

# Drones in Venice: Exploring business model applications for disruptive mobility and stakeholders' value proposition

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## ABSTRACT

Drones can play a significant role in the paradigm shift desired by several international entities. Although many attempts to transport through the technology have encountered regulatory barriers, drones represent disruptive mobility that can foster social and environmental sustainability. For the successful implementation of this new mobility model, the support of several stakeholders is critical. In this regard, the paper applies the theoretical lens of stakeholder theory embedded within the business 4.0 model for the creation of value propositions. Through several semi-structured interviews, the research analyses findings related to a single case study concerning the unique location of Venice, Italy. The city emerges as having international interest because of its singular transportation system. Specifically, Flying Aid, a start-up venture of the Strategy Innovation ecosystem of the Ca' Foscari University of Venice, uses drones to transport drugs to remote areas to promote therapeutic access for patients with chronic diseases and transportation difficulties. The paper contributes to understanding how a paradigm shift through drone transportation may improve patient engagement and overcome transportation barriers. It also expands stakeholder engagement by empowering healthcare providers and promoting knowledge translation and systems integration. Moreover, the research contributes to the investigation of environmental and social sustainability by advancing knowledge toward cleaner production and decarbonized mobility. Finally, the paper provides insights into the elements of the business model 4.0, facilitating value creation for stakeholders.

## 1. Introduction

Several political entities are pushing for a new mobility model for transporting people and goods (European Parliament, 2019; Secinaro et al., 2022). Regulatory efforts have reshaped the transport sector, boosting soft mobility and reducing carbon emissions in urban centers (Calandra et al., 2023; Secinaro et al., 2021). Several smart cities have rethought mobility by integrating electric and hydrogen vehicles with bicycles to create a multimodal design to promote a sustainable transition (Graziano et al., 2020). Moreover, the desire to reduce pollution has resulted in the encouragement of electric vehicles and hydrogen-powered vehicles against the heavy decarbonization involving traditional combustion vehicle production in the EU area end by 2035 (European Commission, 2019).

The pursuit of cleaner production and change in green mobility have resulted in many initiatives falling under the scope of disruptive mobility. The last decades have seen the prominence of drones as a delivery system for transporting goods (Amukele, 2019). Already in 2014, Amazon Prime Air was a rudimentary design revealing the potential of technology, which was not deployed due to legislative restrictions on drone flight (Singireddy and Daim, 2018). However, one of the deterrents blocking its implementation in several cities was the application of this model for ephemeral goods. Still, assumptions appear different if the involved sector is that of healthcare, one of the most sensitive and important as it deals with people's health and well-being. More specifically, rules and processes change if drugs represent the transported goods. Indeed, pharmaceutical products are more valuable, especially considering the aim of their use, and may be subjected to

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conservation requirements. Consistent with the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2015a), and primarily SDG #3 about ensuring healthy lives and promoting well-being for all at all ages, pharmaceutical transportation via drones can provide enhanced care and well-being for chronically ill and fragile patients needing constant treatment plans in remote areas (United Nations, 2015b). Namely, the application of a high-tech integrated system represents a new mobility paradigm to ensure the delivery of recurrent drugs to areas difficult to reach by other transportation systems.

Even if the mobility paradigm shift is a high priority, the change should receive support from all the numerous stakeholders to be successful, as several previous experiences in healthcare have demonstrated (Cobianchi et al., 2022). Indeed, the healthcare sector has been considered an open ecosystem where every actor should contribute to the creation of value and the ultimate goal, namely, the patient's satisfaction and well-being (Secundo et al., 2018). Stakeholder theory has been applied in several business and management studies to understand the relationships among stakeholders as customers, suppliers, employees, or investors of a company or project idea (Mainardes et al., 2011). A theoretical pillar claims that value creation for all stakeholders should be a prerequisite of an organization (Fontaine et al., 2006). Moreover, the theoretical lens appears consistent with developments in business model studies to stress value creation (Bagnoli et al., 2018). The integration of social aspects is essential to understanding the business model effectiveness of drone application to drug delivery in the context of disruptive mobility (Brescia et al., 2023; Massaro et al., 2020).

Although several research studies have investigated mobility using drones to transport goods (Amukele, 2019; Singireddy and Daim, 2018; Stehr, 2015), further disseminating the transportation system demonstrates the need to explore the solution for universal challenges. More specifically, when it comes to the healthcare sector, previous studies investigated drug transportation via drones in the context of hospital logistics (De Silvestri et al., 2022). Still, to the best of our knowledge, no current literature deepens through the lens of stakeholder theory the transportation of pharmaceuticals via drones as a solution for remote locations. In this regard, the present study aims to answer the following research questions.

RQ1: What are the relationships among stakeholders that foster application success in the context of disruptive mobility?

RQ2: How does the business model provide the tools to meet value creation?

Therefore, the present research applies the single case study methodology to explore a business case involving international interest in the Italian city of Venice (Massaro et al., 2022; Yin, 2009). This iconic location represents a place where mobility becomes complicated due to the canals and islands that are difficult to reach with traditional transportation systems. Specifically, using ferries and boats results in a high-emission and high-cost system, and the schedule depends on weather conditions and availability. Informed of the theoretical premises, the present research investigates the Flying Aid project through semi-structured interviews (Gioia et al., 2013).

The study unveils three main contributions for theory and managers to rationalize the disruptive mobility system favoring cleaner production. First, probing the convenience of the end user understands how the paradigm shift related to mobility can increase patient engagement (Hii et al., 2019). Notably, integrating technology broadens the treatment opportunities for patients residing in remote areas, overcoming the barriers related to transportation. Second, it extends the scope of stakeholders involving actors who need knowledge translation and systems integration by empowering healthcare players (Dal Mas et al., 2020). Finally, it contributes to research in environmental and social sustainability. Drone transportation enables progress toward cleaner production and decarbonized mobility (European Commission, 2018). Furthermore, the paper provides insight into the elements of business

model 4.0, allowing value creation for stakeholders relevant to the context.

A thorough literature review and methodology follow this section. Next, the research paper presents the findings that are discussed below. Finally, the article presents the conclusion with essential insights for future research concerning the application of the Technology Acceptance Model (TAM) and related regulation.

## 2. Literature review

### 2.1. Stakeholder theory

Stakeholder theory is a conceptual framework to understand the interrelated relationships between an entity and parties having interests in their operations, such as customers, suppliers, employees, or investors (Mainardes et al., 2011). The pillar of the theory asserts that an organization should create value for all stakeholders, avoiding an emphasis on shareholders and related financing mechanisms exclusively (Fontaine et al., 2006). The stakeholder concept was introduced by Freeman (1984), who defined stakeholders as any group or individual that can affect or is affected by achieving the organization's objectives. Thereby, the stakeholder concept delineates individuals and groups who depend on the organization to achieve their goals and on whom the organization depends for its existence (Näsi, 1995). However, stakeholder theory cannot be considered a single information binder. According to Donaldson and Preston (1995), three streams for the theoretical construct can be identified: normative, instrumental, and descriptive. The normative approach refers to the multitude of theoretical approaches related to the actions of managers and stakeholders to achieve the organization's purpose within established ethical parameters (Friedman and Miles, 2006). The descriptive process explains the interactions between managers and stakeholders to enhance understanding of the complex relationships between different groups (Alsos et al., 2011). The instrumental approach expresses the idea that organizations can risk missing their goals without adequately considering stakeholders (De Colle, 2005).

