A Factor Analysis of the Drivers Impacting the Adoption of Unmanned Aerial Vehicles in Middle- and Last-Mile Logistics

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Abstract: Recognizing the complexity of UAV adoption as a sociotechnical phenomenon, the objective of this work is to understand the underlying dimensions contributing to the adoption of UAVs in middle- and last-mile logistics. A literature review identified several drivers influencing the adoption of UAVs in this sector. These factors include cost, service level, competitiveness, environmental impact, internal and external stakeholder management, process optimization, safety and security, infrastructural requirements, technological maturity, organizational culture, public acceptance, and regulatory environment. These drivers were systemically categorized according to the seven elements of the sociotechnical systems theory. An online questionnaire was distributed to a pool of experts among practitioners and academics who were asked to evaluate the influence of each driver on the adoption of UAVs. The data collected from this survey were analyzed through exploratory factor analysis to explore the relationships among the observed variables and identify the underlying factors that may influence UAV adoption. Following this first step, the thirteen drivers were reduced to four constructs, explaining 61.5% of the total variance. The first factor includes five drivers: competitiveness with a loading of 0.744, service level (0.702), infrastructural requirements (0.652), safety and security (0.608), and technological maturity (0.498). The second factor includes three drivers: public acceptance (0.851), regulatory environment (0.834), organizational culture (0.615), and environmental impact (0.495). The third factor includes three drivers: external (0.815) and internal (0.597) stakeholders' engagement. The fourth factor includes two drivers: cost (-0.749) and process optimization (0.457). The factor analysis confirmed the existence of underlying constructs that provide a comprehensive understanding of the drivers influencing UAV adoption in middle- and last-mile logistics from a sociotechnical perspective.

Keywords: Middle- and last-mile logistics, Sociotechnical systems, Unmanned aerial vehicles, Factor analysis

1. Introduction

In recent years, the exploration of unmanned aerial vehicles (UAVs) has obtained significant attention as a potential solution for logistics challenges (DHL, 2023). In logistics, the middle- and last-mile are of particular importance. UAVs promise to address key issues such as air and noise pollution, traffic congestion, and climate change (van Essen *et al.*, 2019), alongside rising customer expectations for reliability and speed of delivery (Salama and Srinivas, 2020), which are some hurdles affecting middle- and last-mile logistics. Moreover, inefficiencies afflict these segments, with the last-mile alone accounting for a substantial 28% of supply chain delivery costs (Wang *et al.*, 2016). The outbreak of COVID-19 further underlined the urgency for resilient and contactless delivery systems, particularly in reaching isolated or quarantined areas rapidly and safely (Kim *et al.*, 2021). In response to these challenges, research into UAVs within logistics has primarily focused on optimization problems such as vehicle routing (Macrina *et al.*, 2020), facility location, scheduling, and delivery network design (Benarbia and Kyamakya, 2022). Yet, existing literature has largely overlooked the crucial aspect of "human-technology interactions," essential for successful logistics systems (Sgarbossa *et al.*, 2020). The sociotechnical complexity inherent in UAV-enabled logistics systems necessitates a holistic understanding encompassing social and technical elements. To bridge this gap and provide logistics practitioners with a deeper understanding of UAV adoption factors, this study identifies the drivers affecting UAVs adoption in middle- and last-mile logistics from a sociotechnical perspective and quantifies their level of influence. After identifying the drivers through a literature review and categorizing them according to Sociotechnical System (STS) theory, a survey is administered to experts to evaluate the level of influence of each driver on the technology's adoption. Lastly, an exploratory factor analysis (EFA) is conducted to identify potential underlying hidden constructs.

The remainder of this paper is structured as follows: Section 2 presents the drivers identified through the literature review. Section 3 outlines the methodology, detailing the survey design and factor analysis. Section 4 presents the findings, proposing a preliminary analysis of survey responses and performing factor analysis to test the existence of underlying constructs. Finally, Section 5 reports the conclusions drawn from the study and outlines potential future research directions.

