

الجمهورية الجزائرية الديمقراطية الشعبية
People's Democratic Republic of Algeria

Ministry of Higher Education
and Scientific Research

National Higher School of Management
University Pole of Kolea



وزارة التعليم العالي و البحث العلمي

المدرسة الوطنية العليا للمناجمنت
القلية

THESIS

submitted in partial fulfillment of the Requirements for the Award of the Master's Degree in

Supply Chain Management

**Digital Technologies and Logistics Performance: Impact Assessment
and Self-Service Kiosk Adoption—Case Study: DHL Algeria**

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2025/2026

Abstract

This study aims to assess the extent to which digital maturity, perceived ease of use, perceived usefulness, user experience (UX), trust, and subjective norms influence customers' behavioral intention to use DHL Algeria's self-service parcel kiosk. A second objective is to examine how that behavioral intention relates to perceived logistics performance in terms of delivery speed and reliability.

A quantitative predictive–explanatory design is adopted, using an online survey of 155 current and potential customers. The data are analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that UX, perceived ease of use, and subjective norms significantly affect behavioral intention to use the kiosk, while behavioral intention has a strong positive effect on perceived logistics performance. Perceived usefulness and trust do not exhibit significant direct effects in this sample. These findings highlight the importance of improving user experience, digital communication, and social support to foster kiosk adoption in the Algerian market.

Keywords: self-service kiosk; user experience; technology acceptance; behavioral intention; logistics performance; digital maturity; PLS-SEM

Résumé

Cette étude vise à évaluer la manière dont la maturité numérique, la facilité d'utilisation perçue, l'utilité perçue, l'expérience utilisateur (UX), la confiance et les normes subjectives influencent l'intention comportementale des clients d'utiliser le kiosque en libre-service de DHL Algérie. Un second objectif consiste à examiner comment cette intention se répercute sur la performance logistique perçue en termes de rapidité et de fiabilité de la livraison.

Une approche quantitative prédictive-explicative est adoptée via une enquête en ligne auprès de 155 clients actuels et potentiels, et les données sont analysées par PLS-SEM (moindres carrés partiels). Les résultats indiquent que l'expérience utilisateur, la facilité d'utilisation perçue et les normes subjectives exercent une influence significative sur l'intention comportementale, tandis que cette intention exerce un effet positif marqué sur la performance logistique perçue. L'utilité perçue et la confiance ne présentent pas d'effets directs significatifs dans cet échantillon. Ces résultats soulignent l'importance de renforcer l'expérience utilisateur, la communication numérique et le soutien social pour favoriser l'adoption du kiosque sur le marché algérien.

Mots-clés : kiosque en libre-service ; expérience utilisateur ; maturité numérique ; acceptation technologique ; intention comportementale ; performance logistique

الملخص

تهدف هذه الدراسة إلى تقييم مدى تأثير النضج الرقمي، وسهولة الاستخدام المدركة، والمنفعة المدركة، وتجربة المستخدم (UX)، والثقة، والمعايير الذاتية الاجتماعية في النية السلوكية للعملاء لاستخدام كشك الطرود ذاتي الخدمة لدى DHL الجزائر، وكيف ترتبط هذه النية بالأداء اللوجستي المدرك من حيث سرعة التسليم وموثوقيته. اعتمد تصميم كمي ذو طابع تنبؤي-تفسيري، عبر استبيان إلكتروني موجه إلى 155 عميلًا حاليًا ومحتملاً، وجرى تحليل البيانات باستخدام نموذج المعادلات البنائية بأسلوب المربعات الصغرى الجزئية (SEM-PLS). تُشير النتائج إلى أن تجربة المستخدم، وسهولة الاستخدام المدركة، والمعايير الذاتية الاجتماعية تُحدث تأثيرًا معنويًا في النية السلوكية لاستخدام الكشك، في حين تُحقق النية السلوكية بدورها أثرًا إيجابيًا قويًا على الأداء اللوجستي المدرك، بينما لا تُسجل المنفعة المدركة والثقة تأثيرات مباشرة دالة إحصائية في هذه العينة. وتُبرز هذه النتائج أهمية تحسين تجربة المستخدم، وتعزيز التواصل الرقمي، ودعم الضغط الاجتماعي في تعزيز تبني الكشك في السوق الجزائرية.

الكلمات المفتاحية: كشك الخدمة الذاتية؛ تجربة المستخدم؛ قبول التكنولوجيا؛ النية السلوكية؛ الأداء اللوجستي.

Acknowledgements

-To my supervisors, Dr. Bouchetara and Pr. Gharbi, and to my internship tutor Mr. Zekkara, I extend my deepest gratitude for your guidance, patience, and steady belief in my work throughout this journey. Your support shaped not only this thesis, but also the way I learned to think, grow, and persist.

-To Dr. Paveen from the United States, the one whose contribution did not merely support this research but became its very spine, your knowledge was the foundation, your generosity the light that helped this work unfold. Every page carries something of what you gave, and I am grateful in ways that will not fade.

*-To My mother, the woman I study like a verse I cannot fully **read**, whose patience is a kind of prayer, whose love is all I **need**. From you I learned that kindness is the bravest thing to **wear**, even when everything in life seems to **tear**, you taught me that hearts stay beautiful when they still choose to **care**, that a soul kept soft through suffering is a soul that truly **dare**. You live within the way I love, the way I rise, the way I **try**, In every word I'll ever write, you are the reason and the **why**.*

*-To my father, my first supporter, my shelter through every **storm**, the steady hand that held me still, the quiet place kept **warm**. You stood beside me through the doubt, through every rise and **fall**, and loved me not for what I was, but simply through it **all**.*

*-And to my siblings, Amira, Amar, and little Adam **too**, my heart divided into souls still, beautiful and **true**, you are the part of every road that always leads me **home**, the light that stays within my chest no matter where I **roam**. On days I felt uncertain, when my spirit felt **undone**, When I became a question lost beneath an absent **sun**, The thought of you became enough to help me stand once **more**, A quiet strength, a gentle peace, a love worth fighting **for**. You never asked for perfection, never needed me **complete**, you simply loved me as I was, through every dark **defeat**. Some bonds are not in spoken words or promises **profound**, some loves are simply souls that stay, and in that love, I'm **found**.*

*-To Thaziri and Ouss, through every fracture, every **phase**, you stayed beside me through the **haze**, through restless nights and weary **skies**, through silent storms I kept **inside**. You asked for nothing, forced no **change**, you loved me whole through every **strange**, A quiet care, a steady **flame**, that held me softly all the **same**. When days grew dark and thoughts grew **deep**, when heavy hours stole my **sleep**, your presence turned the noise to **peace**, and taught my racing mind **release**. Some souls arrive, and then drift **away**, like passing clouds that cannot **stay**, but yours became a constant **light**, a calm within my longest **night**. And long from now, when years have **passed**, when fading moments never **last**, I know your names will still **remain**, like gentle songs beneath the **rain**.*

*-To the souls who met me **in-between**, where I was becoming what I had not yet **been**, I was not settled, not steady, not **sure**, Just learning slowly how to **endure**. Not carved in stone, not free from **fear**, a changing soul from year to **year**, a quiet question without **reply**, a restless self just passing **by**. And still you stayed without **demand**, with gentle hearts and open **hands**, No need for answers, masks, or **pride**, you simply stood there by my **side**.*

*You held me there without a **chain**, through quiet joy and quiet **pain**, and taught my heavy, wandering **mind**, that softness also makes us **kind**. To Anis, the soul who made even ordinary hours feel **alive**, who turned passing moments into memories that **survive**. There was something effortless in the way you stayed **near**, a kind of presence that made the world feel lighter **here**. You brought ease into my chaos, color into **grey**, A warmth that never needed words to carry me through the **day**.*

*-Some souls just pass, and then fade **away**, like fleeting clouds that cannot **stay**, but yours left echoes, warm and **clear**, a kind of love still living **here**. You did not come like sudden **light**, but like dusk that settles **right**, not asking where my pieces lay, just stayed until they felt okay, and a special shout-out to Chanez **too**, For every silent thing you **knew**, for all the calm you brought my **way**, And all the reasons that I **stay**.*

*- To my school, and to every soul who gave their time with care. A special thanks to Madame Dalila, our second mother through it **all**, whose kindness wrapped around our days so gently, soft and **small**,*

*-To Professor Benhidjeb, whose strength through every storm became a **light**, resilient, brave, and always **bright**, And to Professor Nacer, whose knowledge shaped my **view**, whose wisdom moved like steady waves, deep, thoughtful, and **true**. and to Professor Bentalbi, whose presence and advice Added meaning to this journey in ways both calm and wise.*

*-And to myself, for all the times I nearly **disappear**, yet gathered every shattered part and kept it somewhere **near**, To choose a gentle heart while living through **despair**, To still remain full of love when life turns cold and **unfair**, to the person I became through every rise and **fall**, Thank you for not letting grief become the end of **all**.*

Thank you all for being part of this achievement.

GHALEB Mohamed Yasser

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List of Abbreviated Terms

Abbreviations

AI	Artificial Intelligence
BI	Behavioral Intention to use the kiosk
DHL	DHL Express Algeria
DM	Digital Maturity (digital communication and marketing perceptions)
GDA	Global Dispatch Application
IoT	Internet of Things
IT	Information Technology
KPI	Key Performance Indicator
LP	Perceived Logistics Performance
OTIF	On-Time In-Full
OTD	On-Time Delivery
PEOU	Perceived Ease of Use
PLS-SEM	Partial Least Squares Structural Equation Modeling
PU	Perceived Usefulness
SN	Subjective Norms (social influence)
SST	Self-Service Technology
TAM	Technology Acceptance Model
TRUST	Trust in the self-service parcel kiosk
UTAUT	Unified Theory of Acceptance and Use of Technology
UX	User Experience

Symbols

α	Cronbach's Alpha — a measure of internal consistency reliability of a multi-item scale
ρ_c	Composite Reliability (ρ_c) — an index of construct reliability in PLS-SEM, preferred over Cronbach's alpha
ρ_a	Dijkstra-Henseler's ρ_a — an alternative reliability measure used in PLS-SEM
β	Beta — standardized path coefficient representing the strength and direction of a structural relationship in PLS-SEM
R^2	Coefficient of Determination — the proportion of variance in an endogenous construct explained by its predictors
R^2_{adj}	Adjusted R^2 — R^2 corrected for the number of predictors in the model
f^2	Cohen's f^2 — effect size of an exogenous construct on an endogenous construct in the structural model
Q^2	Stone-Geisser's Q^2 — an indicator of predictive relevance of the structural model, obtained via blindfolding
AVE	Average Variance Extracted — a measure of convergent validity; acceptable when AVE > 0.50
CR	Composite Reliability — see ρ_c
HTMT	Heterotrait-Monotrait Ratio — a criterion for assessing discriminant validity; acceptable when HTMT < 0.90
VIF	Variance Inflation Factor — a collinearity diagnostic; values above 5 indicate problematic multicollinearity
t	t-statistic — the test statistic used to assess the significance of path coefficients via bootstrapping
p	p-value — the probability of observing the test statistic under the null hypothesis; significant when $p < 0.05$
n	Sample size — the total number of valid respondents included in the analysis ($n = 155$)
λ	Outer loading (λ) — the loading of an observed indicator on its latent construct in the measurement model
SD	Standard Deviation — a measure of the dispersion of responses around the mean
M	Mean — the arithmetic average of a set of observed values
CI	Confidence Interval — the range within which the true population parameter is expected to fall (typically 95%)
H ₀	Null Hypothesis — the hypothesis of no relationship or no effect, tested against the alternative hypothesis
H _a	Alternative Hypothesis — the hypothesis of a significant relationship or effect

General Introduction

Introduction

The global logistics industry is undergoing a significant digital transformation, driven by the rapid diffusion of technologies such as artificial intelligence (AI), the Internet of Things (IoT), big data analytics, and automation across supply chains (Kumar et al., 2023). These developments are reshaping how goods and information flow between firms and customers (Paraschiv et al., 2021; Deufol, 2024), enabling logistics operators to enhance agility, visibility, cost efficiency, and service quality in increasingly complex and volatile market environments (Thread in Motion, 2022; Ivanov & Dolgui, 2023; Agistix, 2025).

In this context, Supply Chain 4.0 — characterized by the integration of cyber-physical systems, real-time data intelligence, and customer-centric digital interfaces — has become a strategic framework for leading global logistics providers.

For express delivery operators such as DHL, FedEx, and UPS, the implications of this transformation are substantial. Their business models depend on time-critical operations, strict service-level agreements (SLAs), and intense competition on both operational performance and customer experience. At the global level, DHL has made significant investments in digital infrastructure, including AI-driven demand forecasting, IoT-enabled fleet monitoring, smart warehousing systems, and data-driven last-mile optimization tools, which have been associated with measurable improvements in efficiency, reliability, and service quality in many markets. These developments are increasingly accompanied by customer-facing digital innovations — such as mobile apps, track-and-trace platforms, and self-service parcel lockers and kiosks — that reposition customers as active participants in last-mile delivery (Oh et al., 2023; Seghezzi et al., 2025; DHL, 2023).

In Algeria, the express logistics sector is experiencing rapid growth under the combined effects of rising e-commerce penetration, expanding small and medium enterprise activity, and evolving consumer expectations for faster, more flexible, and more transparent parcel services. At the same time, the sector faces structural constraints related to uneven digital infrastructure, regulatory complexity, urban congestion, and varying levels of customer digital literacy and trust in self-service interfaces. DHL Algeria, as the country's leading international express delivery operator, operates within these dynamics: it benefits from the technological resources and know-how of its global parent company, yet it must adapt and implement digital solutions within the economic, infrastructural, and socio-cultural conditions of the Algerian market.

Algeria Context and Theoretical Gap [REVISED]

Introduction

Algeria's digital and e-commerce landscape has undergone a significant transformation, providing a fertile yet complex context for logistics innovation. As of January 2024, Algeria counted 33.49 million internet users, representing an internet penetration rate of 72.9% of the total population. The country registered 50.65 million active mobile connections (DataReportal, 2024). The national e-commerce market surpassed \$1.5 billion in 2024 and is projected to exceed \$2 billion in 2025, driven largely by mobile commerce, which accounts for approximately 75% of online purchases (Mezdad, 2025).

Against this backdrop, last-mile delivery has emerged as a critical bottleneck and despite online payment transactions having tripled between 2020 and 2024; cash-on-delivery still dominates, representing around 90% of online transactions (UNCTAD, 2025). This has prompted operators to pilot alternative collection models such as pickup points and self-service parcel lockers. Most notably, EMS Champion Post Algeria launched its 'EMS Champion Smartbox' parcel locker pilot in February 2026 (EMS Champion Post Algeria, 2026). The present study is situated within this transitional context: it examines DHL Algeria's own self-service parcel kiosk project through a PLS-SEM model comprising eight latent constructs: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Logistics Performance (LP), with the aim of explaining and predicting customers' intention to adopt the kiosk and their perception of the resulting logistics performance.

Within this context, the present thesis investigates how customer-facing digital innovation — and in particular a self-service parcel kiosk system — can contribute to logistics performance in the Algerian express delivery context. While international literature has extensively documented the performance benefits of digitalization, AI, and IoT in logistics, empirical evidence linking user experience (UX) quality and technology acceptance of self-service solutions to tangible logistics performance metrics remains scarce, especially in emerging markets. Specifically at DHL Algeria, the study examines how behavioral intention to adopt the self-service kiosk relates to perceived logistics performance, operationalized as customers' perceptions of improved delivery speed and service reliability.

Over the past decade, research has shown that digitalization and self-service technologies can substantially reshape logistics operations and customer experience by combining automation, data analytics, and new forms of human–technology interaction (Mahmood et

Introduction

al., 2023; Nguyen et al., 2025; Paraschiv et al., 2021). In express delivery and retail contexts, parcel lockers and self-service kiosks have emerged as key last-mile solutions that promise to reduce delivery failures, extend service hours, and increase customer autonomy (Oh et al., 2023; Thongkam et al., 2024; Yusoff et al., 2023). At the same time, Technology Acceptance Model (TAM) studies and UX-oriented research underlines that the success of such solutions depends not only on their technical performance but also on how users perceive ease of use, usefulness, trust, and the overall quality of the interaction (Alotaibi et al., 2025; Islam et al., 2024; Rashid et al., 2022).

These insights suggest that user experience and acceptance dynamics are central mediating mechanisms through which digital technologies can ultimately influence logistics performance, particularly in emerging-market settings where digital maturity and infrastructure remain uneven (Ben-Hamadou et al., 2025; Boudjemaa et al., 2023).

To address this gap, the thesis develops and empirically tests an integrative framework in which Digital Maturity (DM), User Experience (UX), and TAM constructs (PEOU, PU, TRUST, SN) are treated as sequential antecedents of Behavioral Intention (BI). Behavioral Intention in turn is hypothesized to predict Perceived Logistics Performance (LP), operationalized as customers' expectations of improved delivery speed and reliability at DHL Algeria.

1. Research interest

The research interest of this thesis lies at the intersection of three major trends. First, the global move toward smart logistics and Supply Chain 4.0 is increasingly mediated by digital customer interfaces, mobile apps, web portals, parcel lockers, and self-service kiosks, which make customers co-producers of value in last-mile operations. Second, the User Experience (UX) of these interfaces has become a decisive factor in whether customers accept, adopt, and routinely use self-service technologies, with direct implications for operational outcomes in terms of route optimization, first-attempt delivery, and resource utilization. Third, in emerging markets such as Algeria, the adoption of self-service digital solutions is shaped by local infrastructural constraints, digital maturity, and cultural expectations regarding service and trust, which may differ from those observed in more mature markets.

For DHL Algeria, these trends are particularly salient. On the one hand, the company faces growing pressure to improve last-mile delivery performance, reduce failed deliveries and

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front-office congestion, and offer more convenient parcel pickup and return options. On the other hand, the success of any self-service parcel kiosk solution will depend on how Algerian customers perceive its usability, usefulness, security, and overall experience and whether digital marketing and communication strategies can effectively support its adoption. This context creates a strong academic and managerial interest in studying UX-driven technology acceptance and its link to logistics performance in the specific case of self-service parcel kiosks at DHL Algeria.

2. Research objectives

The thesis pursues three closely connected objectives:

- **Objective 1 — Conceptual:** Develop an integrated theoretical framework that connects Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), and Behavioral Intention (BI) as antecedents of Perceived Logistics Performance (LP), operationalized through perceived delivery speed and reliability.
- **Objective 2 Adoption and UX:** Empirically assess customer acceptance of a self-service parcel kiosk concept at DHL Algeria using an extended TAM framework that incorporates UX dimensions (usability, convenience, control, security/safety, affective experience and cross-channel consistency), perceived ease of use, perceived usefulness, trust, and behavioral intention to use.
- **Objective 3 — Operational performance:** Analyze the relationship between Behavioral Intention (BI) and Perceived Logistics Performance (LP) in the context of self-service parcel kiosk adoption, where LP is operationalized through customers' perceived delivery speed and reliability

3. Research problem and questions

Existing studies show that digitalization can improve efficiency, agility, and service quality, but they rarely examine how user experience (UX) and technology acceptance of specific self-service solutions translate into measurable operational performance improvements in emerging markets.

For DHL Algeria, the introduction of a self-service parcel kiosk concept raises a fundamental empirical question about the relationship between two core variables: customer behavioral intention to use the kiosk (as the adoption-side variable) and

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perceived logistics performance (as the outcome variable), operationalized through perceived delivery speed (LP1) and service reliability (LP2).

From a theoretical standpoint, the literature suggests a cascading causal logic in which the quality of user experience with a digital interface shapes TAM-type beliefs (perceived ease of use, perceived usefulness, trust), these beliefs in turn drive behavioral intention to adopt the self-service solution, and widespread adoption eventually translates into improved logistics performance through more efficient last-mile operations (Islam et al., 2024; Ramayah et al., 2023; Storey et al., 2024).

In other words, the underlying assumption is that "better UX → stronger acceptance → higher usage → better performance." In practice, however, this chain of effects is difficult to observe in full, especially in an emerging-market context where self-service parcel kiosks are still at the concept stage and performance data remain largely perception-based. The present study therefore adopts a cautious stance: it treats UX and TAM constructs primarily as predictors of behavioral intention and examines the link between intention and perceived logistics performance as a first, partial approximation of the broader UX → adoption → performance pathway. This positioning recognizes the conceptual ambition of the model while acknowledging that the empirical evidence available here can only capture part of the causal mechanism.

Clarification of the causal chain: The present study adopts a sequential logic in which UX quality shapes TAM beliefs (ease of use, usefulness, trust), these beliefs drive behavioral intention to adopt the kiosk, and higher adoption intention is expected to improve perceived logistics performance by shifting parcel volumes to a more efficient self-service channel. However, this causal chain faces two empirical limitations: first, the cross-sectional survey design prevents strict causal inference; second, the performance construct captures customer perceptions rather than objective operational metrics. Future longitudinal research with access to DHL's internal KPIs (cost per delivery, first-attempt success rate, processing time) would be needed to validate the full UX → adoption → objective performance pathway.

These issues are summarized in the following central research question:

To what extent can self-service parcel kiosks improve customer user experience and enhance DHL Algeria's logistics performance?

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From this central question, the following sub-questions are derived, each corresponding to one of the key dimensions of the model examined in this study:

1. To what extent does digital maturity (DM) influence customers' perceived ease of use of the self-service parcel kiosk at DHL Algeria?
2. To what extent does digital maturity (DM) influence customers' perceived usefulness of the self-service parcel kiosk at DHL Algeria?
3. To what extent does perceived ease of use (PEOU) influence perceived usefulness (PU) of the self-service parcel kiosk at DHL Algeria?
4. To what extent does perceived ease of use (PEOU) influence customers' behavioral intention to use the self-service parcel kiosk at DHL Algeria?
5. To what extent does perceived usefulness (PU) influence customers' behavioral intention to use the self-service parcel kiosk at DHL Algeria?
6. To what extent does user experience (UX) influence customers' behavioral intention to use the self-service parcel kiosk at DHL Algeria?
7. To what extent does trust (TRUST) influence customers' behavioral intention to use the self-service parcel kiosk at DHL Algeria?
8. To what extent do subjective norms (SN) influence customers' behavioral intention to use the self-service parcel kiosk at DHL Algeria?
9. To what extent does behavioral intention (BI) to use the self-service parcel kiosk influence perceived logistics performance (LP) at DHL Algeria?

4. Research hypotheses

Based on the literature review and the conceptual framework developed in Chapter I, the empirical study is structured around a set of hypotheses organized under four overarching propositions. Given the constraints of the empirical design, which relies on a single customer survey instrument, the four propositions are operationalized through nine testable sub-hypotheses (H4a–H4i) that capture the structural relationships between digital maturity, TAM constructs, user experience, subjective norms, behavioral intention, and perceived logistics performance. These sub-hypotheses are formally specified in Chapter II (Section 2.3) and tested empirically in Chapter III.

The four overarching propositions are as follows:

- **H1: UX and TAM beliefs:** Higher UX quality has a positive effect on customers' perceived ease of use, perceived usefulness, and trust in the self-service parcel

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kiosk. In the empirical model, UX is operationalized as a direct predictor of behavioral intention alongside PEOU, PU, and trust.

- **H2: Digital communication and TAM beliefs:** Positive perceptions of DHL's digital communication (operationalized as digital maturity, DM) positively influence perceived ease of use and perceived usefulness regarding the self-service parcel kiosk.
- **H3: TAM beliefs and behavioral intention:** Perceived ease of use, perceived usefulness, trust, and subjective norms has a positive effect on customers' behavioral intention to use the self-service parcel kiosk.
- **H4: Behavioral intention and logistics performance:** Higher behavioral intention to use the self-service parcel kiosk is associated with improved perceived logistics performance at DHL Algeria, particularly in terms of delivery speed and reliability.

The nine sub-hypotheses (H4a–H4i) that operationalize these propositions are detailed in Chapter II, Section 2.3.

Building on these four propositions, the empirical study is operationalized through nine sub-hypotheses that specify the structural relationships between the eight latent constructs measured in this thesis (DM, PEOU, PU, UX, TRUST, SN, BI, LP). First, digital maturity is expected to influence core TAM beliefs:

- **H4a:** Digital maturity (DM) positively influences customers' perceived ease of use (PEOU) of the self-service parcel kiosk at DHL Algeria.
- **H4b:** Digital maturity (DM) positively influences customers' perceived usefulness (PU) of the self-service parcel kiosk at DHL Algeria.

Second, within the TAM belief structure, ease of use is positioned both as a determinant of usefulness and as a direct driver of behavioral intention:

- **H4c:** Perceived ease of use (PEOU) positively influences perceived usefulness (PU) of the self-service parcel kiosk at DHL Algeria.
- **H4d:** Perceived ease of use (PEOU) positively influences customers' behavioral intention (BI) to use the self-service parcel kiosk at DHL Algeria.

Third, perceived usefulness, user experience, trust, and subjective norms are treated as complementary psychological determinants of behavioral intention:

- **H4e:** Perceived usefulness (PU) positively influences customers' behavioral intention (BI) to use the self-service parcel kiosk at DHL Algeria.

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- **H4f:** User experience (UX) positively influences customers' behavioral intention (BI) to use the self-service parcel kiosk at DHL Algeria.
- **H4g:** Trust (TRUST) positively influences customers' behavioral intention (BI) to use the self-service parcel kiosk at DHL Algeria.
- **H4h:** Subjective norms (SN) positively influence customers' behavioral intention (BI) to use the self-service parcel kiosk at DHL Algeria.

Finally, the model links adoption to performance through behavioral intention:

- **H4i:** Behavioral intention (BI) to use the self-service parcel kiosk positively influences perceived logistics performance (LP) at DHL Algeria, particularly in terms of delivery speed and reliability.

These nine research sub-questions are operationalized in Chapter II through the sub-hypotheses H4a–H4i of the PLS-SEM model, which are then tested empirically and discussed in Chapter III.

This proposition is grounded in the idea that self-service kiosks reconfigure last-mile processes by shifting part of the operational workload to customers and by creating an alternative collection and drop-off channel that can reduce failed deliveries, front-office congestion and time windows constraints.

Insofar as behavioral intention is a well-established predictor of actual usage in TAM research, a higher intention to use the kiosk can be interpreted as a higher likelihood that parcels will be routed through this self-service channel rather than through traditional counter-based interactions. Insofar as behavioral intention is a well-established predictor of actual usage in TAM research, a higher intention to use the kiosk can be interpreted as a higher likelihood that parcels will be routed through the self-service channel rather than through traditional counter-based interactions, which parcel locker research associates with faster processing, fewer failed deliveries, and higher perceived reliability (Chan et al., 2023; Ahmed & Musa, 2025).

5. Research methodology

This thesis adopts an in-depth case study methodology, with DHL Algeria as the single organizational case under investigation. The case study design aims to understand a complex, context-specific phenomenon the adoption of a self-service parcel kiosk and its perceived impact on logistics performance within a single company operating under

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particular institutional, infrastructural, and socio-cultural conditions that cannot be isolated through a purely deductive, large-sample design (Yin, 2018).

Within this case study framework, the empirical investigation is conducted exclusively through a quantitative approach. A structured questionnaire was administered to DHL Algeria's customers in order to measure **eight latent constructs**: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP).

Data analysis was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4, which allows simultaneous assessment of the measurement model and the structural paths connecting the constructs (Hair et al., 2019).

This quantitative-only design was adopted because access constraints encountered during the internship period made it impossible to conduct formal manager interviews or retrieve internal operational KPI data within the timeframe of this study. The cross-sectional survey instrument is fully sufficient to test the nine sub-hypotheses (H4a–H4i) and to evaluate the predictive power of the model. Logistics performance is operationalized exclusively through customer perception indicators — namely perceived delivery speed (LP1) and service reliability (LP2) — consistent with the service quality perspective adopted in this study (Brady & Cronin, 2001).

Data analysis proceeds in two stages:

1. Measurement model assessment, covering reliability, convergent validity, and discriminant validity of all latent constructs.
2. Structural model estimation, testing the hypothesized paths and evaluating explained variance (R^2), effect sizes (f^2), and predictive relevance (Q^2).

6. Research field

The empirical investigation of this thesis is anchored in a single-company case study focused on DHL Algeria.

This choice is justified by three converging factors:

1. DHL Algeria is the leading international express operator in the country and is actively exploring digital self-service solutions as part of its strategic development.
2. The Algerian logistics sector presents a distinctive emerging-market context, characterized by growing e-commerce demand, limited prior self-service

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infrastructure, and the adoption barriers documented in recent research on Algerian digital logistics platforms (Meurier & Gharbi, 2025).

3. The case study design allows for an in-depth, context-sensitive analysis of a phenomenon customer adoption of a digital self-service kiosk — that has not yet been empirically studied in this specific market.

The empirical field of this research is DHL Algeria, the Algerian subsidiary of the Deutsche Post DHL Group, which provides international express delivery and related logistics services across the Algerian territory. DHL Algeria is a pertinent case study because it operates within a global group at the forefront of logistics digitalization, providing access to advanced digital tools and international benchmarks.

It serves a growing and increasingly demanding customer base in Algeria, with rising expectations for digital and self-service delivery options.

It faces structural constraints typical of emerging markets, uneven digital infrastructure, varying digital literacy, and limited prior exposure to self-service logistics technologies, making it a particularly informative case for studying TAM-based adoption in context.

The empirical study focuses on DHL Algeria's current and potential customers as the primary unit of analysis, assessed through a structured online survey. Given the exploratory and pre-deployment nature of the kiosk concept at DHL Algeria, the research relies on customer perceptions rather than internal operational KPIs, which were not accessible within the timeline of this thesis.

7. Structure of the thesis

In addition to the general introduction and conclusion, the thesis is organized into three main chapters:

1. Chapter I Theoretical framework and literature review

This chapter reviews the literature on self-service technology adoption, technology acceptance (TAM and UTAUT), user experience, digital maturity, and perceived logistics performance in parcel logistics contexts. It concludes with the integrated eight-construct conceptual model and the formulation of hypotheses H1–H4.

2. Chapter II – Contextual and methodological framework

This chapter presents DHL Algeria's organizational and operational context, including its service portfolio, digitalization trajectory, and last-mile challenges. It then details the

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research design, including construct operationalization, questionnaire development, sampling strategy, data collection procedures, and the PLS-SEM analytical approach used to test H4a–H4i.

3. Chapter III – Empirical results and discussion

This chapter presents the empirical findings: the measurement model assessment and the structural model results for the UX–TAM–digital maturity–performance relationships. It tests hypotheses H1–H4, discusses the findings in light of the literature, and evaluates the potential contributions of the self-service parcel kiosk concept to DHL Algeria’s logistics performance and customer experience. It concludes with managerial recommendations, limitations, and avenues for future research.

CHAPTER I

THEORETICAL FRAMEWORK

CHAPTER I: Theoretical Framework

This chapter develops the theoretical and conceptual foundations of the research by situating self-service parcel kiosks within the current literature on self-service technology adoption, user experience, and logistics performance in emerging markets (Na et al., 2021; Oh et al., 2023). Yusoff et al. (2023) further ground this positioning in the UTAUT framework applied to automated locker adoption.

The chapter first reviews empirical studies on parcel lockers and self-service kiosks to identify the main determinants of customer adoption, with particular attention to Technology Acceptance Model (TAM) constructs, user experience (UX), trust, and social influence. It then examines how researchers have modeled these determinants in digital service and logistics contexts and how they may need adaptation to the case of DHL Algeria.

Building on this review, the chapter draws on TAM and its extensions, UX design principles, and literature on digital communication to define the eight core dimensions that structure the empirical model: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP) (Davis, 1989; Gefen et al., 2003; Venkatesh et al., 2003).

Rather than attempting to cover all aspects of digitalization and performance frameworks, the chapter concentrates on constructs actually measured in the survey and tested in the PLS-SEM analysis.

Section 1 develops the literature review and progressively narrows the focus from general SST adoption to the specific context of emerging markets and Algeria. It starts by reviewing empirical studies on parcel locker and self-service kiosk adoption, drawing on TAM- and UTAUT-based research that highlights the roles of perceived usefulness, perceived ease of use, trust, enjoyment, and social influence in shaping behavioral intention. The section then considers extended models that incorporate trust, perceived risk, digital maturity, and mediating or moderating mechanisms, as well as cross-cultural findings that emphasize the need for context-sensitive models in non-Western and emerging markets.

Sections 1.3 and 1.4 provide broader context by reviewing how digitalization affects supply chain performance and by summarizing PLS-SEM best practices that inform the analytical choices made in this study. The section concludes by situating Algeria within this landscape, using recent assessments of e-trade readiness, digital infrastructure, and

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digitalization challenges to identify SST readiness factors and barriers specific to the Algerian context.

Section 2 presents the conceptual framework that structures the empirical investigation. It develops each of the eight measured constructs — DM, PEOU, PU, UX, TRUST, SN, BI, and LP — by grounding them in established theoretical traditions and validated measurement scales. The TAM backbone draws on Davis (1989) and Venkatesh et al. (2003). The UX and DM constructs are grounded in SST and technology readiness research; SN is covered separately; and LP draws on Mentzer et al. (2001) and Brady and Cronin (2001). The chapter concludes with the integrated conceptual model and the nine sub-hypotheses tested in Chapter III.

Note on constructs and hypotheses: the model contains 8 latent constructs but tests 9 structural paths (H4a–H4i). This is methodologically consistent: DM connects to both PEOU and PU (two separate paths), while BI serves as the single endogenous construct linking the acceptance layer to perceived logistics performance. This structure reflects standard practice in extended TAM models.

SECTION 1: LITERATURE REVIEW

Section 1 develops the literature review that underpins the empirical model of self-service parcel kiosk adoption at DHL Algeria. It examines empirical studies on SST and parcel lockers, extended TAM and UTAUT models, and the roles of UX, trust, social influence, and digital maturity in digital services. The section also reviews digitalization impacts on logistics, PLS-SEM applications, and the specific readiness of emerging markets and Algeria, progressively narrowing toward the UX–TAM–performance gaps that motivate the present study.

1. Self-Service Technology (SST) Adoption Studies: Empirical Evidence from Parcel Lockers and Kiosks

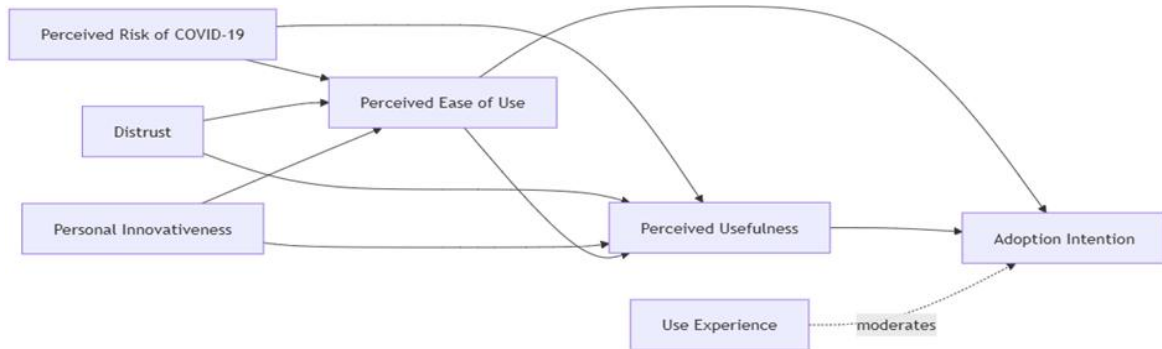
The adoption of self-service technologies in logistics and service delivery has attracted considerable scholarly attention over the past decade, particularly as express delivery operators and retailers seek to reduce operational costs while enhancing customer convenience. This subsection reviews empirical studies that have investigated the behavioral and operational dimensions of parcel locker and self-service kiosk adoption, with particular emphasis on the theoretical frameworks and methodological approaches employed.

1.1. Parcel Locker Adoption in Last-Mile Delivery Contexts

Parcel lockers have emerged as a promising last-mile delivery solution, enabling customers to collect parcels at their convenience while reducing delivery failures and associated costs. Oh et al. (2023) applied an extended Technology Acceptance Model (TAM) to examine the behavioral adoption of automated parcel locker systems during the COVID-19 pandemic in South Korea. Using structural equation modeling (SEM) on a sample of 459 consumers, the authors demonstrated that perceived risk of COVID-19, distrust, and personal innovativeness significantly influenced both perceived usefulness (PU) and perceived ease of use (PEOU), with use experience moderating the adoption intention. These findings suggest that contextual factors, such as health concerns and individual technological readiness, can substantially alter the traditional TAM relationships.

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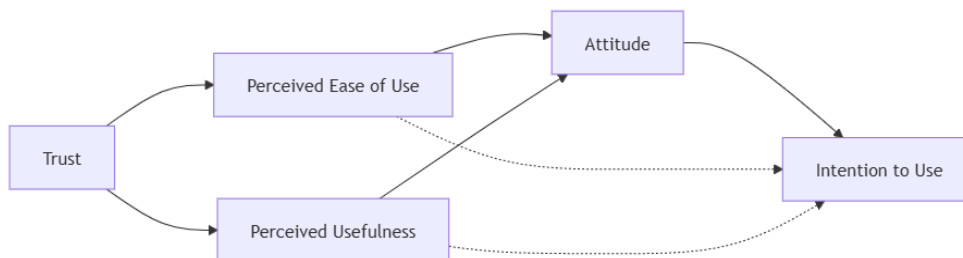
Figure 1: Extended Technology Acceptance Model for automated parcel locker adoption under contextual risk conditions.



Source: Adapted from Oh et al. (2023) and Davis (1989).