Technological advancement enables the theory as a lens to numerous evolving contexts. On the one hand, stakeholder theory has been used to study relationship changes since introducing disruptive technology and Industry 4.0 (de Bem Machado et al., 2021; Mhlana and Moloi, 2020). On the other hand, stakeholder theory allows for assessing, evaluating, and addressing the opposing claims of stakeholders (Reynolds et al., 2006).

Under these premises, the present research is informed by the critical assumptions of stakeholder theory (Freeman et al., 2010). The theory emerges as one of the most widely applied approaches in business and management for social, technological, and sustainability management research (Montiel and Delgado-Ceballos, 2014). Consequently, stakeholder theory has previously been considered a fruitful field of research to keep exploring how traditional approaches can be successfully used to advance sustainable development (Starik and Marcus, 2000). Among the pillars of the theory lies the value creation by mutual interactions rather than focusing on the inevitable trade-offs resulting from divergent stakeholder interests (Key, 1999). However, for technological development to foster sustainability and healthcare access, corporate management is expected to unify wills and overcome different trade-offs (Hörisch et al., 2014).

The literature considers four main dimensions of stakeholder theory: engagement, empowerment, responsibility, and corporate strategic posture. Various organizational and stakeholder engagement models have already been emphasized to connect stakeholders to promote value creation and sustainability. Well-known examples include corporate philanthropy, corporate social responsibility (CSR), corporate social performance, corporate financial performance, shared value creation, social entrepreneurship, social innovation, and value creation for all stakeholders (Shah and Guild, 2022). According to Freeman et al.

(2010), entities returning residual profits to society need to do more to make the stakeholder model sustainable. However, avoiding a strictly economic perspective of the business leads managers to minimize the profit maximization phenomenon as the organization's only goal. The stakeholder theory approach has the potential to effectively orient companies toward the achievement of their multiple purposes, which is a feature lacking in the models mentioned above (Crane et al., 2014). The empowerment theme is closely related to engagement, understood as the attribution of power. Empowerment connotes the understanding of multiple and interconnected levels and relationships, and it enables stakeholders to voice their opinion, transforming into active and knowledgeable counterparts through effective dialogue to create trust-based and potentially long-term relationships (Civera et al., 2019). The achievement of the goal requires the adjustment of power asymmetries to achieve a practical and perceived commitment of corporate engagement to its stakeholders to determine expectations on implemented strategies and pursue their interests for mutual value creation (Freeman et al., 2010). In this regard, there is a connection between empowerment and the stakeholders' concept of value, including recognizing the organization's role in contributing to their well-being (Harrison and Wicks, 2013). When empowered to partner with the institution, stakeholders can participate in collaborative decision-making (Civera and Freeman, 2019).

These dynamics are compelling when it comes to services. Victor Fuchs (1968), highlighted how the service economy (in fields like healthcare, banking, education, and retail) differed from the industrial economy (namely, manufacturing and agriculture). Indeed, in the service economy, the relationship between the user and the producer is more engaging, and the user can actively contribute to the creation of value. Services are, indeed, different than products, and they are "co-produced" with the involvement and engagement of their users. Co-production is particularly common in healthcare, where patients are called to co-design, co-design, co-plan, and co-execute their care with their physicians (Batalden et al., 2016). By engaging in co-production dynamics, patients co-create value for themselves and others (Batalden et al., 2016; Cobianchi et al., 2022; Dal Mas et al., 2020), increasing satisfaction, adherence to care and overall clinical outcomes (Elwyn et al., 2020).

Enhancing the involvement and empowerment of traditionally considered weak and disempowered groups provides an opportunity to boost mutual and joint responsibilities for outcomes and integrate them with the stakeholder groups in the domain (Civera and Freeman, 2019). Similarly, cooperative strategic posture is a tenet of stakeholder theory that promotes the development of harmony between organizations and stakeholders as cooperating partners. Hence, stakeholders and the company can and should have interdependent and common goals other than pursuing purely economic targets (Dal Mas et al., 2020; Shah and Guild, 2022).

## 2.2. Stakeholders theory perspective on business model 4.0

Applying stakeholder theory to business models provides a framework for creating value among stakeholders, particularly in sustainability-focused business models (Freudenreich et al., 2020). According to Freeman (2017), the intersection of stakeholder theory and business models poses challenges related to private sector performance and public policy. Considering the theoretical connections across different dimensions of research, technology serves as a facilitator for integrating corporate social responsibility (CSR), shared value creation, and value generation for all stakeholders (Shah and Guild, 2022). While the concept of the business model is rooted, this study observe high technologies as inherently integrated into the business model, as seen in the context of Industry 4.0 (Kraus and Kraus, 2021).

Traditionally, a business model considers a conceptual framework to provide a holistic understanding of an organization's underlying business logic (Bagnoli et al., 2018). The business model deserves to be

observed from different perspectives since there is no all-inclusive picture of the activities and influences that involve business activity (Bagnoli et al., 2019; Biloslavo et al., 2018). One strand of research defines the business model as a company's organizational and financial architecture (Teece, 2010). Other authors view the business model as a tool for creating value through products and services and how it is delivered and captured (Chesbrough, 2006; Osterwalder et al., 2005). Furthermore, Nielsen & Lund (2014) describe a business model as a sustainable way of doing business and any companies that are developing sustainable businesses. A sustainable business model may offer more significant potential in exploring new synergies and design tools (Biancone et al., 2022; Cosenz et al., 2020).

Among the technologies enabling new business models are artificial intelligence (AI) and blockchain (Secinaro et al., 2021). Artificial Intelligence (AI) offers the potential to achieve economies of scale in collecting and using large datasets, lower search costs for matching between various parties, enhance secure and cost-effective information transfer, and reduce verification expenses (Secinaro et al., 2023). Conversely, blockchain technology enhances accountability in both transactional contexts (Kumar et al., 2022) and by tracking geographical movements (Calandra et al., 2023). Moreover, blockchain technology facilitates the creation of unalterable and immutable ledger, thereby reducing the reliance on trust relationships among the stakeholders (Calandra and Lanzalonga, 2021).