2. Literature Review

2.1. Insights into the middle- and last-mile logistics

The transportation process within a supply chain can be divided into three segments: first-, middle-, and last-mile (Yang *et al.*, 2023). Although being often neglected in favor of last-mile issues and challenges, the middle-mile segment is gaining increased interest from both academicians and practitioners due to its significant influence on the final delivery of items (Yang et al., 2023). Middle-mile logistics refers to the "transportation consisting of moving goods between facilities" (e.g., from warehouses or distribution centers to retail stores or fulfillment centers) to ensure products are positioned closer to the end customers while optimizing transportation costs and transit times (Yang et al., 2023). In contrast, last-mile logistics can be defined as "the last stretch of a […] delivery service" from the order penetration point to the final customer, thus focusing on meeting customer expectations with precise coordination to meet delivery windows and an efficient distribution network (Lim *et al.*, 2018).

2.2. UAVs in the middle- and last-mile logistics

By acknowledging UAVs as "disruptive sociotechnical systems" (Coliandris, 2023), it is essential to recognize the complex interactions between humans and technology in their adoption. Researchers emphasized the growing complexity of systems and the necessity for a holistic approach to their development and implementation (Carayon, 2006). Therefore, it becomes necessary to examine the elements within systems and the relationships among these elements (Walker *et al.*, 2008). This holistic viewpoint is particularly crucial in the context of STS, where the effective development of both social and technical components determines system performance (Walker *et al.*, 2008). STS theory conceptualizes organizations as intricate systems, necessitating an examination of their social and technological elements and their relationships. This theory states that complex systems should be analyzed through six key elements: people, culture, technology, infrastructure, goals, and procedures (Davis *et al.*, 2014). By searching the literature, several drivers were identified and divided into thirteen categories affecting the adoption of UAVs for middle- and last-mile logistics, classified according to the six elements of STS theory – plus an additional category named "Regulatory Framework" representing the external environment in which the system operates (Davis *et al.*, 2014).

Four categories have been identified and classified under the "Goals" element of STS theory, thus representing the objectives of the STS represented by middle- and last-mile logistics processes (e.g., good performance of the system considering cost, service level, competitiveness, and sustainability): (1) Cost, i.e., operational cost (Perussi *et al.*, 2019), labor cost (Dong *et al.*, 2021), and delivery cost (Aurambout *et al.*, 2022) that impact the efficient and cost-effective execution of distribution. (2) Service Level, i.e., drivers that influence a timely and reliable service in the middle- and last-mile segments, including efficient delivery processes (Borghetti *et al.*, 2022) and time savings (Cai *et al.*, 2021). (3) Competitiveness, i.e., drivers influencing the ability to gain a competitive advantage, such as efficient route planning (Mohammad *et al.*, 2023), faster delivery (Li *et al.*, 2021), and superior customer experience (Dong *et al.*, 2021). (4) Environmental Impact, i.e., emission reduction – both direct (Benarbia and Kyamakya, 2022) and indirect (i.e., due to decreased road traffic congestion) (Perussi *et al.*, 2019) – and energy-efficient vehicles (Kellermann *et al.*, 2020), thus enabling greener delivery practices (Rashidzadeh *et al.*, 2021). Two categories have been identified and classified under the "People" element of STS theory, which represents the stakeholders involved in the process (e.g., warehouse workers, UAV pilots, final consumers): (5) Internal Stakeholders' Engagement, i.e., workers who are directly involved in the implementation and operation of UAVs logistics – e.g., the employment of a skilled workforce (Raj and Sah, 2019). (6) External Stakeholders' Engagement, i.e., external stakeholders who are not directly involved in the day-to-day operations but have a vested interest in the adoption and impact of UAVs in logistics (Karakikes and Nathanail, 2020).

Two categories have been identified and classified under the "Procedure" element of STS theory: (7) Process Optimization, i.e., drivers addressing the optimization and improvement of logistics processes, including easier scheduling (Mohammad *et al.*, 2023) and enablement of dynamic orders (i.e., a flexible order system adaptable to changing customer requirements and business needs) (Liang and Luo, 2022). (8) Safety and Security, i.e., drivers related to ensuring the safety and security of UAVs, delivery personnel (Rashidzadeh *et al.*, 2021), and customer packages (Aurambout *et al.*, 2022) during transportation and delivery operations.