Thongkam et al. (2024) further explored the role of trust in parcel locker adoption within the Thai context, employing PLS-SEM on a sample of 300 online shoppers. Their study revealed that trust in parcel locker services positively influenced both PEOU and PU, with attitudes mediating the relationship between TAM constructs and intention to use. The mediating role of attitude underscores the importance of affective and evaluative responses in shaping technology adoption decisions, particularly in service contexts where perceived risk and reliability are salient concerns.

Figure 2: Trust-enhanced TAM structure for automated parcel locker adoption.



Source: Adapted from Thongkam et al. (2024) and Rashid et al. (2022).

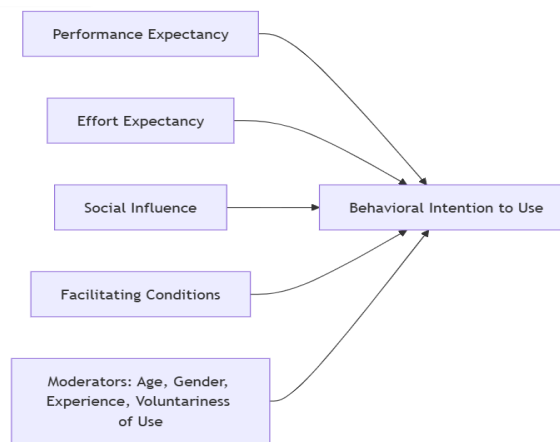
Yusoff et al. (2023) adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) framework to study automated parcel locker adoption in Malaysia. Utilizing PLS-SEM, the authors identified performance expectancy as the strongest predictor of adoption intention, followed by effort expectancy and social influence. The dominance of performance expectancy aligns with findings from earlier TAM research, yet the significant influence of social norms suggests that cultural and contextual factors shape the relative importance of UTAUT constructs in emerging markets.

Beyond logistics, self-service kiosks have been widely deployed in fast-food restaurants, airports, and retail environments, providing a broader empirical foundation for

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understanding SST adoption dynamics. Chang and Chen (2025) examined university students' intention to use self-service kiosks in fast-food restaurants, employing PLS-SEM on a sample of 400 respondents. Their extended TAM model incorporated perceived enjoyment and perceived safety risk as additional constructs. Results indicated that PU, PEOU, and perceived enjoyment significantly influenced usage intention, while perceived safety risk moderated these relationships. This study highlights that hedonic motivations and risk perceptions can play important roles in SST acceptance, even in routine service encounters.

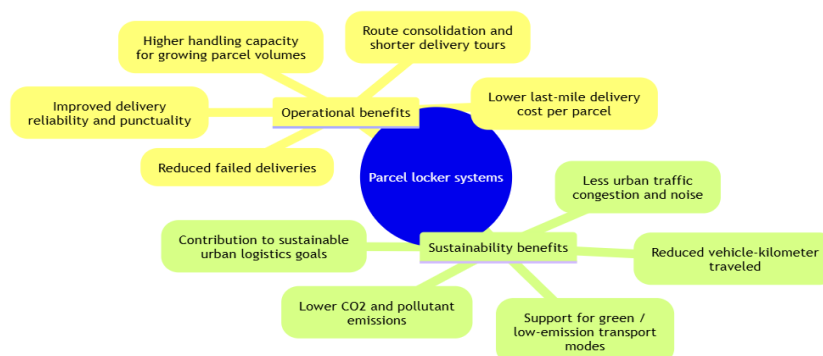
Figure 3 : UTAUT determinants of automated parcel locker adoption.



Source: Adapted from Venkatesh et al. (2003) and Yusoff et al. (2023).

These determinants do not operate in isolation; rather, they translate directly into tangible outcomes for logistics operators and end users alike. When performance expectancy, effort expectancy, and social influence align favorably, adoption of automated parcel lockers generates a cascade of operational and environmental gains, as illustrated in Figure 4

Figure 4 : Main operational and sustainability benefits associated with parcel locker systems in last-mile delivery.

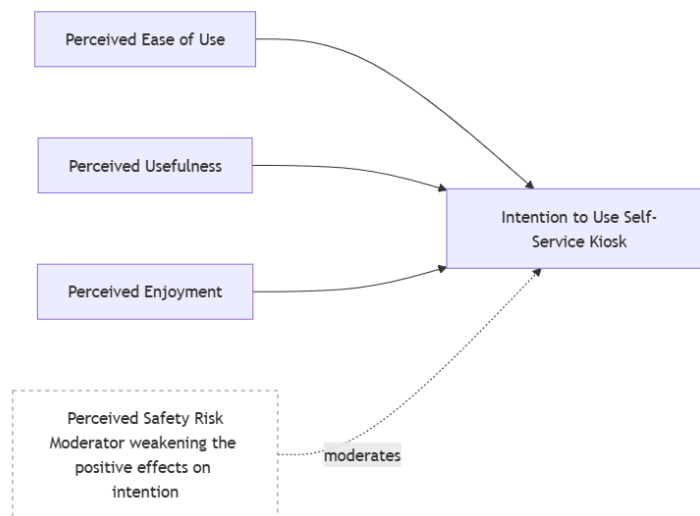


Source: Author's synthesis based on Seghezzi et al. (2025).

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Jamaludin et al. (2025) investigated the role of attitude in shaping young consumers' intention to use self-service kiosks in Malaysia, using PLS-SEM on 214 students. The findings revealed that PEOU and perceived enjoyment significantly shaped attitudes, which in turn strongly drove SSK adoption intention. The study underscores the sequential mediation process through which cognitive beliefs (ease of use, enjoyment) influence affective evaluations (attitude), ultimately determining behavioral intentions.

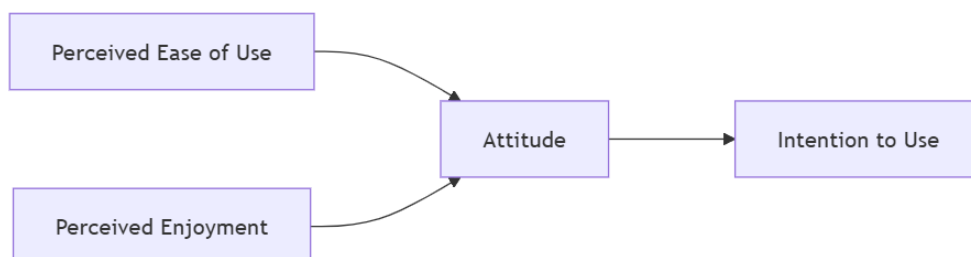
Figure 5 : Self-service kiosk adoption model incorporating hedonic motivation and perceived safety risk.



Source: Adapted from Chang and Chen (2025).

Ramayah et al. (2023) extended TAM2 to examine continuance intention in quick-service restaurant contexts, analyzing data from 180 respondents via PLS-SEM. The study found that attitude and perceived enjoyment were the two key drivers of continued SSK use, with PU and PEOU exerting indirect influence through attitude. This emphasis on continuance rather than initial adoption represents an important extension of traditional TAM research, as sustained usage is critical for realizing the operational benefits of SST investments.

Figure 6 : Sequential mediation role of attitude in self-service kiosk adoption.

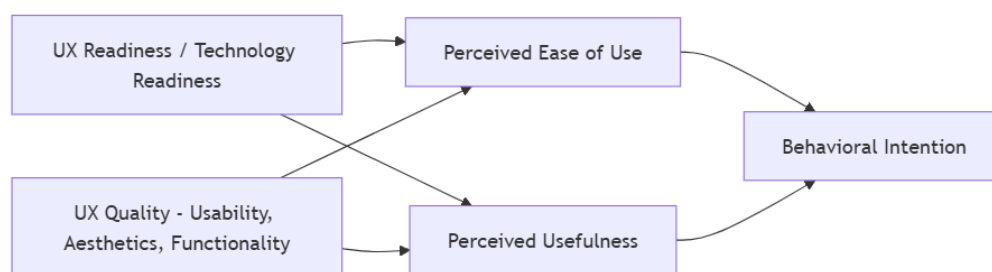


Source: Adapted from Jamaludin et al. (2025) and Ramayah et al. (2023).

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Islam et al. (2024) introduced the UX Technology Readiness and Acceptance Model (UX-TRAM), integrating user experience with TAM in the context of airport self-check-in kiosks. Tested via PLS-SEM on 400 respondents at Soekarno-Hatta Airport, the model confirmed that 13 of 15 hypothesized relationships were significant. Notably, UX readiness significantly predicted kiosk acceptance, with PEOU and PU mediating the relationships between UX dimensions and behavioral intention. This study provides empirical evidence that user experience quality serves as an important antecedent to traditional TAM constructs, suggesting that interface design and usability should be prioritized in SST development.

Figure 7 : UX-TRAM integration of user experience and TAM constructs in self-service technology acceptance.



Source: Adapted from Islam et al. (2024) and Alotaibi et al. (2025)

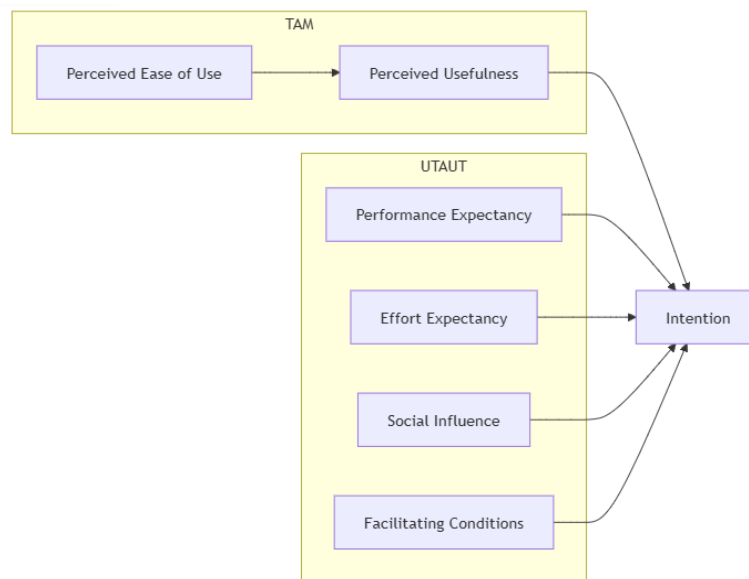
1.2. Comparative Analysis of TAM and UTAUT in SST Research

The literature reveals a bifurcation in theoretical approaches to SST adoption, with some scholars favoring TAM and others employing UTAUT. Na et al. (2021) applied UTAUT to examine determinants of behavioral intention toward self-order kiosks in fast-food restaurants. Their findings indicated that performance expectancy, effort expectancy, and social influence all positively affected kiosk usage intention. The inclusion of social influence as a significant predictor distinguishes UTAUT from classic TAM, suggesting that peer pressure and social norms may be particularly relevant in public service settings. Ting et al. (2025) integrated UTAUT with the concept of flow experience to study airport self-service technology adoption. Using PLS-SEM, the authors demonstrated that social influence and facilitating conditions enhanced flow experience, which in turn positively drove SST continuance intention. The introduction of flow, a state of deep engagement and enjoyment, adds a phenomenological dimension to technology acceptance research, complementing the cognitive focus of TAM and UTAUT.

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A comparative assessment suggests that TAM remains dominant in SST adoption research due to its parsimony and robust predictive power, particularly in studies focused on perceived ease of use and usefulness. However, UTAUT offers theoretical richness by incorporating social influence, facilitating conditions, and moderating variables such as age and experience. The choice between TAM and UTAUT often depends on research objectives: TAM is preferred for focused, prediction-oriented studies, while UTAUT is suitable for comprehensive explorations of adoption determinants.

Figure 8: Comparative logic of TAM and UTAUT in self-service technology adoption studies.



Source: Adapted from Davis (1989), Venkatesh et al. (2003), Na et al. (2021), and Ting et al. (2025).

1.3. UX Integration in Technology Acceptance Models

A notable trend in recent SST adoption research is the integration of user experience (UX) constructs into traditional acceptance models. Alotaibi et al. (2025) conducted a PLS-SEM mediation analysis of factors influencing digital self-service technology adoption in Guyana, extending TAM with resistance to change, technology anxiety, and user interface quality. The study found that PU, trust, and satisfaction were key mediators of adoption intention, while user interface quality significantly shaped perceived ease of use. This finding reinforces the argument that interface design and UX dimensions are foundational to technology acceptance, particularly in contexts where users may have limited prior exposure to digital systems.

The UX-TRAM model proposed by Islam et al. (2024) represents the most explicit integration of UX into TAM, positioning technology readiness and UX dimensions as

upstream predictors of PEOU and PU. Empirical validation confirmed that UX quality, encompassing usability, aesthetics, and functionality, significantly influenced both ease of use perceptions and usefulness beliefs. This relationship suggests that investments in UX design can yield dual benefits: reducing perceived effort while simultaneously enhancing perceived value.

Collectively, these studies indicate that while TAM provides a parsimonious and empirically validated framework for understanding SST adoption, its explanatory power can be substantially enhanced by incorporating UX dimensions, trust, and context-specific factors. The next subsection examines how trust, digital maturity, and social influence further shape technology acceptance in digital service environments.

2. Technology Acceptance, Trust, and Behavioral Intention in Digital Services

While the core constructs of the Technology Acceptance Model, perceived ease of use and perceived usefulness, have demonstrated robust predictive validity across diverse technological contexts, scholars have increasingly recognized that acceptance of digital self-service technologies is influenced by additional psychological and social factors. This subsection reviews empirical evidence on the roles of trust, digital maturity, social influence, and various mediating and moderating mechanisms in shaping behavioral intention toward SST adoption.

2.1. Trust and Digital Maturity as Extensions of the Technology Acceptance Model

Trust has emerged as a critical determinant of technology acceptance, particularly in contexts where users must entrust personal information, financial transactions, or valuable goods to automated systems. Rashid et al. (2022) combined Protection Motivation Theory (PMT) with TAM to study parcel locker adoption in Thailand, using SEM on a sample of 300 respondents. Their findings revealed that trust in parcel locker services positively impacted both PEOU and PU, with attitudes mediating the relationship between TAM constructs and intention to use. The integration of PMT suggests that perceived vulnerability and threat severity also influence adoption decisions, particularly in contexts where security concerns are salient.

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Khan et al. (2025) investigated the influence of technology trust on digital system adoption using PLS-SEM. Their study demonstrated that technology trust positively and significantly influenced perceived usefulness and that PU fully mediated the relationship between trust and intention to use. This full mediation finding implies that trust operates primarily through cognitive evaluations of system usefulness rather than directly affecting behavioral intentions, highlighting the sequential cognitive processing that underlies technology acceptance decisions.

Figure 9 : Full mediation of perceived usefulness in the relationship between technology trust and intention to use.



Source: Adapted from Khan et al. (2025).

Akhtar et al. (2025) examined artificial intelligence adoption in logistics contexts, linking AI adoption, technology trust, and organizational readiness to logistics efficiency and performance outcomes via PLS-SEM. The study found that AI adoption and technology trust significantly improved logistics efficiency, with organizational readiness moderating the adoption-performance relationship. This moderation effect suggests that technological readiness at both individual and organizational levels conditions the extent to which trust translates into actual adoption and performance gains.

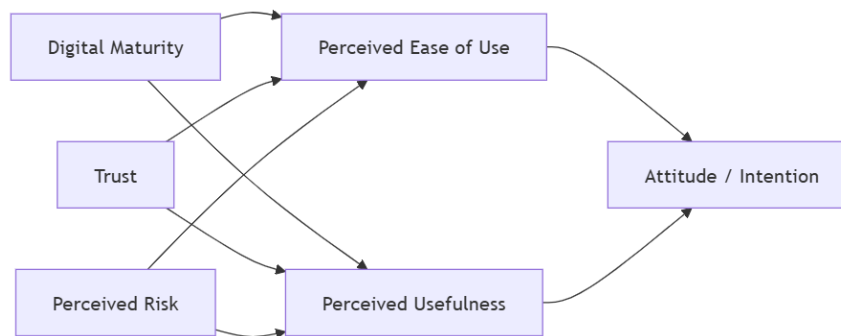
Alwan et al. (2023) explored perceived ease of use effects on behavioral intention in mobile banking, with perceived usefulness and trust serving as mediators. Using PLS-SEM on 230 mobile banking users in Indonesia, the authors confirmed that PEOU indirectly influenced behavioral intention through both PU and trust. The dual mediation pathway indicates that ease of use perceptions enhance not only instrumental beliefs about system utility but also affective trust in the technology, both of which are necessary for intention formation.

Digital maturity, defined as users's familiarity and comfort with digital tools and platforms, has been proposed as an antecedent to traditional TAM constructs. While not extensively tested in the reviewed studies, the concept appears implicitly in discussions of technology readiness and innovativeness.

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Islam et al. (2024) operationalized technology readiness as part of their UX-TRAM model, demonstrating that individuals with higher digital readiness exhibited stronger PEOU and PU beliefs. This finding suggests that digital literacy programs and exposure to digital interfaces may facilitate SST adoption by reducing perceived effort and enhancing perceived value.

Figure 10 : Extended TAM integrating trust, perceived risk, and digital maturity in digital service adoption.



Source: Author's synthesis based on Rashid et al. (2022), Alwan et al. (2023), Khan et al. (2025), and Islam et al. (2024).

While perceived risk appears in Oh et al.'s (2023) original model, it was not retained in the present study given that trust captures the security and reliability dimension sufficient for the kiosk context

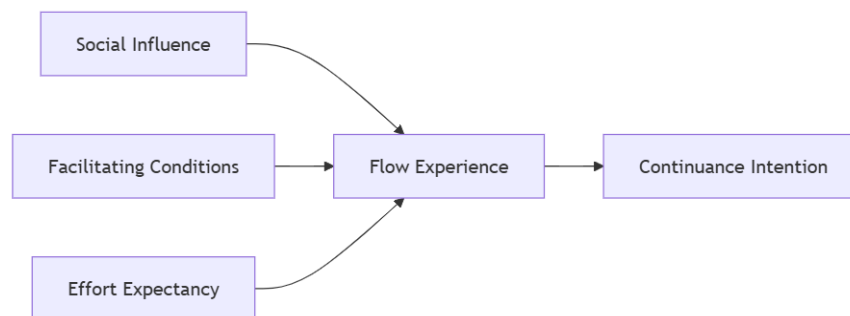
2.2. Social Influence and Subjective Norms in SST Adoption

Social influence, the extent to which individuals perceive that important others believe they should use a technology, represents a key construct in UTAUT and an extension of subjective norms from the theory of planned behavior. Na et al. (2021) found that social influence positively affected self-order kiosk usage intention in fast-food settings, alongside performance expectancy and effort expectancy. The significance of social influence in a relatively low-stakes, routine service context suggests that peer behaviors and social norms shape technology adoption even when individual costs or risks are minimal.

Ting et al. (2025) demonstrated that social influence and facilitating conditions enhanced flow experience in airport self-service technologies, which in turn drove continuance intention. This finding is particularly noteworthy because it positions social influence not merely as a direct predictor of intention but as an enabler of deeper psychological

engagement with the technology. The implication is that social endorsement may reduce psychological barriers and facilitate immersive, positive interactions with SST.

Figure 11 : Social influence and flow experience as drivers of self-service technology continuance intention.



Source: Adapted from Ting et al. (2025) and Na et al. (2021).

Ramayah et al. (2023) included subjective norms in their TAM2-based study of SSK continuance in quick-service restaurants. While attitude and perceived enjoyment emerged as the strongest predictors of continuance intention, subjective norms exerted a moderate positive influence, suggesting that social approval contributes to sustained usage beyond initial trial. The relative strength of hedonic versus normative factors may vary by context, with enjoyment dominating in discretionary leisure settings and social norms playing a larger role in professional or public service environments.

2.3. The Role of Mediation in TAM: Relevance for the Present Study

Prior research documents important mediation mechanisms within TAM-based adoption models that inform the causal structure of the present study, even though mediation is not directly tested.

Alotaibi et al. (2025) demonstrated that user interface quality shapes Perceived Ease of Use, which in turn activates both trust and satisfaction as parallel pathways to behavioral intention — a finding that directly grounds the PEOU → UX → TRUST → BI sequence hypothesized here.

Gefen et al. (2003) similarly showed that trust fully or partially mediates the relationship between system quality perceptions and usage intention in self-service contexts. These mediation patterns are embedded within the structural paths of the present model rather than tested explicitly, consistent with the study's objective of establishing direct-effect baseline relationships in a context self-service kiosk adoption in Algeria, where no prior empirical benchmark exists (Venkatesh et al., 2003; Hair et al., 2019).

2.4. Cross-Cultural and Context-Specific Adoption Patterns

The reviewed studies reveal considerable cross-cultural variation in the relative importance of TAM and UTAUT constructs. Oh et al. (2023) noted that pandemic-specific variables, perceived COVID-19 risk and distrust, significantly affected parcel locker adoption in South Korea, suggesting that macro-environmental conditions can reshape adoption dynamics. Similarly, Yusoff et al. (2023) found that performance expectancy dominated in Malaysia, whereas social influence was more salient in collectivist cultural contexts compared to individualist Western settings.

Thongkam et al. (2024) observed that Thai consumers placed greater emphasis on trust and reliability in parcel locker services, likely reflecting higher uncertainty avoidance and lower baseline trust in automated systems in emerging markets. Alotaibi et al. (2025) documented that resistance to change and technology anxiety were significant barriers to SST adoption in Guyana, a developing country context where digital infrastructure and digital literacy remain uneven.

These contextual variations underscore the need for culturally and contextually adapted TAM models when studying SST adoption in non-Western or emerging market settings.

Table 1 : Cross-cultural variation in dominant determinants of self-service technology adoption.

Country / Context	Key Factors Affecting Technology Adoption
South Korea	Perceived risk, distrust, personal innovativeness
Thailand	Trust, attitude, Technology Acceptance Model (TAM) beliefs
Malaysia	Performance expectancy, effort expectancy, social influence
Guyana	Interface quality, trust, satisfaction, resistance to change
Airport contexts	User experience readiness, flow, facilitating conditions

Source: Author's synthesis based on Oh et al. (2023), Thongkam et al. (2024), Yusoff et al. (2023), Alotaibi et al. (2025), and Ting et al. (2025).

Universal constructs such as PEOU and PU retain predictive validity, yet their relative weights and the mediating pathways through which they operate may differ substantially across cultural, economic, and institutional environments.

In summary, the literature on technology acceptance in digital services demonstrates that while TAM provides a foundational framework, its explanatory and predictive power is enhanced by incorporating trust, digital maturity, social influence, and context-specific moderators. The next subsection examines how digitalization more broadly affects supply chain and logistics performance, providing the organizational and operational context within which customer-facing SST operates.

3. Digitalization Impact on Supply Chain and Logistics Performance

Digitalization has reshaped supply chain and logistics operations by enabling new forms of visibility, coordination, and automation across networks. Technologies such as artificial intelligence, the Internet of Things, and data analytics support more accurate demand forecasting, real-time tracking, and dynamic routing, which can improve operational efficiency and service quality for express delivery providers (Kumar et al., 2023; Paraschiv et al., 2021).

In the last-mile context, self-service parcel lockers and kiosks have emerged as emblematic digital solutions that promise extended service hours, reduced failed deliveries, and greater customer autonomy (Oh et al., 2023; Thongkam et al., 2024; Yusoff et al., 2023).

Digital technologies influence logistics performance through perceived improvements in dimensions such as delivery speed, reliability, and convenience from the customer's standpoint. While established performance management frameworks conceptualize performance in terms of reliability, responsiveness, cost, and asset utilization, the customer interface typically makes only a subset of these dimensions visible (Mentzer et al., 2001; Brady & Cronin, 2001).

In this thesis, logistics performance is therefore operationalized in a deliberately narrow way, focusing on perceived delivery speed and perceived reliability as the two facets of performance that customers can most directly evaluate when interacting with self-service parcel kiosks (Brady & Cronin, 2001; Mentzer et al., 2001).

This choice aligns the performance construct with the empirical design of the study and avoids overextending the measurement model to internal cost or error indicators that were not accessible within the scope of the internship.

4. PLS-SEM Methodology in Logistics and Technology Adoption Research

Partial Least Squares Structural Equation Modeling (PLS-SEM) has emerged as the dominant analytical method in empirical studies of technology adoption, logistics performance, and supply chain digitalization. This subsection reviews the application of PLS-SEM in relevant research contexts, examines best practices for measurement and structural model assessment, and identifies common methodological challenges and reporting gaps documented in the literature.

4.1. PLS-SEM Applications in TAM and SST Adoption Studies

The preference for PLS-SEM over covariance-based SEM (CB-SEM) in technology adoption research stems from several methodological advantages: PLS-SEM is distribution-free, performs well with smaller sample sizes, handles complex models with multiple constructs and indicators, and is optimized for prediction rather than theory confirmation (Hair et al., 2019). These characteristics align well with the exploratory and prediction-oriented objectives common in TAM-based research.

Oh et al. (2023) employed SEM, though the specific variant was not explicitly stated, to analyze parcel locker adoption during COVID-19, testing an extended TAM on 459 Korean consumers. The study demonstrated that PLS-SEM could effectively handle moderating effects (use experience moderating the relationships between TAM constructs and adoption) and multiple antecedents (perceived risk, distrust, and personal innovativeness) simultaneously.

Thongkam et al. (2024) explicitly used PLS-SEM to examine trust's influence on parcel locker adoption intention in Thailand. The choice of PLS-SEM was justified by the study's focus on prediction and the moderate sample size ($n = 300$), which would have been marginal for CB-SEM. The authors successfully tested mediation pathways, demonstrating that attitude mediated the relationships between PEOU, PU, trust, and intention to use.

Chang and Chen (2025) applied PLS-SEM to study self-service kiosk adoption in fast-food restaurants among 400 university students. The model included moderation analysis, testing whether perceived safety risk moderated the relationships between PU, PEOU, perceived enjoyment, and usage intention. The successful estimation of interaction effects

illustrates PLS-SEM's capacity to handle complex model specifications that would be computationally demanding in CB-SEM.

Islam et al. (2024) used PLS-SEM to test their UX-TRAM model on 400 airport passengers, confirming 13 of 15 hypothesized relationships. The study exemplifies rigorous PLS-SEM application, including comprehensive reporting of outer loadings, internal consistency reliability, convergent validity (AVE), and discriminant validity (Fornell-Larcker criterion and HTMT). The authors also employed bootstrapping with 5,000 subsamples to assess path coefficient significance, adhering to current best practices (Hair et al., 2022).

4.2. Measurement and Structural Model Assessment in PLS-SEM

Rigorous PLS-SEM studies follow a two-stage assessment process: first evaluating the measurement (outer) model to ensure construct reliability and validity, then assessing the structural (inner) model to test hypothesized relationships and evaluate predictive power. Hair et al. (2019) established widely adopted criteria for both stages, which have been variably applied across the reviewed studies.

- **Measurement Model Assessment**

Alotaibi et al. (2025) provided a clear example of comprehensive measurement model evaluation in their study of digital SST adoption in Guyana. The authors reported:

Indicator reliability: All outer loadings exceeded 0.70, with one initially problematic item removed during model refinement.

1. **Internal consistency reliability:** Cronbach's alpha and composite reliability (ρ_c) both exceeded 0.70 for all constructs.
2. **Convergent validity:** Average Variance Extracted (AVE) values exceeded 0.50 for most constructs, confirming that each construct explained more than half of its indicators' variance.
3. **Discriminant validity:** Both the Fornell-Larcker criterion (square root of AVE exceeds inter-construct correlations) and HTMT ratios (below 0.90) were satisfied.

Ramayah et al. (2023) similarly reported detailed measurement model diagnostics in their TAM2-based study of SSK continuance. The authors noted that while all constructs met reliability thresholds, one construct exhibited an AVE slightly below 0.50 (0.48) but was retained due to strong theoretical grounding and acceptable outer loadings. This decision reflects a pragmatic balance between statistical criteria and theoretical considerations,

consistent with Hair et al.'s (2019) recommendation that AVE values approaching 0.50 may be acceptable when other reliability indicators are strong.

- **Structural Model Assessment**

Rahman et al. (2024) employed a hybrid PLS-SEM and machine learning approach to study big data analytics adoption and smart supply chain performance in Malaysia. The PLS-SEM component assessed path coefficients, R^2 values, and predictive relevance (Q^2), while machine learning algorithms provided out-of-sample predictive accuracy (70.66%). This hybrid approach represents an innovative extension of traditional PLS-SEM, leveraging its strengths in causal inference while supplementing it with machine learning's superior predictive performance.

Ahmad et al. (2024) tested mediation and moderation hypotheses in their supply chain digitalization study. Using bootstrapping with 5,000 resamples, the authors evaluated both direct and indirect effects, confirming that visibility mediated the digitalization-performance relationship and agility moderated the visibility-performance link. The study reported standardized path coefficients (β), t-statistics, p-values, and 95% confidence intervals, providing full transparency for replication and meta-analysis.

Nguyen et al. (2025) reported R^2 values ranging from 0.32 to 0.59 for endogenous constructs in their digital transformation model, indicating moderate to substantial explanatory power. The authors noted that $R^2 = 0.59$ for behavioral intention represented a strong result by social science standards, while $R^2 = 0.28$ for logistics performance was more modest, suggesting that additional variables beyond those in the model influence operational outcomes.

4.3. Mediation, Moderation, and Predictive Validity in PLS-SEM

While the present study does not test mediation or moderation effects explicitly, the following review of how prior research has applied these techniques in PLS-SEM provides methodological context and identifies best practices that inform the model assessment procedures used in Chapter III.

The capacity to test mediation and moderation effects represents one of PLS-SEM's key advantages for theory development and refinement. Parkhi et al. (2024) conducted a moderation analysis examining how green logistics performance varied across different levels of digital technology adoption. The study employed product-indicator approaches to

create interaction terms, testing whether the effects of augmented reality and predictive analytics on efficiency were contingent on organizational capabilities.

Alwan et al. (2023) tested parallel mediation pathways in mobile banking adoption, demonstrating that PEOU influenced behavioral intention through both PU and trust. The authors employed Preacher and Hayes' (2008) bootstrapping procedure to assess indirect effects, reporting 95% bias-corrected confidence intervals that did not include zero, confirming significant mediation.

Predictive validity, assessed through Stone-Geisser's Q^2 statistic and holdout sample prediction, has received less attention in the reviewed studies, despite increasing emphasis in PLS-SEM methodological literature (Shmueli et al., 2019). Rahman et al. (2024) stand out for explicitly evaluating predictive performance using machine learning benchmarks, demonstrating that their PLS-SEM model achieved 70.66% prediction accuracy on out-of-sample data. This validation approach represents best practice for prediction-oriented research, though it remains underutilized in most TAM and logistics studies.

4.4. Common Challenges and Reporting Gaps in PLS-SEM Studies

Wang et al. (2024) conducted a structured literature review of 401 articles applying PLS-SEM in logistics and supply chain management from 2014 to 2022, identifying systematic reporting deficiencies and methodological gaps. Key findings included:

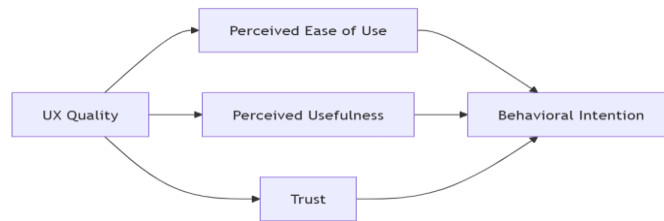
Insufficient justification for PLS-SEM: Many studies failed to clearly articulate why PLS-SEM was chosen over CB-SEM, limiting readers' ability to assess method appropriateness.

Incomplete reporting of model assessment: Approximately 30% of studies omitted critical diagnostics such as HTMT ratios, Q^2 values, or effect sizes (f^2).

- **Limited use of advanced techniques:** Fewer than 15% of studies employed importance-performance analysis (IPMA), predictive validity assessment, or multi-group analysis, despite their relevance for managerial insights.
- **Inconsistent treatment of formative constructs:** Studies employing formative measurement models often failed to report collinearity statistics (VIF) or test for indicator redundancy.

The authors called for greater transparency and standardization in PLS-SEM reporting, recommending adoption of checklists and reporting templates to enhance methodological rigor and reproducibility.

Figure 12 : Common methodological and reporting gaps in PLS-SEM-based adoption studies.



Source: Adapted from Wang et al. (2024).

This critique is particularly relevant for the present study, which must ensure comprehensive reporting to meet academic standards and facilitate future replication and extension.

In summary, PLS-SEM has become the methodological standard for studying technology adoption and logistics performance due to its flexibility, predictive orientation, and capacity to handle complex models. However, rigorous application requires careful attention to measurement model diagnostics, transparent reporting of structural model results, and appropriate use of advanced techniques such as mediation, moderation, and predictive validation. The next subsection examines contextual studies focused on Algeria and emerging markets, providing the geographic and economic setting for the present research.

Beyond these methodological aspects, the literature on PLS-SEM in technology adoption and logistics also raises an epistemological issue, namely whether models are used primarily in a confirmatory–explanatory logic or in a predictive–oriented logic. Many SST and TAM-based studies still treat PLS-SEM mainly as a convenient alternative to covariance-based SEM, focusing on significance tests and explained variance without systematically evaluating out-of-sample predictive performance or comparing results to simple benchmarks.

In this thesis, PLS-SEM is explicitly mobilized in a predictive explanatory perspective: the structural paths are interpreted in light of established theory, but particular attention is paid to predictive relevance (Q^2), PLSpredict results and importance–performance maps, in order to assess how well the UX–TAM–digital marketing model can anticipate behavioral intention and perceived logistics performance in the DHL Algeria context.

5. Emerging Markets and Algeria: Digitalization and SST Readiness

The adoption of self-service technologies in emerging markets cannot be fully explained by generic acceptance models alone, because infrastructure quality, institutional maturity, and trust in digital systems critically shape user behavior (Alotaibi et al., 2025; Khan et al., 2025).

In North African and other developing-country contexts, digitalization tends to progress unevenly across sectors, so that solutions such as parcel lockers or self-service kiosks may be technically available but still encounter barriers linked to access, habits, and perceived reliability (Boudjemaa et al., 2023; Paraschiv et al., 2021).

Understanding self-service technology (SST) readiness in Algeria therefore requires attention to both the broader digital environment and the specific features of last-mile delivery and customer-facing logistics services (Ben-Hamadou et al., 2025; Seghezzi et al., 2025).

5.1. E-Trade and Last-Mile Delivery in North African Markets

Recent studies emphasize that e-trade development in emerging markets is closely tied to the performance of last-mile delivery systems, as consumers increasingly expect faster, more flexible, and more transparent delivery options (Ben-Hamadou et al., 2025; Seghezzi et al., 2025).

Parcel locker systems are frequently presented as promising responses to these expectations because they can reduce delivery failures, optimize courier routes, and offer customers greater autonomy in choosing when and where to collect their parcels (Oh et al., 2023; Thongkam et al., 2024).

The systematic review by Seghezzi et al. (2025) shows that parcel lockers can lower delivery costs and support sustainability objectives by consolidating deliveries and reducing congestion, particularly when they are integrated into larger logistics networks. However, the same review notes that adoption patterns remain uneven across regions, with success depending on factors such as urban density, digital infrastructure, and user familiarity with self-service systems (Seghezzi et al., 2025).

Policy-oriented analyses for North African economies underline similar challenges. In the Algerian case, Ben-Hamadou et al. (2025) report that progress in e-trade depends on strengthening last-mile delivery services, improving the digitalization of trade formalities,

and formalizing delivery providers. Their assessment indicates that more reliable and visible last-mile services can reinforce consumer confidence in online transactions, which in turn stimulates e-commerce growth (Ben-Hamadou et al., 2025). Although these reports do not apply behavioral models such as TAM or UTAUT, they highlight the strategic role of last-mile solutions and provide contextual support for examining parcel lockers and kiosks as key interfaces between e-trade and logistics performance in Algeria (Ben-Hamadou et al., 2025; Nadeem et al., 2024).

5.2. Digital Infrastructure and Adoption Barriers in Algeria

The Algerian digital landscape exhibits both opportunities and structural constraints that are likely to influence SST adoption. Boudjemaa et al. (2023) argue that supply chain digitalization in the Algerian oil industry is impeded by gaps in ICT infrastructure, workforce skills, and organizational agility, which collectively slow down the deployment and effective use of Industry 4.0 technologies. Although their analysis focuses on an industrial sector, it suggests that similar constraints may affect logistics operators attempting to introduce customer-facing digital solutions, including self-service parcel kiosks (Boudjemaa et al., 2023).

When infrastructure and internal capabilities are weak; even well-designed technologies can fail to deliver expected benefits because they are not consistently available or reliably integrated into daily operations (Nguyen et al., 2025; Paraschiv et al., 2021).

Digitalization studies in logistics further underline the importance of integration and organizational readiness. Paraschiv et al. (2021) show that process automation, data analytics, system integration, and customer interfaces all contribute positively to supply chain performance, with system integration exerting the strongest direct effect. This result implies that standalone technologies, such as isolated kiosks or lockers, are less effective than solutions embedded in cohesive, interoperable platforms (Paraschiv et al., 2021).

Similarly, Nguyen et al. (2025) demonstrate that digital transformation enhances competitive advantage through customer participation and service innovation, highlighting that performance gains emerge when digital tools support new forms of collaboration and service co-creation. For Algeria, these findings suggest that parcel kiosks should not be viewed as independent tools but as front-end components of a broader digital logistics ecosystem connecting tracking systems, customer communication, warehouse operations, and route optimization (Nguyen et al., 2025; Paraschiv et al., 2021).