Based on these premises, a business model should explain the following sections: customer value proposition, profit formula, essential resources, and processes (Johnson et al., 2008). According to Spieth et al. (2014), business models can define, manage, and develop the company. However, companies' strategic challenges are not limited to these dimensions but involve social and governance aspects (Schaltegger et al., 2016). Fig. 1 proposes a framework to highlight the significant elements of a business model that can emphasize needs and resources to foster clean production in light of contingent, technological, and systemic changes (Bagnoli et al., 2018). In the present context, the European Commission (2019) has identified different business model the promotion of electric and hydrogen vehicles as alternatives to traditional combustion vehicles in the EU area by 2035 as a way to reduce pollution. This has led to various business models and initiatives falling under the umbrella of disruptive mobility. However, implementing this model for perishable goods has been challenging in many cities. It becomes even more critical when transporting pharmaceuticals as the health sector is responsible for people's well-being. Therefore, the underlying business model needs to be robust enough to create a value proposition for all stakeholders involved in the social dimension.

## 3. Methodology

### 3.1. Case study

This investigation employs qualitative methodology to explore a case study of international interest and answer the research questions. The exploration of a case study is a relevant scientific methodology when the focus of the analysis is on 'why' or 'how' contemporary events occur (Dal Mas et al., 2020). Massaro, Moro et al. (2019, p. 275) defined qualitative methodologies as research methods that "allow researchers to discover to reveal and understand relationships between variables even within complex processes, and to illustrate the influence of the social context." A qualitative approach captures details that could not be defined and understood through large-scale quantitative analysis. Indeed, the extensive review of the current literature underlines how the topic of disruptive mobility through drones is still in its early infancy. Therefore, it emerges a knowledge gap worth addressing by employing an in-depth qualitative approach, with its results and dynamics being useful also in similar cases.

In this vein, by deepening the Italian Flying Aid business venture, it is possible to investigate how disruptive mobility can facilitate the

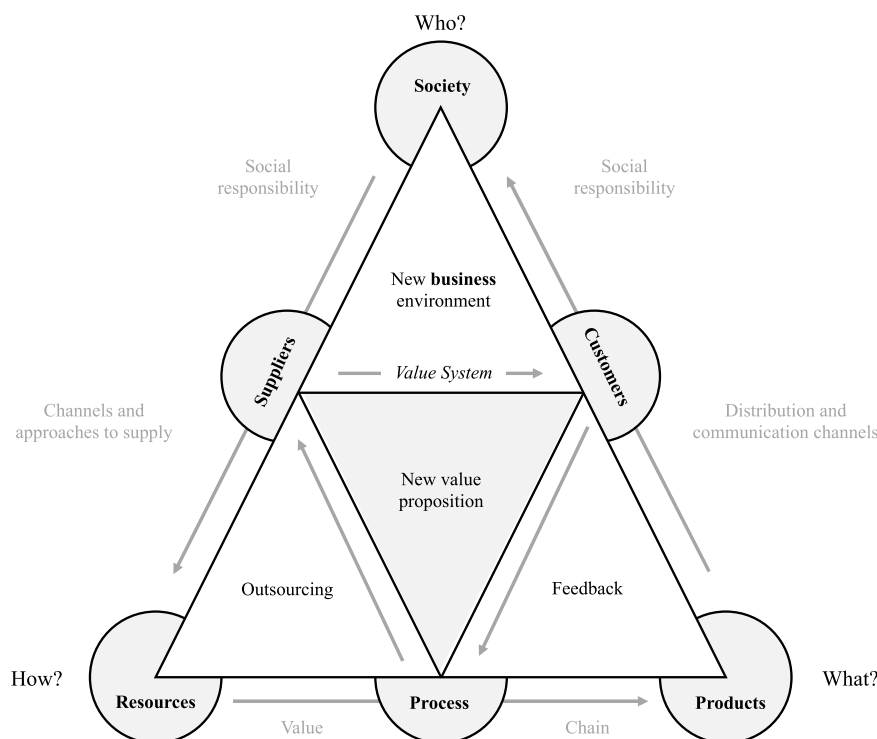


**Fig. 1.** The business model framework.

Source: adapted from Bagnoli et al. (2018).

transportation of drugs to chronically ill patients using drones to pre-established areas in remote and difficult-to-reach locations. Flying Aid is a start-up company belonging to the Strategy Innovation ecosystem of the Ca' Foscari University of Venice. The research considers a project application on Sant' Erasmo and Le Vignole islands in the Venice area, as represented in Fig. 2.

The project's mission is better care for chronically ill patients who need constant therapeutic plans and who, for reasons of their residence in inconvenient locations, often coupled with disabilities or severe

health issues, find it challenging to follow continuous therapeutic programs. The Flying Aid project takes advantage of a new mobility paradigm to guarantee the delivery of recurrent drugs in areas difficult to reach by other transport systems.

Therefore, the need that Flying Aid aims to address is the delivery of drugs to remote locations via an airborne drone-in-a-box system called NEST®250. As a matter of fact, the traditional drug transport service is not applicable in hard-to-reach environments. On the one hand, transport is problematic because it uses costly mobility, such as boats in the

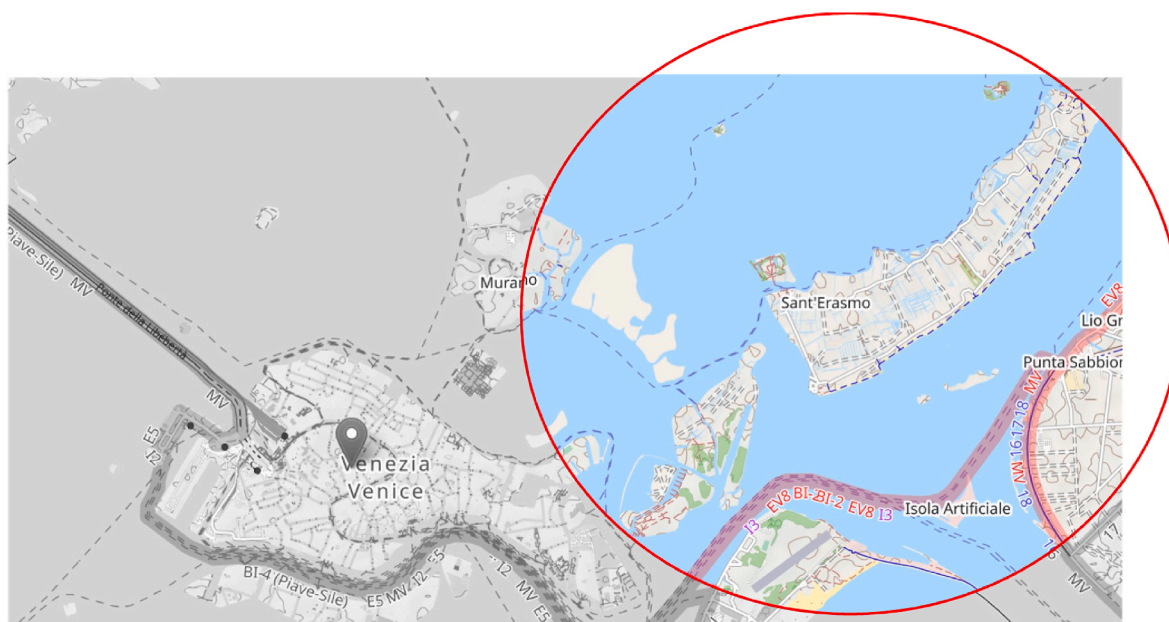


**Fig. 2.** Sant' Erasmo and Le Vignole islands, subjects of the case study.

Source: Authors' elaboration from <https://www.openstreetmap.org/>

Venice area. On the other hand, increasing the variability of transport systems makes it possible to strengthen healthcare in those areas where it is more difficult to maintain patient adherence to therapy. In this sense, the implementation of this new method of transporting drugs makes it possible both to deliver medications to remote locations and to expand the number of people with chronic diseases who decide to seek treatment.