One category was identified and classified under the "Infrastructure" element of STS theory (e.g., distribution centers, recharging stations, and delivery points): (9) Infrastructural Requirements, such as UAVs characteristics of being independent of road infrastructure (Dong *et al.*, 2021) but needing adequate landing facilities, delivery hubs, and accessible pick-up points (Mohammad *et al.*, 2023).

One category was identified and classified under the "Technology" element of STS theory, which UAVs represent in this context: (10) Technological Maturity, i.e., drivers addressing the technological readiness of UAVs for adoption and integration in logistics operations, considering their autonomous guidance (Perussi *et al.*, 2019), level of energy efficiency (Kellermann *et al.*, 2020), payload size and range capabilities (Hwang *et al.*, 2021) required to address the unique challenges of middle- and last-mile logistics.

Two categories have been identified and classified under the STS theory's "Culture" element. It represents the "organization's local culture, which is then set within larger professional and national cultures" (Challenger *et al.*, 2010): (11) Organizational Culture, i.e., drivers related to the values and practices that influence the adoption and integration of UAVs in the logistics environment. It considers the need to embrace innovation- (Osakwe *et al.*, 2022) and sustainability-driven (Mohammad *et al.*, 2023), and customer-centric (Mathew *et al.*, 2021) approaches to meet the demands and challenges of middle- and last-mile logistics. (12) Public Acceptance, i.e., drivers related to public perception and support for the use of UAVs logistics operations, considering the concerns and expectations of end-consumers, communities, and regulatory bodies regarding privacy, safety, and the overall impact of these technologies on the middle- and last-mile delivery experience (EASA, 2021).

One category was identified and classified under an additional element of the STS theory, which was labeled "Regulatory Framework": (13) Regulatory Environment, i.e., legal requirements and compliance standards governing the use of UAVs in logistics, including airspace regulations, privacy considerations, and licensing requirements (Zhang and Kamargianni, 2022).

3. Methodology

We gathered empirical data from a pool of experts to study the underlying dimensions contributing to the adoption of UAVs in middle- and last-mile logistics. Therefore, a survey was developed on Qualtrics (Appendix A), as it provided a rigorous approach for collecting large amounts of data and offered a systematic evaluation of the levels of influence on the adoption of UAVs for the identified drivers. It was divided into three sections. The first section focused on respondents' contextual information: sector of employment (i.e., academy or industry), field of expertise, years of experience, job position, and geographical residence. The second section presented the respondents with a five-point Likert scale to evaluate the levels of influence of the previously identified drivers, ranging from "No influence" to "Very high influence." In the third section, respondents were asked to explain the differences between UAVs employed for middle-mile or last-mile logistics. The questionnaire was sent via e-mail to 400 experts in the UAVs sector (i.e., the sample frame) and administered in English. Consequently, as this is the first time that UAVs adoption drivers are analyzed through STS theory, EFA was found to be a suitable technique (Shirali *et al.*, 2018) to explore the complex system represented by UAVs logistics. In fact, EFA is a "multivariate statistical technique that is primarily used to lessen the higher number of measured variables into a smaller set of hidden constructs" (Shankar *et al.*, 2018). In order to conduct EFA, a subject-to-items ratio of 5:1 is considered adequate (Shankar *et al.*, 2018). In this case, a sample size of 67 is considered for the 13 influencing factors under analysis, thus reaching the appropriate requirement. The software used to perform EFA was JASP, Version 0.18.3.