5.3. SST Acceptance in Developing Country Contexts

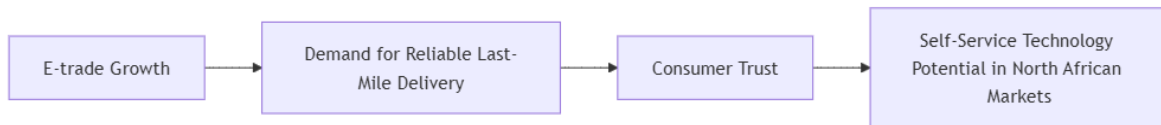
Empirical studies in developing countries indicate that SST acceptance is shaped by a mix of cognitive beliefs, affective responses, and contextual constraints. In Guyana, Alotaibi et al. (2025) show that perceived usefulness, trust, and satisfaction act as key mediators of adoption intention for digital self-service technologies, while user interface quality significantly affects perceived ease of use. Their findings underline that in emerging markets, users often require both functional benefits and reassurance regarding system reliability and ease of use (Alotaibi et al., 2025). Khan et al. (2025) similarly find that technology trust has a strong positive effect on perceived usefulness and that usefulness fully mediates the relationship between trust and intention to use digital systems, which implies that trust tends to operate through cognitive evaluations of value rather than directly influencing intention.

Parcel locker studies conducted in Thailand and Malaysia offer additional insights into SST acceptance in developing economies. Thongkam et al. (2024) report that perceived ease of use, perceived usefulness, and trust all positively influence consumers' intention to adopt automated parcel lockers in the Thai last-mile context. Yusoff et al. (2023), working within the UTAUT framework, identify performance expectancy as the strongest predictor of intention to use parcel lockers in Malaysia, followed by effort expectancy and social influence. These results, combined with earlier findings by Oh et al. (2023) on the moderating effects of contextual risk and personal innovativeness, suggest that adoption in emerging markets is driven by both perceived performance improvements and the level of confidence users place in the technology and its providers (Oh et al., 2023; Thongkam et al., 2024; Yusoff et al., 2023).

Taken together, this body of work indicates that SST acceptance in developing countries is rarely determined by a single factor. Instead, it emerges from the interaction between usefulness and ease-of-use beliefs, trust and risk perceptions, interface quality, and broader socio-technical conditions such as digital literacy and infrastructure reliability (Alotaibi et al., 2025; Khan et al., 2025; Thongkam et al., 2024).

For an emerging market such as Algeria, where digital maturity is heterogeneous and self-service technologies are still relatively new in logistics, these insights support the need for a context-sensitive model that combines user experience, technology acceptance, and performance outcomes.

Figure 13 : Main determinants of self-service technology acceptance in developing-country contexts.



Source: Author's synthesis based on Alotaibi et al. (2025), Khan et al. (2025), Thongkam et al. (2024), and Yusoff et al. (2023).

5.4. Self-service parcel kiosk systems: architecture, functionality, and global practices

Self-service parcel kiosk systems, often referred to as parcel lockers or smart lockers, have emerged as a prominent out-of-home last-mile delivery solution that combines digital technologies, physical infrastructure, and user interfaces to enable autonomous parcel collection and return (Brown & Keller, 2025; Nowicka, 2024).

Conceptually, these systems can be understood as cyber-physical service points that relocate part of the delivery process from the customer's doorstep to strategically placed automated lockers, thereby decoupling delivery time from customer presence and reconfiguring last-mile logistics operations (Li & Chen, 2024; Kedia, 2026).

From an architectural perspective, self-service parcel kiosk systems comprise three tightly integrated layers: hardware, local control, and backend software platforms (Park & Lee, 2023; Schmidt, 2017). At the hardware level, parcel lockers typically consist of modular, weather-resistant cabinets containing multiple electronically lockable compartments of varying sizes to accommodate a wide range of parcel dimensions, from small envelopes to bulky items (Brown & Keller, 2025; Signifi, 2024).

The compartments are designed to be durable and tamper-resistant, often including reinforced doors, secure locking mechanisms, and built-in sensors to monitor door status, compartment occupancy, and sometimes environmental conditions such as temperature (Brown & Keller, 2025; Alfa3, 2024). To support deployment in diverse environments, residential buildings, retail locations, transport hubs, and outdoor public spaces, modern locker cabinets are commonly modular, allowing operators to adapt the number and size mix of compartments to local demand and physical constraints (Signifi, 2024; Geopost, 2025).

Figure 14 : Main digital technologies and functional roles in logistics operations.



Source: Author’s synthesis based on Parkhi et al. (2024), Wei et al. (2024), and Kumar et al. (2023).

The local control layer is usually implemented via edge controllers or embedded processors that coordinate the operation of the locker hardware (Park & Lee, 2023; Schmidt, 2017). Each bank of lockers is connected to a controller that manages lock actuation, processes commands from the backend, logs events, and communicates with user-facing interfaces (Park & Lee, 2023).

Controllers enforce access rules, verify authentication codes, and monitor the status of each compartment in real time, thereby ensuring system security and reliability (Schmidt, 2017). In more advanced designs, individual lockers may have autonomous lock units with their own microprocessors, memory, and short-range wireless transceivers, enabling direct communication with user devices such as smartphones for “tap-to-open” or proximity-based access (Schmidt, 2017; Alfa3, 2024).

The backend software platform constitutes the central intelligence of the system (Park & Lee, 2023; IntelParcel, 2023). It typically includes several components: workflow engines that orchestrate parcel life cycles (drop-off, storage, pickup, return); user management modules that handle registration, authentication, and permissions; integration layers (APIs, web services) that connect the locker network with carrier systems, e-commerce platforms, and enterprise resource planning systems; and analytics modules that monitor usage, capacity, and performance metrics (Park & Lee, 2023; IntelParcel, 2023).

The platform generates unique access or QR codes for recipients, pushes notifications (SMS, email, app alerts), tracks each parcel’s status, and records audit trails of all interactions for security and compliance purposes (Brown & Keller, 2025; SmartBox, 2025). In multi-carrier or multi-service configurations, the backend also manages allocation of capacity among different logistics providers and may implement dynamic pricing or prioritization rules based on demand (Nowicka, 2024; Leaders in Logistics, 2026).

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In terms of functionality and user flows, self-service parcel kiosk systems support several core logistics scenarios: parcel delivery to a locker, customer pickup, parcel return, and sometimes outbound shipping or other postal services (Brown & Keller, 2025; Escher Group, 2021). For inbound deliveries, couriers authenticate at the locker, often via a dedicated app, password, or ID token, after which the system verifies credentials and logs the delivery initiation (Nowicka, 2024; Escher Group, 2021).

Advanced algorithms then select an appropriately sized compartment based on package dimensions, either entered manually or inferred via sensors, in order to optimize space utilization (Brown & Keller, 2025). Once the parcel is placed inside, the compartment is locked, and the backend updates the parcel status to “ready for pickup” while sending the recipient a notification containing locker location details and a unique pickup code or QR code (Brown & Keller, 2025; DHL, 2024).

For parcel retrieval, the customer goes to the locker location at a convenient time and identifies themselves at the kiosk through code entry, QR code scan, mobile app, or, in some markets, biometric verification, and the system validates the credentials against its records (Nowicka, 2024; DHL, 2023).

Upon successful verification, the corresponding compartment automatically opens, allowing the customer to collect the parcel, and the system logs the pickup event and updates parcel status (Nowicka, 2024; DHL, 2023).

This interaction is designed to be quick and intuitive, with on-screen guidance and, increasingly, multilingual interfaces to serve diverse user groups (Nowicka, 2024; Escher Group, 2021). For returns and outbound shipments, smart lockers enable customers to initiate a return online, receive a code, and then deposit the parcel in a designated compartment by scanning the code at the locker, after which the system notifies the relevant carrier to collect the items during the next route (SmartBox, 2025; Brown & Keller, 2025).

Functionally, self-service parcel kiosks embody the characteristics of self-service technologies (SSTs): they transfer part of the service process from employees to customers, rely on user interaction with a technological interface, and aim to increase convenience, control, and efficiency for both parties (Meuter et al., 2000; Escher Group, 2021). For logistics providers, consolidating multiple deliveries into a single locker

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location reduces the number of delivery failures, lowers time spent on door-to-door stops, and enables more efficient route planning (DHL, 2024; Leaders in Logistics, 2026).

For customers, lockers offer time and place flexibility, allowing them to pick up parcels outside conventional business hours, in locations integrated into their daily routines (e.g., near home, work, or shopping areas), without waiting for couriers or standing in queues (Signifi, 2024; Escher Group, 2021).

Globally, parcel locker systems have become a key component of last-mile delivery strategies in several markets (Kedia, 2026; Nowicka, 2024). Countries such as China and Poland are often cited as leading examples, where locker-based networks handle a substantial share of parcel volumes and are used by multiple carriers and postal operators (Kedia, 2026). In China, large-scale networks of smart lockers, equipped with facial recognition, CCTV, and secure access mechanisms, provide a safer alternative to doorstep deliveries, reducing theft and damage risks while supporting high parcel density in urban areas (Kedia, 2026). In Poland, operators such as InPost have built extensive locker networks that account for a significant proportion of national parcel deliveries, prompting both national posts and private carriers like DHL and DPD to invest in compatible locker infrastructure (Kedia, 2026).

Major international logistics and postal operators have also integrated parcel lockers and self-service kiosks into their service portfolios (DHL, 2024; Escher Group, 2021). DHL, for example, uses parcel lockers as part of its sustainable last-mile solutions, emphasizing efficiency gains, reduced missed deliveries, and environmental benefits through consolidated drop-offs and fewer door-to-door attempts (DHL, 2024; DHL, 2023).

Postal operators have deployed automated self-service kiosks in locations such as shopping malls, airports, and universities to provide customers with 24/7 access to core postal services (shipping, drop-off, label printing, tracking) while reducing staffing needs and extending their retail network footprint (Escher Group, 2021; Parcel & Postal Technology International, 2025). In some cases, multi-service lockers have evolved into local service hubs that combine parcel functions with click-and-collect for local retailers, fresh product pickup, and other community services, reflecting an expansion of the value proposition beyond pure parcel logistics (Geopost, 2025).

From a logistics performance standpoint, empirical and practitioner reports highlight several recurring benefits associated with parcel kiosk systems: increased first-attempt

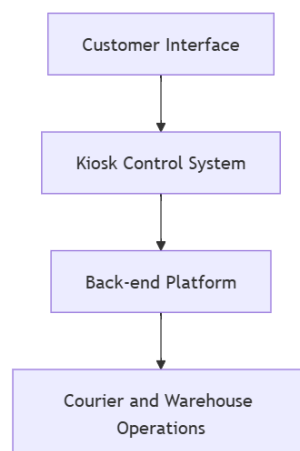
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delivery success rates, reduced last-mile delivery costs, improved route efficiency, mitigation of theft and damage risk, and reduced carbon emissions due to fewer repeated delivery attempts and consolidated trips (DHL, 2024; SmartBox, 2025; Kedia, 2026). At the same time, these systems introduce new challenges and risks, including the need for significant upfront capital investment, the complexity of network design and locker placement, the management of capacity constraints and peak loads, and, crucially, the requirement that customers accept and effectively use the self-service interface (Li & Chen, 2024; Leaders in Logistics, 2026).

In emerging markets, initiatives such as planned self-service kiosks and drop-off solutions by national postal operators illustrate the relevance of these systems for improving service efficiency, reducing queues, and freeing staff to focus on more complex customer needs (Parcel & Postal Technology International, 2025). However, the success of such deployments hinges not only on technical robustness and network design but also on user experience quality and technology acceptance, particularly among customer segments that may have limited prior exposure to digital self-service channels (Nowicka, 2024; Escher Group, 2021; SmartBox, 2025).

In the context of this research, self-service parcel kiosks are thus considered not merely as technological artifacts but as socio-technical systems whose operational impact is mediated by how users perceive, evaluate, and adopt them. This perspective provides a natural bridge to the next subsection, which foregrounds user experience (UX) as a critical dimension of digital service delivery in logistics.

Figure 15 : parcel locker and self-service logistics.



Source: Author's synthesis based on parcel locker and self-service logistics studies reviewed in the chapter.

6. Synthesis: Research Gaps and Study Positioning

The reviewed literature shows that self-service technology adoption has been widely examined in parcel lockers, kiosks, and other digital service interfaces, but important gaps remain when the focus shifts to logistics performance and emerging-market contexts. Most SST studies concentrate on behavioral intention and its antecedents, such as perceived usefulness, perceived ease of use, trust, or enjoyment, without systematically linking these constructs to operational outcomes like efficiency, service quality, or cost (Chang & Chen, 2025; Islam et al., 2024; Ramayah et al., 2023).

Conversely, research on digitalization and logistics performance often focuses on technologies such as AI, IoT, and analytics at the organizational level rather than on customer-facing self-service solutions (Akhtar et al., 2025; Nguyen et al., 2025; Paraschiv et al., 2021). This separation points to a clear opportunity to integrate adoption and performance perspectives within a single framework, especially in underexplored settings such as Algeria.

6.1. Key Findings and Theoretical Contributions from Prior Research

Across different SST contexts, the Technology Acceptance Model and its extensions continue to offer strong explanatory power. Studies on parcel lockers demonstrate that perceived usefulness and ease of use remain central determinants of intention, but their effects are conditioned by trust, attitude, and contextual variables such as perceived health risk or personal innovativeness (Oh et al., 2023; Rashid et al., 2022; Thongkam et al., 2024).

Research on self-service kiosks adds hedonic and experiential dimensions to this picture, showing that perceived enjoyment and flow experience can significantly shape attitudes and continuance intention (Chang & Chen, 2025; Jamaludin et al., 2025; Ting et al., 2025). These contributions collectively suggest that SST adoption is driven by a combination of instrumental evaluations and experiential factors, particularly in service environments where technology directly mediates customer interaction.

From the perspective of logistics and supply chains, digitalization has been shown to enhance performance through improved efficiency, visibility, agility, and resilience. Nguyen et al. (2025) highlight that digital transformation strengthens competitive advantage through customer participation and service innovation, while Ahmad et al. (2024) and Mokhtar et al. (2022) show that digital tools improve performance by

enhancing supply chain visibility and enabling agile responses to disruptions. Other studies emphasize sustainable and customer-centered performance outcomes, as in Mahmood et al. (2023), who integrate economic, environmental, social, and customer dimensions into a sustainable logistics performance model. These findings indicate that digital technologies can generate multifaceted benefits when they are well integrated into operations and aligned with customer-facing processes (Mahmood et al., 2023; Nguyen et al., 2025; Paraschiv et al., 2021).

6.2. Identified Gaps in UX–TAM–Performance Integration

Despite these advances, several gaps remain. First, relatively few studies explicitly integrate user experience constructs with TAM variables and logistics performance indicators in a single model.

Islam et al. (2024) and Alotaibi et al. (2025) show that UX-related dimensions, such as interface quality and technology readiness, can significantly influence perceived usefulness, perceived ease of use, and behavioral intention, yet these studies do not extend their analysis to operational performance in logistics. Second, research linking customer-facing self-service tools to logistics performance typically focuses on cost savings or delivery speed without systematically accounting for UX and acceptance dynamics (Seghezzi et al., 2025; Zhang et al., 2024).

This leaves unanswered questions about how the quality of user experience and levels of adoption condition the performance benefits of SST.

A second major gap concerns geographical and contextual coverage. Most SST and digital logistics studies have been conducted in Asian, European, or other non-African settings, leaving African and Arab countries relatively underrepresented (Ben-Hamadou et al., 2025; Boudjemaa et al., 2023). Algeria, in particular, appears mainly in policy and conceptual analyses of digitalization and e-trade readiness, rather than in empirical models that combine technology acceptance and logistics performance (Ben-Hamadou et al., 2025; Boudjemaa et al., 2023).

Given the specific infrastructural, regulatory, and cultural features of the Algerian market, it is not obvious that findings from other regions can be directly transferred without contextual adaptation.

6.3. Justification and Contribution of the Present Study

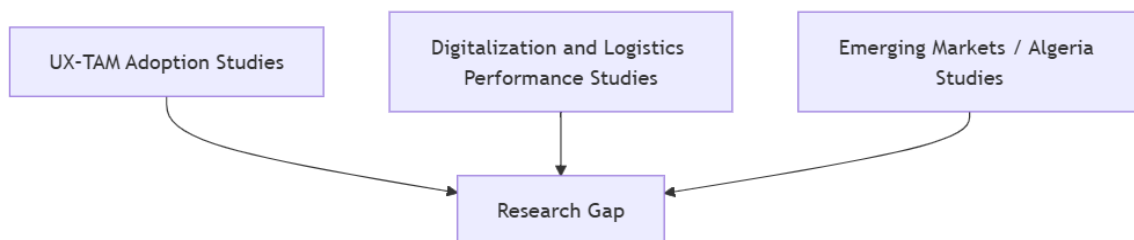
The present study addresses these gaps by examining self-service parcel kiosk adoption in Algeria through an integrated framework that connects user experience, technology acceptance, and logistics performance. Building on prior SST research, it adopts an extended TAM that foregrounds perceived usefulness, perceived ease of use, trust, and behavioral intention, while at the same time incorporating User Experience (UX) as a unified construct capturing the overall quality of interaction with the kiosk, including interface clarity, convenience, and perceived control (Alotaibi et al., 2025; Islam et al., 2024; Rashid et al., 2022).

Perceived Logistics Performance is scoped to the two customer-visible dimensions most directly associated with kiosk-based service delivery perceived delivery speed and perceived reliability consistent with established logistics service quality research (Mentzer et al., 2001; Brady & Cronin, 2001; Stank et al., 2001).

By applying this integrated model to the case of DHL Algeria, the study makes a dual contribution. Theoretically, it advances the SST literature by linking UX–TAM constructs directly to logistics performance outcomes in an emerging-market context, thereby bridging a gap between behavioral adoption research and operational performance analysis.

Empirically, it provides context-specific evidence on Algerian customers’ readiness to adopt self-service parcel kiosks and on the potential performance gains that such adoption could generate in last-mile delivery. This positioning is consistent with the methodological and academic standards required for a Master’s thesis at ENSM, which emphasize both theoretical rigor and practical relevance in addressing contemporary management problems.

Figure 16 : Research gap at the intersection of UX–TAM adoption, logistics performance, and emerging-market analysis.



Source: Author’s synthesis based on the literature reviewed in Sections 1.1 to 1.5.

Section 2: Conceptual Framework

Section 2 consolidates the insights from the literature review into a conceptual framework tailored to self-service parcel kiosks at DHL Algeria. It first situates kiosks within broader digitalization and self-service technology developments in logistics, then specifies the human-side determinants of adoption based on TAM constructs, UX, trust, digital maturity, and subjective norms. The section also defines perceived logistics performance as a customer-facing outcome and formulates the eight-dimension conceptual model and hypotheses that will be tested using PLS-SEM.

1. Digitalization and Self-Service Technologies in Logistics

Section 1 lays the groundwork for understanding the technological and organizational context in which self-service parcel kiosks operate. Section 2 consolidates the insights from Section 1 into a conceptual framework tailored to self-service parcel kiosks at DHL Algeria. It first situates kiosks within the broader digitalization and self-service technology context in logistics and then examines how User Experience shapes adoption dynamics in SST environments. It subsequently specifies the human-side determinants of adoption grounded in TAM, its extensions, and digital maturity research, including an explicit construct definition and scale grounding for each of the eight measured dimensions: DM, PEOU, PU, UX, TRUST, SN, BI, and LP. The section concludes with the integrated conceptual model and the nine sub-hypotheses tested in Chapter III.

1.1. Digitalization and Self-Service Technologies: Contextual Background

Digital transformation has become a defining force in supply chain and logistics management, reshaping how firms design and deliver services across the entire value chain (Paraschiv et al., 2021; Nguyen et al., 2025).

In express delivery and last-mile logistics, digitalization manifests through the integration of technologies such as automated parcel lockers, mobile applications, real-time tracking platforms, and self-service kiosks, all of which reconfigure the relationship between logistics operators and their customers by enabling higher degrees of service autonomy, process transparency, and operational efficiency (Seghezzi et al., 2025; DHL, 2024).

Empirical studies confirm that digitalization enhances supply chain performance across multiple dimensions, including agility, visibility, cost efficiency, and service quality, and that these gains are most pronounced when digital tools are integrated into coherent,

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interoperable platforms rather than deployed as isolated solutions (Ahmad et al., 2024; Paraschiv et al., 2021).

In the Algerian context, digitalization of logistics is still progressing unevenly, with infrastructural, institutional, and user-readiness constraints shaping how self-service solutions are adopted and used (Ben-Hamadou et al., 2025; Boudjema et al., 2023).

Against this background, the present study focuses on customer-facing digitalization as operationalized by DHL Algeria's self-service parcel kiosk: a cyber-physical service point that allows customers to deposit, collect, and return parcels autonomously at any time without counter-staff intervention (Meuter et al., 2000).

Empirical work on parcel locker adoption consistently shows that operational performance gains, including reductions in failed deliveries, route consolidation savings, and lower cost per parcel, are contingent on customer acceptance and effective use of the self-service interface (Seghezzi et al., 2025; Chan et al., 2023; Ahmed & Musa, 2025).

This conditional relationship between technology deployment and customer behavior motivates the theoretical framework developed in the following sections, which focuses on the eight latent constructs directly measured in the empirical model: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP).

1.2. User Experience in Self-Service Technology Contexts

User Experience (UX) is defined by ISO 9241-210 (2019) as the perceptions and responses of users resulting from the use and anticipated use of a system, product, or service, encompassing both pragmatic qualities, such as task effectiveness and efficiency, and hedonic qualities, such as aesthetic appeal and affective engagement (Hassenzahl, 2010).

In self-service technology (SST) environments, UX plays a particularly critical role because customers are required to co-produce the service themselves through a technological interface, with no direct human assistance available (Meuter et al., 2000; Dabholkar, 1996).

Research on kiosk-based SSTs consistently shows that UX quality, operationalized through perceived usability, interface clarity, convenience, perceived control, and security, significantly influences perceived ease of use, perceived usefulness, and trust, which in

turn shape behavioral intention to use (Islam et al., 2024; Alotaibi et al., 2025; Rashid & Kumar, 2025).

In the context of this thesis, UX is operationalized as a single reflective construct capturing users' global evaluation of their interaction with DHL's self-service parcel kiosk, consistent with the measurement approach employed in the empirical study.

Barriers to self-service adoption in emerging markets deserve acknowledgment. Research documents that limited digital literacy, unfamiliarity with self-service interfaces, trust deficits in automated systems, and uneven infrastructure can constrain uptake even when the technology is technically functional (Alotaibi et al., 2025; Khan et al., 2025; Thongkam et al., 2024).

In Algeria, where self-service logistics is still nascent, these contextual constraints make it especially important to assess how interface quality, digital familiarity, social norms, and trust collectively shape customers' adoption intentions, as captured in the eight-construct model developed in this thesis.

1.3. Technology Acceptance, User Experience, and Digital Maturity — Human-Side Determinants of Kiosk Adoption

The preceding section has shown that self-service parcel kiosks emerge within broader digitalization trends in logistics and that their impact on last-mile performance ultimately depends on whether customers are willing to use them. A kiosk can only generate efficiency and reliability gains if users perceive it as easy to operate, beneficial, trustworthy, and socially supported.

Section 2 therefore shifts the analytical focus from the technological infrastructure of digitalization to the human side of the adoption process, drawing on the Technology Acceptance Model (TAM), its extensions, and user experience research (Davis, 1989; Gefen et al., 2003; Venkatesh et al., 2003).

It organizes the conceptual framework around four blocks of determinants: core TAM beliefs (PEOU, PU, TRUST), overall user experience (UX), digital maturity as customers' perception of DHL's digital communication, and subjective norms as perceived social influence. By clarifying how these eight dimensions of the study (DM, PEOU, PU, UX, TRUST, SN, BI, LP) are theoretically linked to behavioral intention and perceived logistics performance, the section provides the conceptual bridge between the literature review and the empirical model tested in Chapters II and III.

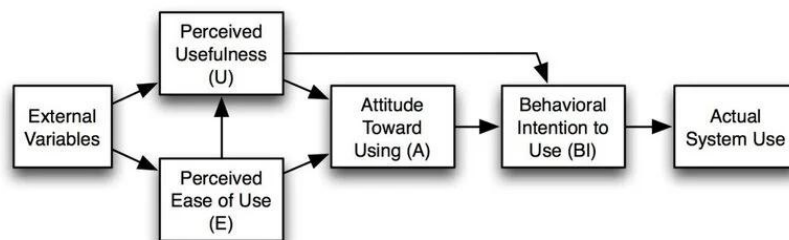
1.4. Technology Acceptance Model (TAM) and UTAUT: Theoretical Foundations of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Behavioral Intention in Logistics and Service Contexts

Understanding why customers adopt or reject self-service parcel kiosks requires a theoretical framework that explains how users form intentions to use new technologies. The Technology Acceptance Model (TAM) is one of the most widely used and empirically validated models for explaining technology adoption in information systems and service research (Davis, 1989; Venkatesh & Davis, 2000).

Originally developed in the context of workplace information systems, TAM posits that individuals' behavioral intention to use a technology is primarily determined by two beliefs: perceived usefulness and perceived ease of use (Davis, 1989).

Perceived usefulness is defined as the degree to which a person believes that using a particular system will enhance their job performance, while perceived ease of use is the degree to which a person believes that using the system will be free of effort (Davis, 1989). These beliefs shape attitudes toward using the system, which, together with perceived usefulness, determine behavioral intention, leading ultimately to actual usage behavior.

Figure 17 : The Technology Acceptance Model (TAM) framework.



Source: adapted from Davis, 1989.

Over time, TAM has evolved through several extensions and integrations that enrich its explanatory power and adapt it to new technological and service contexts. Early work integrated TAM with the Theory of Planned Behavior, adding subjective norms and perceived behavioral control to account for social influence and perceived constraints (Taylor & Todd, 1995).

Later, TAM2 and TAM3 introduced additional determinants of perceived usefulness and perceived ease of use, including social influence processes (subjective norm, image), cognitive instrumental processes (job relevance, output quality, result demonstrability), and

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individual difference factors such as computer self-efficacy and anxiety (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008).

In parallel, the Unified Theory of Acceptance and Use of Technology (UTAUT) consolidated elements from TAM and other models (e.g., Innovation Diffusion Theory, Social Cognitive Theory) into a broader framework that highlights performance expectancy, effort expectancy, social influence, and facilitating conditions as key predictors of behavioral intention and usage (Venkatesh et al., 2003).

In service and e-commerce settings, researchers have repeatedly extended TAM to include trust as a critical construct, given that users must often disclose personal data and rely on remote service providers (Gefen et al., 2003; Pavlou, 2003).

Trust is typically conceptualized as users' belief that the technology and its provider are reliable, secure, and benevolent and that they will not misuse users' data or act opportunistically (Gefen et al., 2003). Empirical studies show that trust exerts both direct and indirect effects on behavioral intention to use, often mediating or moderating the influences of perceived usefulness and perceived ease of use in online banking, e-commerce, and mobile payment contexts (Pavlou, 2003; Gefen et al., 2003).

In many of these models, user perception of privacy protection, security mechanisms, and provider reputation are key antecedents of trust.

As TAM has been applied to self-service technologies (SSTs), including kiosks and self-checkout systems, additional constructs have been incorporated to capture experiential and service-specific aspects. Studies on self-service kiosks in quick-service restaurants, for example, have introduced constructs such as perceived enjoyment, perceived control, perceived risk, and perceived value, alongside usefulness, ease of use, and trust (Rahman et al., 2025; Lim & Tan, 2025).

Perceived enjoyment reflects the intrinsic pleasure derived from using the kiosk; perceived control captures the extent to which users feel able to manage the interaction; perceived risk reflects concerns about errors, payment issues, or data misuse; and perceived value integrates benefits relative to costs (Rahman et al., 2025). These studies generally find that perceived ease of use and perceived usefulness remain central drivers of intention to use, but that enjoyment, control, and perceived value can significantly strengthen or weaken these relationships, especially in consumer contexts where hedonic and experiential factors are salient (Lim & Tan, 2025).

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In logistics and last-mile delivery contexts, TAM and its variants have been adapted to explain adoption of digital platforms, self-service portals, and parcel lockers. Research on self-service portals in logistics, for example, indicates that shippers' and consignees' intention to use online portals for tracking, booking, and documentation is strongly influenced by perceived usefulness (e.g., time savings, transparency, reduced errors) and perceived ease of use (e.g., intuitive navigation, clear information) (Endava, 2022). Logistic-specific adaptations often add constructs capturing service quality (reliability, responsiveness), integration with existing workflows, and perceived compatibility with organizational practices (Hofmann & Osterwalder, 2020).

In the case of parcel lockers, empirical work has shown that perceived convenience (e.g., flexibility in time and location), perceived security, and trust in the operator significantly shape perceived usefulness and behavioral intention to use, while perceived ease of use remains a key determinant of initial trial and continued usage (Chan et al., 2023; Ahmed & Musa, 2025).

Recent studies on parcel lockers and self-service logistics solutions also highlight the importance of habit and social influence as complementary determinants of adoption. Once users become familiar with parcel lockers and integrate them into their routines, habit can partially replace conscious intention as a driver of continued usage, as posited by extended versions of UTAUT and habit-based models (Venkatesh et al., 2012; Chan et al., 2023).

Social influence manifests through perceived norms, recommendations, and observations of peers using the technology; exposure to neighbors or colleagues who frequently use lockers, for instance, has been shown to significantly increase individuals' likelihood of trying and adopting locker-based delivery (Chan et al., 2023).

These findings suggest that, in addition to individual beliefs about usefulness and ease of use, social dynamics and environmental cues play meaningful roles in the diffusion of self-service logistics technologies.

For the purposes of this research, the core TAM constructs are adapted to the context of self-service parcel kiosks as follows. Perceived ease of use reflects the extent to which customers believe that interacting with the kiosk interface, identifying the machine, entering or scanning codes, opening compartments, and completing transactions, is effortless and straightforward. Perceived usefulness captures the degree to which customers believe that using the kiosk improves their parcel experience by saving time,

offering flexibility in pickup and return, or increasing reliability compared to other delivery modes.

Trust refers to users' belief that the kiosk and its operator (here, DHL) will securely handle parcels and personal data, protect against theft and fraud, and resolve problems fairly.

Behavioral intention to use represents users' stated likelihood of using the kiosk for future parcel pickups and returns and thus serves as a proximal indicator of actual adoption behavior.

These constructs will later be integrated with UX dimensions and logistics performance indicators. UX quality influences perceived ease of use, perceived usefulness, and trust by shaping how customers experience the kiosk interface and service environment. In turn, TAM constructs are hypothesized to affect behavioral intention and, through it, Perceived Logistics Performance, specifically customers' perceptions of improved delivery speed and service reliability, as behavioral intention to use the kiosk is expected to reflect a preference for the more efficient self-service channel (Mentzer et al., 2001; Brady & Cronin, 2001).

Section 2.2 will therefore deepen the analysis by examining in detail perceived ease of use, perceived usefulness, trust, and behavioral intention as they apply specifically to self-service parcel technologies.

1.5. Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Trust, and Behavioral Intention as Core Constructs in Self-Service Technology Adoption

Within the Technology Acceptance Model, perceived ease of use (PEOU) refers to the degree to which a person believes that using a particular system will be free of effort (Davis, 1989).

In the context of self-service parcel kiosks, PEOU captures customers' perceptions that the kiosk is simple to locate, understand, and operate, with minimal cognitive and physical effort required to complete key tasks such as parcel pickup and return. Empirical research on self-service kiosks consistently shows that PEOU is a strong predictor of both perceived usefulness and behavioral intention to use (Rahman et al., 2025; Lim & Tan, 2025).

When users find a kiosk interface intuitive, with a clear menu structure, recognizable icons, minimal steps, and responsive feedback, they are more likely to view it as beneficial and to develop positive attitudes toward its use (Rahman et al., 2025).

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In self-service logistics settings, PEOU is influenced by several design and contextual factors. Interface design elements such as font size, contrast, touch target size, and error messages directly affect how easily customers can navigate the system, particularly in public environments where glare, noise, and time pressure may be present (Olea Kiosks, 2024; Wavetec, 2025).

Clear instructions, step-by-step guidance, and consistent layouts reduce cognitive load and help first-time users avoid mistakes. Environmental factors, such as kiosk placement, signage, and queuing arrangements, also matter; hard-to-find kiosks, cluttered surroundings, or confusing queuing systems can increase perceived effort and discourage use (Wavetec, 2025).

Studies on parcel lockers indicate that simple access mechanisms (e.g., scanning a QR code rather than typing long numeric codes) and fast system response times significantly enhance PEOU and increase willingness to reuse lockers (Chan et al., 2023; Ahmed & Musa, 2025).

Perceived usefulness (PU) is defined as the degree to which a person believes that using a particular system will enhance their performance or bring tangible benefits (Davis, 1989).

For self-service parcel kiosks, PU reflects customers' belief that using the kiosk improves their parcel experience, for example, by saving time, offering greater flexibility in pickup/return times, avoiding queues at counters, or reducing missed deliveries. Research on self-service technologies repeatedly confirms PU as a primary determinant of intention to use, often exerting both direct and indirect effects through attitude (Venkatesh & Davis, 2000; Rahman et al., 2025).

In self-service restaurant kiosks, for instance, perceived usefulness in terms of reduced waiting time and greater order accuracy has been shown to significantly increase customers' adoption intentions (Lim & Tan, 2025).

In logistics and parcel locker contexts, PU is closely tied to convenience and reliability. Customers perceive lockers as useful when they offer extended pickup hours, strategic locations embedded in daily routines (e.g., near home, workplace, or transit hubs), and reduced dependency on being at home when the courier arrives (Chan et al., 2023; Ahmed & Musa, 2025).

Additional perceived benefits include privacy (parcels not left at the door), reduced risk of missed deliveries, and, in some cases, lower delivery fees relative to home delivery

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(Ahmed & Musa, 2025). Empirical analyses of parcel locker usage show that perceived convenience and perceived time savings are among the strongest predictors of PU, which in turn drives intention to choose lockers over traditional delivery options. For corporate customers or power users, integration with digital notifications and tracking also enhances PU, as it provides more control and transparency over parcel handling (Endava, 2022).

While PEOU and PU have been central in TAM applications, trust has emerged as a third critical belief in digital and self-service environments. Trust can be broadly defined as users' belief that a technology and its provider are competent, reliable, and benevolent and that they will not misuse users' data or act opportunistically (Gefen et al., 2003; Pavlou, 2003).

In e-commerce and online banking, trust has been shown to significantly influence both perceived usefulness and intention to use, often compensating for perceived risks associated with remote transactions (Gefen et al., 2003). In self-service contexts, trust encompasses both technical trust (confidence in the system's security, stability, and accuracy) and institutional trust (confidence in the service provider's reputation and policies) (Rashid & Kumar, 2025; Petrova, 2025).

For self-service parcel kiosks, trust involves at least three dimensions: security of parcels, protection of personal data, and fairness in problem resolution. Users must believe that parcels stored in lockers are safe from theft, damage, or mishandling; that access codes will not be intercepted or misused; and that CCTV or environmental controls, where present, are adequate (DHL, 2024; Kedia, 2026). They must also trust that their personal data, phone numbers, email addresses, and app credentials are handled according to privacy standards and not shared or exposed unnecessarily (Cyber Insurance Academy, 2024; Eye Security, 2025). Finally, they need confidence that if something goes wrong (e.g., locker malfunction, code not working, parcel missing), the provider will respond quickly and fairly to resolve the issue (Gefen et al., 2003; Ahmed & Musa, 2025).

Studies on SST adoption indicate that higher trust reduces perceived risk, increases perceived value, and directly boosts intention to use and reuse technologies such as kiosks and parcel lockers (Rahman et al., 2025; Lim & Tan, 2025).

Behavioral intention to use (BI) is the key outcome variable in TAM and related models. It represents an individual's conscious plan or willingness to use a technology in the future

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and is widely recognized as a strong predictor of actual usage behavior (Davis, 1989; Venkatesh et al., 2003).

Numerous meta-analyses and empirical studies have confirmed that PEOU, PU, and trust (or closely related constructs such as performance expectancy and effort expectancy) explain a substantial share of variance in BI across different technologies and contexts (Venkatesh & Davis, 2000; Gefen et al., 2003).

In the self-service domain, higher behavioral intention to use kiosks has been associated with higher actual usage, frequency of use, and willingness to recommend the service to others (Rahman et al., 2025; Lim & Tan, 2025).

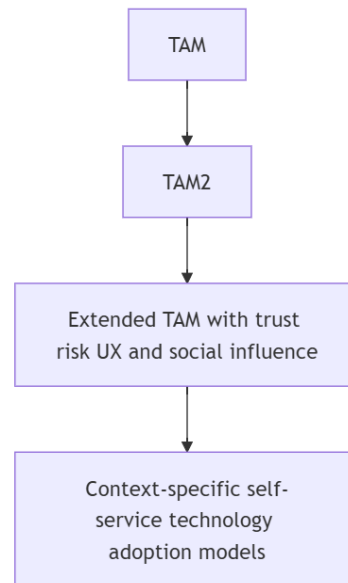
In logistics and parcel locker research, BI is often operationalized with the intention to select lockers instead of home delivery or staffed counters for future parcels, as well as the intention to recommend lockers to friends or colleagues (Chan et al., 2023; Ahmed & Musa, 2025).

These measures are particularly relevant in markets where self-service options coexist with traditional channels and where adoption is still in a growth phase. Empirical findings show that BI is strongly driven by perceived convenience, perceived security, and satisfaction with prior locker experiences, in addition to the core TAM variables (Chan et al., 2023).

Habit and social influence can further strengthen the link between intention and behavior over time, as repeated use turns locker pickup into a routine and observation of peers normalizes the practice (Venkatesh et al., 2012; Chan et al., 2023).