The city of Venice is a relevant case study because of its unique characteristics that make it a challenging and interesting site for testing new disruptive mobility solutions (Massaro et al., 2022). Located in northern Italy, districts are divided by canals, not roads, like in other cities. In this sense, the city's mobility is exceptional because it is based on water buses (or "vaporetti"), or water taxis that provide public transport. In contrast, private transportation is provided by very similar boats. Goods are transported by boats of different sizes but always using canals, making deliveries difficult. Furthermore, even if there are several territorial pharmacies in Venice where people can get supplies, not all the islands provide such a service, like in the abovementioned Sant'Erasmo and Le Vignole. The inhabitants of the islands are around 700 people, of whom approximately 50 percent of in-home care have to travel frequently to other islands to obtain the necessary drugs for their therapies.

In connection with the case study, it is well known that the delivery of drugs to people in remote areas and islands is also remarkably complex (Emmons et al., 2021). Moreover, the proximity to Venice's Marco Polo airport makes the case study symbolic due to the difficulty in obtaining licenses for drone flight and airspace occupation from regulatory bodies. In particular, the presence of the airport significantly limits the concessions and flight permits in the surrounding areas. Therefore, this additional feature allows the project's potential to be replicated in other places where it is less complex to obtain flight permits.

### 3.2. Research design

Considering the assumptions emerging from the literature review and theoretical framework, the present section describes the qualitative and exploratory approach to examine the value of disruptive mobility and technology for healthcare stakeholders. Qualitative management research allows researchers to capture several intangible factors that create value in the literature (Gummesson, 2006). According to Cascante et al. (2022), the research has four phases to ensure the reliability of the results. In the first stage, the research design and question are defined (Eisenhardt, 1989). In the second stage, a transparent and rigorous methodology is used to validate the case studies (Massaro et al., 2019). The present research considers Flying Aid introduced in the previous sections. In the project context, practitioners with decision-making or operational roles were interviewed. In the process of selection for

establishing the fitting information to address the research questions, the research employs the snowball sampling technique. According to Noy (2008), the method allows researchers to access information through contacts provided by other interviewees. Moreover, the selection strategy enables researchers to search for unknown cases through auxiliary and informal systems (Hendriks et al., 1992).

The third stage included collecting primary data and conducting semi-structured interviews with technological development contact persons from companies (Meng et al., 2019; S. Secinaro, Brescia et al., 2021). Finally, the authors analyzed the data in an iterative reasoning cycle through the inductive research approach, the Gioia methodology (Gioia et al., 2013). The technique allows us to explain the phenomena of interest, making relevant connections between information flows and theory.

The data collection and analysis process is described in the following Fig. 3.

### 3.3. Interviews' data

As suggested by Flick (1998), the investigators considered several sources to build the holistic case study by implementing the information triangulation methodology. To explore the phenomenon comprehensively, the authors held internal materials and disclosable project documents and semi-structured interviews with project partners. The texts of the discussions were coded through ATLAS. TI version 9 software, which ensures transparency and reliability for the group of authors (Hwang, 2008). The interviews lasted a total of 387 min for 4 of the active partners, and a transcription and refinement work of the texts was carried out to proceed with the coding.

Information was collected over 6 months. Table 1 summarizes the details concerning the semi-structured interviews. Some interviews were conducted by the authors in focus groups of 3 or more people, a factor that positively affected the variety of responses offered (Balasubramanian et al., 2021). Furthermore, Table 2 describes the respondents and their role within the project.

Fig. 4 shows the elements that ensure the triangulation of sources for the entire case study analysis process. Data collection for the present research follows a source triangulation protocol that allows the phenomenon to be observed from different perspectives (Flick, 1998). As in

**Table 1**  
Case study data, focus on interviews.

| Data                   | Description |
|------------------------|-------------|
| Monitoring period      | 6 months    |
| Number of interviewees | 6           |
| Duration of interviews | 387 min     |

Source: authors' elaboration

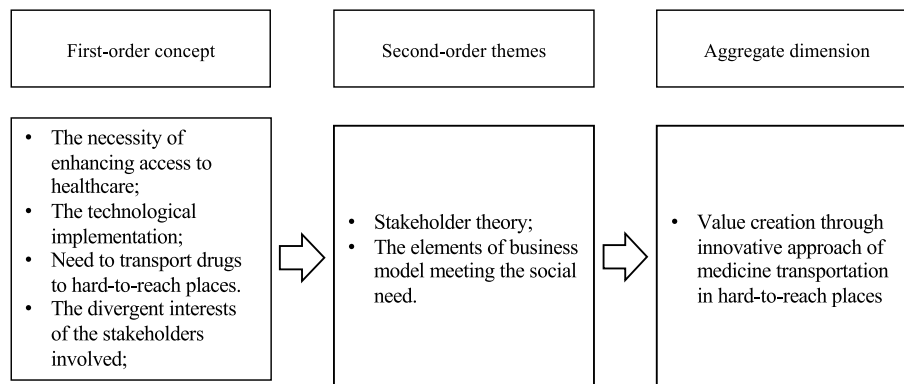


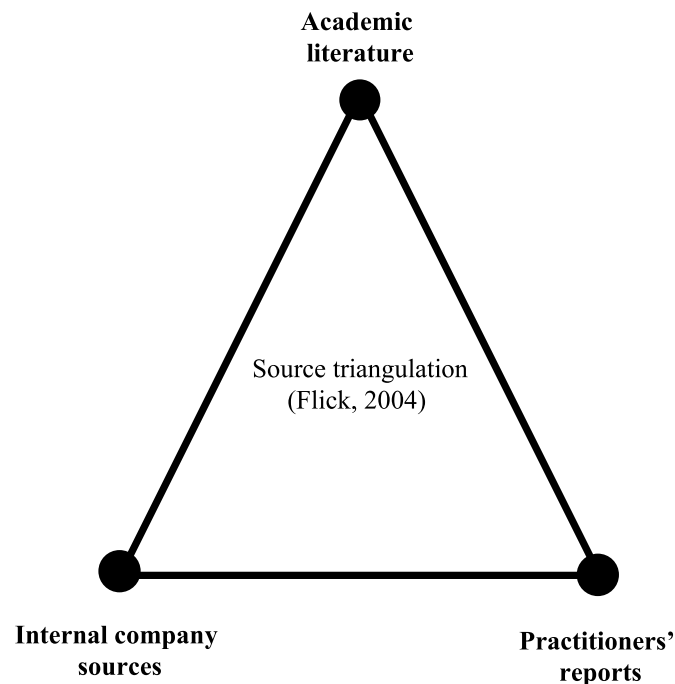
**Fig. 3.** Graphical summary of the analysis.  
Source: adapted from Gioia et al. (2013).