4. Findings

4.1. Preliminary analysis

The survey generated 119 responses, of which only 67 (16.7% of the sample frame) were complete and used for subsequent analysis. Most respondents reside in Europe (40), particularly Italy (24 or 35.8% of the sample). The rest come from various countries, including America, Africa, Asia, Oceania, and the Middle East. The respondents' profile showed that 80.6% worked in the academic sector, while 19.4% worked in the industrial sector. 19% of the experts declared to have less than 5 years of experience in the area, another 19% had between 5 and 10 years of experience, 24% between 10 and 15 years of experience, 7% between 15 and 20 years of experience, and the rest stated to have more than 20 years of experience. 31% of experts stated to work in the aerospace sector (half of them specifically focused on UAVs), 21% in the area of supply chain and logistics management, 19% in systems and robotics, 10% in the healthcare sector, and the rest in other areas (e.g., mobility, computer science, and safety and security).

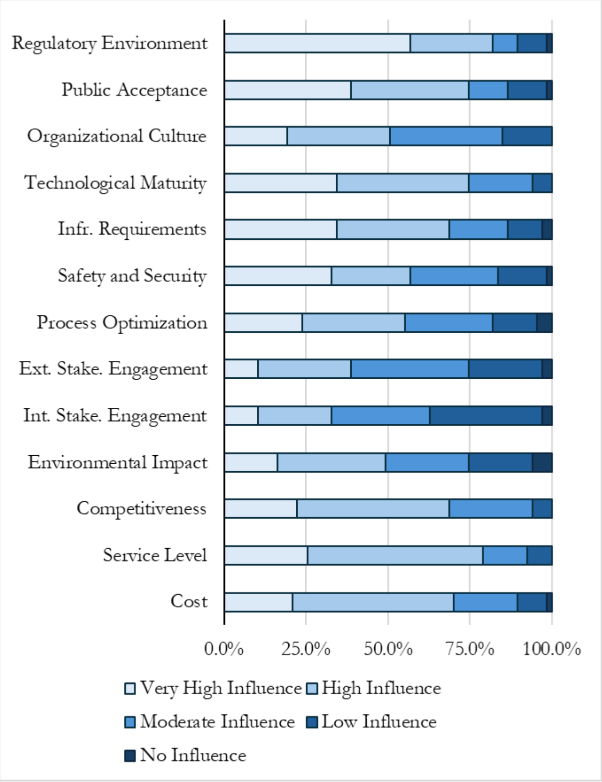

Figure 1. Percentage of responses for each driver

On the one hand, the regulatory environment was identified as the most relevant driver towards adopting UAVs in the middle- and last-mile logistics, as 82.1% of the respondents found it to have a high influence, followed by service level (79.1%), technological maturity (74.6%), and public acceptance (74.6%). On the other hand, internal stakeholders' engagement was the least influential driver, with 67.2% of the respondents finding it to have moderate to no influence. This is followed by external stakeholders' engagement (61.2%) and environmental impact (50.7%). Figure 1 summarizes the percentage of responses for each driver.

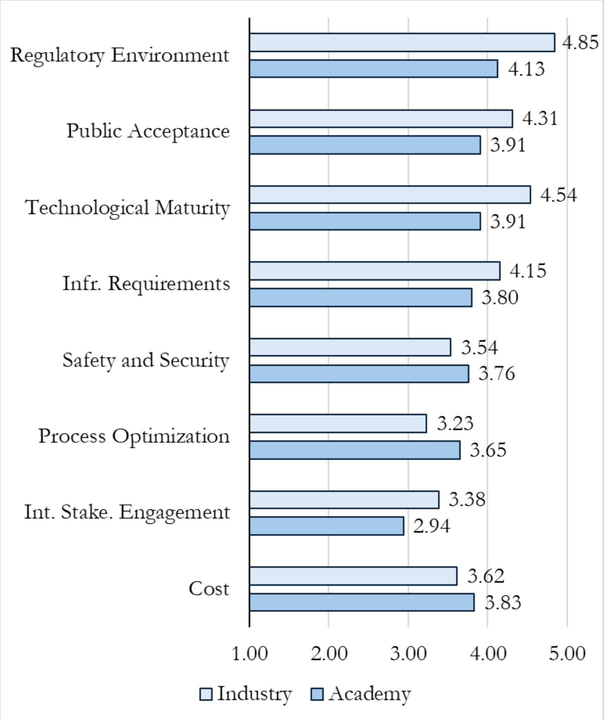

Figure 2. Level of influence on UAV adoption of certain drivers for sector of employment – average values on a 5-point Likert scale

A preliminary analysis of the respondents' backgrounds highlighted the importance of these factors in evaluating the influence of UAV adoption drivers. This was observable for the employment sector, years of experience, and geographical residence. It was possible to notice a relevant difference in the perception of certain drivers based on the employment sector (see Figure 2).