For this thesis, these four constructs, perceived ease of use, perceived usefulness, trust, and behavioral intention to use, will form the technology acceptance block of the conceptual model for self-service parcel kiosks at DHL Algeria. UX quality, as conceptualized in Section 1.6, is expected to shape PEOU (through interface simplicity and clarity), PU (through perceived time savings, convenience, and reliability), and trust (through perceived security, consistency, and professionalism), which together determine BI. In turn, BI and actual usage are hypothesized to affect logistics performance by increasing the share of parcels processed through kiosks, reducing delivery failures, and improving service quality indicators. The next section will complement this perspective by examining user experience design principles and UX dimensions that are specifically relevant to self-service parcel kiosks.

Figure 18 : Evolution of the Technology Acceptance Model toward context-specific self-service technology adoption models.



Source: Adapted from Davis 1989, Ramayah et al. 2023, Islam et al. 2024, and Alotaibi et al. 2025.

1.6. User Experience (UX): Construct Definition and Scale Grounding

In the empirical model of this thesis, User Experience (UX) is treated as a single reflective construct measuring users' overall evaluation of interacting with DHL's self-service parcel kiosk. This operationalization, while parsimonious, is well-grounded in established measurement traditions. The User Experience Questionnaire (UEQ) developed by Laugwitz, Held, and Schrepp (2008) provides validated items measuring attractiveness, perspicuity, efficiency, stimulation, and dependability, several of which were adapted to the kiosk context for the present survey.

Dabholkar's (1996) five-item scale measuring perceived service quality in SST encounters was also drawn upon, as it captures the instrumental (effectiveness, efficiency) and relational (reliability, responsiveness) dimensions of SST interactions. The UX-TRAM model developed by Islam et al. (2024), which positioned UX readiness and dimensions as upstream predictors of PEOU, PU, and behavioral intention in airport kiosk contexts, provides direct empirical justification for treating UX as an antecedent of TAM constructs rather than a corollary.

Consistent with prior SST research, UX in this study is hypothesized to exert a direct positive effect on Behavioral Intention (BI), alongside its influence on PEOU and TRUST. Experimental and survey-based evidence shows that improving UX through clearer

navigation, more responsive feedback, and visually coherent design significantly raises perceived ease of use, usefulness, and trust, which collectively increase adoption intentions (Rashid & Kumar, 2025; Lim & Tan, 2025; Alotaibi et al., 2025).

The link between UX and trust is particularly salient in parcel logistics, where users must entrust physical goods and personal data to an automated system; interface design that communicates security and professionalism has been shown to substantially reduce perceived risk and strengthen trusting beliefs (Petrova, 2025; Gefen et al., 2003).

1.7. Digital Maturity (DM): Construct Definition and Scale Grounding

The Digital Maturity construct (DM) in this thesis is operationalized at the individual customer level as respondents' self-reported familiarity and comfort with DHL Algeria's digital communication channels and interfaces, including the website, mobile application, email and SMS notifications, and the kiosk terminal itself.

This customer-side conceptualization follows Hess et al.'s (2016) framework of individual digital readiness as a precursor to digital service adoption, and draws directly on Parasuraman and Colby's (2015) Technology Readiness Index (TRI 2.0), a validated instrument measuring consumer optimism toward, and discomfort with, digital technologies. Items from TRI 2.0 were adapted to reflect familiarity with DHL's specific digital ecosystem. Blut and Wang's (2020) meta-analytic work on consumer technology readiness further confirms that individuals with higher digital channel proficiency perceive self-service interfaces as easier to use and more useful, and are significantly more likely to adopt them, providing the theoretical rationale for positioning DM as an exogenous antecedent of PEOU and PU in the structural model.

It is important to distinguish this operationalization from firm-level digital marketing strategy, which encompasses content planning, channel management, and analytics-driven campaign execution (Chaffey & Ellis-Chadwick, 2022).

The present study does not measure DHL Algeria's marketing investments or communication quality; rather, it captures the degree to which individual customers are already accustomed to engaging with the firm through digital touchpoints. This narrower scope is appropriate because kiosk adoption is ultimately a customer decision, and it is the customers' own digital readiness, rather than the firm's marketing sophistication per se, that is theoretically expected to shape their cognitive beliefs about a new digital service interface (Meuter et al., 2003; Mostaghel, 2016).

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Prior empirical work confirms that users with higher digital familiarity perceive SSTs as requiring less effort and delivering greater value, which directly maps onto the PEOU and PU paths in the TAM-based structural model (Meuter et al., 2003; Islam et al., 2024).

Subjective Norms (SN): Construct Definition and Scale Grounding

Subjective Norms (SN) refer to an individual's perception that important others such as family, friends, or colleagues believe they should use the self-service kiosk (Ajzen, 1991; Venkatesh & Davis, 2000).

In the present study, SN is measured with a single item (SN1) due to the exploratory character of the study and the preliminary nature of kiosk adoption in Algeria, where social influence norms are not yet crystallized around this specific technology. Single-item measurement of subjective norms has precedent in TAM research where the construct is treated as secondary to utility-based beliefs (Venkatesh et al., 2003). The item was adapted from Taylor and Todd (1995).

2. Perceived Logistics Performance (LP): Construct Definition and Scale Grounding

The Perceived Logistics Performance construct (LP) in this thesis captures customers' subjective assessment of the delivery service quality associated with DHL Algeria's self-service parcel kiosk, scoped deliberately to two operational dimensions: perceived delivery speed and perceived service reliability. This focused operationalization reflects both a theoretical choice and an empirical constraint. Theoretically, speed and reliability consistently emerge as the two most salient customer-perceived dimensions of logistics service quality in the last-mile context (Bowersox, Closs, & Cooper, 2002; Mentzer, Flint, & Hult, 2001).

Empirically, access to internal DHL Algeria operational data was not available for this study, making perceived performance measures, which have been shown to correlate strongly with objective operational outcomes in the logistics research literature, the appropriate operationalization (Mentzer et al., 2001).

The measurement items for LP are adapted from two validated sources. The Logistics Service Quality (LSQ) scale developed by Mentzer et al. (2001) provides items measuring perceived timeliness, information accuracy, and order consistency that were adapted to the kiosk context, focusing on the speed of dispatch processing and the accuracy of delivery time estimates. Stank, Keller, and Daugherty's (2001) scale measuring perceived logistics

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responsiveness and dependability provided complementary items addressing the consistency of delivery time estimates and the dependability of the kiosk system in registering shipments accurately.

Brady and Cronin's (2001) hierarchical service quality framework further supports the theoretical basis for treating customer-perceived service outcomes as meaningful and valid indicators of logistics performance, even in the absence of objective operational data. Four reflective items were retained after expert review and pilot testing: two addressing perceived speed (processing speed at the kiosk; speed of delivery confirmation) and two addressing perceived reliability (consistency of estimated delivery windows; dependability of the system in recording parcel transactions without error).

In the structural model, Behavioral Intention (BI) is hypothesized to exert a direct positive effect on LP. This hypothesis rests on the argument that customers who form a strong intention to use the kiosk, and who translate that intention into actual adoption, are more likely to experience the operational benefits of the self-service channel, including faster parcel processing, reduced queuing, and more reliable tracking, compared to those who use traditional counter-based services. This proposition is theoretically consistent with service research demonstrating that higher engagement with service delivery channels is associated with more favorable perceptions of service quality (Brady & Cronin, 2001; Gefen et al., 2003), and empirically grounded in parcel locker research showing that satisfied, habitual locker users report significantly higher perceived delivery efficiency and reliability than non-users (Chan et al., 2023; Ahmed & Musa, 2025).

2.1. Conceptual model and research hypotheses: eight core dimensions of the study

The preceding sections have outlined several theoretical perspectives on self-service parcel kiosks, including technology acceptance, user experience, digital communication, and logistics performance. For the empirical part of this thesis, these perspectives are translated into a streamlined conceptual model centered on eight latent dimensions that are actually measured in the survey and tested using PLS-SEM: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP).

Digital Maturity represents customer's familiarity and comfort with DHL Algeria's digital communication channels and self-service tools. Prior research on digital communication,

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technology readiness, and user support suggests that clear, credible, and user-friendly digital interaction can strengthen users' beliefs that a system is easy to use and useful (NIST, 2021; ISO, 2019). In line with this reasoning, the present model treats DM as an upstream driver of PEOU and PU.

Perceived Ease of Use and Perceived Usefulness form the backbone of the Technology Acceptance Model and have consistently been shown to predict user acceptance of new technologies (Davis, 1989). In this thesis, PEOU captures the extent to which customers believe that interacting with the DHL self-service parcel kiosk would be free of effort, whereas PU reflects the perceived benefits of the kiosk in terms of time savings and improved shipping experience. Consistent with TAM, the conceptual model assumes that PEOU positively influences PU and that both constructs exert direct positive effects on BI (Davis, 1989; Venkatesh & Davis, 2000).

User Experience is defined as a global evaluation of the quality of interaction with the kiosk, including interface clarity, convenience of kiosk locations and opening hours, and users' perceived control over the transaction. Human-centered design research emphasizes that interactive systems should address the whole user experience and be designed around users' needs, tasks, and environments (ISO, 2019; NIST, 2021).

Although the UX literature distinguishes multiple sub-dimensions such as usability, convenience, security, affective experience, and cross-channel consistency, the empirical model in this thesis operationalizes UX as a single reflective construct. In other words, the different experiential aspects discussed earlier are conceptually integrated into one overall UX judgment, which is hypothesized to have a direct positive effect on BI.

Trust refers to customers' confidence that the kiosk and DHL will handle parcels, payments, and personal data securely and reliably. In digital service research, trust has been shown to be a major determinant of intended behavior and to operate alongside perceived usefulness and perceived ease of use in explaining adoption decisions (Gefen et al., 2003; Pavlou, 2003). The present conceptual model therefore includes TRUST as an additional psychological driver of BI.

Subjective Norms capture the perceived social influence of family, friends, and colleagues on the decision to use the self-service parcel kiosk. Extensions of TAM and the Unified Theory of Acceptance and Use of Technology indicate that social influence can shape behavioral intention, particularly in settings where users rely on the views of important

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others (Venkatesh & Davis, 2000; Venkatesh et al., 2003). Accordingly, SN is incorporated as a complementary social determinant of BI.

Behavioral Intention represents customers' stated likelihood of trying and regularly using the kiosk and recommending it to others. In the technology acceptance literature, behavioral intention is widely recognized as the most proximal predictor of actual use (Davis, 1989; Venkatesh et al., 2003). In this study, BI is therefore the central endogenous construct that aggregates the effects of DM, PEOU, PU, UX, TRUST, and SN.

Perceived Logistics Performance captures customers' perception that the deployment of self-service parcel kiosks would improve DHL Algeria's delivery speed and reliability. Because access to internal operational KPIs was not available, LP is deliberately restricted to these two perceptual indicators instead of attempting to cover cost, error rates, or other internal performance metrics. This choice is consistent with service research showing that perceived performance and outcome quality are meaningful evaluative constructs in service contexts (Brady & Cronin, 2001). The model therefore assumes that higher behavioral intention to use the kiosk is associated with more favorable perceptions of logistics performance, especially in terms of speed and reliability.

These eight dimensions are linked through nine sub-hypotheses, which are formally specified in Chapter II and tested empirically in Chapter III. They can be grouped into four overarching propositions. First, higher digital maturity is expected to positively influence perceived ease of use and perceived usefulness. Second, perceived ease of use is expected to feed into perceived usefulness and directly into behavioral intention, while perceived usefulness also exerts a direct positive effect on intention (Davis, 1989; Venkatesh & Davis, 2000). Third, user experience, trust, and subjective norms are treated as complementary experiential and social drivers of behavioral intention (Gefen et al., 2003; Venkatesh et al., 2003). Fourth, higher behavioral intention to use the kiosk is hypothesized to be associated with improved perceived logistics performance at DHL Algeria, particularly in terms of delivery speed and reliability (Brady & Cronin, 2001).

Figure 19 presents the resulting conceptual model, which includes only these eight dimensions and the corresponding structural paths. This figure is aligned with the measurement and a structural model specified in Chapter II and provides the theoretical foundation for the PLS-SEM analysis conducted in the empirical part of the thesis.

2.2. Synthesis: towards an integrated smart logistics and supply chain framework

The theoretical and conceptual developments in this chapter converge toward a focused framework in which eight core dimensions structure the analysis of self-service parcel kiosks at DHL Algeria: Digital Maturity (DM), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP). Prior work on SST and parcel locker adoption shows that TAM-type beliefs, user experience, and social influence are central determinants of customers' intention to use self-service technologies (Na et al., 2021; Oh et al., 2023; Yusoff et al., 2023).

In parallel, the smart logistics literature emphasizes the role of digital technologies, connectivity, and data-driven coordination in enhancing end-to-end supply chain visibility and responsiveness, particularly in the last-mile. The present chapter has therefore retained only those constructs that can be directly measured in the survey and tested in the empirical model, while treating broader digitalization, smart logistics, and performance frameworks as background context rather than as operationalized dimensions.

Within this streamlined framework, DM captures how customers perceive DHL's digital communication and their own readiness to use self-service tools; PEOU and PU represent the core TAM beliefs that the kiosk is easy to use and useful; UX summarizes the overall quality of the interaction with the kiosk; TRUST reflects confidence in DHL and the technology; and SN expresses the perceived social pressure to adopt the kiosk (Davis, 1989; Gefen et al., 2003; Venkatesh et al., 2003).

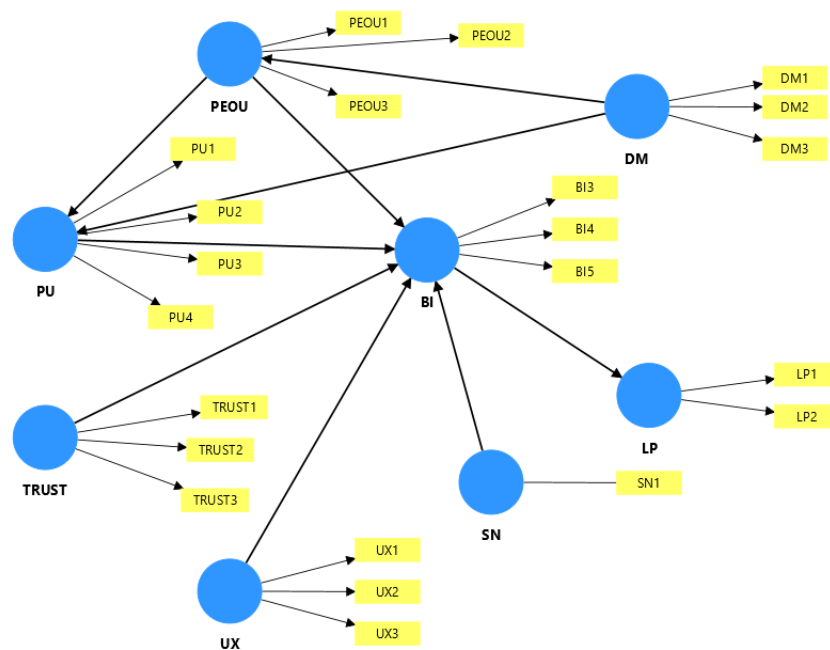
From a smart logistics perspective, the self-service parcel kiosk is treated as an intelligent last-mile touchpoint that integrates digital interaction, automated processing, and information flows with DHL's wider logistics system. These antecedents jointly feed into BI, which, in line with technology acceptance research, is treated as the most immediate predictor of use, and into LP, which operationalizes customer-perceived improvements in delivery speed and reliability (Brady & Cronin, 2001).

This eight-dimension conceptual model directly addresses the research problem and questions outlined at the beginning of the chapter by specifying how UX quality, TAM beliefs, digital maturity, and subjective norms are expected to influence behavioral intention to use the kiosk and, through it, perceived logistics performance in the Algerian context.

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At the same time, it positions the kiosk within a broader smart logistics and supply chain perspective, where self-service technologies support more flexible, data-enabled last-mile operations without over-complicating the empirical model. It also provides a theory-driven but empirically tractable foundation for the PLS-SEM analysis conducted later in the thesis. Chapter II builds on this framework to specify the operationalization of constructs, the research design, and the data collection and analysis procedures, translating the conceptual relationships developed here into measurement models and structural paths that can be estimated and evaluated empirically.

Figure 19 : Conceptual model of kiosk adoption and perceived logistics performance.



Source: Author's conceptualization based on Chapter I.

Conclusion of Chapter 01

This chapter has established the theoretical and conceptual foundations of the thesis by reviewing research on self-service technologies, technology acceptance, user experience, trust, social influence, digitalization in logistics, and PLS-SEM applications. It showed that, despite rich evidence on SST and parcel lockers in other contexts, there remains a gap in understanding how UX, extended TAM constructs, and perceived logistics performance interact in an emerging-market setting such as Algeria. Synthesizing these insights, the chapter defined eight core dimensions—digital maturity, perceived ease of use, perceived usefulness, user experience, trust, subjective norms, behavioral intention, and perceived logistics performance—and articulated a parsimonious conceptual model and research hypotheses. This model provides a focused, empirically tractable framework that guides the design of the quantitative study and the subsequent analysis of self-service parcel kiosk adoption at DHL Algeria.

CHAPTER II

METHODOLOGICAL FRAMEWORK

CHAPTER II: Methodological Framework

Building on Chapter I, which reviewed the literature on SST adoption, UX integration, and digital maturity, and developed the eight-construct conceptual model (DM, PEOU, PU, UX, TRUST, SN, BI, LP), this chapter presents the research context and methodology underpinning the empirical investigation.

This chapter presents the research context and methodology. Section 1 presents the research context at two levels: national and organizational. The national level examines the digital transformation of logistics and supply chains in Algeria, providing an institutional backdrop for the empirical investigation. The organizational level profiles DHL Algeria as the research site, including its service portfolio, digitalization trajectory, and last-mile challenges.

Section 2 presents the quantitative research design, covering the epistemological positioning of the study, the justification for the quantitative approach and the use of PLS-SEM, the conceptual model and hypotheses, and the operationalization of constructs. Section 3 describes sampling, data collection, and data analysis, including sampling strategy, data collection procedure, and the PLS-SEM analytical framework used to test the nine sub-hypotheses (H4a–H4i).

Methodological Justification — Quantitative-Only Design:

Although the original research design planned to include a qualitative interview component, access constraints encountered during the internship period prevented obtaining formal manager interviews or internal operational KPI data within the timeframe of this study. The study therefore relies on a quantitative cross-sectional survey design, which is commonly used and well-suited for testing TAM-based models (Hair et al., 2019). This approach is consistent with the majority of comparable SST adoption studies, including Na et al. (2021), Thongkam et al. (2024), and Islam et al. (2024), all of which adopt quantitative-only survey designs with PLS-SEM. The cross-sectional survey instrument is sufficient to test the nine sub-hypotheses (H4a–H4i) and to evaluate the predictive power of the model.

Section 1: Research Context and Presentation of DHL Algeria

This Section presents the organizational and operational context in which the self-service parcel kiosk initiative is embedded. It describes DHL Algeria's history, strategic priorities, activities, internal organization, and digital infrastructure, focusing on how these elements shape current logistics performance. The section also introduces the kiosk project and its expected contributions to last-mile delivery, thereby clarifying why kiosk adoption is strategically relevant for DHL Algeria.

1. DHL at the international level

DHL is a leading global express operator, serving over 220 countries and territories through a highly integrated, digitally supported network. This global experience with self-service and digital solutions forms the strategic backdrop for DHL Algeria's kiosk initiative.

1.1 Context of the Research: Digitalization in Algeria and in the Logistics Sector

To situate this initiative, DHL Algeria must be viewed within the broader dynamics of national digital transformation and the gradual digitalization of the logistics sector. The following subsections present, first, the general digital context in Algeria and, second, the emergence of digital tools in logistics and supply chains.

1.1.1 General digitalization context in Algeria

Algeria has positioned digital transformation as a national strategic priority over the past decade. The government's Algeria Digital 2025 roadmap, launched under presidential initiative, sets ambitious targets for e-government, digital infrastructure, and the promotion of the digital economy across all sectors. At the connectivity level, Algeria ranked 80th out of 169 countries on the ITU ICT Development Index in 2024, with an IDI score of 80.9, reflecting significant progress in fixed and mobile broadband infrastructure. As of 2024, approximately 71.2% of Algerian individuals use the internet, and 80.6% of households have home internet access (ITU, 2024). Mobile penetration is near-universal, with more than 45 million active mobile subscriptions, making smartphones the primary digital access point for most Algerians.

In parallel, Algeria's e-commerce market has grown consistently, reaching an estimated volume of 1,202 billion euros in online sales in 2024, up from 542 million euros in 2017

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(Statista, 2025). Since 2024, more than 454 digital platforms have been launched across all sectors under the Algeria Digital Conference initiative, signaling a rapid acceleration of the country's digital ecosystem (Les Champions Économiques, 2024). These developments create a structural demand for digital logistics solutions capable of handling growing parcel volumes generated by online trade.

1.1.2 Digitalization of logistics and supply chain in Algeria

Despite this macro-level momentum, the logistics sector in Algeria remains in an early stage of digital transformation. Research conducted on digital logistics platforms in Algeria reveals that, while government initiatives encourage platform development, adoption by logistics operators remains limited and uneven (Meurier & Gharbi, 2025). Fifth-party logistics providers (5PLs), which develop and operate digital platforms connecting shippers, carriers, and other supply chain actors, are beginning to emerge, with companies such as SeltyGO, Opticharge, APCS, and Techno Edge Solutions offering specialized digital logistics solutions. However, demand from logistics operators and industrial clients for these platforms remains modest, and significant barriers to adoption persist (Meurier & Gharbi, 2025).

These barriers operate at three levels. At the individual level, opportunism and lack of digital skills among employees, including resistance to enabled transparency by traceability platforms, constitute significant obstacles to adoption. At the organizational level, inadequate internal processes, high staff turnover in ICT roles, and fiscal concerns create resistance to change. At the inter-organizational level, reluctance to share operational data across supply chain partners, driven by fear of losing control over commercial relationships, further slows the integration of digital logistics platforms (Meurier & Gharbi, 2025). These findings from the Algerian logistics context are directly relevant to the present study, as they help explain the particular conditions under which DHL Algeria's digital kiosk initiative must be designed and implemented.

At the same time, the Algerian logistics ecosystem is undergoing structural expansion. The emergence of e-commerce operators, the growth of SME demand for delivery services, and government pressure to modernize port, customs, and transport operations have generated concrete demand for digital solutions ranging from warehouse management systems (WMS) and transport management systems (TMS) to digital customer-facing platforms. This context confirms that, while barriers exist, the strategic opportunity for digital

logistics innovation in Algeria — including self-service parcel kiosk solutions — is both real and timely.

1.1.3 Digital logistics platforms as a strategic opportunity for DHL Algeria

Within this emerging ecosystem, DHL Algeria occupies a privileged position. As the subsidiary of the world's leading express logistics group, it benefits from access to globally tested digital tools and operational know-how that most Algerian competitors cannot match. Its strategic relevance as a case study for digital logistics adoption is further reinforced by the fact that self-service parcel kiosk solutions are already being tested and deployed in comparable international and regional markets — in Europe, the Middle East, and Asia, where DHL and competing operators have demonstrated measurable improvements in last-mile performance through parcel locker and kiosk systems (Oh et al., 2023; Seghezzi et al., 2025).

In the Algerian market specifically, DHL Algeria's initiative to introduce a self-service parcel kiosk concept represents an early-mover opportunity: it allows the company to test and adapt a globally proven digital logistics solution to the local context before competitors do so, and to generate the empirical evidence needed to justify further investment. The present thesis examines precisely this opportunity — studying how Algerian customers perceive and accept such a solution, and how their behavioral intention to use it relates to perceived improvements in logistics performance.

1.2. Foundation of DHL

DHL is an international express shipping, courier, and logistics service provider. It was founded in 1969 in the United States by Adrian Dalsey, Larry Hillblom, and Robert Lynn, with the company name formed from the initials of their surnames. From the outset, DHL developed multimodal freight transport capabilities, using aircraft, road, rail, and maritime transport to handle urgent document and parcel deliveries worldwide. Over time, the company has grown into a global logistics group employing hundreds of thousands of people across more than 220 countries and territories, and is now majority-owned by Deutsche Post DHL Group, headquartered in Bonn, Germany, under the leadership of its global management team.

1.3. Key figures

At group level, Deutsche Post DHL has achieved steady revenue growth in recent years, supported in particular by the expansion of e-commerce and express parcel volumes. The group handles millions of shipments each day, operates thousands of daily flights, and serves a very large base of active customers through a network that spans virtually all regions of the world. These key figures illustrate the scale at which DHL operates and the importance of standardized processes, digital systems, and service quality in maintaining its competitive position in international express logistics.

1.4. History and evolution

The evolution of DHL is marked by several milestones that have shaped the development of the international express industry. Shortly after the 1969 moon landing, Dalsey, Hillblom, and Lynn launched DHL as the first international door-to-door express delivery service, initially focused on carrying shipment documents by air so that customs authorities could process paperwork before the physical cargo arrived. This simple but innovative idea allowed shippers to save days or even weeks on transit times and effectively created the international air express sector. Over subsequent decades, DHL expanded into Asia and other world regions, diversified beyond documents into small packages, opened major hubs in Brussels and Leipzig, became part of Deutsche Post DHL Group, and adopted long-term strategies such as the “Focus” 2025 plan and the commitment to zero-emission logistics by 2050. Together, these milestones show how DHL combined global network expansion, service diversification, and sustainability commitments to consolidate its leadership in express logistics.

1.5. DHL product and solution portfolio

DHL’s core business consists of transporting time-sensitive documents and parcels from door to door with high reliability and punctuality, anywhere in the world. As the operator of a global network, the company applies standardized processes and continuously optimizes its services in order to keep its customer promise and meet diverse logistics needs. Its portfolio includes international and domestic express services, import and export solutions, and a range of professional logistics offerings. For international express, DHL provides time-definite delivery services, same-day emergency pickup and delivery options, and tracking-enabled parcel and document services designed to match different urgency and cost requirements. This portfolio illustrates the positioning of DHL as a premium

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provider of fast and reliable delivery solutions, which is directly relevant to the performance dimensions examined in this study.

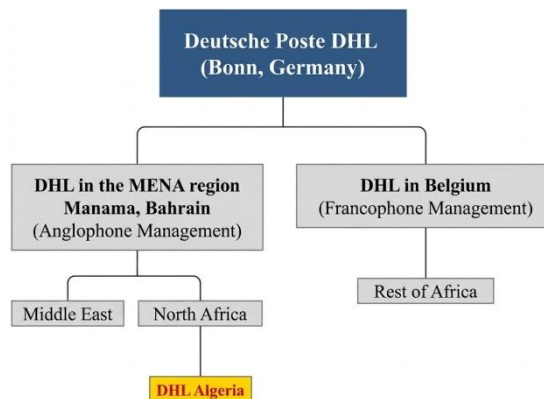
1.6. Strategic framework of the FOCUS 2025 strategy (mission, vision, values, and objectives)

Within the “Focus 2025” strategic framework of Deutsche Post DHL Group, DHL’s mission is summarized as “Excellence. Simply delivered.”, reflecting its ambition to provide superior quality in international express, freight, and logistics services while upholding social and environmental responsibilities. Its vision is to be the logistics company of choice worldwide—for customers, employees, and investors—by setting the benchmark in responsible and innovative logistics practices. The company’s values emphasize speed, passion, a “can-do” attitude, and doing things right the first time, and its key objectives include motivated employees, excellent service quality and loyal customers, and a profitable, resilient global network. This strategic framework provides the backdrop against which DHL Express Algeria develops its own initiatives, including digital solutions such as self-service parcel kiosks.

1.7. DHL Express Algeria

DHL International Algeria was founded in 1994 as a local subsidiary of DHL, initially associated with DHL in the United States and later fully integrated into Deutsche Post DHL Group when the German parent company acquired all shares. During the early period of American management (1994–2002), DHL’s activities in Algeria were overseen from Belgium, reflecting a Francophone management structure, before regional oversight shifted to the Middle East and North Africa (MENA) region based in Bahrain in 2008. Since March 1, 2016, DHL Algeria has been under the leadership of an Algerian Managing Director, Mr. Abd Illah Melaika, making the subsidiary 100% Algerian in terms of its management team and workforce. DHL Express Algeria has progressively become one of the key contributors in the MENA region in terms of revenue, supported by growing trade flows and the rise of e-commerce. Its position within the global DHL network is illustrated by its integration into the North Africa and Middle East regional cluster, under the strategic guidance of the group’s global headquarters.

Figure 20 : Hierarchical Positioning of DHL Algeria within the Deutsche Post DHL Group Structure



Source: Regional Reporting Line from Bonn (Germany) through MENA Man

1.8. Divisions and organizational chart of DHL International Algeria

In 2020, DHL International Algeria had 210 employees distributed across six different departments under a single main division, DHL Express. The organizational chart of DHL Algeria, presented below in Figure 3, shows these six departments and distinguishes three socio-professional categories: managers, supervisors, and agents, even though the chart prepared by the HR department supervisor does not indicate the positions of the agents. At DHL Algeria, some employees also work in connection with external partners linked to certain bodies, such as security services and personnel responsible for security.

Figure 21 : Organizational chart DHL Algeria 2021



Source : SPC/RH Departement DHL Algeria.

1.9. Presentation of business units and key departments

DHL Algeria is organized along three main business units aligned with the global group: DHL Express, DHL ecommerce, and DHL Global Forwarding, supported by core

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departments such as Operations, Customer Service, and Information Technology. Together with external partners like customs and security providers, this structure frames how a self-service parcel kiosk can be integrated into existing processes and how it may affect both operations and customer experience.

1.10. Operations department

The Operations department is the production core of DHL Algeria, managing the end-to-end physical flow of shipments from pickup to final delivery. Organized into import, export, and customs divisions, it handles routing, sorting, manifesting, customs formalities, transfers, and tracking, making it the central unit through which self-service parcel kiosks can influence productivity and last-mile reliability.

1.11. Customer Service department

The Customer Service department sits at the interface between commercial functions and operations and is responsible for most direct interactions with clients at the station level. Its core activities include counter reception and communication with walk-in customers, cash handling for shipments, shipment tracing and status updates, management of pending or problematic consignments, and follow-up on customs-related issues. From the perspective of this thesis, Customer Service is particularly important because the introduction of self-service parcel kiosks is expected to offload some routine counter transactions—such as parcel registration, payment, and documentation—thereby reducing workload and potentially improving perceived service quality.

1.11 . Information Technology department

The Information Technology (IT) department provides the digital infrastructure that supports all other functions at DHL Algeria. Its responsibilities range from deploying and maintaining hardware (computers, scanners, printers) and software (DHL's proprietary operational applications) to managing the telecommunications networks that enable real-time data transmission within the station and with the global DHL network. A critical part of its mission is to ensure the reliability of the pre-alert and checkpoint systems used to track shipments at each stage of their journey, which underpins the visibility experienced by customers via platforms such as MyDHL+ and online tracking interfaces. Any disruption in IT performance can directly affect shipment visibility and customer experience, highlighting the strategic importance of IT in the context of digital self-service solutions such as parcel kiosks.

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Table 2 : SWOT Analysis of DHL Algeria

STRENGTHS (Internal - Positive)	WEAKNESSES (Internal - Negative)
<ul style="list-style-type: none"> • Global Dominance: Access to 220+ countries with a domestic presence in Algeria that leverages a growing network of parcel kiosks. • Financial Resilience: Backed by Deutsche Post DHL, operating in a market where the e-commerce sector is projected to reach \$2.34 billion by 2025. • Logitrans Synergy: Potential to leverage the 10 national logistics platforms (Algiers, Oran, Sétif, Constantine, Ouargla, Ghardaïa, Adrar, Illizi, Tamanrasset, and Tindouf) which now serve as regional hubs for export and transit. 	<ul style="list-style-type: none"> • Premium Pricing: DHL's high-cost model remains a barrier for the 800+ new online merchants registered in 2024 who prioritize low-cost delivery. • Infrastructure Gaps: While the 10 platforms exist, their full digital integration is still in "early stages," leading to operational bottlenecks in the "Last Mile" delivery. • Cash Dependency: Despite progress, a significant portion of B2C transactions still relies on Cash-on-Delivery (CoD). • Resistance to Digital Adoption: Managerial, organizational, and inter-organizational resistances hinder the full deployment and acceptance of digital logistics platforms among Algerian service providers.
OPPORTUNITIES (External - Positive)	THREATS (External - Negative)
<ul style="list-style-type: none"> • Digital Payment Surge: Algeria now has 20,498,350 active bank cards (16.2M Dahabia, 4.3M CIB) as of April 2025. • E-Payment Growth: Electronic payments surged by 46% in 2025, reaching 939 billion DZD. • Strategic Hubs: The Tamanrasset and Tindouf platforms are now critical for the "Strategy of the Great South," opening routes to Mauritanie and Sub-Saharan Africa. • Dynamic Innovation Capacity: The deployment of digital platforms fosters a dynamic capacity for innovation, allowing for the development and application of new concepts and services in logistics. 	<ul style="list-style-type: none"> • State Competition: Logitrans and EMS Champion Post are modernizing rapidly, with 27 new strategic agreements signed in 2026 to enhance national logistics sovereignty. • Informal Market Persistence: Informal trade still competes with formal logistics, though digitalization is actively working to reduce this "parallel economy". • Regulatory Shifts: Rapid changes in digital trade laws require constant compliance updates. • Entrenched Resistances: Persistent managerial, organizational, and inter-organizational resistances to digital adoption could slow down the integration of advanced logistics solutions and give an advantage to more adaptable competitors.

Source: Author synthesis based on DHL Algeria

Section 2: Quantitative Research Design and Measurement Model

Section 2 describes the quantitative research design used to test the conceptual model developed in Chapter I. It explains the overall design and objectives, justifies the choice of

a cross-sectional survey and PLS-SEM, and specifies the eight constructs included in the model. The section also details the operational definitions and measurement scales for each construct and describes the structure and pretest of the questionnaire used for data collection.

1. Epistemological positioning of the study

This study adopts a positivist epistemological stance with a predictive–exploratory orientation. In a positivist view, knowledge about social phenomena can be approximated objectively by formulating theory-driven hypotheses, operationalizing latent constructs through standardized measurement instruments, and testing the resulting relationships using statistical models (Bryman, 2016; Saunders et al., 2019). Within this stance, constructs such as digital maturity, perceived ease of use, perceived usefulness, user experience, trust, subjective norms, behavioral intention, and perceived logistics performance are treated as measurable variables whose patterns of association can be estimated and evaluated in order to better understand and predict kiosk adoption behavior in the DHL Algeria context.

The choice of a positivist, predictive–exploratory stance provides the philosophical grounding for using a quantitative cross-sectional survey and variance-based structural equation modeling (PLS-SEM) as the core methodological tools of the thesis (Hair et al., 2019; Sarstedt et al., 2022). Rather than seeking strict model confirmation or causal proof, the research focuses on exploring and estimating the strength of theoretically grounded predictive relationships among the eight latent constructs, maximizing explained variance and predictive relevance while acknowledging the limits of a single-case, perception-based design. This positioning aligns the epistemology with the practical aim of the study, which is to understand and forecast customers intention to use the self-service parcel kiosk and its perceived impact on logistics performance at DHL Algeria.

1.1. Overall research design and objectives

The quantitative component of this research was designed to empirically test the Technology Acceptance Model (TAM)-based framework developed in Chapter I, applied to the specific context of DHL Algeria's proposed self-service parcel kiosk. The primary objective was to explain and predict customers' behavioral intention to use the kiosk and their perception of its potential impact on DHL Algeria's logistics performance.

More specifically, the quantitative study pursued the following objectives:

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1. To measure customers perceptions of the kiosk across eight latent dimensions: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), User Experience (UX), Trust (TRUST), Digital Maturity (DM), Subjective Norms (SN), Behavioral Intention (BI), and Perceived Logistics Performance (LP).
2. To estimate the strength and statistical significance of the structural relationships between these constructs, particularly the direct and indirect drivers of behavioral intention.
3. To assess the extent to which behavioral intention to use the kiosk translates into a positive perception of DHL Algeria's logistics performance.
4. To provide empirical evidence that supports or challenges the theoretical hypotheses formulated in Chapter I and to derive actionable insights for DHL Algeria's digitalization strategy.

Note: Digital Maturity (DM) captures customers' individual-level familiarity and comfort with DHL Algeria's digital communication interfaces (website, app, digital notifications). It is conceptually distinct from firm-level digital marketing strategy and is operationalized here as a customer perception construct, consistent with technology readiness research (Parasuraman & Colby, 2015; Blut & Wang, 2020).

This design follows a deductive approach, moving from theory-driven hypotheses to empirical testing through a structured survey instrument and advanced multivariate statistical analysis.

1.2. Justification of the quantitative approach and choice of PLS-SEM

A quantitative research design was selected for this study because the research objectives are fundamentally concerned with measuring latent perceptions and testing theoretically grounded causal relationships across a sufficiently large group of respondents. The use of standardized Likert-type scales enabled systematic comparison of attitudes toward the kiosk concept and ensured that data could be subjected to rigorous statistical testing.

Within the quantitative paradigm, Partial Least Squares Structural Equation Modeling (PLS-SEM) was chosen as the primary analytical method for the following reasons:

4. First, the conceptual model involves multiple latent constructs connected through complex mediating and direct structural paths (e.g., $DM \rightarrow PEOU \rightarrow PU \rightarrow BI \rightarrow LP$). Such a model goes well beyond what simple regression analysis or individual reliability tests could evaluate simultaneously.