**Table 2**

Respondent presentation.

| Respondent ID | Role in project                             |
|---------------|---------------------------------------------|
| VB            | Project manager                             |
| FZ            | Lead entrepreneur                           |
| AC            | Head of the hospital pharmacy and service   |
| CB            | Scientific strategist and consultant        |
| ICT           | Independent expert consultant in technology |
| ICHC          | Independent expert consultant in healthcare |

Source: authors' elaboration

**Fig. 4.** Source triangulation.Source: Authors' elaboration following [Flick \(2004\)](#).

traditional qualitative research, identifying sources using this method enables data from various sources at different times, in different places, or from different people to be combined and balance the subjective influences of individuals ([Flick, 2004](#)). Besides interviews conducted with project partners, the present research uses recent literature on the topic and internal project documents to asseverate the veracity of information and to combine methods only within a single research approach ([Blaikie, 1991](#)). Specifically, the authors used the white paper to examine examples consistent with each partner's reference domains with respect to stakeholder theory and business model elements. The interviews were conducted in a virtual room using Webex software, followed by the composition of minutes later analyzed as described earlier ([Smith et al., 1994](#)).

#### 4. Results

This section examines the issues identified through the present literature, the Flying Aid project's internal sources, and semi-structured interviews conducted with contact persons in decision-making or operational roles. Therefore, this paragraph is organized into three sections to rationalize different stages of the process, investigate disruptive mobility for reaching remote areas, and explore innovations related to the business model. Literature-informed semi-structured interviews allow us to examine the role of stakeholders and to identify the needs and resources to determine the contribution of disruptive mobility in the paradigm shift. In this sense, the project is presented as follows:

*"An innovative method that brings the pharmacy closer to the patient and not as it usually is, with the patient who approaches the pharmacy to collect his or her medicine."*

Taken from VB's interviews, project manager

The innovative drug transport solution makes it possible to increase the effectiveness of healthcare for people with ongoing treatment plans by increasing the possibility of patients sticking to their treatment and reducing the potential number of hospitalizations following adherence to care.

##### 4.1. The different stages of the process and the stakeholders involved

For the Flying Aid project presentation, three main stages can be considered, as reported in the following [Fig. 5](#).

The first stage concerns drug management within the hospital pharmacy. Automated lockers with a dual function will be placed at Dell'Angelo Hospital in the Venice mainland district of Mestre. First, the locker takes charge of all incoming drugs reading their contents and origin and storing them, ready for delivery requests. Through the upload of treatment plans, the locker handles all the demands and needs for drugs from patients, thus being able to plan drug deliveries. In this sense, it will be possible to automate part of the functions performed by the hospital pharmacy, which will manage all the drugs to be delivered in Integrated Home Assistance (IHA) after validation by the pharmacist ([Stecca et al., 2016](#)).

*"There are several stakeholders involved within this first phase of the project. In the first instance, one of the stakeholders is undoubtedly the company LABEL, which specializes in process automation and robotics for logistics services, particularly for pharmacies and drug management. In the second instance, another stakeholder is the company Plurima S.p.a. - Log-OS, which deals with the hospital supply chain and provides support to healthcare companies in the technological development phase and in the structural reorganization in the logistics and management area."*

Taken from AC's interviews, head of the hospital pharmacy and service

The second phase involves the transport of the drugs with the drone and concerns disruptive mobility. The pharmacist takes the dispensed drugs from the automated locker and prepares the drone through a unique transport basket equipped with a QR code that will ensure traceability throughout the process ([Wang and Qu, 2019](#)). Then the drone will fly in a fully automated manner without using a pilot to one of the landing sites on the two islands of Sant'Erasmus or Le Vignole. Upon arrival, the drone will find another automated cupboard on the public ground to deliver the drugs. The drone will rest on the automatic locker via a magnetic guidance system, release the package, and the cupboard will automatically pick up the box containing the patient's drugs.

*"The stakeholders involved at this stage are the company Dronus, which is responsible for the construction of the drones, D-Flight S.p.a. for the flight licences, and LABEL, which is in charge of the territory locker. Dronus is a start-up that has patented an airborne drone-in-a-box system that allows flight activities to deliver drugs and other goods with total autonomy. The second stakeholder is the D-Flight company set up by ENAV S.p.a., which deals with air navigation services with the management of the platform for U-Space services required for the safe deployment of UAVs within the airspace."*

Taken from FZ's interviews, lead entrepreneur

Finally, the last step is drug collection by the patient or caregiver from the automated territorial locker. The identification of the patient to pick up the drug is done through either a tax code or a shipping code that will be sent by sms. In addition, the Artificial Intelligence (AI) system

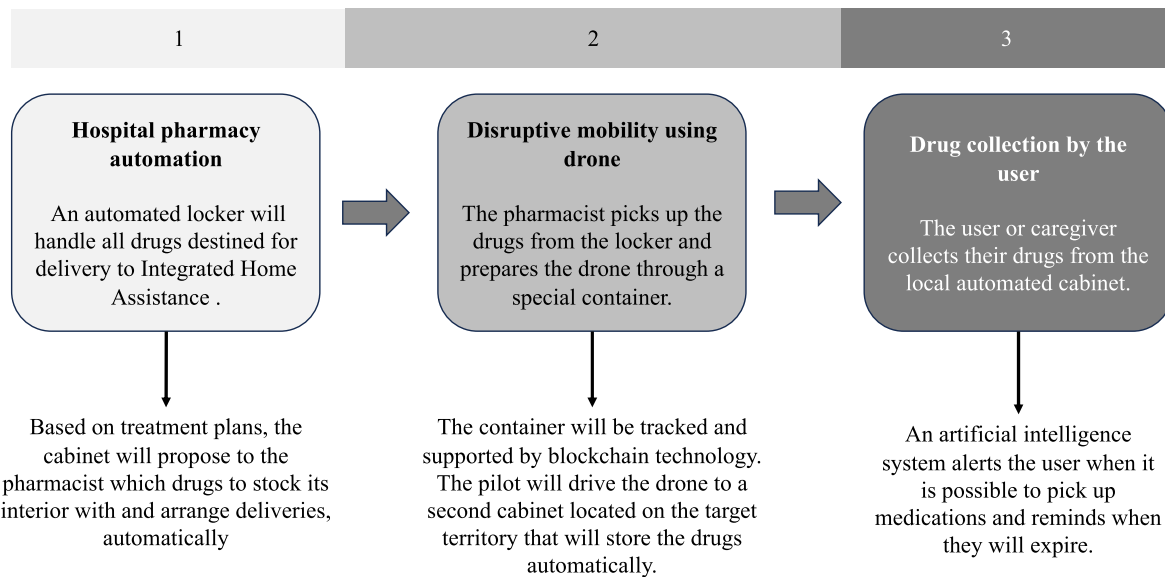


**Fig. 5.** The Flying Aid's process.

Source: Authors' elaboration based on internal sources of Flying Aid

gives advance notice of the day and time when the drugs will be available for pickup until the pickup is made (Secinaro et al., 2023).