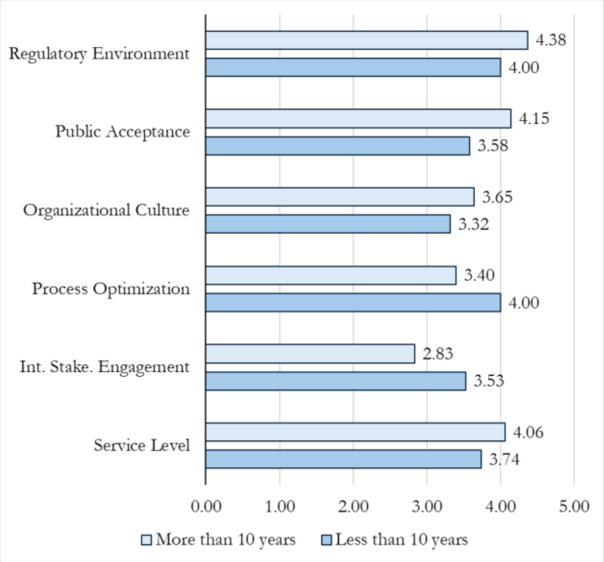

Figure 3. Level of influence on UAV adoption of certain drivers for years of experience – average values on a 5-point Likert scale

On average, respondents from the industry emphasized the importance of internal stakeholders' engagement, regulatory environment, public acceptance, technological maturity, and infrastructural requirements. Instead, respondents from academia found costs, safety and security, and process optimization more relevant. Furthermore, respondents were divided according to their expertise in the field, and 10 years was chosen as an adequate amount of experience for a full-fledged field expert, as per Ericsson *et al.* (1993). It was possible to notice a relevant difference in the perception of certain drivers based on the respondents' years of experience in the sector (see Figure 3). On average, respondents with less than 10 years of experience emphasized the importance of internal stakeholders' engagement and process optimization. Instead, respondents with more than 10 years of experience found the regulatory environment, public acceptance, organizational culture, and service level more relevant.

Lastly, it was possible to notice a relevant difference in the perception of certain drivers based on geographical residence (see Figure 4). On average, European respondents emphasized the importance of safety and security. Instead, respondents from the rest of the world found the environmental impact, internal stakeholders' engagement, process optimization, and organizational culture more relevant.

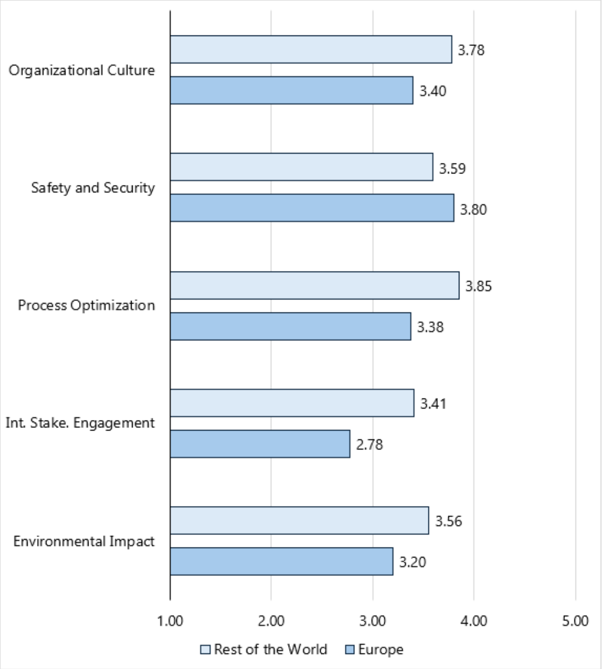

Figure 4. Level of influence on UAV adoption of certain drivers for geographical residence – average values on a 5-point Likert scale

