

THE IMPACT OF SUSTAINABILITY STRATEGY ON TECHNOLOGY ADOPTION IN LOGISTICS: A PERSPECTIVE ON USER'S PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE

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Agenda

- Motivation & Intro
- Lit Review
- Technology adoption Frameworks
- Methodology
- Integrated TAM-TOE framework
- Integrated framework Application
- Findings
- Challenges
- Concluding Remarks

dotivation

- The United Nations has recognised the role of digitalisation in achieving the 17 United Nations Sustainable Development Goals (SDGs) (UN, 2023).
- Logistics UK's (2021) Manifesto highlighted the role of technology in achieving net zero sustainability targets, but much effort is required to realise this potential.
- Researchers have studied 3PL outsourcing and strategies, limited attention was given to sustainability in 3PL operations (Evangelista, et al., 2018).
- Studies investigating **digitalisation in the logistics industry** have **ignored** a strategic focus on **sustainability** and limited their scope to areas like production logistics, just-in-time, etc. (Ilin, et al, 2019).
- As digital technology operational implementation is **impacted by end-users**, there is a need to **examine the role of users in technology adoption** that is **driven by a sustainability strategy** within last-mile operations (Raji et al., 2021).

Introduction

Phase 1: Technology-Organisation-Environment (TOE) framework to examine the drivers and enabling factors for sustainability technology adoption.

Objective: Evidence of the TOE framework's limited application in extant literature. Need to incorporate an ecological aspect within the "E" of the TOE framework Phase 2:Asses the impact of sustainability strategy on technology adoption in logistics, with a focus on the users' perceived usefulness and perceived ease of use.

Objective: investigate the role of users in the digital transformation journey of a third-party logistics (3PL) firm in its lastmile operations.

 This study aims to investigate the role of users in technology adoption by integrating TAM with the TOE framework focusing on the impact of a sustainability strategy in last-mile operations.

Literature Review

- Sustainability in 3PL operations is effective by adopting a TBL approach, though other researchers have concentrated on the ecological aspect while ignoring the other components of TBL (Duker and Olugunna, 2014; Woschank et al., 2021).
- 3PL operations have embraced digitalization, but firms often lack the digital capabilities (technological) and transformation management capabilities (organisational) to fully utilise the data to achieve 'digital maturity'.
- Consequently, a robust framework is required to provide an approach to employ digitalisation to deliver sustainability aspirations.

Technology adoption frameworks - TOE

- Technology-Organisation-Environment (TOE) framework is used to analyse the adoption of new technologies at a firm level and to evaluate internal and external factors affecting this decision (Tornatzky and Fleischer 1990, Mohammed et al. 2020, wael Al-khatib 2023).
- Limitations:
 - 1. Extant literature applications ignored the ecological aspect within the environmental dimension of TOE.
 - 2. TOE is used to capture technology adoption (Davis 1989) at the firm level considering internal and external factors, it has been criticised for being very generic and lacking a focused approach on users' acceptance of the technology.
- TOE framework needs to be adapted to allow for the integration of user-specific characteristics.

Technology adoption frameworks – TAM

- Technology Acceptance Model (TAM) suggests that a user's behavioural intention to embrace technology is shaped by two core beliefs, namely: the perceived usefulness and perceived ease of use (Bryan and Zuva 2021, Chatterjee et al 2021, Mogaji et al. 2024).
- Limitations:
 - 1. Factors such as specific IT type, targeted users, and context of IT usage, impact IT acceptance and usage behaviour.
 - 2. Social influences and social factors such as cost and structural imperatives within the working environment are not adequately incorporated. As a result, TAM's capacity to predict real-world problem-solving IT use is constrained (Malatji et al. 2020, Edo et al. 2023).
- The complex landscape of digitalisation technologies in last-mile operations necessitates an integrated approach achieved by bringing the TAM and TOE frameworks together.

Methodology

- A Qualitative holistic case study design employing mixed approach of five data sources was employed (Saunders et al., 2019).
- Case study strategy is appropriate for exploratory research, given that existing literature that integrates the TAM-TOE framework is limited (Yin, 1994; Gibbert and Ruigrok, 2010).