"The stakeholders, in this case, are represented by the company that is in charge of the automated territorial locker that allows the patient or caregiver to pick up the drugs and the company Blu-it that is in control of the AI systems of the drug management software in the warehouse and blockchain systems for the protection and security of the data concerning flight plans, flight coordinates, drug movements, drug delivery, and pickup, the communication to the patient of the drug delivery, the prescription software, CRM software for the management of patient relations and blockchain systems for the security of the data used. In addition, one more crucial stakeholder at this stage is the patient or caregiver who is in charge of the drug pickup."

Taken from VB's interviews, project manager

Furthermore, many more stakeholders are involved in all three project phases. One important player is represented by the Health Agency "ULSS 3 Serenissima," which holds responsibilities for patients' management and care needs. One more crucial stakeholder is the Veneto Region, which handles the Regional Health System, with financing and control duties.

#### 4.2. Disruptive mobility for reaching remote areas

This new disruptive mode of transport enables several essential changes in the social aspect of healthcare for chronically ill patients or those living in remote locations. On the one hand, the new mode of transport makes it possible to expand drug delivery methods, reaching those fragile patients who reside in out-of-reach places. On the other hand, it represents a valuable system for workload forecasting. In addition, the delivery of medication to patients via drones makes it possible to increase the number of patients on IHA, thus enabling them to be assisted and cared for at home as if they were under direct management from the hospital. Integrating AI technologies empowers automate relations with patients or caregivers to arrange drug delivery. In addition, AI systems offer a 24-h customer care service for both deliveries and therapeutic indications via instant messaging systems and call to increase inclusivity for fragile and older people. Finally, the paradigm shift brings pharmacies closer to the patient by reducing the number of trips. As the project manager stated:

"The AI systems provided by the Blue Panther spin-off will allow the patient or caregiver to be contacted via instant messaging systems or by phone to be notified that the drugs will be delivered and available for pickup from a specific date. In addition, the AI systems will also allow to agree with the patient or caregiver whether that date is OK or changes are needed. In this way, the service will be as patient-driven as possible. In addition, AI systems will also allow monitoring of the time limits for withdrawal before the patient's therapy from the previous withdrawal is finished. Finally, as long as the AI systems do not detect the withdrawal, they will contact the patient or caregiver daily to remind them that the drugs are available for collection."

Taken from VB's interviews, project manager

Considering environmental sustainability, the system is net zero-emission and in line with international exogenous trends. The drone used to transport the drugs uses lithium batteries that do not contribute to the increase of CO<sub>2</sub> in the air. At the same time, the presented transport system reduces the traffic of boats with diesel engines and highly polluting both in terms of emissions and noise pollution on the islands of Venice. Furthermore, the automated wardrobe used in the area is self-sufficient in energy, equipped with solar panels and energy storage batteries. As a scientific strategist and consultant reported:

"From the point of view of environmental sustainability, the project stimulates a new format of mobility both in drug delivery and scalable in other areas and contexts. In particular, the project can be considered green for several reasons that I will outline below. The first concern is that the automated locker placed on the islands will be self-sufficient from an electrical point of view because it is equipped with solar panels and accumulators. In this sense, the energy consumption of the automated locker is managed autonomously. The second concerns the drone, which is equipped with batteries and will make it possible to replace traffic on tires or boat traffic as far as Venice is concerned with a considerable and relevant impact."

Taken from CB's interviews, scientific strategist and consultant

#### 4.3. Explore social innovations related to the business model

The new value proposition emerging from the case study exploration

allows for the rationalization of the company's actions by meeting users' needs (Bagnoli et al., 2018). Integrating the stakeholders' interests is a critical and essential part of the project. The various stakeholders are involved in fostering and not hindering the dissemination and social purpose of the process (Biloslavo et al., 2018). It is only through the system integration of different technologies used in various domains and activities implemented throughout the multiple actors that knowledge is spread to facilitate the different stages of the process.

" Project implementation requires the connection of several stakeholders who can relate to each other to implement a new value proposition through the integration of skills and knowledge translation. Specifically, we observe the involvement of the drone company, the empowerment of the entity issuing flight licenses, and the integration of high technologies in supply organization through AI and management software."

Taken from ICT's interviews, independent expert consultant in technology

The interviews conducted provided insights into the emerging new value proposition based on business model 4.0 (Bagnoli et al., 2018). Table 3 summarizes how the dimensions can be represented to identify the overall new value proposition for disruptive mobility.

The social dimension appears to be represented by an increase in the effectiveness of pre-established medical treatment resulting in improved treatment success through the transportation system unveiled in the case study. The advantage for the user arises in lower transportation costs, which in remote areas can mean financial savings for the citizen and the entire healthcare system. In terms of the service, it is observed how the disruptive mobility system allows for the delivery of needed medicines in remote locations and facilitates reaching patients with mobility constraints. Furthermore, the process empowers the creation of new value for companies to become influential players through the inherent interdisciplinarity arising from the integration of technologies. In this regard, the enabling technologies require a variety of suppliers that shift from the traditional supply system extending the perimeter for the entire field and generating value for companies outside the present process. Finally, the potential reduction of carbon emissions creates value for the environment and represents a change in the whole transportation paradigm for inhabitants of remote places.

In view of the previous points of value proposition, Fig. 6 illustrates the business model canvas 4.0 (Biloslavo et al., 2018). The visual representation utilizes categories identified in recent literature, such as society, users, services, processes, resources, and suppliers, to illustrate

both the preferred business model and the primary social outcomes resulting from its implementation.

## 5. Discussion

### 5.1. Theoretical implications related to stakeholder theory

Stakeholder theory defines how an organization should create value for all stakeholders involved while avoiding placing emphasis only on shareholders and their financing mechanisms (Fontaine et al., 2006). Through the investigation of the case study, it is observed how the involvement of all project stakeholders can promote value creation and sustainability (Freudenreich et al., 2020). The successful integration of stakeholder theory with technology-focused business models has been verified through this study. This innovative approach has been instrumental in identifying a valuable offering and promoting social sustainability (Shah and Guild, 2022). Furthermore, the research has also emphasized the crucial role of engaging and empowering a diverse range of stakeholders in the healthcare sector.