4.2 UAVs in the middle- and last-mile logistics

The survey responses regarding differences in UAVs employed for last-mile and middle-mile logistics provided different perspectives. Even though 25% of respondents did not find any significant differences in the challenges and opportunities between the two segments, the majority believed otherwise. Payload capacity emerged as a prominent difference, with middle-mile drones capable of transporting larger parcels but requiring larger UAVs (typically fixed-wing machines) that need larger infrastructures (e.g., runways for take-off and landing). Furthermore, this segment's longer distances and larger payloads demand more advanced navigation systems and certification processes, leading to potentially greater challenges related to stricter regulations and airspace restrictions. The last-mile segment operates on smaller payloads and shorter distances, thus requiring smaller UAVs (typically multi-rotor machines) praised for their precision and flexibility in urban settings, but more susceptible to weather conditions and more affected by regulatory and energy constraints. Technological maturity for last-mile drones remains low, although some respondents reported that advancements in battery technology are showing promising results. Contrasting opinions were voiced regarding the future of UAV logistics. Some experts believe middle-mile adoption is more probable as it could be supported by a greater public acceptance and a perceived readiness of the required technology, in contrast to safety and regulatory obstacles for last-mile UAVs. Others argue that conventional transportation means will still be used for years in middle-mile logistics due to the larger and heavier payloads transported, thus leaving multi-rotor machines to pave the way for UAVs in logistics.

4.3 Exploratory and confirmatory factor analysis

Following the preliminary analysis, the identified variables were tested for underlying hidden constructs using the EFA technique. First, three tests were performed to ensure EFA could be conducted on the Likert scale.

- Cronbach's alpha was computed to ensure data reliability – an acceptable score is $\alpha > 0.7$ (Field, 2009), obtaining $\alpha = 0.77$.
- The Kaiser-Meyer-Olkin test was performed to ensure sampling adequacy – the minimum acceptable score is KMO > 0.5 (Kaiser, 1974), obtaining KMO = 0.74.
- Barlett's test of sphericity was performed to ensure EFA suitability, obtaining a value lower than 0.001. This result confirmed that there are indeed correlations among variables under analysis, as is usually the case when Barlett's test of sphericity returns values lower than 0.05 (Tobias and Carlson, 1969).

The adopted extraction method was the principal component analysis, using varimax as the rotation method (Shankar *et al.*, 2018). Factors were extracted for all eigenvalues greater than 1. Adopting a threshold value of loading for all the measured variables greater than 0.40 (Shankar *et al.*, 2018), a total of four factors were extracted (see Table 1). The average communality of the retained factors was also checked, as for a sample size smaller than 100, it is advisable to have an average value above 0.6 (MacCallum *et al.*, 1999). In this study, the computed average communality value was 0.615.

The first construct in Table 1, labeled "competitive edge and technical readiness," explains 30.665% of the total variance. It includes five categories of drivers: competitiveness (3), service level (2), infrastructural requirements (9), safety and security (8), and technological maturity (10). Factor loadings range from 0.498 to 0.744. The second construct, "societal and regulatory landscape," explains 12.971% of the total variance. It includes four categories of drivers: public acceptance (12), regulatory environment (13), organizational culture (11), and environmental impact (4). Factor loadings range from 0.495 to 0.851. The third construct, "stakeholders' engagement," explains 10.012% of the total variance. It includes two categories of drivers: external stakeholders' engagement (6) and internal stakeholders' engagement (5). Factor loadings range from 0.597 to 0.815. The fourth construct, "operational efficiency," explains 7.821% of the total variance. It includes two categories of drivers: process optimization (7) and cost (1). Factor loadings range from -0.749 to 0.457.