Methodology

Interviews	 Guided by a questionnaire focusing on the drivers and impact of the company's sustainability strategy and its technology adoption
Company website	• Provides fundamental details about the company and its strategy. They also provide access to rich documentary information
Videos	• An established source of secondary data, it provided rich combination of audio and visual details information about the case firm that was freely accessible.
Publications	• Information about the company which has been carefully analysed, potentially in comparison with other 3PL logistics companies to identify commonalities across the sector
Observation	• Enables the first-hand experience and discovery of work practices or operations for the researcher(s) to verify and triangulate data obtained from internal and external sources about the organisation

Integrated TAM-TOE framework



Alshamila, 2013; Bryan and Zuva 2021

TAM-TOE External Factors

Environmental (sustainability)

Technology (digitalisation)





Findings I - Organisational Factors

- The theoretical framework constructs provided the structure for reporting the industry findings.
- **Organisational Factors** (company strategy)



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In 2018 In 2020 We have introduced a fourth element to our 2155TH successful 1–2–3 strategy:

Aiming to be the UK's leader in sustainable delivery



Integrated TAM-TOE framework



Alshamila, 2013; Bryan and Zuva 2021

Findings II – Technological Factors

Need for a stakeholder perspective to engage partners and customers.

- User-centric tools
- Digital PDAs are used for planning and confirming delivery instead of paper to avoid waste which reduces CO₂ footprint.
- Company app generates real-time updates to consumers to provide flexibility to plan their delivery
 according to their preference, reducing inefficiencies and carbon emissions from wasted journeys.

- Provider-centric tools route optimization to avoid running more vehicles than needed and reducing CO₂ emission.
- Route optimisation of vehicles helps to avoid congestion

Findings III - Environmental Factors

Need for a stakeholder perspective to engage partners and customers.

- Partners risk of companies having limited commitment to sustainability and engaging in greenwashing, leading to reputational and environmental damage
 - Remedy an independent audit on its suppliers. However, when partner firms are committed to decarbonisation to achieve a net zero emission target, this is positive.

- End consumers creating a demand for reverse logistics due to the habit of ordering varieties of products to return what does not fit or match their preferences.
 - Remedy partners and retailers begin to charge for returns after establishing a pattern of behaviour.

Integrated TAM-TOE framework



Alshamila, 2013; Bryan and Zuva 2021

TAM-TOE Internal Factors

User Perceived Usefulness

"...With the cargo e-bikes and electric vehicles, I have been getting excellent reactions from strangers as much as clients, my neighbours, and everybody. They are quite proud and happy that we made a responsible choice".

"...a combination of these technologies help to achieve that by planning the delivery route, providing up-to-the-minute information to the employee and the customer..." User Perceived ease of use

...e-bike is easy to use, relaxing, free from queues and easy to park...

..."it is easy to use, and it saves time". ...

Challenges



Older consumers (e.g. over 60s) are slow to embrace the app.



Potential shortage of PDA supply and sustained functionality due to their batteries to sustain the scale of operations



Where PDAs are substituted with employees' phones, there is the risk of technology compatibility and ethical practice



Particulate matter emissions from EV tyres and brake discs are unsafe for the environment

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- EXISTING TECHNOLOGY HAVE THEIR LIMITATIONS AND NECESSITATES ONGOING DEVELOPMENT TO DISCOVER GREENER ALTERNATIVES.
- PHASE 2 OF THIS RESEARCH EMPLOYED AN INTEGRATED VIEW OF INTERNAL AND EXTERNAL FACTORS IN TECHNOLOGY ADOPTION FOR SUSTAINABILITY STRATEGY IMPLEMENTATION AN INTEGRATED TAM-TOE FRAMEWORK.
- EXTERNAL FACTORS SUCH AS ETHICAL DILEMMAS, CONSUMER BEHAVIOUR, AND TECHNOLOGY INNOVATION CHALLENGES, MUST BE OVERCOME TO CREATE VALUE FOR ALL STAKEHOLDERS AND DELIVER THEIR SUSTAINABILITY STRATEGY
- PHASE 3 AIMS FOR FURTHER EXPLORATION OF A WIDER PERSPECTIVE OF ORGANISATIONAL CHARACTERISTICS AND DEEPER INQUIRY INTO THE IMPACT ON A WIDER RANGE OF USERS.
- the role of users in technology adoption is crucial in achieving success and exposing limitations

Concluding Remarks





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End Questions

Findings I - Organisational Factors

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- Organisational Factors (company strategy)

In 2018

In 2020



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