To answer the first research question, the change in the mode of drug transport can better assist the end-user and increase engagement at different stages of the process. The patient or caregiver, through a paradigm shift in mobility, will be able to enjoy a service that better meets their needs (Hii et al., 2019). In this sense, being more favored to receive the therapy at an automated locker close to where they reside increases the likelihood that the patient will adhere to the treatment, thus reducing the risk of hospitalization and transport to the hospital. The added value is considerable, given the difficulties and costs of transporting the patient to remote areas of the hospital. In addition, by reducing the number of patient admissions, the regional health system will have more free beds in the hospital to be used for other services or needs.

Furthermore, the study reveals an increase in the number of stakeholders involved compared to the traditional healthcare system. As more stakeholders collaborate and relate to each other for the project, their empowerment will also change (Harrison and Wicks, 2013). However, effectively guiding the different stakeholders toward achieving the project's ultimate goal remains central. According to Civera et al. (2019), the paradigm shift defines a more significant number of stakeholders involved in the value-creation process. Thus, the company that produces lockers (LABELS), the company that constructs drones (Dronus), the stakeholder that deals with services for air navigation (D-Flight), and the company that works with AI and blockchain systems (Blu-it) are identified as otherwise uninvolved actors. Although some stakeholders are initially present in the delivery system, the observed change reveals an increase in the level of empowerment (Harrison and Wicks, 2013). The variety of stakeholders also includes public bodies, like the Health Agency – ULSS 3 Serenissima in charge of healthcare management, and the Veneto Region, responsible for the regional health system and policies. Both of them, along with the private firm Plurima S. p.a. - Log-Ofs will relate with more companies following the value chain from the first project to the last phase. According to de Bem Machado et al. (2021), technological advancement allows it to be a lens in changing contexts. Indeed, technology can be a tool to enable increased stakeholder engagement. Interestingly enough, technology availability and paradigms do not appear to be critical elements in the development of the Flying Aid project. Drones, automated cabinets, AI, and blockchain are already significantly in use in other contexts (Dwivedi et al., 2021; Stehr, 2015). Still, the real challenges and obstacles related to the implementation of the new transport system are different. One first barrier is represented by the regulatory dimension, as the mobility system needs to deal with a variety of strict rules concerning both mobility (e.g., flying permissions, proximity to the airport) and drug management (e.g., storage, prescription needs, ...). One second issue concerns the acceptance of the new paradigm, especially for healthcare professionals (e.g., pharmacists in charge of some logistic aspects,

**Table 3**  
New value proposition elements emerging from the interviews.

| Business model dimension | New value proposition elements                                                                                                             | Interviewer                                      |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| (1) Society              | Increase in the effectiveness of healthcare for people living in remote areas.                                                             | VB, project manager                              |
| (2) Customer/ User       | Reducing the potential number of hospitalizations following adherence to care.                                                             | AC, head of the hospital pharmacy and service    |
| (3) Product/ Service     | New disruptive mobility to increase the number of patients able to comply with medical therapy.                                            | FZ, lead entrepreneur                            |
| (4) Process              | Multidisciplinary extension of a vertical process to the healthcare sector.                                                                | VB, project manager                              |
| (5) Resources            | Integration of advanced technology into the three stages identified for drug pickup and delivery.                                          | ICT, independent expert consultant in technology |
| (6) Supplier             | A paradigm shift in drugs management and delivery. The healthcare system is closer to the user by reducing carbon-emitting transportation. | CB, scientific strategist and consultant         |

Source: Authors' elaboration

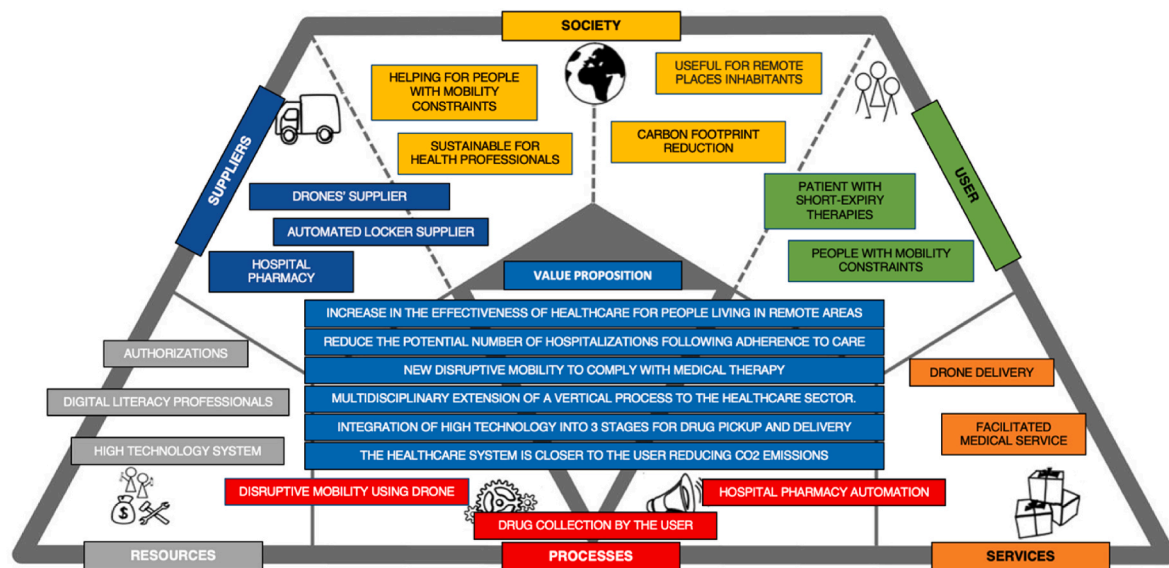


Fig. 6. Business model canvas 4.0.

Source: Authors' elaboration on Biloslavo et al. (2018).

general practitioners who should enroll their patients in the IHA program and monitor their progress), patients, their General Practitioner, and their caregivers.

According to Birks et al. (2020), in the present case study, technological development should foster sustainability and access to healthcare for people with chronic illnesses and living in remote locations. Furthermore, the project allows the unification of the stakeholders' wills, overcoming the purely individual interests of each of them. In this sense, Flying Aid is a practical example of how the stakeholder theory has the potential to effectively steer companies toward the achievement of numerous objectives beyond those purely related to profit maximization. Empowerment underpins these aspects and enables the different stakeholders to increase their mutual responsibilities to achieve the project's purpose (Civera and Freeman, 2019; Dal Mas et al., 2020).

## 5.2. Practical implications related to enabling the sustainable business model

The concept of a business model provides a holistic understanding of the underlying logic of an organization (Bagnoli et al., 2018). The case study shows how the mobility paradigm shift potentially leads to a high-value proposition. Indeed, the project's high value lies in fulfilling a latent need within society. By changing the resources and the way drugs are delivered, it is possible to make deliveries more agile by getting closer to the patient's needs. In particular, integrating technologies used in other sectors and contexts, such as drones for transport, lockers, AI, and the Blockchain, can increase the value proposition. In this sense, it is possible to answer the second research question. Changing the mode of delivery also requires an adaptation of the processes established within the value chain (Bagnoli et al., 2018; Birks et al., 2020). At the same time, there will also be a change and increase in the number of suppliers involved in the new value proposition. Following the implementation of this change from traditional modes of transport, feedback from end users will also be relevant (Bagnoli et al., 2018). They can suggest changes within the processes to increase the value proposition.