Table 1. EFA Constructs for UAVs adoption drivers

Influencing Factors	Factor Loadings	Construct Label
Competitiveness (3)	0.744	Competitive Edge and Technical Readiness
Service Level (2)	0.702	
Infrastructural Requirements (9)	0.652	
Safety and Security (8)	0.608	
Technological Maturity (10)	0.498	
Public Acceptance (12)	0.851	Societal and Regulatory Landscape
Regulatory Environment (13)	0.834	
Organizational Culture (11)	0.615	
Environmental Impact (4)	0.495	
External Stakeholders' Engagement (6)	0.815	Stakeholders Engagement
Internal Stakeholders' Engagement (5)	0.597	
Process Optimization (7)	0.457	Operational Efficiency
Cost (1)	-0.749	

5. Discussion and Conclusions

While previous research on UAVs predominantly focused on optimization problems, this study focused on the sociotechnical aspects, which have not received the attention they deserve in the past. After having identified thirteen categories of drivers from the literature and their level of influence on UAVs adoption through an online survey of sector experts, we used EFA to reduce the high number of variables and identify four key constructs to understand the drivers enabling a successful adoption of UAVs in middle- and last-mile logistics. Each construct represents an essential dimension of the adoption process. Competitive edge and technical readiness (explaining 30.665% of the variance) represent the competitive advantage gained through technological maturity and enhanced service level: two of the most influential drivers toward UAV adoption. Industrial respondents have emphasized this construct more, confirming that logistics stakeholders must leverage UAV technology to improve delivery services and gain a competitive advantage (Perussi *et al.*, 2019). Furthermore, the inclusion of safety and security considerations reflects the importance of risk management in shaping technology adoption decisions (Mathew *et al.*, 2021), the importance of which varies according to the geographical location, as European experts evaluated it to be much more important than their colleagues residing on other continents. The societal and regulatory landscape (12.971%) represents the complex relationships between regulatory and societal factors fundamental to successful technology adoption. Taking an STS perspective, this construct further underlines the necessity of adopting a holistic approach in the analysis of technology adoption in complex systems, thus taking into consideration not only technical elements (e.g., technological maturity) (Challenger *et al.*, 2010) but also societal values, environmental impact, and regulatory requirements (EASA, 2021). The regulatory environment was the most influential driver towards UAVs adoption, thus aligning with previous studies suggesting their significance (Borghetti *et al.*, 2022). Stakeholders' engagement (10.012%) represents the importance of involving all stakeholders in the adoption process, highlighting the significance of collaboration and communication. Including factors such as internal and external stakeholders' engagement shows the central role of human factors in enhancing technology adoption (Karwowski, 2005). Moreover, internal stakeholders' engagement was perceived as the least influential driver toward UAVs adoption, suggesting potential gaps in the scientific literature for enhancing this technology's integration by involving workers in the adoption process, further underlining the necessity of more human-centric approaches for technology adoption (Sgarbossa *et al.*, 2020). This gap is further highlighted by the higher influence of this driver perceived by industry experts compared to their academic counterparts. Operational efficiency (7.821%) represents the importance of process optimization factors and cost considerations, underlining the significance of efficiency and cost-effectiveness and reflecting the pragmatic considerations shaping technology adoption. This construct shows the need for rigorous evaluation of the impact of technology adoption strategies on operational efficiency and cost management (Borghetti *et al.*, 2022). Interestingly, academic experts placed a greater emphasis on the drivers included in this construct, suggesting a reason for the richness in the scientific literature of the branch concerning optimization problems such as vehicle routing (Macrina *et al.*, 2020), including cost-optimization objectives (Ha *et al.*, 2018).

In conclusion, this study clarifies the complexities shaping the adoption of UAVs in the middle- and last-mile logistics. By integrating demographic insights and EFA, the work comprehensively explains the drivers leading to adoption and their variations across sectors, regions, and experience levels. This holistic approach enriches the scientific discourse and provides insights for companies by highlighting the main drivers on which to focus and by enhancing the engagement of several stakeholders within their decision-making processes to improve the technology adoption success. Future research might focus on the gaps identified in this work. First, additional research on internal stakeholder engagement (specifically on workers) and innovative- and sustainability-driven organizational culture could provide valuable insights to enhance acceptance further and facilitate integration. Second, conducting targeted studies (e.g., case studies and action research) comparing UAV usage in middle- and last-mile logistics could clarify the differing viewpoints about whether to prioritize UAV adoption in one of these segments.