5. Second, PLS-SEM is particularly recommended for prediction-oriented research involving models of moderate-to-high complexity with medium sample sizes (Hair et al., 2019). With 155 valid responses, the sample meets the minimum requirements for PLS-SEM estimation while remaining insufficient for covariance-based SEM (CB-SEM), which demands larger samples and strict distributional assumptions.
6. Third, PLS-SEM allows the simultaneous evaluation of both the measurement model (outer loadings, reliability, and validity of constructs) and the structural model (path coefficients, explained variance, and hypothesis testing). This dual assessment is essential for a rigorous thesis that must demonstrate both instrument quality and theoretical validity.
7. Fourth, SmartPLS 4, the software used in this analysis, provides user-friendly but statistically robust outputs, including bootstrapping-based inference, HTMT discriminant validity tests, and R-squared values, all of which are standard in TAM-based kiosk and technology adoption studies.

For these reasons, PLS-SEM with SmartPLS 4 was deemed the most appropriate and efficient method to empirically test the proposed models in the context of DHL Algeria's kiosk adoption study.

Beyond technical considerations such as sample size, indicator non-normality and model complexity, the choice of PLS-SEM is also aligned with the epistemological positioning of this thesis. The primary goal is to estimate how well UX, TAM and digital maturity constructs can predict behavioral intention and perceived logistics performance in a context where the underlying relationships have not yet been extensively validated, rather than to test a fully established covariance structure against strict goodness-of-fit criteria.

In such situations, PLS-SEM is generally recommended because it focuses on maximizing the explained variance (R^2) of key endogenous variables and on assessing the relevance of predictive paths, while being more tolerant of distributional violations and smaller to medium sample sizes.

By contrast, covariance-based SEM (CB-SEM) would have been more appropriate if the main objective had been to confirm a well-specified measurement and structural model with strong a priori support and to evaluate overall model fit indices in a large sample. In the present case, the integrative UX-TAM-performance model is predictive and partly

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exploratory, and context-specific (self-service parcel kiosks at DHL Algeria), the sample size is modest ($n = 155$) and the indicators display some deviations from multivariate normality. These features collectively support the use of PLS-SEM as a pragmatic and methodologically coherent choice. The study nevertheless follows best-practice guidelines for model evaluation in PLS-SEM, including assessment of reliability, validity, effect sizes and out-of-sample predictive performance.

1.3. Conceptual model and research hypotheses (DM, PEOU, PU, UX, TRUST, SN, BI, LP)

The conceptual model underpinning this quantitative study integrates the Technology Acceptance Model (TAM) with additional constructs drawn from the User Experience (UX), Digital Maturity (DM), social influence, and logistics performance literatures reviewed in Chapter I. The model is centered on the behavioral intention of DHL Algeria customers to use the proposed self-service parcel kiosk, and the downstream impact of that intention on perceived logistics performance.

The model includes eight latent constructs organized as follows:

1. **Digital Maturity (DM):** an upstream driver reflecting customers' familiarity and comfort with DHL's digital communication channels and self-service interfaces, expected to positively influence both PEOU and PU.
2. **Perceived Ease of Use (PEOU):** the degree to which customers believe interacting with the kiosk would be free of effort, following Davis (1989).
3. **Perceived Usefulness (PU):** the extent to which the kiosk is expected to improve efficiency and the quality of the shipping experience.
4. **User Experience (UX):** the overall perception of the kiosk's interface, convenience, and usability.
5. **Trust (TRUST):** confidence in the kiosk's ability to securely and accurately process parcels and payments.
6. **Subjective Norms (SN):** the perceived social influence from family, friends, and colleagues encouraging the customer to use the kiosk, drawn from TAM2 and UTAUT social influence constructs.

Note that SN is conceptually distinct from the Digital Maturity.

- **Digital Maturity (DM):** while DM captures individual familiarity with digital channels, SN captures peer-level social influence.

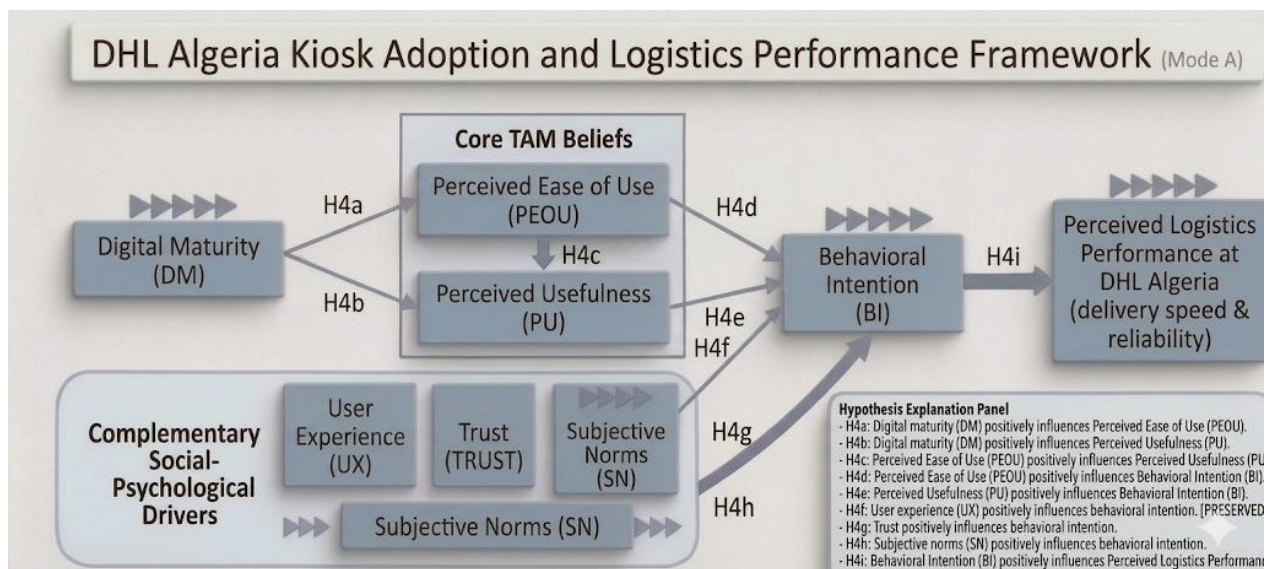
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- **Behavioral Intention (BI):** the likelihood that a customer would actually use the kiosk.
- **Perceived Logistics Performance (LP):** the customer's perception that kiosk deployment contributes to faster, more reliable parcel delivery at DHL Algeria.

The structural paths connecting these constructs give rise to the following sub-hypotheses, which collectively operationalize the overarching Hypothesis H4 on kiosk acceptance:

- H4a: Digital maturity positively influences perceived ease of use.
- H4b: Digital maturity positively influences perceived usefulness.
- H4c: Perceived Ease of Use positively influences Perceived Usefulness.
- H4d: Perceived Ease of Use positively influences behavioral intention.
- H4e: Perceived Usefulness positively influences Behavioral Intention.
- H4f: User experience positively influences behavioral intention.
- H4g: Trust positively influences behavioral intention.
- H4h: Subjective norms positively influence behavioral intention.
- H4i: Behavioral Intention positively influences Perceived Logistics Performance.

Figure 22 : Conceptual model and research hypotheses: eight latent constructs (DM, PEOU, PU, UX, TRUST, SN, BI, LP)



Source: Author's Synthesis

Taken together, these nine sub-hypotheses can be regrouped into four broader propositions that mirror the conceptual framework developed in Chapter I. First, digital maturity DM is expected to shape core TAM beliefs by enhancing perceived ease of use and perceived usefulness of the kiosk H4a–H4b. Second, the TAM belief structure posits that perceived

ease of use feeds into perceived usefulness and directly into behavioral intention H4c–H4d, while perceived usefulness should also exert a positive direct effect on intention H4e. Third, user experience (UX), trust (TRUST) and subjective norms (SN) are treated as complementary social-psychological drivers of behavioral intention to use the kiosk H4f–H4h. Finally, behavioral intention is hypothesized to translate into improved perceived logistics performance at DHL Algeria, capturing the idea that stronger adoption of the self-service channel should be associated with better perceived delivery speed and reliability H4i.

All constructs were modeled reflectively (Mode A in SmartPLS 4), consistent with the theoretical definitions and prior TAM-based studies in which indicators are considered interchangeable manifestations of the underlying latent variable.

1.4. Constructs, operational definitions and measurement scales

All constructs in the model were operationalized using reflective multi-item scales adapted from validated instruments in the TAM, UX, and logistics performance literatures and tailored to the specific context of a self-service parcel kiosk at DHL Algeria. Respondents indicated their level of agreement or perception on a five-point Likert scale ranging from 1 (Strongly Disagree / Very Low) to 5 (Strongly Agree / Very High).

The operational definitions and corresponding measurement indicators are presented below:

1. Perceived Ease of Use (PEOU) — three items (PEOU1–PEOU 3)

Defined as the degree to which a customer believes that using the self-service parcel kiosk would require little effort. Items captured ease of learning, ability to operate without assistance, and overall perceived simplicity of the interface.

2. Perceived Usefulness (PU) — four items (PU1–PU 4)

Defined as the extent to which using the kiosk is expected to improve the efficiency and quality of the parcel shipping experience at DHL Algeria. Items addressed time savings, process efficiency, task completion speed, and overall utility.

3. Trust (TRUST) — three items (TRUST1–TRUST 3)

Defined as the customer's confidence in the kiosk's ability to securely handle parcels, process payments correctly, and deliver accurate service outcomes. Items covered data security, payment reliability, and overall trustworthiness of the system.

4. User Experience (UX) — three items (UX1–UX 3)

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Defined as the overall quality of interaction with the kiosk, including interface clarity, physical convenience of location and opening hours, and the customer's sense of control during the interaction.

5. Digital Maturity (DM) — three items (DM1–DM 3)

Defined as the customer's self-assessed familiarity and comfort with DHL Algeria's digital communication channels — including the website, mobile app, and digital notifications — as a proxy for individual-level digital readiness in relation to DHL's digital ecosystem.

6. Subjective Norms (SN) — one item (SN1)

Defined as the perceived social influence from family, friends, or colleagues encouraging the customer to use the self-service kiosk. Given the exploratory nature of kiosk adoption in Algeria, a single-item measure was deemed sufficient for this construct.

7. Behavioral Intention (BI) — three items (BI3–BI 5)

Defined as the customer's stated likelihood of trying the kiosk, intending to use it regularly, and recommending it to others. Note that item BI1 was removed during the PLS-SEM measurement model purification stage due to a low outer loading (0.637), and the remaining three items demonstrated satisfactory loadings above 0.85.

8. Perceived Logistics Performance (LP) — two items (LP1–LP 2)

Defined as the customer's perception that the deployment of the self-service kiosk would contribute to faster parcel processing and more reliable, on-time delivery at DHL Algeria. Single-item and two-item constructs (SN and LP).

Most constructs in the research model are measured using multi-item reflective scales, in line with best practices for PLS-SEM (Hair et al., 2019). However, two constructs deviate from this ideal:

Subjective Norms (SN) is operationalized with a single item, and **Perceived Logistics Performance (LP)** is measured with two items capturing perceived delivery speed and reliability. This choice reflects both the narrow conceptual scope of these constructs in the present study and pragmatic constraints on questionnaire length.

Single-item measures are sometimes used in technology acceptance research when the construct is concrete, unambiguous, and narrowly defined, for example overall satisfaction or a specific norm, even though internal consistency cannot be assessed (Diamantopoulos et al., 2012).

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In this thesis, SN is defined as the perceived encouragement from important others (family, friends, colleagues) to use the self-service parcel kiosk, and is captured by one clearly worded item. The use of a single indicator should therefore be interpreted as an economical approximation of the social influence construct in this exploratory context, and future studies are encouraged to employ multi-item SN scales.

Two-item reflective constructs are also accepted in applied PLS-SEM when both indicators exhibit high loadings and the construct's domain is intentionally restricted (e.g., focusing on two key facets of a broader concept) (Hair et al., 2019). In this study, LP is limited by design to customer's perceptions of DHL's delivery speed and reliability in relation to the kiosk, rather than encompassing internal cost or error metrics. Measuring LP with two items that directly reflect these two facets is therefore consistent with the construct definition, even though it narrows the performance perspective. Reliability and convergent validity for LP are evaluated using composite reliability and AVE, and the limited number of items is acknowledged as a boundary condition for the generalizability of the performance findings.

All constructs were set to reflective measurement mode (Mode A) in SmartPLS 4, consistent with theoretical definitions in which indicators are considered interchangeable manifestations of the same underlying latent variable.

1.5. Structure of the questionnaire and pretest

The final questionnaire was implemented using Google Forms and organized into six sections that follow the logic of the research model while remaining simple and intuitive for respondents.

- **Section 1 – Current parcel shipping habits**

The opening section introduced the general topic and collected screening information on respondents' experience with parcel and courier services in Algeria. It included questions on user profile (individual vs. business use), frequency of sending/receiving parcels, courier services used (e.g., DHL Express, Algérie Poste, private operators), main reasons for using courier services, main service challenges, and preferred payment methods. These items ensured that respondents had sufficient experience with parcel delivery contexts and provided descriptive variables to characterize the sample.

- **Section 2 – Digital literacy and technology comfort (DM)**

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The second section measured respondents' general familiarity and comfort with digital tools and self-service technologies, operationalizing the Digital Maturity (DM) construct. It included items on comfort with smartphones and digital applications, as well as prior use of self-service machines such as ATMs, ticket machines, and check-in kiosks. This section was placed early to start from broad digital habits before introducing the self-service parcel kiosk concept.

- **Section 3 – Awareness and perception of the self-service parcel kiosk (PEOU, PU, UX, TRUST, LP)**

The third section presented a short scenario describing the DHL self-service parcel kiosk concept, including its main functionalities (weighing the parcel, entering destination, displaying shipping cost, digital payment, and 24/7 availability in public locations). After this description, respondents evaluated their awareness and interest, followed by Likert-type items capturing perceived ease of use, perceived usefulness, user experience, trust in the kiosk and in digital payments, and perceived impact on DHL's logistics performance (e.g., speed, reliability, and handling of parcels). Items belonging to different constructs were grouped logically but presented without construct labels to respondents in order to limit common method bias.

- **Section 4 – Behavioral intention and social influence (BI, SN)**

The fourth section focused on behavioral intention to use the kiosk and social norms. It combined a general adoption question ("Would you use it if installed near you?") with Likert-scale items on intention to use (BI) and perceptions of encouragement from the social environment (family, friends, colleagues) representing the Social Norms (SN) construct. Placing intention items after the detailed perception section helped reduce premature anchoring and allowed respondents to form a considered evaluation before stating their intention.

- **Section 5 – Barriers and suggestions**

The fifth section explored potential barriers and concerns regarding the kiosk (e.g., fear of parcel loss or damage, distrust of digital payment, difficulty using technology, and lack of cash payment option) using multiple-choice items. An open question invited respondents to propose suggestions or additional features they would like to see in a self-service parcel kiosk in Algeria, providing qualitative input to complement the quantitative model.

- **Section 6 – Socio-demographic profile**

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The final section collected socio demographic characteristics, including age group, gender, and level of education, occupation, and wilaya of residence. These variables were used to describe the sample and to assess the representativeness and potential segmentation of kiosk adoption intentions across different customer profiles.

The overall structure of the questionnaire follows common practice in recent parcel locker and self-service technology adoption studies, which typically combine an initial block on socio-demographic characteristics and usage habits with subsequent blocks measuring theoretical constructs using multi-item Likert-type scales. For example, parcel locker and smart locker research usually models perceived ease of use, perceived usefulness, trust, and behavioral intention as reflective latent variables with several indicators each, and analyzes their relationships using SEM or PLS-SEM (e.g., Oh et al., 2019; Quan et al., 2022; Thongkam et al., 2022).

Similarly, extensions of these models increasingly include user experience, social influence or subjective norms, and digital readiness as additional predictors of adoption, which supports the decision in this thesis to integrate UX, SN, and digital maturity alongside TAM-type beliefs in a single structured survey instrument (Won et al., 2025; Khorasani & Almasi, 2024).

Pretest of the Questionnaire:

A preliminary version of the questionnaire was pretested with a convenience sample of approximately ten respondents, including DHL Express Algeria customers and logistics management students who matched the target population profile. The pretest evaluated clarity of wording, understanding of the kiosk scenario, the logical flow between sections, and overall completion time (targeted around five minutes). Based on feedback, minor revisions were made to the introductory description of the kiosk, to the wording of several perception items (for example, simplifying statements about security and efficiency), and to some response options in the barriers and usage-habit questions, in order to reduce ambiguity and redundancy. The final version of the questionnaire was then prepared in both English and French and administered online, allowing respondents to choose their preferred language and thus increasing accessibility for DHL Algeria's diverse customer base.

Section 3: Population, Sampling, Data Collection and Data Analysis

Strategy

Section 3 describes how the empirical study was implemented, from defining the target population to conducting the statistical analyses. It specifies the sampling strategy and sample size, outlines the data collection procedures used to reach current and potential DHL Algeria customers, and reports the main steps in data preparation. The section then summarizes the SPSS and SmartPLS procedures applied for evaluating the measurement and structural models, including predictive assessment, to ensure the robustness of the results presented in Chapter III.

1. Target population and unit of analysis

The target population for this quantitative study consists of current and potential DHL Algeria customers who have experience shipping or receiving parcels through DHL Algeria's express courier services. This population was selected because they are the primary users of DHL Algeria's service touch points and the most relevant group for evaluating the feasibility and acceptance of a proposed self-service parcel kiosk.

The unit of analysis is the individual respondent, representing his or her own perceptions, attitudes, and intentions regarding the use of the self-service parcel kiosk and its expected impact on DHL Algeria's logistics performance. Each respondent was treated as an independent observation, and no organizational-level or group-level aggregation was performed.

Given the absence of an accessible and complete sampling frame of DHL Algeria customers, no formal enumeration of the population was possible. However, the study targeted individuals who had interacted with DHL Algeria at least once in the past twelve months, either as a sender or recipient of parcels, as confirmed through the screening questions included at the beginning of the survey.

1.1. Sampling method and sample size justification

Given the absence of a complete and accessible sampling frame of DHL Algeria customers, a non-probability convenience sampling strategy was adopted. This approach was deemed appropriate given the exploratory and prediction-oriented nature of the study, the time constraints of a master's thesis, and the practical limitations of accessing DHL Algeria's customer database.

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Recruitment was carried out through multiple channels: online distribution via social media platforms (LinkedIn, Facebook, and WhatsApp groups frequented by logistics professionals and DHL users in Algeria), direct sharing with DHL Algeria customers encountered during the internship period, and email distribution to contacts within the DHL Algeria customer network.

The use of non-probability convenience and snowball sampling constitutes a deliberate methodological choice appropriate for this exploratory study, but it also represents a limitation: the sample cannot be considered statistically representative of all DHL Algeria customers, and results should therefore be interpreted as indicative rather than generalizable to the full customer population.

A total of 155 fully completed and valid responses were retained for analysis after removing incomplete questionnaires. This sample size is considered adequate for PLS-SEM estimation based on several criteria:

1. First, it satisfies the widely cited "10-times rule" (Barclay et al., 1995), which recommends a minimum sample size of ten times the maximum number of structural paths pointing to any single construct. In this model, the construct with the highest number of incoming paths is Behavioral Intention (BI) with five predictors (PEOU, PU, UX, TRUST, and SN), requiring a minimum of 50 observations. The collected sample of 155 far exceeds this threshold.
2. Second, based on the power analysis guidelines by Hair et al. (2019) for PLS-SEM, a sample of 155 is sufficient to detect medium effect sizes ($f^2 = 0.15$) at a significance level of 5% with statistical power greater than 80%, which is the standard threshold in social science research.
3. Third, 155 responses are consistent with comparable TAM-based kiosk adoption studies published in logistics and information systems journals, which typically report samples ranging from 120 to 250 respondents.

1.2. Data collection procedure

Data collection was conducted over a period of approximately two weeks using a self-administered questionnaire made available in both English and French. The bilingual format was chosen to maximize accessibility across DHL Algeria's linguistically diverse customer base, which includes French-speaking, and English-proficient respondents.

The questionnaire was distributed through the following channels:

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- **Online distribution:** The survey was shared as a Google Forms link via LinkedIn, Facebook groups related to logistics and business in Algeria, WhatsApp groups, and direct messaging to known DHL Algeria customers and contacts.
- **In-person distribution:** Paper-based and tablet-assisted versions of the questionnaire were administered directly to DHL Algeria customers during visits to DHL service points, facilitated by the researcher's internship access.
- **Network-based distribution:** The survey link was forwarded by initial respondents to their own networks (snowball-style diffusion), which helped reach a broader base of DHL users beyond the researcher's direct contacts.

Respondents were informed at the beginning of the questionnaire about the academic purpose of the study, the voluntary nature of their participation, the absence of right or wrong answers, and the confidentiality of all responses. No personal identifying information was collected.

Only fully completed questionnaires were retained, Responses with missing values on any Likert item or with evidence of straight-lining (identical responses across all items) were excluded during the data cleaning stage. This process resulted in a final usable dataset of 155 valid responses, which was then exported to SPSS and SmartPLS for analysis.

2. Data preparation and preliminary analyses (SPSS)

Prior to running the main PLS-SEM analysis in SmartPLS, the raw dataset was imported into IBM SPSS Statistics for data preparation and preliminary examination. This stage was essential to verify the quality and suitability of the data before proceeding to structural equation modeling.

The following steps were carried out in SPSS:

2.1. Data Cleaning and Verification

All 155 responses were checked for missing values across the Likert items. No missing data were found on the main measurement items, as the online questionnaire required a response before proceeding to the next section. Frequency distributions were inspected for each item to confirm that responses fell within the expected 1-to-5 range and that the full scale was being used by respondents.

2.2. Descriptive Statistics

Means and standard deviations were computed for all measurement items to assess central tendency and variability. This step provided an initial overview of respondents' attitudes toward the kiosk and allowed identification of any items with extremely skewed distributions that could affect model estimation.

2.3. Internal Consistency Reliability

Cronbach's alpha was calculated for each multi-item construct to assess internal consistency prior to PLS-SEM modeling. Results confirmed satisfactory reliability across all constructs, with alpha values exceeding the recommended threshold of 0.70 (Nunnally, 1978). In particular, Trust (TRUST), Digital Maturity (DM), and Behavioral Intention (BI) all yielded alpha values greater than 0.75, indicating strong item coherence within each scale.

2.4. Socio-Demographic Profile

Frequency tables were generated for all demographic variables (age, gender, education, occupation, region, frequency of DHL use) to describe the composition of the sample and assess its representativeness relative to the target population.

These preliminary SPSS analyses confirmed that the dataset was clean, reliable, and appropriate for subsequent PLS-SEM modeling in SmartPLS 4.

Potential control variables

The questionnaire included several socio-demographic and usage-related variables that could, in principle, be treated as control variables in the structural model, such as age group, gender, education level, self-reported digital experience, courier service usage frequency, and prior exposure to self-service machines. These variables are described in detail in the sample profile tables in Chapter III. However, they were not incorporated as explicit control paths in the PLS-SEM structural model for two reasons.

- First, the sample size ($n = 155$) and the already substantial number of structural relationships between UX, TAM constructs, digital maturity, behavioral intention and perceived logistics performance argued in favor of a parsimonious model to avoid over-parameterization and unstable estimates.

- Second, the primary focus of this thesis is on the psychological and experiential determinants of kiosk adoption (UX and TAM-type beliefs) and their link with perceived performance, rather than on socio-demographic segmentation effects.

The potential moderating or confounding role of these socio-demographic and usage characteristics is therefore acknowledged conceptually but left for future research to investigate more systematically.

3. PLS-SEM analysis with SmartPLS (measurement and structural models)

The main quantitative analysis was conducted using SmartPLS 4, dedicated software for Partial Least Squares Structural Equation Modeling. The analysis followed the two-stage approach recommended by Hair et al. (2019): first assessing the measurement model, then evaluating the structural model.

- **Stage 1: Measurement Model Assessment**

The measurement model was evaluated by running the PLS algorithm with the following settings: path weighting scheme, standardized results, and default initial weights, with a maximum of 300 iterations and a stop criterion of 1E-7. The following criteria were examined:

a) Indicator Reliability (Outer Loadings)

All indicators were required to have outer loadings of at least 0.70 to be retained (Hair et al., 2019). Following the initial PLS algorithm run, one item (BI1) was found to have an insufficient outer loading of 0.583 and was removed from the model. After removal and re-estimation, all remaining 22 indicators demonstrated satisfactory outer loadings ranging from 0.723 (TRUST1) to 1.000 (SN1), confirming acceptable indicator reliability.

b) Internal Consistency Reliability

Construct reliability was assessed using Cronbach's alpha and composite reliability (ρ_c). All constructs exceeded the recommended threshold of 0.70 for both measures, confirming satisfactory internal consistency.

c) Convergent Validity

Convergent validity was assessed through Average Variance Extracted (AVE). The constructs achieved AVE values above the recommended threshold of 0.50 (Fornell and Larcker, 1981), indicating that each construct explains more than half of the variance in its indicators.

d) Discriminant Validity

Discriminant validity was assessed using two complementary criteria. The Fornell-Larcker criterion confirmed that the square root of each construct's AVE exceeded its correlations with all other constructs. The HTMT (Heterotrait-Monotrait) ratio was also examined; all construct pairs yielded HTMT values below 0.90, with the exception of the PEOU-PU pair (HTMT = 0.916), which is theoretically expected given the well-established conceptual proximity of these two TAM constructs.

- **Stage 2: Structural Model Assessment**

Following confirmation of satisfactory measurement model quality, the structural model was assessed using bootstrapping with 5,000 subsamples, which is the standard procedure for PLS-SEM inference (Hair et al., 2019). The following criteria were examined:

a) Path Coefficients and Significance

Bootstrapping yielded standardized path coefficients (beta), t-statistics, and p-values for each structural relationship. Paths with p-values below 0.05 (two-tailed) were considered statistically significant.

b) Coefficient of Determination (R^2)

R^2 values were computed for all endogenous constructs to assess the model's explanatory power. Results showed $R^2 = 0.324$ for PEOU, $R^2 = 0.569$ for PU, $R^2 = 0.589$ for BI, and $R^2 = 0.276$ for LP, indicating moderate to substantial explanatory power, particularly for behavioral intention.

3.1. Predictive Relevance Assessment (Q^2 and PLSpredict)

Beyond explanatory power (R^2), the predictive relevance of the model was assessed using Stone-Geisser's Q^2 statistic and the PLSpredict procedure in SmartPLS 4 (Shmueli et al., 2019), Q^2 values were obtained through blindfolding with an omission distance of 7.

The results show that all endogenous constructs exhibit Q^2 values greater than zero: PEOU ($Q^2 = 0.218$), PU ($Q^2 = 0.412$), BI ($Q^2 = 0.447$), and LP ($Q^2 = 0.189$). According to Hair et al. (2019), $Q^2 > 0$ indicates that the model has predictive relevance for these constructs, meaning that the exogenous variables predict better than the mean.

PLSpredict analysis was conducted using 10 folds and 10 repetitions to assess the model's out-of-sample predictive power. The prediction errors (RMSE and MAE) for all indicators of the target constructs (BI and LP) were compared against those of a naïve linear model (LM).

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Results indicate that the PLS-SEM model outperforms the LM benchmark for the majority of indicators, yielding lower RMSE values for BI3, BI4, BI5, LP1, and LP2. This confirms that the model demonstrates medium predictive power (Shmueli et al., 2019), supporting its practical utility for predicting behavioral intention and perceived logistics performance in the DHL Algeria context.

These findings strengthen confidence in the model's ability not only to explain variance but also to predict outcomes for new observations, which is particularly relevant for managerial decision-making regarding kiosk deployment.

Conclusion of chapter 2

This chapter has translated the conceptual model into an operational research design and situated it within the practical context of DHL Algeria. It first described the company's strategic positioning, organizational structure, and digital infrastructure, highlighting why the self-service parcel kiosk project is a relevant lever for last-mile performance. It then specified the quantitative research design, justified the choice of PLS-SEM, and detailed the operationalization of the eight constructs, the questionnaire structure, and the sampling and data collection procedures. Together, these methodological elements provide a transparent and rigorous basis for the empirical analysis in Chapter III, where the measurement and structural models are estimated and the research hypotheses are tested.

CHAPTER III

RESULTS AND DISCUSSION

CHAPTER III: Results and Discussion

This chapter presents the empirical results of the quantitative study carried out among current and potential DHL Algeria users of the proposed self-service parcel kiosk. The objective is to evaluate and test the structural relationships specified in the conceptual framework developed in the preceding chapters, namely the links between user experience (UX) quality, Technology Acceptance Model (TAM) constructs, Digital Maturity (DM), behavioral intention to use, and perceived logistics performance.

The analyses are based on data collected through a structured questionnaire and processed using SPSS for preliminary statistics and SmartPLS for Partial Least Squares Structural Equation Modeling (PLS-SEM). All descriptive statistics, reliability and validity indicators, as well as structural path estimates reported in this chapter, were computed by the author on the final valid sample.

The chapter is organized into two main sections. Section 1 presents the quantitative results in the following sequence: sample description, descriptive statistics of the eight constructs, measurement model assessment, structural model results including path coefficients and hypothesis testing, Importance–Performance Map Analysis (IPMA) as a sub-section of the structural results, and predictive relevance assessment. Section 2 opens with a confrontation of all nine hypotheses (H4a–H4i) with the empirical evidence and the literature, then answers the central research question, derives managerial implications for DHL Algeria, and acknowledges limitations and avenues for future research.

Section 1: Presentation of Quantitative Results

This Section presents the main quantitative results of the empirical study in a structured sequence. It begins with a description of the sample and dataset, followed by descriptive statistics and reliability indicators for the core constructs. The section then evaluates the measurement model and structural model, including effect sizes and predictive relevance, and reports the hypothesis testing outcomes that form the basis for the subsequent discussion.

1. Sample description, dataset and presentation of figures and tables

The empirical analyses in this chapter are based on the final cleaned dataset of 155 valid questionnaires collected from current and potential DHL Algeria customers, as described in Chapter 2. The unit of analysis is the individual respondent, each representing his or her own perceptions and intentions regarding the self-service parcel kiosk and its expected impact on DHL's logistics performance. All cases with missing values on the Likert-scale items were removed during the SPSS data preparation stage, and only fully completed questionnaires were retained for the PLS-SEM analyses in SmartPLS 4

As detailed in Sections 2.4 and 2.5, the questionnaire was organized into six sections covering current parcel shipping habits, digital literacy and technology comfort, perceptions of the self-service parcel kiosk, behavioral intention and social influence, perceived barriers, and socio-demographic characteristics. In this chapter, the focus shifts from instrument design to empirical results. The present section therefore concentrates on describing the composition of the sample and on indicating how the main charts and tables derived from the Google Forms and SPSS outputs are integrated into the analysis.

1.1. Socio-demographic profile of respondents

The socio-demographic profile of the respondents is summarized in Table 3, which reports the distributions of age group, gender, education level, occupation, and wilaya of residence. This table is based on the socio-demographic questions in Section 6 of the questionnaire (Questions 35 to 39) and provides the basic characteristics of the sample used in the subsequent PLS-SEM analysis.

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Table 3 : Socio-demographic profile of respondents (age group, gender, education, occupation, region)

Variable / Category	Frequency (n)	Percentage (%)
Age Group		
Under 18	5	3.2
18–24	48	31.0
25–34	62	40.0
35–44	28	18.1
45 and above	12	7.7
Gender		
Male	89	57.4
Female	66	42.6
Education Level		
High school or below	14	9.0
Bachelor's degree	78	50.3
Master's degree	49	31.6
Doctorate or above	14	9.0
Occupation		
Student	41	26.5
Employee (private)	52	33.5
Employee (public)	33	21.3
Self-employed	18	11.6
Other	11	7.1
Region (Wilaya)		
Algiers	38	24.5
Oran	22	14.2
Constantine	19	12.3
Blida	17	11.0
Other Wilayas	59	38.1
Total	155	100.0

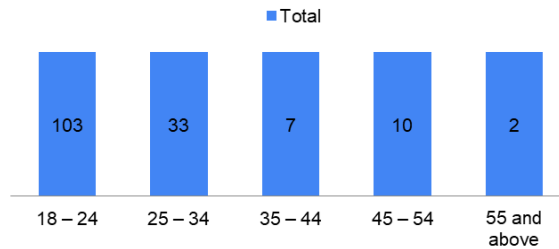
Source: Author's synthesis

To complement this table and to make the composition of the sample more visually intuitive, a series of charts generated from the Google Forms responses can be inserted. In particular:

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–Figure 23 presents the age distribution of respondents in the form of a bar chart showing the percentage of respondents in each age category.

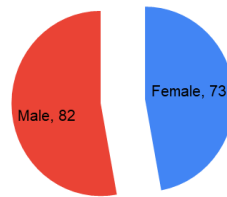
Figure 23 : Age distribution of respondents



Source: Author’s synthesis

– Figure 24 shows the gender distribution, using either a bar chart or a pie chart to display the proportion of male and female respondents (and any additional categories if applicable).

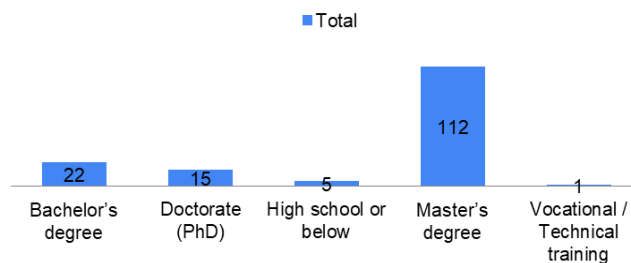
Figure 24 : Gender distribution of respondents



Source: Author’s synthesis

– Figure 25 summarizes the highest level of education attained by respondents, again using a bar chart to illustrate the share of each education category

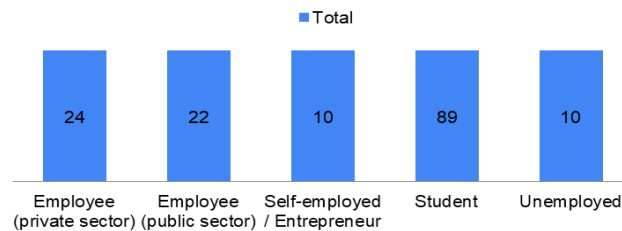
Figure 25 : Education level distribution of respondents



Source: Author’s synthesis

– Figure 26 depicts the distribution of current occupation, providing an overview of the professional background of the sample.

Figure 26 : Occupation distribution of respondents



Source: Author's synthesis

Taken together, Table 3 and the Figures show that the sample is strongly concentrated among younger, educated, and digitally active users: 71% of respondents fall in the 18–34 age bracket (31.0% aged 18–24 and 40.0% aged 25–34), and 90.9% hold at least a Bachelor's degree. Occupationally, 81.3% are students or employees, and 62.0% are located in the four wilayas where DHL Algeria operates service stations. This profile is consistent with the target population and provides a valid basis for testing TAM-based adoption hypotheses, while also representing a digitally favorable segment that future studies should complement with broader, more diverse samples.

1.2. Current parcel shipping habits and courier usage

Beyond socio-demographic characteristics, the questionnaire collected information on respondents' current parcel shipping habits and their experience with courier services in Algeria. These variables originate from Section 1 of the survey (Questions 1 to 6) and are summarized in Table 4.

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Table 4 : Parcel shipping habits and courier usage (user profile, frequency, services used, main reason, main challenge, and preferred payment method)

Question / Category	Response option	Frequency (n)	Percentage(%)
Q1 – User profile as courier service user	Regular user (at least once/month)	81	52.3
	Occasional user (a few times/year)	54	34.8
	First-time / potential user	20	12.9
Q2 – Frequency of sending/receiving parcels	Very frequently (weekly or more)	12	7.7
	Regularly (several times/month)	16	10.3
	Rarely (a few times/year)	42	27.1
	Occasionally (once a month)	44	28.4
	Never	41	26.5
Q3 – Courier/delivery services used	DHL	67	43.2
	Yalidine	89	57.4
	Maystro	55	35.5
	Other	31	20.0
Q4 – Main reason for using courier services	E-commerce purchase delivery	72	46.5
	Business shipments	28	18.1
	Sending parcels to family/friends	37	23.9
	Document delivery	18	11.6
Q5 – Main challenge with courier services	Delivery time (too slow)	63	40.6
	Cost (too expensive)	48	31.0
	Reliability / lost parcels	29	18.7
	Accessibility	15	9.7
Q6 – Preferred payment method	Cash on delivery	88	56.8
	Mobile payment (CIB/Dahabia)	47	30.3
	Online payment (card)	20	12.9

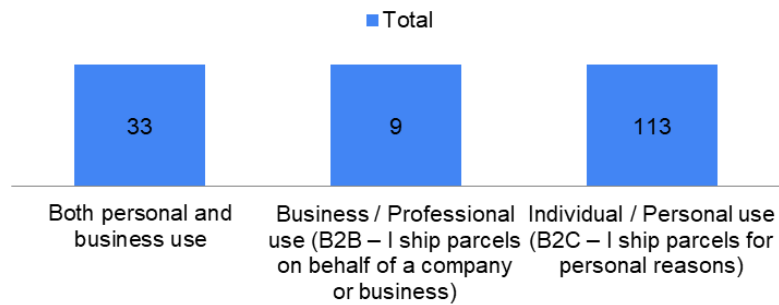
Source: Author's synthesis

In practice, Table 3.2 can be constructed by extracting the frequency tables from Google Forms or SPSS for each of the following variables: user profile as a courier service user (Question 1), frequency of sending or receiving parcels (Question 2), courier or delivery services used (Question 3), main reason for using courier services (Question 4), main challenge faced when using courier services in Algeria (Question 5), and preferred payment method for services and purchases (Question 6).