According to Cosenz et al. (2020), the development of sustainable business models appears relevant and worthy of further investigation. In particular, the business model of the case study reveals an improvement in social and environmental aspects. From the point of view of social aspects, the project makes it possible to satisfy the users' need to receive drugs in places close to their homes. In addition, through this new

disruptive mode of transport, it is possible to increase the purpose of public health, which is linked to fulfilling patients' demands for care. Secondly, from the point of view of environmental aspects, the Flying Aid project makes it possible to reduce CO<sub>2</sub> emissions to deliver drugs in rural areas to patients with chronic diseases. The use of disruptive modes of transport, such as drones, reduces emissions compared to the use of diesel-powered boats in the city of Venice. This development is in line with the EU's call to be 'climate-neutral' in 2050 (European Commission, 2018). Specifically, the European Commission's goal is to reduce greenhouse gas emissions within the EU so that the amount of greenhouse gas emitted is offset by equivalent amounts absorbed or removed from the atmosphere, thus achieving a net zero balance. The Flying Aid project is mainly involved in the EU strategy because transport is one of the key focus areas of the net zero emissions strategy by 2050.

Following the conception and implementation of the business model of this case study for the island of Sant' Erasmo and Le Vignole in the city of Venice, there is a good chance of its replicability in other areas. Since it is a business model that requires the involvement of various partners, it will be necessary to replace some of them that are purely territorial for implementation in other remote locations. An example may be stakeholders such as ULSS 3 Serenissima and the Veneto Region if the project implementation area is outside their competence. The project's objective will remain the same, to increase the number of patients in IHA, increase the uptake of therapy by patients at home, and reduce the number of hospital admissions of patients.

## 6. Conclusion

The paradigm shift arising from international pressures for a green transportation system and cleaner production has revealed multiple disruptive mobility applications. Although drones have been explored as a solution for transporting everyday goods, the many flight-related barriers have stalled developments by big players (Singireddy and Daim, 2018). However, technological evolution has turned drones into a safe and effective clean transportation system for ephemeral goods and essential goods such as pharmaceuticals (Amukele, 2019). In this vein, the present paper explored a case study of international interest to understand how to integrate different stakeholders in the paradigm shift and to emphasize the social value stemming from the change (Bagnoli et al., 2018; Freeman et al., 2010).

To answer the research questions, the results are informed by the

Gioia method to conduct a series of semi-structured interviews that captured the potential of the case study in shaping a new cleaner transportation model for remote areas (Gioia et al., 2013). Specifically, the results shed light on enabling the integration of the healthcare sector and disruptive technologies to reveal a drug transport system. On the one hand, AI technology enables the automation of drug selection processes based on medical therapies. On the other hand, blockchain allows monitoring of the unaltered state of the drug throughout the transportation and landing phase of the drone. Venice represents an emblematic case of how the system brings a new value proposition. Namely, the transportation of drugs at islands pertaining to the city and traditionally inaccessible by standard vehicles demonstrates the high generalization of the case study and the scalability of the entire process.

Therefore, this research considers several theoretical contributions based on stakeholder theory. First, the end user is facilitated in following their medicinal therapy program by integrating technology. Specifically, the research reveals that the paradigm shift increases engagement and allows for a better response to the patient's needs (Hii et al., 2019). Second, technology integration allows for an increase in medical stakeholders. This includes the presence of stakeholders who alternatively would not be involved in the delivery system and empowers the actors of traditional strategies who foster knowledge translation and systems integration (Dal Mas et al., 2020). In the open healthcare ecosystem, private firms, technology leaders, universities, and research centers must cooperate with medical doctors, healthcare executives, public bodies, and patients' representatives to foster innovation and add value to the healthcare service (Secundo et al., 2018). Third, the research reveals the need to be legislation consistent with the use of drones for transportation. Notably, the challenges in enabling the project's testing have shown that institutions appear more prone to disruptive mobility to goods of higher moral standing.

Moreover, the research has important practical implications. Consistent with international goals, the disruptive mobility system presented in the case study provides a meaningful way to achieve environmental sustainability. In particular, drone transportation enables progress toward cleaner production and decarbonized mobility (European Commission, 2018). Therefore, employing a smart and greener mobility approach, we expect to see more of its applications in the near future. Second, the research discloses implications inherent in social sustainability connected to healthcare, one of the most sensitive sectors (Bagnoli et al., 2018). The case study analysis deepens the relevance of social aspects related to the healthcare system and how the change in the drug delivery system can facilitate patients in need to adhere to their treatment plan and prevent hospitalizations. Last but not least, the presented case offers food for thought to managers and healthcare executives as it stands as a best practice with the possibility to be scalable and replicable in other geographical contexts worldwide.

The study deepens the current dialogue about policies as well. While technology has demonstrated the potential to increase both environmental and social sustainability, its translation to practice is limited by the current legislation. Therefore, there is a call for policymakers to speed up the evaluation and assessment of such opportunities, amending the legislation when it may lead to valuable outcomes for users and institutions.

Like other research, the present research has limitations. First, although our results may be considered satisfactory, only six people were interviewed and involved in the study. A broader expert panel of stakeholders, also outside the single case study, would have been beneficial to add more details and insights on the theme. Although the case study is of international interest and presents relevant challenges, it is only sure to be applicable in some areas where mobility is complex. Furthermore, application to the Italian context makes stakeholder theory fit in the present frame. Other regions could benefit from the application of different approaches. Finally, the application of pioneering technologies and the embryonic stage of the drone study may make the case study outdated in the coming years. Our limitations may

lead to exciting new research avenues.

However, the present study allows for flourishing fields of future research. Remarkably, the TAM could allow a better understanding of the integration of technological elements at all stages of the process (Davis, 1985). Moreover, the differences in regulations deserve further investigation in different geographical areas. Specifically, it will be relevant for researchers to delve into the barriers to process integration among various stakeholders to make the present research the basis for disruptive mobility studies related to drone transportation.

## CRedit authorship contribution statement

**Federico Lanzalonga:** took care of data collection, Writing – original draft, took care of the required revisions in round 1. **Michele Oppioli:** took care of data collection, Writing – original draft, took care of the required revisions in round 1. **Francesca Dal Mas:** Conceptualization, the idea of the study, took care of data collection, Writing – review & editing, in a critical way, took care of the required revisions in round 1. **Silvana Secinaro:** revised the manuscript in a critical way, Supervision, All the authors agree with the latest version of the manuscript.

## Declaration of competing interest

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

## Data availability

Data will be made available on request.

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