilot implementations while charting a research agenda to refine the understanding of conditional adoption mechanisms in underserved markets.

Disclosure statements

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

Data availability statement

The data are not publicly available because they contain information that could compromise the privacy of research participants.

Ethics

Our research strictly adheres to the General Data Protection Regulation (GDPR), ensuring all participant data is processed lawfully, transparently, and securely. We have implemented robust mechanisms to protect data integrity and confidentiality, thus upholding our ethical responsibility to protect participants' information.

Informed Consent

Informed consent was obtained from all participants involved in this study. Prior to their participation, participants were provided with a detailed consent form outlining the purpose of the study, the nature of data collection, their rights as participants, and the confidentiality measures in place. The form clearly stated that participation was voluntary, and participants could withdraw without penalty. Consent was recorded electronically; participants indicated their agreement by clicking the "I agree" button after accessing the consent form.

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