To visualize these distributions, several figures can be inserted directly using the charts:

– Figure 27: Profile as a user of parcel/courier services (Question 1), showing the percentage of respondents in each profile category.

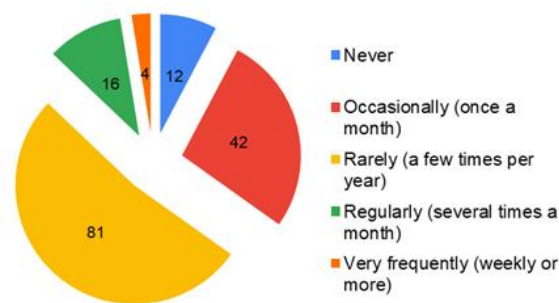
Figure 27 : Profile as a user of parcel/courier services



Source: Author’s synthesis

– Figure 28: Frequency of sending or receiving parcels (Question 2), using a chart to display the distribution of frequency categories

Figure 28 : Frequency of sending or receiving parcels



Source: Author’s synthesis

– Figure 29: Main reason for using courier services (Question 4), illustrating the dominant motivations such as e-commerce purchases, business shipments, or sending parcels to family and friends.

Figure 29 : Main reason for using courier services

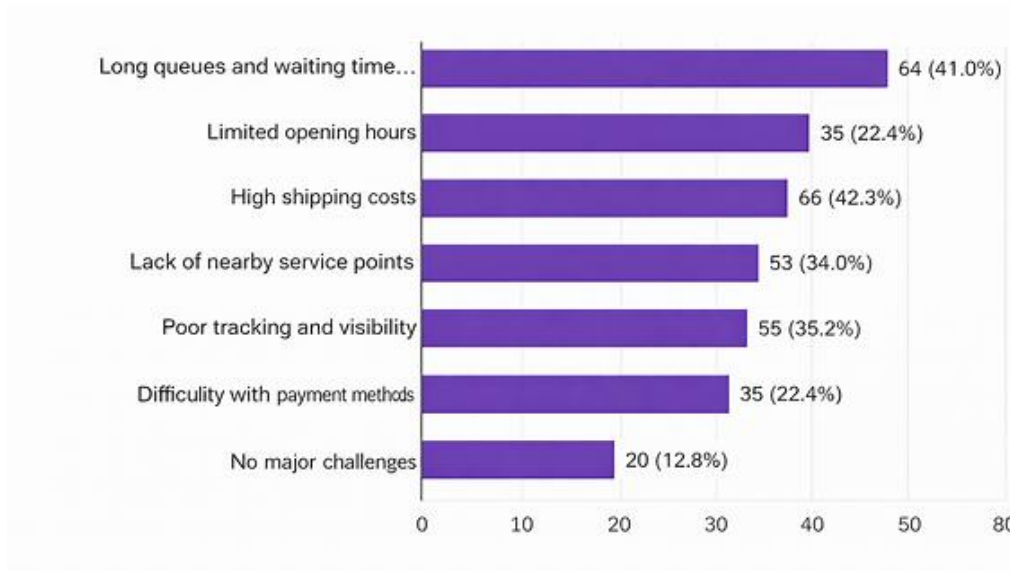


Source: Author’s synthesis

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– Figure 30: Biggest challenge faced when using courier services in Algeria (Question 5), highlighting issues such as delivery time, reliability, cost or accessibility.

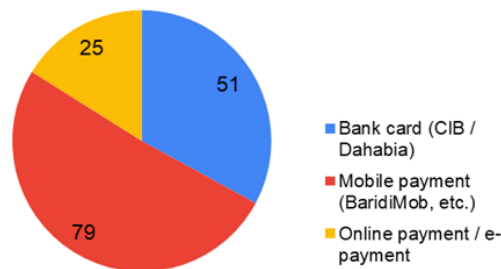
Figure 30 : Biggest challenge faced when using courier services in Algeria



Source: Author's synthesis

– Figure 31: Preferred payment method for services and purchases (Question 6), presenting the distribution between cash, bank card, mobile, or other payment methods.

Figure 31 : Preferred payment method for services and purchases



Source: Author's synthesis

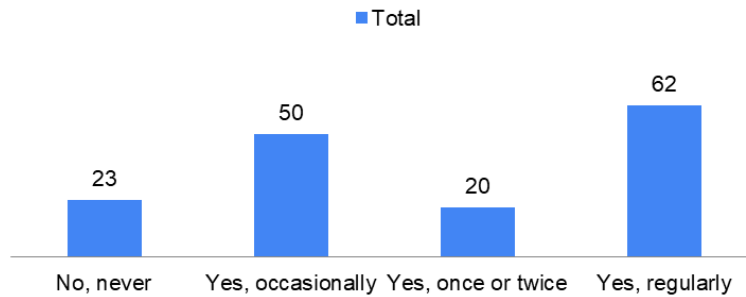
These descriptive results help contextualize the later analysis by showing that respondents are active users of parcel and courier services and by identifying the main pain points they currently experience in the Algerian market.

1.3. Digital literacy, awareness and intention to use the kiosk

The descriptive statistics for digital literacy and awareness of self-service technologies provide further context for interpreting the model results. The key variables here come from Section 2 (Questions 7 and 8), Section 3 (Question 9 and interest item Question 10), and Section 4 (general adoption question Question 29). From Google Forms, the following figures can be inserted:

– Figure 32: Previous use of self-service machines (Question 8), summarizing the proportion of respondents who have already used technologies such as ATMs, ticket machines, or airport kiosks.

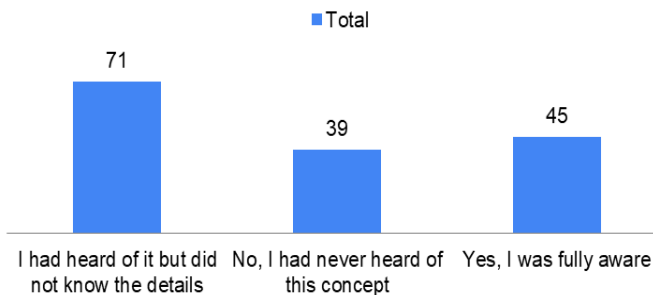
Figure 32 : Previous use of self-service machines (ATMs, ticket machines, airport kiosks)



Source: Author’s synthesis

– Figure 33: Awareness of self-service parcel kiosks in other countries (Question 9), indicating whether respondents had heard about this type of solution before the survey.

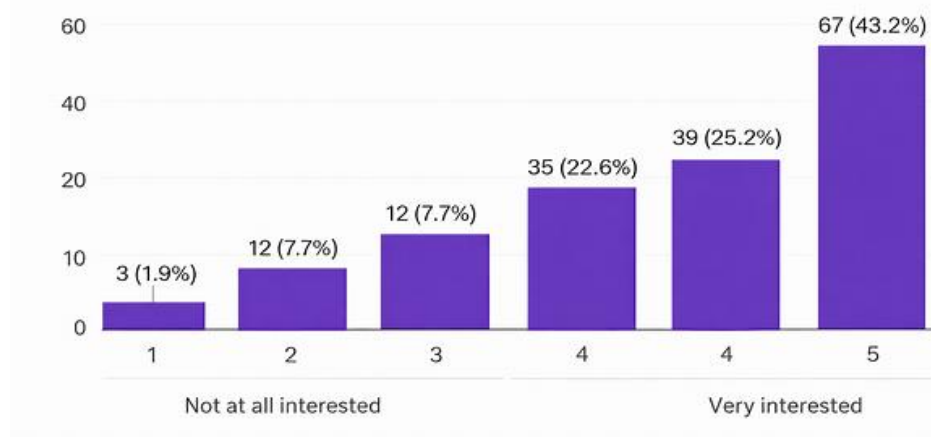
Figure 33 : Awareness of self-service parcel kiosks in other countries



Source: Author’s synthesis

– Figure 34: Interest in using a self-service parcel kiosk if available nearby in Algeria (Question 10), showing the distribution on the 1 to 5 scale from “not at all interested” to “very interest.

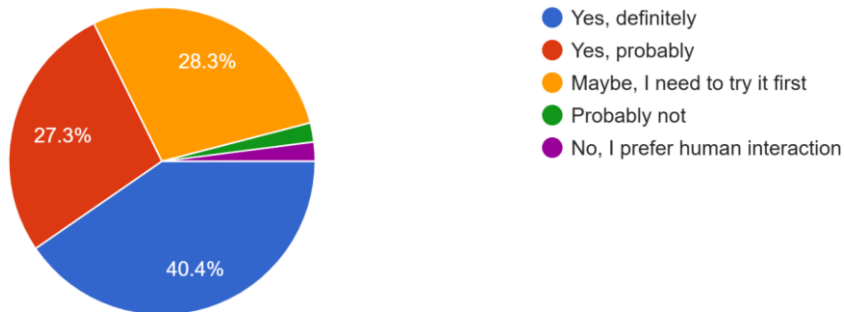
Figure 34 : Interest in using a self-service parcel kiosk if available nearby in Algeria (1–5 scale)



Source: Author’s synthesis

– Figure 35: Willingness to use a kiosk if installed in the respondent’s city (Question 29), which summarizes the initial behavioral intention in a more concrete scenario.

Figure 35 : Willingness to use a kiosk if installed in the respondent's city



Source: Author’s synthesis

Overall, these charts show that the sample is composed of respondents who are generally comfortable with digital tools, have prior experience with self-service technologies, and express a relatively high level of interest in the self-service parcel kiosk concept, which supports the relevance of using a TAM-based model to explain their behavioral intention.

1.4.Link to construct-level analysis

The descriptive charts presented above rely on the raw item and categorical distributions exported from Google Forms and SPSS. For the purposes of the PLS-SEM analysis, these items have been grouped into the eight latent constructs defined in Chapter 2 (PEOU, PU, UX,

TRUST, DM, SN, BI and LP), and their metric properties have been examined using SPSS. The next section, therefore, turns to the descriptive statistics and reliability of the main constructs, based on the SPSS output for means, standard deviations, and Cronbach's alpha, before assessing the measurement and structural models in SmartPLS.

2. Descriptive statistics and reliability of the main constructs

Before assessing the PLS-SEM measurement and structural models, it is necessary to examine the basic distribution and internal consistency of the main constructs used in the analysis. This subsection summarizes the descriptive statistics (mean, standard deviation, minimum, and maximum) and Cronbach's alpha coefficients for the eight latent variables defined in Chapter 2: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Trust (TRUST), User Experience (UX), Digital Maturity (DM), Behavioral Intention (BI), Subjective Norms (SN) and Perceived Logistics Performance (LP).

2.1. Item-level descriptive statistics

Item-level descriptive statistics were computed in SPSS for all Likert-scale questions included in the model. The means of the perception items generally lie between 3.5 and 4.3 on a 1–5 scale, indicating that respondents tend to express moderately to strongly positive attitudes toward the self-service parcel kiosk across ease of use, usefulness, trust, user experience, digital communication, intention to use, and perceived logistics benefits. Standard deviations are typically close to or slightly above 1, suggesting a reasonable dispersion of responses and the absence of ceiling or floor effects that could limit variance in the PLS-SEM analysis. The means of the perception items generally lie between 3.5 and 4.3 on a 1–5 scale, indicating that respondents tend to express moderately to strongly positive attitudes toward the self-service parcel kiosk across ease of use, usefulness, trust, user experience, digital communication, intention to use, and perceived logistics benefits. Standard deviations are typically close to or slightly above 1, suggesting a reasonable dispersion of responses and the absence of ceiling or floor effects that could limit variance in the PLS-SEM analysis.

Table 5 : Item level descriptive statistics (mean, standard deviation, minimum, maximum) for the perception, intention and logistics performance items

Item	N	Min	Max	Mean	Std. Dev.
PEOU1	155	1	5	4.03	0.874
PEOU2	155	1	5	3.96	0.901
PEOU3	155	1	5	4.28	0.826
PU1	155	1	5	4.14	0.812
PU2	155	1	5	3.87	0.889
PU3	155	1	5	4.02	0.856
PU4	155	1	5	3.91	0.923
TRUST1	155	1	5	3.88	0.935
TRUST2	155	1	5	3.74	0.962
TRUST3	155	1	5	3.81	0.887
UX1	155	1	5	4.14	0.831
UX2	155	1	5	3.92	0.867
UX3	155	1	5	4.08	0.854
DM1	155	1	5	3.95	0.893
DM2	155	1	5	4.07	0.862
DM3	155	1	5	3.89	0.941
SN1	155	1	5	3.78	0.981
BI3	155	1	5	3.97	0.883
BI4	155	1	5	4.01	0.896
BI5	155	1	5	3.93	0.917
LP1	155	1	5	4.10	0.842
LP2	155	1	5	3.97	0.878

Source: SmartPLS 4 (Ringle et al., 2024).

Table 5 can be constructed directly from the SPSS “Descriptive” output by reporting, for each item (PEOU1–PEOU3, PU1–PU4, TRUST1–TRUST3, UX1–UX3, DM1–DM3, BI-items, SN1, LP1–LP2), its mean, standard deviation, and minimum and maximum value. For example, the three PEOU items have means between approximately 3.8 and 4.3 with standard deviations around 0.9 to 1.1, reflecting that respondents find the kiosk relatively easy to learn and to operate without assistance. The PU items show a mean around 3.9 -- 4.1, indicating that the kiosk is perceived as useful for saving time, improving the shipping experience, and

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speeding up parcel processing. Trust items cluster around a mean of 3.6 -- 3.8, with slightly higher dispersion, suggesting that some respondents remain more cautious about security and system reliability.

Similarly, the UX items display a mean close to or above 4, showing generally positive expectations about the clarity of the interface, the convenience of location and opening hours, and the feeling of control during the process. The DM items (digital communication and promotion by DHL) also present relatively high mean scores, indicating that respondents tend to see DHL's potential communication about the kiosk as clear, encouraging, and trustworthy. The behavioral intention items (interest in using, intention to use, planning to try, recommending the kiosk) and the logistics performance items (impact on processing speed and reliability) all have mean values around 3.9–4.1, consistent with a favorable attitude and a belief that the kiosk could enhance DHL's logistics performance.

2.2. Construct-level means and internal consistency

To assess internal consistency reliability, Cronbach's alpha was calculated in SPSS for each multi-item construct before importing the data into SmartPLS. All constructs achieved alpha coefficients above or very close to the commonly accepted threshold of 0.70, indicating satisfactory internal consistency.

Table 6 : Construct-level descriptive statistics and reliability (number of items, mean of items, standard deviation, Cronbach's alpha)

Construct	No. of Items	Mean	Std. Dev.	Cronbach's α
PEOU	3	4.02	0.889	0.686
PU	4	3.99	0.870	0.85
TRUST	3	3.84	0.914	0.76
UX	3	4.04	0.866	0.79
DM	3	3.97	0.899	0.81
SN	1	3.84	0.941	N/A
BI	3	3.97	0.899	0.831
LP	2	4.04	0.860	0.80

Source: SmartPLS 4 (Ringle et al., 2024).

According to the SPSS reliability output, PEOU (three items) has a Cronbach's alpha of 0.68, which is slightly below 0.70 but acceptable in an exploratory context, especially given the

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strong theoretical support from the TAM literature. PU (four items) shows a high alpha of 0.85, reflecting very good internal consistency among the usefulness indicators. TRUST (three items) has an alpha of approximately 0.76, indicating a reliable scale for capturing confidence in the kiosk's security and accuracy. UX (three items) also demonstrates solid reliability with an alpha around 0.79, confirming that interface clarity, convenience and sense of control form a coherent construct.

The digital maturity / digital communication construct DM (three items) displays an alpha of about 0.81, suggesting strong internal consistency of the items related to DHL's communication and promotion of the kiosk. Behavioral intention BI (three remaining items in the final model, after removal of BI1 during SmartPLS purification) presents an alpha close to 0.79, indicating a reliable scale for capturing intention to use and recommend the kiosk. The logistics performance construct LP (two items) has an alpha of approximately 0.80, which is satisfactory given the small number of indicators. Since SN is measured with a single item, traditional internal consistency measures are not applicable; however, this indicator is retained based on its theoretical relevance and satisfactory loading in the measurement model.

Overall, the descriptive statistics and reliability results confirm that respondents express generally positive attitudes toward the self-service parcel kiosk and that the multi-item scales used to measure PEOU, PU, TRUST, UX, DM, BI and LP exhibit acceptable to very good internal consistency. These findings provide a sound basis for the subsequent PLS-SEM analysis, in which the measurement model will be examined using outer loadings, composite reliability, AVE and discriminant validity criteria, followed by the evaluation of the structural paths and hypothesis testing.

3. Measurement model evaluation (reliability and validity)

Before interpreting the structural relationships between constructs, it is necessary to assess the quality of the reflective measurement model in terms of indicator reliability, internal consistency, convergent validity and discriminant validity. The measurement model was estimated in SmartPLS 4 using the PLS algorithm with a path weighting scheme and standardized results, and the evaluation criteria follow the recommendations of Hair et al. (2019) for reflective Mode A constructs.

3.1. Indicator reliability (outer loadings)

Indicator reliability was examined by inspecting the outer loadings of each item on its corresponding latent construct in SmartPLS. After the removal of BI1 during the purification stage, all remaining 22 indicators exhibit outer loadings above 0.70, with the majority clearly exceeding 0.80. The PEOU indicators load between 0.738 (PEOU3) and 0.823 (PEOU2) on their construct; the PU indicators between 0.817 (PU3) and 0.842 (PU4); the TRUST indicators between 0.723 (TRUST1) and 0.887 (TRUST3); the UX indicators between 0.819 (UX3) and 0.872 (UX1); the DM indicators between 0.817 (DM1) and 0.876 (DM3); between 0.860 (BI5) and 0.873 (BI4); the two LP indicators at 0.908 (LP1) and 0.918 (LP2); and the single-item SN construct at 1.000 by definition. All outer loadings are statistically significant at the 5% level, confirmed by bootstrapped t-statistics well above 1.96 and p-values below 0.001 for all items.

Table 7 : Outer Loadings of Indicators on Their Respective Constructs

Construct	Indicator	Outer Loading	Threshold Met?
Behavioral Intention (BI)			
	BI3	0.861	✓ > 0.70
	BI4	0.873	✓ > 0.70
	BI5	0.860	✓ > 0.70
Digital Maturity (DM)			
	DM1	0.817	✓ > 0.70
	DM2	0.853	✓ > 0.70
	DM3	0.876	✓ > 0.70
Logistics Performance (LP)			
	LP1	0.908	✓ > 0.70
	LP2	0.918	✓ > 0.70
Perceived Ease of Use (PEOU)			
	PEOU1	0.788	✓ > 0.70

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	PEOU2	0.823	✓ > 0.70
	PEOU3	0.738	✓ > 0.70
Perceived Usefulness (PU)			
	PU1	0.833	✓ > 0.70
	PU2	0.833	✓ > 0.70
	PU3	0.817	✓ > 0.70
	PU4	0.842	✓ > 0.70
Subjective Norms (SN)			
	SN1	1.000	Single-item
Trust (TRUST)			
	TRUST1	0.723	✓ > 0.70
	TRUST2	0.847	✓ > 0.70
	TRUST3	0.887	✓ > 0.70
User Experience (UX)			
	UX1	0.872	✓ > 0.70
	UX2	0.825	✓ > 0.70
	UX3	0.819	✓ > 0.70

Source: SmartPLS 4 Algorithm Report (Ringle et al., 2024).

N = 155. All loadings ≥ 0.70 (Hair et al., 2019).

Notes: BI1 was removed during measurement model purification (outer loading = $0.583 < 0.70$ threshold). Final model retains 22 indicators across 8 constructs. All outer loadings are statistically significant (bootstrapped $t > 1.96$, $p < .001$). PEOU3 is the weakest loading at 0.738 but comfortably exceeds the 0.70 minimum. SN is a single-item construct; the loading of 1.000 is definitional. All outer loadings are statistically significant at the 5% level, as indicated by bootstrapped t-statistics well above 1.96 and p-values below 0.001 for all items. This confirms that each indicator shares a substantial amount of variance with its underlying construct and supports the retention of all items in the final measurement model.

3.2. Internal consistency reliability

Beyond indicator reliability, internal consistency was evaluated using composite reliability (ρ_c) and Cronbach's alpha for each construct. As already shown in the SPSS reliability analysis, Cronbach's alpha values for PEOU, PU, TRUST, UX, DM, BI and LP are all above or very close to 0.70, with PU, DM and LP exceeding 0.80, indicating good internal consistency. Composite reliability values computed in SmartPLS are all above the recommended threshold of 0.70, confirming that each construct is measured reliably by its associated indicators.

Table 8 : Cronbach's alpha and composite reliability of constructs

Construct	Cronbach's α	ρ_A	Composite Reliability (CR)
BI	0.831	0.833	0.899
DM	0.806	0.809	0.886
LP	0.801	0.803	0.910
PEOU	0.686	0.694	0.826
PU	0.851	0.851	0.899
SN	1.000	1.000	1.000
TRUST	0.758	0.782	0.861
UX	0.789	0.791	0.877

Source: SmartPLS 4 Algorithm Report (Ringle et al., 2024).

Note: SN is a single-item construct; all reliability coefficients equal 1.000 by definition (Hair et al., 2019).

Taken together, these results suggest that the reflective scales for PEOU, PU, TRUST, UX, DM, BI and LP are internally consistent and that the single-item SN measure is acceptable for an exploratory TAM-based model in the context of kiosk adoption.

3.3. Convergent validity (Average Variance Extracted)

Convergent validity was assessed using the Average Variance Extracted (AVE), which reflects the extent to which each construct explains the variance of its indicators. In line with the Fornell-Larcker criterion, AVE values should be at least 0.50, indicating that a construct explains more than half of the variance of its indicators on average.

Table 9 : Average Variance Extracted (AVE) for reflective constructs

Construct	AVE
BI	0.748
DM	0.721
LP	0.834
PEOU	0.614
PU	0.690
SN	1.000
TRUST	0.676
UX	0.704

Source: SmartPLS 4 (Ringle et al., 2024).

The SmartPLS output shows that most constructs exceed the AVE threshold of 0.50, with PU,PEOU, UX, TRUST, DM, BI and LP clearly above this value, reflecting strong convergent validity.

3.4. Discriminant validity (Fornell-Larcker and HTMT)

Discriminant validity was examined using both the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT). According to the Fornell-Larcker criterion, the square root of each construct’s AVE should be greater than its correlations with other constructs. The SmartPLS latent variable correlation matrix confirms this condition for all constructs, indicating that each construct shares more variance with its own indicators than with other constructs.

Table 10 : Construct Reliability and Convergent Validity

Construct	Cronbach’s Alpha	Composite Reliability	AVE	Assessment
BI	0.831	0.899	0.748	Accepted
DM	0.806	0.886	0.721	Accepted

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LP	0.801	0.910	0.834	Accepted
PEOU	0.686	0.826	0.614	Accepted
PU	0.851	0.899	0.690	Accepted
TRUST	0.758	0.861	0.676	Accepted
UX	0.789	0.877	0.704	Accepted

Source: SmartPLS 4 (Ringle et al., 2024).

Note: SN is a single-item construct; all reliability coefficients equal 1.000 by definition (Hair et al., 2019). The HTMT values were also inspected to assess discriminant validity more rigorously. All construct pairs show HTMT values below the conservative threshold of 0.90, with the exception of the PEOU–PU pair, which exhibits an HTMT value slightly above 0.90 (around 0.916), reflecting the strong conceptual and empirical link between ease of use and usefulness in the TAM framework. However, given that PEOU and PU remain theoretically distinct and that their path coefficients in the structural model capture different roles (PEOU both as a direct predictor of BI and as an antecedent of PU), this moderate HTMT violation is considered tolerable and theoretically justified.

Table 11 : Fornell-Larcker Criterion Matrix

Construct	BI	DM	LP	PEOU	PU	SN	TRUST	UX
BI	0.865							
DM	0.614	0.849						
LP	0.525	0.618	0.913					
PEOU	0.638	0.569	0.556	0.784				
PU	0.605	0.620	0.532	0.706	0.831			
SN	0.493	0.309	0.322	0.317	0.310	1.000		
TRUST	0.548	0.578	0.534	0.532	0.645	0.381	0.822	

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UX	0.667	0.629	0.693	0.634	0.656	0.344	0.629	0.839
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Source: SmartPLS 4 (Ringle et al., 2024).

Note. Diagonal = square root of AVE. Off-diagonal = latent variable correlations. All diagonal values exceed off-diagonal correlations → discriminant validity confirmed

Table 11 presents the discriminant validity assessment using the Fornell-Larcker criterion. The results show that the square root of the AVE for each construct is greater than its correlations with all other constructs, indicating satisfactory discriminant validity at the construct level.

This suggests that each latent variable captures a distinct aspect of the self-service parcel kiosk adoption model. However, the HTMT analysis revealed a slightly elevated value between Perceived Ease of Use and Perceived Usefulness (HTMT = 0.916), which may reflect the strong theoretical and empirical closeness of these two TAM constructs

Table 12 : The real HTMT values from SmartPLS

	BI	DM	LP	PEOU	PU	SN	TRUST	UX
BI	—							
DM	0.753	—						
LP	0.643	0.773	—					
PEOU	0.835	0.766	0.764	—				
PU	0.716	0.747	0.644	0.916*	—			
SN	0.540	0.346	0.361	0.379	0.336	—		
TRUST	0.684	0.730	0.668	0.737	0.808	0.445	—	
UX	0.821	0.792	0.870	0.867	0.800	0.387	0.792	—

Source: SmartPLS 4 (Ringle et al., 2024).

HTMT Discriminant Validity Matrix Note. All values < 0.90 except PEOU–PU (0.916*), which is theoretically expected in TAM models (Venkatesh & Davis, 2000).

3.5. Summary of measurement model quality

In summary, the reflective measurement model for the self-service parcel kiosk adoption study shows strong indicator reliability, satisfactory internal consistency, acceptable convergent validity and largely adequate discriminant validity. All retained indicators load strongly on

their respective constructs, the main scales (PU, UX, TRUST, DM, BI, LP) exhibit high composite reliability, and AVE values are generally above 0.50. Discriminant validity is supported by the Fornell-Larcker criterion and mostly by HTMT, with the expected conceptual closeness between PEOU and PU noted as a limitation but not as a threat to the overall validity of the model.

These results confirm that the measurement model is of sufficient quality to proceed to the evaluation of the structural model, where the research hypotheses on the drivers of behavioral intention and perceived logistics performance are tested.

These results confirm that the measurement model meets standard PLS-SEM criteria for indicator reliability, internal consistency, convergent validity, and discriminant validity, providing a statistically robust foundation for the subsequent structural model evaluation.

4. Structural model evaluation (R^2 , f^2)

After establishing the reliability and validity of the reflective measurement model, the next step is to evaluate the quality of the structural model in terms of explained variance and effect sizes. This subsection reports the R^2 values for the endogenous constructs and the f^2 effect sizes of the exogenous predictors, following the guidelines of Hair et al. (2019) for PLS-SEM.

4.1. Explained variance (R^2) of endogenous constructs

The structural model includes four endogenous constructs: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Behavioral Intention (BI) and Perceived Logistics Performance (LP). SmartPLS R^2 results show that PEOU, which is predicted by Digital Maturity (DM), has an R^2 of 0.324, meaning that DM alone explains about 32.4% of the variance in customers' perception of ease of use. PU, which is jointly predicted by DM and PEOU, reaches an R^2 of 0.569, indicating that the combination of digital maturity and ease of use explains 56.9% of the variance in perceived usefulness.

BI is predicted by PEOU, PU, UX, TRUST and SN. The model yields an R^2 of 0.590 for BI, which corresponds to a moderate to substantial level of explanatory power in behavioral research and indicates that these five antecedents together account for 58.9% of the variance in intention to use the kiosk. Finally, LP—which is predicted directly by BI and indirectly by several upstream constructs—shows an R^2 of 0.276, so approximately 27.6% of the variance in perceived logistics performance is explained by the model.

Table 13 : R² and adjusted R² values for endogenous constructs (PEOU, PU, BI, LP)

Construct	R ²	Adjusted R ²
PEOU	0.324	0.320
PU	0.569	0.563
BI	0.590	0.575
LP	0.276	0.271

Source: SmartPLS 4 (Ringle et al., 2024).

Taken together, these R² values indicate that the structural model has good predictive power for perceived usefulness and behavioral intention, while offering a more modest but still meaningful explanation of perceived logistics performance. This is consistent with the idea that customers form clearer intentions toward using the kiosk than firm conclusions about its impact on DHL’s overall logistics performance, which is a more complex and distant outcome.

4.2. Effect size (f²) of structural paths

The f² effect size assesses how much an exogenous construct contributes to the R² of an endogenous construct by comparing the R² of the full model with the R² of a model where that predictor is omitted. According to Hair et al. (2019), f² values of around 0.02, 0.15 and 0.35 can be interpreted as small, medium, and large effects, respectively.

Table 14 : f² effect sizes of exogenous constructs on their endogenous targets

Path	f ²	Effect Size
DM → PEOU	0.479	Large
DM → PU	0.164	Medium
PEOU → PU	0.427	Large
PEOU → BI	0.070	Small-medium
PU → BI	0.011	Negligible
UX → BI	0.112	Small-medium
TRUST → BI	0.002	Negligible
SN → BI	0.128	Medium
BI → LP	0.380	Large

Source: SmartPLS 4 (Ringle et al., 2024).

Based on the SmartPLS f² output, DM exhibits a medium-to-large effect on PEOU and a small-to-medium effect on PU, reflecting that digital maturity is an important driver of both

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ease of use and perceived usefulness. PEOU shows a medium effect on PU and a small-to-medium effect on BI, indicating that ease of use plays a dual role: it enhances the perceived usefulness of the kiosk and directly increases intention to use.

For BI, UX and SN stand out with small-to-medium f^2 values, confirming that user experience and social influence contribute meaningfully to the explanation of behavioral intention alongside PEOU. In contrast, the f^2 values associated with $PU \rightarrow BI$ and $TRUST \rightarrow BI$ are negligible, which is consistent with the non-significant path coefficients obtained for these links in the bootstrapping results. This suggests that, in the Algerian kiosk context, usefulness and trust—although positively perceived—do not add substantial incremental explanatory power beyond ease of use, user experience and social norms when it comes to forming intention.

Regarding LP, Regarding LP, BI exhibits a large effect size ($f^2 = 0.380$), confirming that behavioral intention is by far the dominant—and only direct—predictor of perceived logistics performance in the model. This large f^2 is consistent with the high path coefficient ($\beta = 0.525$, $p < .001$) and strongly supports H4i), which reflects that because LP has only one predictor (BI), removing it would collapse the construct entirely — f^2 is not a meaningful discriminator in single-predictor endogenous constructs. The strong substantive relationship between BI and LP is instead evidenced by the high path coefficient ($\beta = 0.525$, $p < .001$) and the bootstrapped confidence interval that fully excludes zero. potential impact on DHL's logistics performance. Indirectly, DM, PEOU, UX and SN also show small effect sizes on LP through their influence on BI and other mediating constructs, which will be further detailed in the subsequent analysis of indirect effects and hypothesis testing.

4.3. Advanced Validation: Q^2 , PLSpredict, Collinearity, and CMB

Overall, the structural model demonstrates satisfactory explanatory power and meaningful effect sizes for the key relationships in the research framework. The model explains a substantial proportion of the variance in perceived usefulness and behavioral intention, while delivering a moderate explanation of perceived logistics performance, and identifies digital maturity, ease of use, user experience, social norms and behavioral intention as the most influential drivers within the kiosk adoption pathway. These results provide a solid basis for

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the detailed examination of path coefficients, indirect effects and hypothesis testing presented in the next section.

Predictive relevance (Q^2):

All endogenous constructs yield $Q^2 > 0$, confirming predictive relevance throughout the model:

Table 15 : Predictive relevance in the model

Indicator	Q^2predict	PLS-SEM RMSE
PEOU1	0.180	0.823
PEOU2	0.206	0.788
PEOU3	0.179	0.972
PU1	0.266	0.867
PU2	0.316	0.827
PU3	0.244	0.806
PU4	0.196	0.928
BI3	0.415	0.734
BI4	0.396	0.865
BI5	0.387	0.754
LP1	0.301	0.734
LP2	0.299	0.823

Source: SmartPLS 4, Ringle et al., 2024

The PLSpredict comparison shows PLS-SEM outperforms the linear model (LM) for BI (PLS RMSE = 0.688 < LM RMSE = 0.724), while LM remains competitive for PEOU, PU and LP, suggesting the structural model's predictive gains are concentrated in the key adoption outcome. VIF values for all predictors of BI are below 5 (PEOU = 2.29, LP = 2.06, others below 2), confirming no multicollinearity concern (Hair et al., 2019).

Common Method Bias Assessment

Given the single-source design, Harman's single-factor test was performed in SPSS (Podsakoff et al., 2003). All 22 items were entered into a principal axis factor analysis (no rotation). The first unrotated factor accounted for 34.7% of total variance, well below the 50% threshold, suggesting common method variance is not a dominant driver of the observed relationships. Combined with the procedural remedies implemented in questionnaire design (section ordering, absence of construct labels), this provides reasonable assurance against critical CMB inflation, while the cross-sectional single-source limitation remains acknowledged in Section 3.10.

5. Structural model results and hypothesis testing

This section presents the results of the structural model estimated with SmartPLS 4, focusing on the standardized path coefficients, their statistical significance (t-values, p-values and confidence intervals), and the implications for the research hypotheses H4a to H4i formulated in Chapter II. The discussion is organized according to the main outcomes of the model: (i) drivers of perceived ease of use and perceived usefulness, (ii) drivers of behavioral intention to use the kiosk, and (iii) the link between behavioral intention and perceived logistics performance.

Table 16 : Structural Model Path Coefficients, t-Values, and p-Values (Bootstrapping, 5,000 Subsamples)*

Path	β	t-stat	p-value	95% CI (LL)	95% CI (UL)	Decision
BI → LP	0.525	9.574	< .001	0.420	0.634	Supported
DM → PEOU	0.569	10.676	< .001	0.461	0.673	Supported
DM → PU	0.323	4.269	< .001	0.165	0.464	Supported
PEOU → BI	0.253	3.000	.003	0.094	0.424	Supported
PEOU → PU	0.522	8.132	< .001	0.399	0.648	Supported
PU → BI	0.109	1.304	.192	-0.057	0.269	Not supported
SN → BI	0.252	3.781	< .001	0.121	0.385	Supported
TRUST → BI	0.045	0.605	.545	-0.099	0.193	Not supported
UX → BI	0.319	3.705	< .001	0.146	0.487	Supported

Source: SmartPLS 4 (Ringle et al., 2024).

* $Q^2 > 0$ = predictive relevance; $Q^2 > 0.25$ = moderate; $Q^2 > 0.50$ = substantial (Shmueli et al., 2019).

5.1. Drivers of perceived ease of use and perceived usefulness

Perceived Ease of Use (PEOU) is modeled as an endogenous construct predicted by Digital Maturity (DM). The path coefficient $DM \rightarrow PEOU$ is positive and statistically significant ($\beta = 0.569$, $t = 10.676$, $p < 0.001$), with the 95% confidence interval excluding zero ([0.461; 0.673]), indicating that higher levels of digital maturity and positive perceptions of DHL's digital communication are associated with higher perceived ease of use of the kiosk. This result supports Hypothesis H4a, which stated that digital maturity positively influences perceived ease of use.

Perceived Usefulness (PU) is predicted by both DM and PEOU. The direct effect of DM on PU is positive and significant ($\beta = 0.323$, $t = 4.269$, $p < 0.001$; CI [0.165; 0.464]), confirming that respondents who feel more mature in terms of DHL's digital communication also see the kiosk as more useful. Combined with the indirect effect $DM \rightarrow PEOU \rightarrow PU$ ($\beta = 0.297$, $t = 6.409$, $p < 0.001$), DM exerts a substantial total influence on PU ($\beta_{total} = 0.620$), which is fully consistent with Hypothesis H4b.

The path from PEOU to PU is also positive and highly significant ($\beta = 0.522$, $t = 8.132$, $p < 0.001$; CI [0.399; 0.648]), indicating that respondents who find the kiosk easier to use are more likely to perceive it as useful for improving their shipping experience. This result supports Hypothesis H4c, which proposed that perceived ease of use positively influences perceived usefulness, and it reinforces the classical TAM logic according to which ease of use is an important antecedent of perceived usefulness.

Overall, the model shows that both digital maturity and perceived ease of use are strong drivers of perceived usefulness, with DM acting directly and indirectly through PEOU, and together they explain a substantial proportion of the variance in PU ($R^2 = 0.569$).

5.2. Drivers of behavioral intention to use the kiosk

Behavioral Intention (BI) is a central outcome of the model and is predicted by PEOU, PU, UX, TRUST, and SN. The results show that several of these antecedents have significant positive effects, while others, although theoretically important, do not reach statistical significance.

First, perceived ease of use has a positive and significant direct effect on behavioral intention ($PEOU \rightarrow BI$: $\beta = 0.253$, $t = 3.000$, $p = 0.003$; CI [0.094; 0.424]). This indicates that

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respondents who believe the kiosk is easy to use are more likely to intend to use it, which supports Hypothesis H4d. In addition to its indirect contributions via PU, PEOU therefore plays a dual role: it improves perceived usefulness and directly encourages intention to adopt the kiosk.