Acknowledgments

This study is part of the research activities belonging to the HumanTech Project, Department of Management, Economics and Industrial Engineering at Politecnico di Milano (Italy). The HumanTech Project is financed by the Italian Ministry of University and Research (MUR) for the 2023-2027 period as part of the ministerial initiative "Departments of Excellence" (L. 232/2016).

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Appendix A. ONLINE QUESTIONNAIRE

SECTION 1 – CONTEXTUAL INFORMATION

Q1. What is your employment setting?

- Academy
- Industry

Q2. What is your field of expertise?

Q3. How many years have you been working in your field?

Q4. What is your job position?

Q5. Where are you from?

SECTION 2 – UAV ADOPTION DRIVERS IN MIDDLE- AND LAST-MILE LOGISTICS

Q6. Please, rate the influence of the drivers (i.e., factors that enhance UAV adoption) on the adoption of UAVs in middle- and last-mile logistics.

	No influence	Low influence	Moderate influence	High influence	Very high influence
Cost – The category is related to the influencing cost and related aspects (e.g., UAVs may bring potential cost savings in labor and transportation expenses).	○	○	○	○	○
Service Level – This category includes factors that influence a timely and reliable service (e.g., UAVs may bring faster delivery times and increased operational efficiency).	○	○	○	○	○
Competitiveness – This category refers to factors influencing the ability to gain a competitive advantage (e.g., UAVs may bring the ability to gain a competitive advantage by offering faster and cheaper deliveries compared to competitors).	○	○	○	○	○
Environmental Impact – This category includes factors addressing the impact on the environment (e.g., UAVs may bring a reduction of road traffic congestion and associated emissions).	○	○	○	○	○
Internal Stakeholders' Engagement – This category focuses on stakeholders who are directly involved in the operations (e.g., collaboration and active engagement of workers in decision-making processes may improve the chances of UAVs adoption).	○	○	○	○	○
External Stakeholders' Engagement – This category focuses on stakeholders who are not directly involved in the operations (e.g., collaboration and active engagement of stakeholders not directly involved in day-to-day operations in decision-making processes may improve the changes of UAVs adoption).	○	○	○	○	○
Process Optimization – This category includes factors addressing the optimization of processes (e.g., through UAVs adoption may be possible to employ optimization algorithms and data analytics to improve delivery routes and monitoring capabilities for security purposes).	○	○	○	○	○
Safety and Security – This category includes factors related to ensuring the safety and security during operations (e.g., UAVs may bring enhanced surveillance and monitoring capabilities for security purposes).	○	○	○	○	○
Infrastructural Requirements – This category includes factors related to the infrastructural needs (e.g., potential for optimized use of existing infrastructure and reduced	○	○	○	○	○

dependency on ground transportation may improve the changes of UAVs adoption).					
Technological Maturity – This category includes factors addressing the readiness of UAVs (e.g., technological advancements improving UAV capabilities and ease of use may improve the chances of UAVs adoption).	○	○	○	○	○
Organizational Culture – This category includes factors that influence the adoption and integration of UAVs (e.g., embracing a culture of innovation and sustainability, through new job positions and skilled workforce may improve the chances of UAVs adoption).	○	○	○	○	○
Public Acceptance – This category includes factors related to public perception and support to the use of UAVs (e.g., positive public perception of the technology may improve the changes of UAVs adoption).	○	○	○	○	○
Regulatory Environment – This category includes factors related to legal requirements for the use of UAVs (e.g., clear and supportive regulatory framework that enables safe and efficient UAV operations may improve the chances of UAVs adoption.	○	○	○	○	○

SECTION 3 – DIFFERENCES FOR UAV IN MIDDLE- AND LAST-MILE LOGISTICS

Q7. Do you believe there are substantial variations in how the adoption of UAVs could affect middle-mile logistics compared to last-mile logistics? If so, how do you perceive the weights of the factors influencing these two logistics segments would change?