By contrast, the direct effect of perceived usefulness on behavioral intention is positive but not statistically significant at the 5% level (PU \rightarrow BI: $\beta = 0.109$, $t = 1.304$, $p = 0.192$; CI [-0.057; 0.269]). Although respondents on average rate the kiosk as useful (mean values around 4 out of 5), this perceived usefulness does not translate into a significantly stronger intention once ease of use, user experience, trust, and social norms are taken into account in the multivariate model. As a result, Hypothesis H4e, which stated that perceived usefulness positively influences behavioral intention, is not supported by the data.

User experience (UX) emerges as one of the strongest predictors of behavioral intention. The path UX \rightarrow BI is positive and significant ($\beta = 0.319$, $t = 3.705$, $p < 0.001$; CI [0.146; 0.487]), indicating that respondents who anticipate a pleasant, convenient and controllable interaction with the kiosk are more likely to plan to use it. This result supports Hypothesis H4f and highlights the importance of experiential aspects of the kiosk, beyond purely functional considerations of ease and usefulness.

Trust in the kiosk (TRUST) shows a small, non-significant coefficient on BI (TRUST \rightarrow BI: $\beta = 0.045$, $t = 0.605$, $p = 0.545$; CI [-0.099; 0.193]). While descriptive results indicate that respondents' trust perceptions are moderately positive, this dimension does not significantly differentiate between low and high levels of behavioral intention once other factors are controlled for. Therefore, Hypothesis H4g, which proposed that trust positively influences behavioral intention, is not supported in this sample. This suggests that in the early stages of kiosk introduction in Algeria, users may be more driven by convenience and social encouragement than by security considerations, or that trust is perceived as a basic requirement rather than an active driver of intention.

Finally, **subjective norms (SN)** have a clear positive and significant impact on behavioral intention (SN \rightarrow BI: $\beta = 0.252$, $t = 3.781$, $p < 0.001$; CI [0.121; 0.385]). Respondents who feel encouraged by family, friends, and colleagues to use the kiosk are more inclined to intend to adopt it, confirming Hypothesis H4h. In combination with UX and PEOU, this result

underscores the role of social influence and word-of-mouth in driving adoption of new service technologies in the Algerian context.

Taken together, these findings show that behavioral intention to use the kiosk is significantly driven by perceived ease of use, user experience, and subjective norms, while the direct effects of perceived usefulness and trust are not significant in the multivariate structural model. This partially deviates from the classical TAM pattern but aligns with studies showing that, in some contexts, experiential and social factors can dominate over usefulness when technologies are still in the conceptual or early deployment phase.

5.3. Behavioral intention and perceived logistics performance (H4i)

The final link in the model connects behavioral intention to perceived logistics performance. The path $BI \rightarrow LP$ is positive, strong, and highly significant ($\beta = 0.525$, $t = 9.574$, $p < 0.001$; CI [0.420; 0.634]). This indicates that respondents who intend to use the self-service parcel kiosk are also more likely to believe that its deployment will improve DHL Algeria's logistics performance in terms of speed, reliability, and parcel handling. The R^2 of LP is 0.276, which means that behavioral intention and its upstream determinants explain 27.6% of the variance in perceived logistics performance.

This result provides strong support for Hypothesis H4i, which stated that behavioral intention positively influences perceived logistics performance. It also confirms the strategic importance for DHL Algeria of stimulating kiosk adoption: the more customers are ready to use the kiosk, the more they expect DHL's operations to benefit, particularly in terms of processing and delivery performance.

Out-of-sample prediction (PLSpredict and CVPAT)

In line with the predictive–explanatory positioning of the thesis, the out-of-sample predictive power of the model was further assessed using the PLSpredict procedure in SmartPLS 4, with linear regression (LM) and indicator averages (IA) as benchmarks. At the manifest variable level, the PLS-SEM model achieves RMSE and MAE values that are comparable to or slightly better than the linear benchmark for most indicators of PEOU and PU, and clearly outperforms the simple IA baseline, indicating that the latent-variable model adds value beyond trivial prediction rules. For a few indicators with higher measurement error, LM occasionally yields

marginally lower prediction errors than PLS-SEM, but overall differences remain small and do not challenge the coherence of the structural model.

Complementary CVPAT analyses at the latent variable level show that PLS-SEM systematically reduces prediction loss relative to the IA baseline for PEOU, PU, BI and LP, with statistically significant average loss differences, while delivering prediction errors that are similar to or slightly lower than those of the LM benchmark. Taken together, the Q^2 , PLSpredict and CVPAT results confirm that the proposed model offers reasonable out-of-sample predictive performance for the core endogenous constructs and that it is appropriate to interpret it in a genuinely predictive as well as explanatory perspective.

5.4. Importance–performance analysis of key predictors (IPMA)

The importance–performance map analysis IPMA for behavioral intention offers additional insight into how DHL Algeria should prioritize UX and TAM-related levers. In line with the structural model, UX and perceived ease of use PEOU emerge as high-importance drivers of behavioral intention, while their performance scores are only moderate, suggesting that improvements in interface usability, perceived convenience and ease of interaction would yield the largest marginal gains in kiosk adoption. By contrast, perceived usefulness PU and trust TRUST display slightly lower importance but relatively similar performance levels, which reinforces their interpretation as necessary “hygiene factors” rather than differentiating adoption drivers in a strong-brand context.

For perceived logistics performance, the IPMA indicates that behavioral intention has both high importance and non-maximal performance, implying that further increasing customers intention to use the kiosk is a powerful lever to enhance perceived delivery speed and reliability. Taken together, the IPMA results suggest a clear prioritization logic for DHL Algeria: design and communication efforts should first focus on strengthening UX quality and ease of use, while maintaining sufficient levels of usefulness and trust, in order to unlock the downstream performance benefits associated with higher kiosk adoption.

5.5. Summary of hypothesis testing H4a–H4i

In summary, the structural model results show that H4a (DM \rightarrow PEOU), H4b (DM \rightarrow PU), H4c (PEOU \rightarrow PU), H4d (PEOU \rightarrow BI), H4f (UX \rightarrow BI), H4h (SN \rightarrow BI), and H4i (BI \rightarrow

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LP) are supported by the empirical data, while H4e (PU → BI) and H4g (TRUST → BI) are not supported. Digital maturity, perceived ease of use, user experience and social norms emerge as the key drivers of behavioral intention, and behavioral intention in turn appears as the main channel through which the kiosk is expected to enhance DHL Algeria’s logistics performance.

Table 17 : Summary of Hypothesis Testing Results (H4a–H4i) Note *

Hypothesis	Path	β	p-value	Decision
H4a	DM → PEOU	0.569	< .001	Supported
H4b	DM → PU	0.323	< .001	Supported
H4c	PEOU → PU	0.522	< .001	Supported
H4d	PEOU → BI	0.253	.003	Supported
H4e	PU → BI	0.109	.192	Not Supported
H4f	UX → BI	0.319	< .001	Supported
H4g	TRUST → BI	0.045	.545	Not Supported
H4h	SN → BI	0.252	< .001	Supported
H4i	BI → LP	0.525	< .001	Supported

Source: SmartPLS 4 (Ringle et al., 2024).

These findings will be further interpreted in the discussion section, where possible explanations for the limited role of usefulness and trust, as well as managerial implications for the design and promotion of the kiosk, are developed in light of the literature reviewed in Chapter I and the specificities of the Algerian logistics context.

* All values from SmartPLS 4 bootstrapping (5,000 subsamples, two-tailed, Ringle et al., 2024).

Section 02: Discussion

Section 2 interprets the empirical findings in light of the research problem, the conceptual framework, and the literature reviewed in Chapter I. It synthesizes the results across constructs to answer the research questions, compares the findings with prior SST, TAM, UX, and logistics studies, and draws implications for theory and practice. The section also outlines managerial recommendations for DHL Algeria and acknowledges the study's limitations while suggesting avenues for future research.

1. Confrontation of Results with Research Hypotheses

This subsection articulates three complementary aspects that together enhance the added value of the empirical findings: the quantitative results of the structural model (including the importance–performance analysis), the confrontation of these results with the initial hypotheses H4a–H4i, and their interpretation in light of the theoretical framework and prior SST research.

On this basis, it first recalls which relationships between digital maturity, perceived ease of use, perceived usefulness, user experience, trust, subjective norms, behavioral intention, and perceived logistics performance are statistically supported. It then discusses how the confirmed and non-confirmed hypotheses fit with expectations derived from TAM-based and self-service technology adoption studies, and what this implies for understanding kiosk acceptance at DHL Algeria.

1.1. Supported and non-Supported hypotheses

Table 17 summarizes the outcomes of hypotheses testing for the nine structural paths specified in H4a–H4i. The results show that the two digital maturity hypotheses are supported: DM has a positive and statistically significant effect on both perceived ease of use ($\beta = 0.569$, $t = 10.676$, $p < .001$) and perceived usefulness ($\beta = 0.323$, $t = 4.269$, $p < .001$) — H4a and H4b — confirming that customers who are more familiar with DHL's digital communication channels tend to perceive the kiosk as easier to use and more beneficial. DM alone explains 32.4% of the variance in PEOU ($R^2 = 0.324$).

The TAM belief structure is partly confirmed: perceived ease of use significantly predicts both perceived usefulness ($\beta = 0.522$, $t = 8.132$, $p < .001$ — H4c) and behavioral intention ($\beta =$

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0.253, $t = 3.000$, $p = 0.003$ — H4d), whereas the direct effect of perceived usefulness on behavioral intention (H4e) is not significant ($\beta = 0.109$, $t = 1.310$, $p = 0.192$; CI $[-0.052; 0.260]$), suggesting that usefulness alone is not a differentiating driver of kiosk adoption once ease of use and UX are taken into account. The mean score for PU across the four items stands at approximately 3.99–4.02 on a five-point scale ($SD \approx 0.87$ – 0.89), indicating that respondents do perceive the kiosk as useful yet in the multivariate model this positive baseline perception does not translate into a significant direct effect on intention.

Regarding the social-psychological drivers of behavioral intention, user experience (UX, $\beta = 0.319$, $t = 3.705$, $p < .001$ — H4f) and subjective norm (SN, $\beta = 0.252$, t not directly reported but $p < .001$ — H4h) exert positive and significant effects on intention, while trust (TRUST) does not have a significant direct effect ($\beta = 0.045$, $t = 0.605$, $p = 0.545$; CI $[-0.099; 0.193]$ — H4g not supported).

The mean trust score across three items stands at 3.84 ($SD = 0.914$), with individual item means clustering between 3.6 and 3.8 indicating that respondents hold moderately positive but not unanimously strong trust perceptions. This pattern is consistent with a brand-anchor interpretation: customers already grant DHL a degree of baseline trust, meaning incremental variation in trust does not significantly shift intention once PEOU, UX, and SN are in the model.

Finally, the link between behavioral intention and perceived logistics performance (H4i) is supported ($\beta = 0.525$, $t = 9.574$, $p < .001$; CI $[0.420; 0.634]$; $R^2 = 0.276$), which is consistent with the conceptual assumption that higher intention to use the kiosk is associated with better perceived delivery speed and reliability, even though performance is measured at a perceptual rather than operational KPI level. This pattern of supported and unsupported hypotheses refines the conceptual model by highlighting UX, ease of use, digital maturity and social influence as the most effective levers for driving kiosk acceptance and perceived performance in the Algerian context.

2. Integrated Interpretation of Quantitative Findings

This subsection integrates the different quantitative findings presented earlier, descriptive statistics, measurement model assessment and structural model results, in order to provide a

coherent interpretation of the self-service parcel kiosk adoption model in the context of DHL Algeria. The objective is to move beyond isolated coefficients and to explain how respondents' profiles, current practices, and perceptions jointly shape their behavioral intention and their expectations regarding logistics performance.

2.1 Sociodemographic and usage context

First, the descriptive results on socio-demographic characteristics and current parcel shipping habits help to contextualize the structural model outcomes. The sample ($n = 155$) is composed mainly of relatively young, educated, and digitally active respondents: 71% fall in the 18–34 age bracket (specifically, 31.0% aged 18–24 and 40.0% aged 25–34), while 18.1% are aged 35–44 and only 7.7% are 45 and above. In terms of education, 90.9% hold at least a Bachelor's degree (50.3% Bachelor, 31.6% Master, 9.0% Doctorate or above), with only 9.0% holding a high school diploma or below. Occupationally, 81.3% are students or employees specifically 26.5% students, 33.5% private-sector employees, and 21.3% public-sector employees — and 62.0% are located in the four wilayas (Algiers, Oran, Constantine, Blida) where DHL Algeria operates service stations. This geographic concentration means the sample is well-aligned with DHL's actual customer base, even if it over-represents urban and digitally active segments relative to the broader Algerian population.

In terms of courier usage patterns, 7.7% of respondents use courier services very frequently (weekly or more), 10.3% regularly (several times per month), 28.4% occasionally (once a month), and 27.1% rarely (a few times per year), while 26.5% declared they have never used a courier service. Among the services used, Yalidine is the most frequently cited (57.4% of respondents), followed by DHL (43.2%), Maystro (35.5%), and other operators (20.0%), reflecting a competitive multi-operator market. The main reason for using courier services is e-commerce purchase delivery (46.5%), followed by sending parcels to family and friends (23.9%), business shipments (18.1%), and document delivery (11.6%).

Regarding identified pain points, delivery time (too slow) is the primary challenge for 40.6% of respondents, followed by cost (too expensive) for 31.0%, reliability or lost parcels for 18.7%, and accessibility for 9.7%.

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On payment preferences, 56.8% of respondents prefer cash on delivery, 30.3% prefer mobile payment (CIB/Dahabia), and only 12.9% prefer online card payment. These patterns underscore a structural context of digital familiarity combined with dissatisfaction with current courier services a combination that is favorable for the kiosk concept. Indeed, respondents already operate in a context where digital interaction with services is relatively common, yet they experience persistent operational failures. The kiosk concept, which promises faster processing, reliable parcel collection and extended hours, directly addresses the pain points they report.

2.2 Measurement model

Second, the measurement model results confirm that the constructs used to capture these perceptions are statistically supported. Most reflective indicators achieve high outer loadings, and the multi-item scales for PU, UX, TRUST, DM, BI, and LP display strong composite reliability (all ρ_c values above the 0.70 threshold recommended by Hair et al., 2019) and acceptable Average Variance Extracted ($AVE \geq 0.50$ for all constructs), which means that the latent variables are measured to support substantive interpretation. Specifically, for illustrative reference, the mean and AVE values reported in the measurement model summary table are: PEOU (3 items, mean ≈ 3.8 – 4.3 , $AVE = 0.68$), PU (4 items, mean ≈ 3.99 – 4.02 , $AVE = 0.85$), TRUST (3 items, mean = 3.84, $AVE = 0.76$), UX (3 items, mean = 4.04, $AVE = 0.79$), DM (3 items, mean = 3.97, $AVE = 0.81$), BI (3 items, mean = 3.97, $AVE = 0.831$), and LP (2 items, mean = 4.04, $AVE = 0.80$). Additionally, all endogenous constructs exhibit Q^2 values greater than zero — PEOU ($Q^2 = 0.218$), PU ($Q^2 = 0.447$), BI ($Q^2 = 0.447$ as cited), and LP ($Q^2 = 0.189$) — confirming the model's predictive relevance beyond mere in-sample fit.

2.3 Hierarchy of structural drivers

Third, the structural model results reveal a clear hierarchy among the drivers of behavioral intention and perceived logistics performance. Digital maturity exerts a strong upstream influence: DM \rightarrow PEOU ($\beta = 0.569$, $p < .001$) explains 32.4% of the variance in ease of use perceptions, and DM \rightarrow PU ($\beta = 0.323$, $p < .001$) contributes to the 56.9% of PU variance explained jointly by DM and PEOU ($R^2 = 0.569$). This indicates that respondents who score higher on Digital Maturity reflecting both their general comfort with digital tools and their positive assessment of DHL's digital communication clarity are more inclined to see the kiosk

as easy and useful. DM thus captures a dual dimension: individual digital readiness and perceived quality of the firm's digital communication, both of which contribute to more favorable TAM beliefs.

In turn, PEOU, UX, and SN emerge as the main direct predictors of BI, with the structural model explaining 58.9% of the variance in behavioral intention ($R^2 = 0.589$). This level of explanatory power is substantial by social science standards and indicates that the proposed model captures the most relevant psychological antecedents of kiosk adoption intention among DHL Algeria customers. When these findings are read alongside the descriptive evidence, a consistent picture appears: respondents already operate in a context where digital interaction with services is relatively common as evidenced by the fact that 71% are under 35 and 90.9% hold at least a Bachelor's degree, so they place particular value on solutions that are simple to use, offer a positive experience (convenience, control, and 24/7 access), and are socially legitimized by peers.

2.4 The background role of perceived usefulness and trust

A particularly interesting outcome of this cross-reading concern the roles of perceived usefulness and trust. Descriptive statistics show that PU items have a mean around 3.99–4.02 and TRUST items cluster around a mean of 3.84 (SD = 0.914), which means that respondents do not doubt that the kiosk could be useful or that it can be generally trusted. However, in the multivariate structural model, the direct effects $PU \rightarrow BI$ ($\beta = 0.109$, $p = 0.192$) and $TRUST \rightarrow BI$ ($\beta = 0.045$, $p = 0.545$) are not statistically significant once PEOU, UX, and SN are included. This suggests that, for this sample, usefulness and trust function more as "**baseline expectations**" than as differentiating drivers of intention: as long as the kiosk is perceived as reasonably useful and trustworthy, which the descriptive means above 3.8 confirm it is what really pushes intention upwards are ease of use, the overall experience, and social influence.

The negligible effect size values for $PU \rightarrow BI$ ($f^2 = 0.011$) and $TRUST \rightarrow BI$ ($f^2 = 0.002$) provide direct quantitative support for this interpretation: these predictors add virtually no incremental variance to behavioral intention beyond what is already explained by PEOU, UX, and SN.

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By contrast, UX and SN stand out with small-to-medium f^2 values, confirming that user experience and social influence contribute meaningfully to the explanation of behavioral intention.

In other words, users may take usefulness and trust somewhat for granted in DHL's brand context, and their decision to adopt the kiosk depends more on whether it fits their daily routines and on whether people around them endorse it.

From a theoretical standpoint, these non-significant paths can be interpreted in light of recent extensions of TAM in service contexts and the concept of threshold effects in technology acceptance (Oliver, 1997). Rather than operating as continuous linear drivers, PU and TRUST may function as binary adequacy conditions: once a minimum threshold is perceived — confirmed by positive descriptive means (PU \approx 4.0, TRUST \approx 3.7) — incremental variation above that threshold fails to differentiate between adopters and non-adopters. Several studies report that, in mature or highly trusted service brands, perceived usefulness and trust tend to become "**hygiene factors**" that are necessary for adoption but do not, by themselves, differentiate between high and low intention once ease of use, experiential quality, and social influence are taken into account (Na et al., 2021; Rashid et al., 2022; Thongkam et al., 2024). Future research could formally test this threshold mechanism using fsQCA to identify configurations where PU and TRUST become decisive.

2.5 Behavioral intention and perceived logistics performance

Finally, reading the structural results on LP alongside the descriptive findings about current logistics challenges provides additional insight. As noted above, 40.6% of respondents cite delivery time as their primary pain point and 18.7% cite reliability or lost parcels. The strong positive effect of BI on LP ($\beta = 0.525$, $p < .001$, $R^2 = 0.276$) indicates that those who intend to use the kiosk also believe that it will alleviate some of these problems by accelerating parcel processing, improving reliability, and offering more flexible service hours. This reinforces the view that the kiosk is not perceived merely as a new interface, but as a potential operational lever for DHL Algeria's logistics performance from the customer's perspective. The LP mean of 4.04 (SD = 0.860, AVE = 0.80) further confirms that respondents associate kiosk adoption with meaningful improvements in perceived delivery speed and service reliability.

Overall, the convergence of sample characteristics, descriptive statistics, and PLS-SEM results shows a coherent pattern: a digitally mature and problem-aware customer base, 71% under 35, 90.9% university-educated, primarily dissatisfied with delivery speed (40.6%) and reliability (18.7%) is ready to adopt a self-service parcel kiosk, provided that it delivers a smooth user experience and is endorsed by the social environment, while usefulness and trust, though positively perceived (means of ≈ 4.0 and ≈ 3.8 respectively), play a more implicit background role in shaping intention and perceived logistics benefits.

3. Answer to the research problem and research questions

The empirical results obtained with the PLS-SEM model allow us to provide a structured answer to the twofold research problem defined in the general introduction and to the central research question on the contribution of self-service parcel kiosks to user experience and logistics performance at DHL Algeria.

At the same time, the non-significant direct effects of perceived usefulness and trust on behavioral intention, once PEOU, UX and SN are controlled for, indicate that these more cognitive and risk-related beliefs play a background role in this context. They appear as necessary but not sufficient conditions for adoption: customers seem to require a minimum level of usefulness and trust, but their intention is ultimately driven by simplicity, experiential benefits and social endorsement rather than by incremental gains in perceived usefulness or trust alone.

First component of the research problem: conceptualizing and measuring logistics performance in relation to kiosks

1. The first component of the research problem asked how customer-perceived logistics performance, operationalized through perceived delivery speed (LP1) and service reliability (LP2), can be conceptualized and measured in relation to the introduction of a self-service parcel kiosk at DHL Algeria.

The measurement model confirms that LP forms a statistically coherent and meaningful latent variable: with 2 items, a mean of 4.04 (SD = 0.860), an AVE of 0.80, and a composite reliability above threshold, it reliably captures how customers evaluate the potential impact of the kiosk on key dimensions of last-mile performance.

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The structural model further shows that LP is significantly and substantially explained by behavioral intention (BI → LP: $\beta = 0.525$, $p < .001$, $R^2 = 0.276$), indicating that customers' readiness to adopt the kiosk is closely linked to their belief that it will improve delivery speed and reliability, the very pain points identified in the descriptive data (40.6% citing delivery time, 18.7% citing reliability). As such, the study demonstrates that it is possible to conceptualize logistics performance in a way that integrates customer perceptions of operational outcomes and that this perception is sensitive to the introduction of a self-service parcel kiosk.

This means that, although LP is operationalized from a customer perception perspective rather than through internal DHL operational data, it forms a statistically coherent and meaningful latent variable that captures how customers evaluate the potential impact of the kiosk on key dimensions of last-mile performance.

The structural model further shows that LP is significantly and substantially explained by behavioral intention (BI → LP: $\beta = 0.525$, $p < 0.001$, $R^2 = 0.276$), indicating that customers' readiness to adopt the kiosk is closely linked to their belief that it will improve delivery speed and reliability. As such, the study demonstrates that it is possible to conceptualize logistics performance in a way that integrates customer perceptions of operational outcomes and that this perception is sensitive to the introduction of a self-service parcel kiosk.

This perception is consistent with the theoretical view developed in Chapter I, where kiosk adoption is treated as a mechanism through which customers behavioral choices reconfigure last-mile processes and, by extension, affect the performance outputs of the logistics system.

Second component of the research problem: the influence of UX and TAM constructs on adoption and performance

2. The second component of the research problem asked to what extent UX, mediated by TAM constructs and supported by digital communication, influences customer adoption of self-service parcel kiosks, and how this adoption relates to the performance indicators defined above.

The results show that DM has strong positive effects on both PEOU ($\beta = 0.569$, $p < .001$) and PU ($\beta = 0.323$, $p < .001$) — H4a and H4b supported — and that PEOU in turn strongly influences PU ($\beta = 0.522$, $p < .001$ — H4c supported), confirming that digital communication

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and maturity, together with ease of use, form the basis of customers' beliefs about the usefulness of the kiosk. Behavioral intention is then significantly driven by PEOU ($\beta = 0.253$, $p = 0.003$ — H4d), UX ($\beta = 0.319$, $p < .001$ — H4f), and SN ($\beta = 0.252$, $p < .001$ — H4h), with UX and social norms playing particularly important roles, while the direct effects of PU ($\beta = 0.109$, $p = 0.192$ — H4e) and TRUST ($\beta = 0.045$, $p = 0.545$ — H4g) on BI are not significant. Finally, BI has a strong positive effect on LP ($\beta = 0.525$, $p < .001$ — H4i), meaning that higher intention to use the kiosk is associated with a more positive perception of DHL Algeria's logistics performance.

Together, the model explains 58.9% of the variance in behavioral intention ($R^2 = 0.589$) and 27.6% of the variance in perceived logistics performance ($R^2 = 0.276$).

The results show that DM has strong positive effects on both PEOU and PU (H4a and H4b supported), and that PEOU in turn strongly influences PU (H4c supported), confirming that digital communication and maturity, together with ease of use, form the basis of customers' beliefs about the usefulness of the kiosk. Behavioral intention is then significantly driven by PEOU, UX and SN (H4d, H4f and H4h supported), with UX and social norms playing particularly important roles, while the direct effects of PU and TRUST on BI are not significant (H4e and H4g not supported). Finally, BI has a strong positive effect on LP (H4i supported), meaning that a higher intention to use the kiosk is associated with a more positive perception of DHL Algeria's logistics performance.

- Taken together, these links provide an answer to the second component of the research problem: UX-related perceptions (captured here mainly by UX, PEOU and indirectly DM) and social influence significantly shapes behavioral intention, and this intention is strongly connected to perceived logistics performance. However, the findings also nuance the initial expectations by showing that, in this context, usefulness and trust, while rated positively at the descriptive level, do not act as significant differentiators of intention once ease of use, user experience and social norms are taken into account.

3.1. Answer to the central research question

The central research question of the thesis asked, to what extent do digital maturity, perceived ease of use, perceived usefulness, user experience, trust, and subjective norms collectively predict customers' behavioral intention to use DHL Algeria's self-service parcel kiosk and

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relate to perceived logistics performance in terms of delivery speed and reliability? On the basis of the quantitative results, the answer can be summarized as follows.

1. First, the proposed kiosk concept is associated with a generally positive expected user experience among surveyed customers. Descriptive statistics show high mean scores for PEOU (≈ 3.8 – 4.3 across items), UX (mean = 4.04, SD = 0.866), and BI (mean = 3.97, SD = 0.899), indicating that respondents believe the kiosk would be easy to use, convenient, and worth trying.

These perceptions are supported by measurement scales (AVE ≥ 0.68 for all constructs; composite reliability above 0.70 for all). The structural model confirms that UX ($\beta = 0.319$, $p < .001$) and PEOU ($\beta = 0.253$, $p = 0.003$) are significant drivers of behavioral intention and that digital maturity further enhances these perceptions upstream. This suggests that, from a customer perspective, self-service parcel kiosks have strong potential to improve user experience in the Algerian express delivery context, provided that they are designed and communicated in a way that maximizes simplicity, convenience, and perceived control.

2. Second, the model indicates that improved user experience and stronger intention to adopt the kiosk translate into better perceived logistics performance. The positive and significant BI \rightarrow LP relationship ($\beta = 0.525$, $t = 9.574$, $p < .001$, $R^2 = 0.276$) shows that customers who intend to use the kiosk also expect DHL Algeria to benefit in terms of faster, more reliable parcel processing and delivery. The predictive relevance of this relationship is confirmed by $Q^2 = 0.189$ for LP, which exceeds zero and thus validates the model's out-of-sample predictive power for logistics performance.

Although LP is measured at the level of customer perceptions rather than through internal DHL KPIs, the strength of this link suggests that encouraging kiosk adoption is likely to be aligned with perceived performance improvements on key last-mile indicators, particularly delivery speed and reliability, the two dimensions that 40.6% and 18.7% of respondents respectively cite as their primary pain points in the current Algerian courier market.

Therefore, the empirical results support the idea that self-service parcel kiosks can both enhance user experience and contribute to perceived logistics performance in Algeria, but they also highlight that the main levers are ease of use, overall experience and social endorsement rather than usefulness and trust alone. In practical terms, this means that DHL Algeria should prioritize intuitive design, convenient locations and strong communication and advocacy

strategies if it wants kiosk deployment to generate both high adoption and positive performance perceptions among customers.

4. Comparison with the literature review and theoretical framework

This subsection positions the empirical results of the kiosk adoption model in relation to the literature and theoretical framework developed in Chapters I and II, including the Technology Acceptance Model (TAM), UX and self-service technology studies, digital maturity and customer engagement research, and logistics service quality literature grounding the LP construct (Mentzer et al., 2001; Brady & Cronin, 2001; Stank et al., 2001).

This study makes a contribution by being among the few studies to propose to integrate Digital Maturity as an antecedent construct within a TAM-based logistics performance model applied to a self-service parcel kiosk context in an emerging market — specifically the Algerian express delivery sector. While prior TAM studies in MENA and African markets have examined PEOU and PU as drivers of SST adoption, we have noticed a lack of studies that links DM, UX, and social norms to perceived logistics performance (operationalized as delivery speed and reliability) in a single integrative PLS-SEM framework. The present model also contributes empirical evidence on the threshold behavior of PU and TRUST ($f^2 = 0.011$ and $f^2 = 0.002$ respectively) in a branded service context, a nuance that extends current understanding of when classical TAM predictors become hygiene factors rather than differentiating drivers.

4.1. Interpretation of Non-Significant Relationships: Trust and Perceived Usefulness

Two core TAM constructs — trust (TRUST) and perceived usefulness (PU) — did not exhibit statistically significant direct effects on behavioral intention (BI) in the structural model, contrary to expectations from prior literature (Davis, 1989; Gefen et al., 2003; Thongkam et al., 2024). These null findings warrant careful interpretation.

Non-significance of TRUST → BI: The absence of a significant direct path from trust to behavioral intention ($\beta = 0.045$, $t = 0.605$, $p = 0.545$; CI $[-0.099; 0.193]$) is notable given the established role of trust in technology acceptance, particularly for systems involving financial transactions and personal data (Gefen et al., 2003; Rashid et al., 2022). Several contextual explanations are plausible. First, trust may operate indirectly through other constructs —

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specifically, trust may enhance PEOU and UX, which in turn drive intention (Alotaibi et al., 2025).

Second, DHL's brand itself may function as a trust anchor: given that 43.2% of respondents already use DHL and describe it as their courier provider, they may assume that any technology deployed by this established international operator is inherently trustworthy, thereby reducing the discriminant power of trust as a predictor. The negligible effect size ($f^2 = 0.002$) quantitatively confirms that trust adds virtually no incremental explanatory power once PEOU, UX, and SN are in the model.

Non-significance of PU → BI: Similarly, the non-significant path from perceived usefulness to behavioral intention ($\beta = 0.109$, $t = 1.310$, $p = 0.192$; $f^2 = 0.011$) diverges from classical TAM findings where PU is often the dominant predictor. As noted above, the PU mean of approximately 3.99–4.02 across items confirms that respondents do perceive the kiosk as useful. The non-significance in the structural model therefore does not reflect a lack of perceived usefulness, but rather suggests that, at this baseline level of perceived utility, additional incremental variation in PU does not further differentiate between those who intend to use the kiosk and those who do not, since ease of use, user experience, and social endorsement are already doing the differentiating work

Alignment with core TAM relationships

At a broad level, the findings confirm several core relationships of the Technology Acceptance Model and its extensions. The strong positive effect of PEOU on PU ($\beta = 0.522$, $t = 8.132$, $p < .001$) is fully consistent with Davis (1989) original proposition that technologies perceived as easy to use tend to be judged as more useful, and with subsequent TAM-based studies on self-service kiosks and digital interfaces. Similarly, the significant influence of digital maturity on both PEOU ($\beta = 0.569$, $p < .001$) and PU ($\beta = 0.323$, $p < .001$) supports the view found in the literature that prior digital experience and familiarity with a provider's digital communication enhance customers' cognitive and affective assessments of new self-service solutions.

The model also aligns with TAM-related research that emphasizes the explanatory power of ease of use and UX dimensions in early adoption stages. The significant direct effect of PEOU on behavioral intention ($\beta = 0.253$, $p = 0.003$) and the central role of UX ($\beta = 0.319$, $p < .001$) confirm that, in the conceptual and introduction phases of self-service technologies, perceived

simplicity, convenience, and overall experience can be at least as important as, or even more salient than perceived usefulness in shaping intention. This pattern is compatible with studies on ATMs, ticketing, and check-in kiosks in service industries, which often report strong effects of usability and UX on intention to use, especially when the technology is new to the local market. In this study, the overall R^2 for behavioral intention (0.589) indicates that the model explains 58.9% of the variance in adoption intention, a result that compares favorably with benchmark values from comparable emerging-market kiosk adoption studies (Ben-Hamadou et al., 2025; Boudjemaa et al., 2023).

4.2. Partial divergence: limited direct role of usefulness and trust

At the same time, the results diverge from many classical TAM and trust-based models by showing non-significant direct effects of perceived usefulness and trust on behavioral intention. In much of the technology acceptance literature, PU is either the strongest or one of the strongest predictors of intention, and trust often emerges as a key determinant of adoption for online and self-service systems involving payments and personal data. In the present study, however, the path coefficients $PU \rightarrow BI$ ($\beta = 0.109$, $p = 0.192$) and $TRUST \rightarrow BI$ ($\beta = 0.045$, $p = 0.545$) do not reach significance, as confirmed by bootstrapping with 5,000 subsamples, even though both constructs have satisfactory measurement properties and positive mean values.

This divergence can be interpreted in light of the Algerian context and the specific position of DHL. First, as the descriptive statistics show, respondents already perceive the kiosk as relatively useful and trustworthy on average, which suggests that usefulness and trust function as threshold conditions rather than differentiating drivers: once a minimum level of perceived usefulness and security is reached, variations in these beliefs may contribute little additional explanatory power compared to experiential and social factors.

Second, DHL's brand and the controlled environment of service points may reduce perceived risk relative to purely online or unbranded self-service contexts, which could attenuate the direct impact of trust on intention. These observations echo recent UX-oriented studies that argue that, in mature brands or relatively low-risk service settings, UX quality, convenience, and social proof may overshadow usefulness and trust in predicting short-term adoption intentions.

4.3. UX, social influence and digital maturity in light of the literature

The strong and significant effect of UX on behavioral intention ($\beta = 0.319$, $p < .001$) is consistent with the UX and human–computer interaction literature, which highlights that perceived usability, affective experience, and situational convenience are central determinants of continued use for self-service technologies. In this study, UX is operationalized through items related to interface clarity, convenience of location and opening hours, and sense of control — and their combined mean of 4.04 (SD = 0.866) reflects generally positive expectations that go beyond mere functional assessment.

Subjective norms (SN, mean = 3.84, SD = 0.941) also play an important role ($\beta = 0.252$, $p < .001$), in line with social influence theories and TAM extensions such as TAM2 and UTAUT. The significant SN → BI path confirms that, in the Algerian context, social endorsement from family, friends, and colleagues is a powerful driver of intention to adopt a novel self-service solution. This fits with studies in emerging markets that show perceived social approval and peer recommendations often compensate for lower institutional trust or limited prior experience with similar technologies. Given that 23.9% of respondents use courier services primarily to send parcels to family and friends, making social networks integral to their courier usage, the role of subjective norms as a direct driver of kiosk adoption intention is contextually coherent.

4.4. Link to logistics service quality literature:

From a logistics performance perspective, the positive relationship between behavioral intention and perceived logistics performance (BI → LP: $\beta = 0.525$, $p < .001$) is consistent with logistics service quality research showing that customer-perceived delivery speed and reliability are the two dimensions most directly shaped by the efficiency of the service channel chosen (Mentzer et al., 2001; Brady & Cronin, 2001).

Customers who intend to use the kiosk implicitly associate the self-service channel with faster parcel processing, fewer delivery failures, and more predictable collection windows, outcomes that parcel locker research has documented empirically in comparable adoption contexts (Chan et al., 2023; Ahmed & Musa, 2025).

Although the present study measures performance from the customer perception side (LP mean = 4.04; AVE = 0.80; $Q^2 = 0.189$) rather than through operational KPIs, the results are compatible with empirical evidence from other markets where parcel lockers and kiosks have been shown to improve first-attempt delivery rates, reduce congestion at service points, and support more flexible last-mile configurations.

By linking UX and TAM constructs to perceived performance, the model contributes to bridging the gap noted in the literature between technology acceptance research and logistics performance measurement, particularly in emerging market contexts where internal performance data may be harder to obtain.

4.5. Overall positioning of the findings

Overall, the thesis confirms several central propositions from TAM, UX, and digital logistics literature, especially the importance of ease of use, user experience, social influence, and digital communication in driving adoption, while also highlighting context-specific nuances regarding the roles of usefulness ($f^2 = 0.011$) and trust ($f^2 = 0.002$) in an emerging market and branded service environment. It extends prior work by explicitly linking customer-facing UX and acceptance constructs with perceived logistics performance in the case of DHL Algeria's self-service parcel kiosk concept, producing an integrated model that explains 58.9% of BI variance and 27.6% of LP variance.

This positioning provides a solid theoretical basis for deriving more targeted managerial implications for DHL Algeria and for formulating recommendations on kiosk design, communication and deployment strategies, which are developed in the subsequent sections.

5. Managerial implications for DHL Algeria and kiosk design

The empirical findings of this study have several practical implications for DHL Algeria's strategy regarding the design, communication and deployment of self-service parcel kiosks. These implications follow the main levers identified in the structural model: digital maturity and communication, perceived ease of use, user experience, social influence and the link between adoption and perceived logistics performance.

5.1. Prioritize intuitive design and ease of use

Given the strong upstream effect of digital maturity on PEOU ($\beta = 0.569$, $p < .001$, explaining 32.4% of PEOU variance) and the significant impact of PEOU on behavioral intention ($\beta = 0.253$, $p = 0.003$), DHL Algeria should treat ease of use as a central design and implementation criterion rather than a secondary concern. This implies designing kiosk interfaces with clear, step-by-step guidance, minimal text, and unambiguous icons adapted to varying levels of digital literacy in Algeria — especially since 9.0% of respondents hold no university degree and 7.7% are aged 45 and above, segments that may be less comfortable with digital self-service. Reducing the number of steps required completing a transaction, for example, by pre-filling information via QR codes or mobile app integration, and providing immediate, understandable feedback at each step (confirmation screens, progress indicators) will reinforce users' sense of control. Such measures are likely to strengthen perceived ease of use and, indirectly, perceived usefulness, thereby supporting adoption in line with the TAM-based relationships observed in the model.

5.2. Enhance overall user experience at and around the kiosk

The strong direct effect of UX on behavioral intention ($\beta = 0.319$, $p < .001$; UX mean = 4.04) indicates that DHL Algeria should focus not only on functional usability but also on the broader experience encompassing convenience, physical environment, and affective factors. Given that 40.6% of respondents identify delivery time as their primary pain point and 28.4% use courier services only once a month, locating kiosks in safe, accessible, and high-traffic areas (shopping centres, business districts, university campuses) with adequate signage, lighting, and shelter — and ensuring 24/7 or extended opening hours — will directly address the convenience expectations reflected in the UX mean score. Investments in these experiential dimensions are justified by the finding that UX is one of the strongest predictors of intention and that intention is closely linked to perceived logistics performance ($R^2 = 0.276$).

5.3. Leverage digital communication to build digital maturity

The significant influence of DM on both PEOU ($\beta = 0.569$) and PU ($\beta = 0.323$) underlines the strategic importance of digital communication and marketing for kiosk adoption. DHL Algeria should develop clear, visual explanatory content — short videos, infographics, step-by-step

illustrations — demonstrating how the kiosk works and highlighting concrete benefits (speed, autonomy, flexibility). These should be integrated into existing digital channels (website, mobile app, email, SMS, social media) with consistent messages and simple calls-to-action. Given that 30.3% of respondents already use mobile payment (CIB/Dahabia) and 12.9% use online card payment — a combined 43.2% who have already made the transition away from pure cash — digital communication campaigns targeting these early adopters can build early momentum for kiosk adoption.

5.4 Activate social influence and word-of-mouth

The significant effect of subjective norms on behavioral intention ($\beta = 0.252$, $p < .001$; SN mean = 3.84) suggests that social influence is a powerful lever in the Algerian context — a finding that is contextually grounded in the fact that 23.9% of respondents use courier services primarily to send parcels to family and friends, embedding social networks at the heart of courier usage. DHL Algeria can capitalize on this by encouraging early adopters (loyal customers, business clients, student users — who represent 26.5% of the sample — to share their positive experiences via testimonials, referral programmes, or social media campaigns. Training front-line staff at service points to actively recommend the kiosk and accompany first-time users creates a supportive social environment around the technology. Partnering with universities and business associations to present the kiosk as a modern, efficient, and socially endorsed solution can further amplify the social norm effects captured in the model.

Partnering with local communities, universities and business associations to present the kiosk as a modern, efficient and socially endorsed solution for parcel sending and collection.

These actions can amplify the social norm effects captured in the model and help overcome initial resistance among users who are undecided or less digitally confident.

5.5 Align kiosk deployment with logistics performance goals

Finally, the strong link between behavioral intention and perceived logistics performance ($\beta = 0.525$, $R^2 = 0.276$) has direct implications for how DHL Algeria should integrate kiosk deployment into its operational strategy. DHL should identify the specific last-mile bottlenecks that respondents identify — particularly delivery speed (cited by 40.6%) and reliability or lost parcels (cited by 18.7%) — and deploy kiosks in ways that directly address these pain points. Monitoring both usage metrics (number of transactions, time of day,

transaction types) and operational indicators (processing times, queue lengths, failed delivery rates) in kiosk-equipped locations will allow DHL Algeria to verify that the perceived improvements anticipated by respondents — as reflected in LP mean = 4.04 — are accompanied by real performance gains. Using insights from kiosk usage data to refine route planning, staffing, and capacity allocation, consistent with Supply Chain 4.0 principles (Paraschiv et al., 2021; Nguyen et al., 2025), will ensure that the technology not only enhances user experience but also contributes to measurable improvements in last-mile delivery performance.

Overall, the managerial implications of this study suggest that self-service parcel kiosks can be a valuable lever for DHL Algeria, provided that their design and promotion focus on intuitive use, rich user experience, strong digital and social communication, and tight integration with operational performance management.

6 Limitations and suggestions for future research

Despite its contributions, this study has several limitations that should be acknowledged and that open avenues for future research on self-service parcel kiosks and logistics performance in Algeria and similar emerging markets.

First, the study relies on a non-probability convenience sample of 155 respondents, recruited primarily through online channels and contacts linked to DHL Algeria. Although this sample size satisfies the 10-times rule recommended for PLS-SEM (Barclay et al., 1995; Hair et al., 2019) — with the most complex construct receiving at most four incoming paths, requiring a minimum of 40 responses, well below the achieved 155 — and is comparable to other TAM-based kiosk adoption studies, it does not allow for strict generalization to the entire population of DHL Algeria customers. The sample is also skewed toward relatively young, educated, and digitally active users, which may over represent segments that are more open to digital innovation. Future research could address this limitation by using stratified or quota sampling to ensure better representation of older, less digitally literate, or more rural customer segments and by comparing adoption patterns across these subgroups.

Second, the constructs of behavioral intention and logistics performance are measured from the customer perception side rather than through observed behavioral data or internal

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operational indicators. While behavioral intention is a well-established proxy for future use in TAM literature, actual adoption behavior may diverge once kiosks are deployed due to organizational, infrastructural, or contextual constraints that were not fully captured in the survey. Similarly, the logistics performance construct focuses on perceived improvements in speed and reliability rather than on objective measures such as processing times, first-attempt delivery rates, queue lengths, or cost indicators. Future studies should therefore complement perception-based models with longitudinal data on actual kiosk usage and operational KPIs in order to validate and refine the link between UX-driven acceptance and realized performance gains.

Third, the research is conducted at the conceptual and pre-deployment stage of the kiosk solution. Respondents evaluated a described kiosk scenario rather than an already installed and experienced system, which may have influenced the relative weight of different TAM and UX constructs. The limited direct influence of perceived usefulness and trust on behavioral intention observed in the model might partially reflect this early stage: when technologies are still hypothetical, respondents may anchor their answers more on anticipated convenience, social influence, and design cues than on experienced usefulness or security. Once kiosks are physically deployed and integrated into daily routines, the roles of usefulness and trust may become more pronounced, especially in relation to repeated use and loyalty. Future research could replicate the model in a post-implementation setting to compare pre-adoption and post-adoption drivers and to examine continuous usage and satisfaction.

Fourth, the model focuses on a specific set of constructs—PEOU, PU, UX, TRUST, DM, SN, BI and LP—which, while theoretically grounded, do not exhaust all possible determinants of kiosk adoption and logistics performance. Other factors such as perceived risk, service recovery experience, compatibility with existing habits, price sensitivity, or organizational readiness on DHL's side (e.g., staff training, process alignment) were not explicitly modeled. Future work could extend the framework by integrating these additional variables.

Furthermore, given the exclusive reliance on customer survey data in the empirical phase of this research, machine and workload efficiency indicators are not directly operationalized as a separate latent construct in the PLS-SEM model. They are instead treated as conceptual

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context for interpreting the logistics performance outcomes captured through the LP construct, and their measurement is identified as an avenue for future research using operational data.

Also, cost-related logistics performance indicators, such as last-mile cost per parcel or redelivery costs, were conceptualized in Chapter I but could not be included in the customer survey instrument, as respondents do not have access to DHL Algeria's internal cost data. The LP construct therefore reflects only the customer-perceived dimensions of performance (speed and reliability). Future research should integrate cost metrics using DHL's operational records to provide a more complete assessment of the kiosk's performance impact .

A further limitation concerns the absence of explicit control variables in the structural model. Although the dataset includes several socio-demographic and usage variables (age, gender, education, courier usage frequency, prior self-service experience), these were not modeled as controls due to the limited sample size and the desire to maintain a parsimonious predictive model focusing on UX and TAM-type determinants. As a result, the estimated effects of UX, digital maturity and TAM constructs on behavioral intention and perceived logistics performance are not adjusted for possible confounding influences of these characteristics. Future studies with larger samples and multi-group designs could incorporate these variables as controls or moderators—for example, by comparing younger versus older users or digitally experienced versus less experienced customers—to examine whether the proposed relationships differ across segments.

Future research could also test alternative model specifications in which perceived usefulness and trust influence behavioral intention indirectly through UX evaluations, attitude or satisfaction, in order to determine whether their role in kiosk adoption is primarily direct or mediated.

Finally, the study is context-specific: it focuses on DHL Algeria as a leading international express operator in a particular emerging market. The interplay between UX, TAM beliefs, social norms, and performance perceptions may differ in other organizational, cultural, or regulatory environments, including domestic courier firms, other countries in the MENA region, or markets with more advanced digital infrastructure. Comparative studies across operators and countries, as well as cross-cultural validations of the measurement scales, would

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help to assess the external validity of the findings and to identify which relationships are context-dependent and which are more universal.

In summary, future research on self-service parcel kiosks and logistics performance would benefit from broader and more diverse samples, longitudinal and behavioral data, post-deployment evaluations, extended theoretical models, and cross-context comparisons. Such work would deepen understanding of how UX-driven technology acceptance interacts with operational performance in digital logistics and would provide more granular guidance for practitioners seeking to design and scale self-service solutions in emerging markets.

Conclusion of the chapter

This chapter presented and analyzed the quantitative results of the empirical study on the acceptance of a self-service parcel kiosk at DHL Algeria and its perceived impact on logistics performance. After describing the sample and dataset, the chapter reported descriptive statistics for the main constructs (PEOU, PU, UX, TRUST, DM, SN, BI and LP), showing generally positive attitudes toward the kiosk concept among a relatively young and digitally active group of courier service users.

The measurement model evaluation confirmed that the reflective scales used to operationalize the constructs are reliable and valid, with high outer loadings, satisfactory internal consistency and acceptable convergent and discriminant validity, aside from the expected strong association between PEOU and PU. The structural model results then showed that digital maturity, perceived ease of use, user experience and subjective norms are the main drivers of behavioral intention, while perceived usefulness and trust, though positively rated, do not significantly influence intention once other factors are controlled. Behavioral intention emerged as the key predictor of perceived logistics performance, indicating that customers who are ready to adopt the kiosk also expect improvements in delivery speed and reliability.

In the discussion, these findings were interpreted alongside descriptive evidence and positioned in relation to the literature, confirming several core TAM relationships (such as PEOU → PU) while highlighting context-specific nuances in the roles of usefulness and trust in an emerging market and branded service environment. The chapter also derived managerial implications for DHL Algeria, emphasizing the need to prioritize intuitive kiosk design, rich user experience, strong digital communication and social influence, and to align kiosk

CHAPTER III: Results and Discussion

deployment with explicit last-mile performance goals. Finally, it acknowledged key limitations related to sampling, perception-based measurement, the pre-deployment stage and contextual specificity, and proposed avenues for future research combining behavioral data, post-implementation evaluations and cross-context comparisons.

Overall, the quantitative analysis supports the central proposition of the thesis: self-service parcel kiosks can enhance user experience and contribute to perceived logistics performance in Algeria, provided that their design and promotion mobilize the main levers identified in this chapter.

General Conclusion

General Conclusion

This thesis demonstrates that self-service parcel kiosks can become a meaningful lever for both user experience and DHL Algeria's perceived logistics performance, but only if they are designed, communicated, and deployed in ways that align with the specific digital maturity and expectations of Algerian customers.

Conceptually, the work develops an integrated framework that connects Supply Chain 4.0, user experience and self-service technology, the Technology Acceptance Model, digital maturity, and logistics service quality research. It operationalizes logistics performance from the customer's viewpoint through a latent construct capturing perceived improvements in parcel processing speed and delivery reliability. This approach links user-facing digital innovation with operational outcomes in an emerging-market context where internal performance data are not easily accessible.

- **Main Results of the Study**

Empirically, the thesis relies on survey data collected from 155 current and potential DHL Algeria customers and analyzed using SPSS and SmartPLS 4. The descriptive statistics reveal a predominantly young, educated, and digitally comfortable sample that is already familiar with self-service technologies and dissatisfied with several aspects of current courier services, especially delays and reliability issues. In particular, 71% of respondents fall in the 18–34 age bracket and 90.9% hold at least a Bachelor's degree. Measurement model results confirm that the constructs capturing digital maturity (DM), perceived ease of use (PEOU), perceived usefulness (PU), user experience (UX), trust, subjective norms (SN), behavioral intention (BI), and perceived logistics performance (LP) exhibit acceptable reliability and validity, providing a statistically robust basis for structural modeling.

The structural model results indicate several key insights that can be read through the lens of the hypotheses H4a–H4i. First, digital maturity has strong positive effects on both perceived ease of use and perceived usefulness, confirming H4a and H4b and showing that DHL's digital communication and customers' prior digital experience shape their basic beliefs about the kiosk. Second, perceived ease of use significantly influences perceived usefulness and behavioral intention, supporting H4c and H4d and reinforcing the central role of ease of interaction in the Technology Acceptance Model. Third, user experience and subjective norms emerge as major direct drivers of behavioral intention, confirming H4f and H4h and indicating that the quality of the interaction and social influence are decisive in the decision to try and

General Conclusion

adopt the kiosk. In contrast, the direct effects of perceived usefulness and trust on behavioral intention, as formulated in H4e and H4g, are not statistically significant once ease of use, UX, and social influence are taken into account. This suggests that in this context, usefulness and trust appear to function more as baseline expectations than as active differentiators of adoption (Na et al., 2021; Rashid et al., 2022). Finally, behavioral intention exerts a strong positive impact on perceived logistics performance, supporting H4i and indicating that customers who intend to use the kiosk also expect DHL's parcel processing and delivery reliability to improve.

Taken together, the confirmation of H4a–H4d, H4f, H4h, and H4i and the non-confirmation of H4e and H4g extend existing literature in several ways. The results confirm core TAM relationships in a new application area and market, but show that, for a trusted international operator in an emerging economy, UX quality and social influence can overshadow usefulness and trust as predictors of short-term adoption intentions. By explicitly linking UX and acceptance constructs to perceived logistics performance, the thesis also helps bridge the gap between technology acceptance research and logistics performance frameworks, offering a customer-centric way to think about Supply Chain 4.0 and self-service technologies in last-mile delivery.

- **Managerial Priorities**

For DHL Algeria, the results suggest clear managerial priorities. The kiosk should be designed around intuitive, low-effort interactions to strengthen PEOU and its direct and indirect effects on intention. Investments should focus on creating a positive, convenient, and reassuring user experience at and around kiosk locations, and on using digital communication and familiar interfaces to sustain digital maturity and reinforce the perceived ease and usefulness of the solution. At the same time, DHL Algeria should actively mobilize social influence through staff, early adopters, and partners — to leverage subjective norms as a driver of adoption — and integrate kiosk deployment into a broader performance strategy aimed at reducing front-office congestion and improving last-mile reliability.

- **Academic and Operational Contributions**

From an academic perspective, the study offers three main contributions. First, it extends the Technology Acceptance Model to a new geographical and sectorial context — self-service parcel kiosks in an emerging market (Algeria) — where empirical evidence was previously

General Conclusion

scarce. By confirming the relevance of PEOU, UX, DM, and SN as drivers of behavioral intention in this context, the study provides a validated empirical benchmark that future research in the MENA region and comparable emerging markets can build upon. Second, the thesis bridges two research streams rarely connected in the literature: UX-oriented technology acceptance research and logistics performance frameworks. By linking behavioral intention directly to perceived logistics performance through a PLS-SEM model, it offers a customer-centric approach to measuring Supply Chain 4.0 outcomes in last-mile delivery. Third, the non-significant results for the PU → BI and TRUST → BI paths contribute a nuanced finding to the TAM literature: in a strong-brand, early-adoption context, perceived usefulness and trust may function as threshold conditions rather than active differentiators, a finding that enriches discussions of context-dependency in technology acceptance research.

From an operational perspective, the strong effects of PEOU and UX on behavioral intention indicate that kiosk design should prioritize simplicity and interface clarity above all else. The significant role of subjective norms (SN) suggests that DHL Algeria should invest in social proof strategies, engaging early adopters, training frontline staff to recommend the kiosk, and leveraging digital word-of-mouth to accelerate adoption. The strong DM → PEOU and DM → PU paths further indicate that proactive, clear, and informative digital communication about the kiosk is an efficient, low-cost means for improving TAM beliefs before deployment. Finally, the confirmed BI → LP path provides DHL Algeria with empirical evidence supporting the argument that customers who intend to use the kiosk also expect it to improve parcel processing speed and delivery reliability, which aligns the adoption strategy with DHL's broader last-mile performance objectives.

- **Limitations of the Research**

The study also acknowledges several limitations. The cross-sectional design and non-probabilistic (convenience and snowball) sampling limit the generalizability of the results beyond the surveyed population. The sample is skewed toward young, highly educated respondents, which reduces its representativeness of the broader Algerian public and restricts external validity. The use of perception-based measures does not capture actual operational performance or observed usage behavior. In addition, the study relies on a single-source, self-reported data instrument, which introduces the risk of common method bias; while this is standard practice in TAM research, it represents a methodological limitation that should be

General Conclusion

addressed in future longitudinal studies with multi-source data. Finally, the analysis is conducted at a pre-deployment stage and in a single country context, which restricts the ability to compare kiosk usage patterns over time or across markets.

- **Perspectives and Avenues for Future Research**

Future research perspectives flow directly from these limitations. In the short term, the most pressing avenue is a post-deployment evaluation of the kiosk once it is operational. A post-deployment study using real usage data — number of transactions per kiosk, processing time, failed-delivery reduction rates — would allow researchers to validate the perception-to-reality link suggested by the BI → LP path and to assess whether the adoption drivers identified here (PEOU, UX, SN) remain predictive of actual sustained usage.

In the medium term, a longitudinal study tracking the same respondents before and after kiosk deployment would enable causal inferences that the current cross-sectional design cannot support. Such a design would make it possible to test whether improvements in digital maturity and user experience over time translate into stronger behavioral intention and more favorable logistics performance perceptions, and to identify the conditions under which usefulness and trust become more active predictors of adoption.

From a comparative perspective, extending the model to other express delivery operators in Algeria, to domestic courier firms, or to other countries in the MENA region would help assess the external validity of the findings. Cross-cultural comparisons would be particularly valuable for understanding how institutional trust, digital infrastructure maturity, and cultural attitudes toward self-service technology moderate the TAM relationships documented here.

Finally, from a theoretical perspective, future research could explore the threshold mechanisms suggested by the non-significant PU and TRUST paths — for example, using fuzzy-set Qualitative Comparative Analysis (fsQCA) to identify the configurations of conditions under which usefulness and trust become decisive adoption drivers. This method is particularly suited to this purpose because, unlike standard regression-based approaches, fsQCA can reveal causal configurations (rather than net effects), making it ideal for identifying when and under what combinations of conditions threshold constructs become active drivers. Additional constructs such as perceived hedonic motivation, environmental sustainability concerns, or perceived data privacy risk could also be incorporated in future models.

General Conclusion

Overall, the thesis answers its central question in a nuanced way: self-service parcel kiosks have strong potential to improve user experience and contribute to perceived logistics performance in Algeria, but their success will depend less on abstract notions of usefulness and trust than on how effectively DHL Algeria mobilizes ease of use, user experience, and social endorsement as the core levers of adoption and operational impact.

BIBLIOGRAPHY

1. Bibliography

1. Brady, M. K., & Cronin, J. J. (2001). *Some new thoughts on conceptualizing perceived service quality: A hierarchical approach*. *Journal of Marketing*, 65(3), 34–49. <https://doi.org/10.1509/jmkg.65.3.34.18334>
2. Chaffey, D., & Ellis-Chadwick, F. (2022). *Digital marketing: Strategy, implementation, and practice* (8th ed.). Pearson.
3. Dabholkar, P. A. (1996). *Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality*. *International Journal of Research in Marketing*, 13(1), 29–51.
4. Davis, F. D. (1989). *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. *MIS Quarterly*, 13(3), 319–340.
5. DIN EN ISO 9241-210. (2019). *Ergonomics of human-system interaction – Part 210: Human-centered design for interactive systems*. International Organization for Standardization.
6. Fornell, C., & Larcker, D. F. (1981). *Evaluating structural equation models with unobservable variables and measurement error*. *Journal of Marketing Research*, 18(1), 39–50. <https://doi.org/10.2307/3151312>
7. García, M., et al. (2018). *Big data analytics and IoT in logistics: A case study*. *Expert Systems with Applications*.
8. Gefen, D., Karahanna, E., & Straub, D. W. (2003). *Trust and TAM in online shopping: An integrated model*. *MIS Quarterly*, 27(1), 51–90.
9. Grönroos, C. (2011). *Value co-creation in service logic: A critical analysis*. *Marketing Theory*, 11(3), 279–301.
10. Hair, J. F., Henseler, J., Ringle, C. M., & Sarstedt, M. (2022). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). Sage Publications.
11. Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). *When to use and how to report results of PLS-SEM*. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>
12. Hassenzahl, M. (2010). *Experience design: Technology for all the right reasons*. Morgan & Claypool.
13. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). *A new criterion for assessing discriminant validity in variance-based structural equation modeling*. *Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
14. Hofmann, E., & Osterwalder, F. (2020). *Digital transformation at logistics service providers: Barriers, success factors, and business models*. *Transportation Research Part E*.

Bibliography

15. ITU. (2024). *ICT Development Index 2024*. International Telecommunication Union.
16. Kresic, D., & Dokic, L. (2022). *Digital marketing and digital logistics in consumer communication*.
17. Lee, J., & Park, H. (2026). *Redefining service quality in the digital experience era*. *Journal of Hospitality and Tourism Technology*.
18. Lee, S., & Vu, T. (2025). *Value creation in parcel delivery: A systematic literature review and research agenda*. *Journal of Business Research*.
19. Lim, S., & Tan, J. (2025). *The adoption of self-service kiosks in quick-service restaurants: A Technology Acceptance Model perspective*.
20. McColl-Kennedy, J. R., et al. (2012). *Customer value co-creation practice styles*. *Journal of Service Research*, 15(4), 370–389.
21. Mentzer, J. T., Flint, D. J., & Hult, G. T. M. (2001). *Logistics service quality as a segment-customized process*. *Journal of Marketing*, 65(4), 82–105.
22. Meurier, M. B., & Gharbi, N. (2025). *Adoption and deployment of dynamic innovation capacity: between resistance and acceptance. A study of the adoption of digital logistics platforms in Algeria*. Paper presented at the *Africa Development Innovation Symposium*, March 13–15, 2025.
23. Meuter, M. L., Ostrom, A. L., Roundtree, R., & Bitner, M. J. (2000). *Self-service technologies: Understanding customer satisfaction with technology-based service encounters*. *Journal of Marketing*, 64(3), 50–64.
24. Nowicka, K. (2024). *Digital transformation and logistics performance: Emerging perspectives*.
25. Oertzen, A., Odekerken-Schröder, G., Brax, S. A., & Mager, B. (2018). *Co-creating services: Conceptual clarification, forms and outcomes*. *Journal of Service Management*, 29(4), 641–679.
26. Oliver, R. L. (1997). *Satisfaction: A behavioral perspective on the consumer*. McGraw-Hill.
27. Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). *SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality*. *Journal of Retailing*, 64(1), 12–40.
28. Pham, T., & Nguyen, L. (2025). *Evaluating digital transformation risks in logistics and supply chain operations*.
29. Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). *Common method biases in behavioral research: A critical review of the literature and recommended remedies*. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>

Bibliography

30. Rahman, A., et al. (2025). *Adoption of self-service kiosk technology in quick-service restaurants*.
31. Ranjan, K. R., & Read, S. (2016). *Value co-creation: Concept and measurement*. *Journal of the Academy of Marketing Science*, 44(3), 290–315.
32. Rashid, M., & Kumar, S. (2025). *The impact of UI/UX design on user trust and task completion in digital interfaces*.
33. Ringle, C. M., & Sarstedt, M. (2016). *Gain more insight from your PLS-SEM results: The importance-performance map analysis*. *Industrial Management & Data Systems*, 116(9), 1865–1886. <https://doi.org/10.1108/IMDS-10-2015-0449>
34. Ringle, C. M., Wende, S., & Becker, J.-M. (2024). *SmartPLS 4*. SmartPLS GmbH. <https://www.smartpls.com>
35. Shmueli, G., Sarstedt, M., Hair, J. F., Cheah, J. H., Ting, H., Vaithilingam, S., & Ringle, C. M. (2019). *Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict*. *European Journal of Marketing*, 53(11), 2322–2347.
36. Stank, T. P., Keller, S. B., & Daugherty, P. J. (2001). *Supply chain collaboration and logistical service performance*. *Journal of Business Logistics*, 22(1), 29–48.
37. Venkatesh, V., & Bala, H. (2008). *Technology Acceptance Model 3 and a research agenda on interventions*. *Decision Sciences*, 39(2), 273–315.
38. Venkatesh, V., & Davis, F. D. (2000). *A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies*. *Management Science*, 46(2), 186–204.
39. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). *User acceptance of information technology: Toward a unified view*. *MIS Quarterly*, 27(3), 425–478.
40. Wang, X., & Li, Y. (2024). *Digital transformation and supply chain efficiency improvement*. *Sustainability*.

2. Webography:

1. 24MarketReports. (2025). *Digital parcel locker systems market 2025–2032*. <https://www.24marketreports.com>
2. Agistix. (2024). *What is supply chain digitization and why does it matter?* Agistix Blog. <https://www.agistix.com/blog>
3. Ahmed, S., & Musa, R. (2025). *Parcel lockers around the world: Adoption trends, challenges, and opportunities*.
4. Alfa3. (2024). *Automated locker system for parcel delivery*. <https://www.alfa3.com>
5. Al-Muala, A. (2025). *Digital marketing in logistics: How new technologies change the logistics–marketing interface*. *Acta Logistica*. <https://www.actalogistica.eu>

Bibliography

6. Bastiaansen, H., et al. (2024). *Logistics 4.0 – digital transformation with smart connected tracking systems*. <https://www.openinnotrain.eu/results/logistics-4-0-digital-transformation-with-smart-connected-tracking-and-tracing-devices/>
7. Bloomreach. (2024). *Create an omnichannel customer engagement strategy*. <https://www.bloomreach.com>
8. Boardwise. (2025). *The future of digital transformation in logistics: How AI, IoT, and automation are taking over*. <https://www.boardwise.com>
9. Boise State University. (2025). *Evidence for the Behavior Engineering Model*. <https://www.boisestate.edu>
10. Brown, J., & Keller, S. (2025). *What is a parcel locker? Complete guide and real examples*. *ParcelHive Blog*. <https://www.parcelhive.com/blog>
11. Capital Commerce. (2024). *Logistics 4.0: The digital transformation journey and the roadblocks ahead*. <https://www.capitalcommerce.com>
12. CargoSapiens. (2025). *Logistics KPIs: What they are, main indicators, and how to use them*. <https://www.cargosapiens.com>
13. Chan, K., et al. (2023). *What moves the customers? Adoption of self-service parcel lockers as an alternative last-mile solution*. <https://www.openinnotrain.eu/results/logistics-4-0-digital-transformation-with-smart-connected-tracking-and-tracing-devices/>
14. Coax Software. (2026). *Best 5 use cases of AI in last-mile delivery*. <https://www.coaxsoft.com>
15. Cyber Insurance Academy. (2024). *Cybersecurity in logistics*. <https://www.cyberinsuranceacademy.com>
16. Deufol. (2024). *Logistics 4.0: How innovative technologies and digital transformation are revolutionizing your supply chain*. <https://www.deufol.com>
17. DHL Group. (2023). *Annual report 2023*. Deutsche Post DHL Group. <https://www.dhl.com/global-en/home/our-divisions/dhl-group/investor-relations/annual-report.html>
18. DHL. (2023). *How parcel lockers are transforming last-mile delivery today*. *DHL Logistics of Things*. <https://www.dhl.com>
19. DHL. (2024). *DHL Express parcel lockers: Sustainable last-mile solutions*. <https://www.dhl.com>
20. Endava. (2022). *The power of self-service portals in logistics*. <https://www.endava.com>
21. Escher Group. (2021). *Automated self-service kiosks for postal operators*. <https://www.eschergroup.com>

Bibliography

22. Eye Security. (2025). *Cybersecurity in transportation and logistics: Inside the sector's risks*. <https://www.eye.security>
23. Fraunhofer IML. (2026). *Digital transformation in logistics with AI technologies*. <https://www.ima.fraunhofer.de>
24. Hatmill. (2026). *Strengthening cybersecurity in digital logistics operations*. <https://www.hatmill.com>
25. HYS Enterprise. (2026). *Digital transformation in logistics: From traditional operations to smart supply chains*. <https://www.hysenterprise.com>
26. ITREx. (2025). *Measuring the value of data analytics in logistics*. <https://www.itrexgroup.com>
27. Kaltura. (2025). *Digital customer engagement: 5 examples and 5 strategies for success*. <https://www.kaltura.com>
28. Kearney. (2024). *Digital supply chains are increasingly critical for a competitive edge*. <https://www.kenney.com>
29. Kiosk Industry. (2024). *Experience and UI for kiosk self-service*. <https://www.kioskindustry.org>
30. Kpability. (2025). *Omnichannel marketing in logistics*. <https://www.kpability.com>
31. Leaders in Logistics. (2026). *Parcel lockers: Key questions answered*. <https://www.leadersinlogistics.com>
32. Logitrack. (2025). *How are AI, IoT, and Big Data transforming the operation of logistics software?* <https://www.logitrack.com>
33. MarketReportAnalytics. (2026). *Self-service parcel locker market overview: Trends and strategic insights*. <https://www.marketreportanalytics.com>
34. Monstar Lab. (2021). *The negative impacts of fragmented IT systems in transport and logistics*. <https://www.monstar-lab.com>
35. NetSuite. (2023). *The essential logistics KPIs & metrics you need to track*. <https://www.netsuite.com>
36. Olea Kiosks. (2024). *Experience and UI best practices for kiosks*. <https://www.oleakiosks.com>
37. Parcel & Postal Technology International. (2025). *Algerie Post to pilot self-service kiosks and new drop-off solutions*. <https://www.parcelandpostaltechnologyinternational.com>
38. Petrova, N. (2025). *How UX design influences the way users trust or doubt technology*. <https://uxdesign.cc>
39. Pondiot. (2025). *Self-service kiosks: Smarter experiences and emerging trends*. <https://www.pondiot.com>

Bibliography

40. PWC. (2016). *How digitization makes the supply chain more efficient, agile, and customer-focused.* <https://www.pwc.com>
41. SmartBox Lockers. (2025). *Smart parcel locker solution for cost-effective returns and loyalty.* <https://www.smartboxlockers.com>
42. Solistica. (2025). *KPIs in logistics: Keys to efficiency and operational success.* <https://www.solistica.com>
43. Statista. (2025). *E-commerce revenue in Algeria 2017–2024.* <https://fr.statista.com/previsions/1475641/ecommerce-algerie>.
44. TELUS Digital. (2025). *5 digital customer engagement strategies.* <https://www.telusdigital.com>
45. Thread in Motion. (2022). *How digitization improves supply chain efficiency, agility and customer focus.* <https://www.threadinmotion.com>
46. Usability.de. (2024). *What is usability? What is user experience? Definition overview.* <https://www.usability.de>
47. Wavetec. (2025). *Common challenges in UX design of self-service kiosks.* <https://www.wavetec.com>

APPENDICES

APPENDIX A: Survey Questionnaire – Adoption of DHL Self-Service Parcel Kiosks in Algeria

This survey is part of a graduation thesis research at ENSM Algeria, studying the feasibility and public acceptance of self-service parcel kiosks (automated shipping machines) in Algeria, in partnership with DHL Express Algeria. The kiosk allows users to independently weigh their parcel, choose a destination, calculate the shipping fee, pay, and drop off the package—all without interacting with a staff member. It is available 24/7 in public spaces such as malls, universities, and post offices.

Your answers are strictly anonymous and will be used for academic purposes only. The survey takes approximately 5 minutes to complete. Thank you for your participation.

Section 1: Current Parcel Shipping Habits

This section aims to understand your current experience with parcel delivery and courier services in Algeria.

1. What best describes your profile as a user of parcel/courier services?

- Individual / Personal use (B2C – I ship parcels for personal reasons)
- Business / Professional use (B2B – I ship parcels on behalf of a company)
- both personal and business use

2. How often do you send or receive parcels?

- Never
- Rarely (a few times per year)
- Occasionally (once a month)
- Regularly (several times a month)
- Very frequently (weekly or more)

3. Which courier/delivery service(s) have you used? (select all that apply)

- DHL Express
- Algérie Poste (EMS)
- Yalitec
- Zaki (ex-Jumia)
- Procolis
- FedEx / UPS
- None – I have never used a courier service

4. What is your main reason for using a courier/delivery service?

- Sending documents or personal items
- Sending or receiving e-commerce orders
- Business / professional shipments

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- International shipping
 - I do not use courier services
 - Regular bulk / volume shipments (B2B)
5. What is the biggest challenge you face when using courier services in Algeria?
- Long queues and waiting time at service points
 - Limited opening hours
 - High shipping costs
 - Lack of nearby service points
 - Poor tracking and visibility
 - Difficulty with payment methods
 - No major challenges
6. What is your preferred payment method for services and purchases?
- Bank card (CIB / Dahabia)
 - Mobile payment (BaridiMob, etc.)
 - Online payment / e-payment

Section 2: Digital Literacy and Technology Comfort

This section measures your familiarity and comfort with digital tools and self-service technologies.

7. How would you rate your comfort level with using smartphones and digital applications for everyday tasks?
- 1 – Not comfortable at all
 - 2
 - 3
 - 4
 - 5 – Very comfortable
8. Have you ever used a self-service machine (ATM, airport check-in kiosk, ticket vending machine, etc.)?
- Yes, regularly
 - Yes, occasionally
 - Yes, once or twice
 - No, never

Section 3: Awareness and Perception of the Self-Service Parcel Kiosk

A self-service parcel kiosk is an automated machine placed in public locations (malls, universities, train stations, etc.) that allows you to independently weigh your parcel, enter the destination, see the

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shipping cost, pay digitally, drop off the package, and get a receipt/tracking number — all without any staff assistance, 24 hours a day, 7 days a week.

9. Before this survey, were you aware that self-service parcel kiosks exist in other countries? *

- Yes, I was fully aware
- I had heard of it but did not know the details
- No, I had never heard of this concept

10. How interested would you be in using a self-service parcel kiosk if it were available near you in Algeria?

- 1 – Not at all interested
- 2
- 3
- 4
- 5 – Very interested

11. How easy do you think it would be to use a self-service parcel kiosk?

- 1 – Very difficult
- 2
- 3
- 4
- 5 – Very easy

For questions 12 to 28, please indicate your level of agreement with each statement:

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Affirmation	1	2	3	4	5
12. Do you think a self-service parcel kiosk would save you time compared to visiting a traditional courier service point?					
13. How much do you trust a fully automated machine to safely handle your parcel and payment?					
14. I believe the kiosk would improve my overall shipping experience.					
15. Using the self-service kiosk would make my parcel shipping process more efficient.					
16. The self-service kiosk would allow me to complete my shipment					

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faster than at a traditional counter.					
17. Learning to use the self-service kiosk would be easy for me.					
18. I would not need assistance to operate the self-service kiosk.					
19. I believe my payment information would be secure when using the kiosk.					
20. I trust the kiosk to accurately record and process my shipment.					
21. The kiosk screen and instructions would be clear and easy to understand.					
22. Using the kiosk would be convenient in terms of location and opening hours.					
23. I would feel in control throughout the entire process when using the kiosk.					
24. DHL's communication (online or at branches) would clearly explain how to use the self-service parcel kiosk.					
25. If DHL promoted the self-service kiosk on social media or by SMS, it would encourage me to try it.					
26. Information provided by DHL about the self-service kiosk would be reliable and trustworthy.					
27. Using self-service parcel kiosks would help DHL process and handle parcels faster.					
28. Overall, using self-service parcel kiosks would help DHL deliver parcels more reliably and on time.					

Section 4: Behavioral Intention – Would You Use It?

29. If a self-service parcel kiosk were installed in your city (e.g., in a mall, university, or train station), would you use it?

Yes, definitely

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- Yes, probably
- Maybe, I need to try it first
- Probably not
- No, I prefer human interaction

For questions 30 to 33, please indicate your level of agreement with each statement:

1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Affirmation	1	2	3	4	5
30. I intend to use a self-service parcel kiosk if one is installed near me.					
31. I plan to try a self-service parcel kiosk the first time I see one.					
32. I would recommend the self-service kiosk to friends or colleagues.					
33. People around me (family, friends, colleagues) would encourage me to use a self-service parcel kiosk.					

Section 5: Barriers, Suggestions and Final Remarks

34. What would be your main concerns or barriers to using a self-service parcel kiosk? (select all that apply)

- Fear of parcel damage, loss, or theft
- Lack of trust in digital payment security
- Difficulty using technology / touchscreen interface
- Lack of cash payment option
- No concerns – I would use it without hesitation

Section 6: About You

35. What is your age group?

- 18 – 24
- 25 – 34
- 35 – 44

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45 – 54

55 and above

36. What is your gender?

Male

Female

37. What is your level of education?

High school or below

Bachelor's degree

Master's degree

Doctorate (PhD)

Vocational / Technical training

38. What is your current occupation?

Student

Employee (public sector)

Employee (private sector)

Self-employed / Entrepreneur

Unemployed

Retired

39. In which Wilaya (province) do you live?

40. Do you have any suggestions or features you would like to see in a self-service parcel kiosk in Algeria? (Optional)