

# Last-Mile Delivery Options: Exploring Customer Preferences and Challenges

Evangelia Filiopoulou

Department of Informatics and Telematics  
Harokopio University of Athens  
Omirou 9, Tavros 17778  
Email: evangelf@hua.gr

Cleopatra Bardaki

Department of Informatics and Telematics  
Harokopio University of Athens  
Omirou 9, Tavros 17778  
Email: cleobar@hua.gr

Dimitrios Boukouvalas

Department of Informatics and Telematics  
Harokopio University of Athens  
Omirou 9, Tavros 17778  
Email: itp19127@hua.gr

Mara Nikolaidou

Department of Informatics and Telematics  
Harokopio University of Athens  
Omirou 9, Tavros 17778  
Email: mara@hua.gr

Panos Kourouthanassis

Department of Informatics  
Ionian University  
7 Tsirigoti Square, Corfu, 49100 Greece  
Email: pkour@ionio.gr

**Abstract**—As consumers turn more and more to on-line shopping, requirements such as on time delivery and delivery cost saving are of major importance. Retail and logistics companies struggle to find strategies that offer a successful and fast last-mile delivery service that satisfies consumers' preferences and expectations. Last-mile delivery is an opportunity, as well as a challenge for e-commerce retailers and logistics companies because it needs to satisfy customers' preferences, offering the best customer experience. This paper explores Greek consumers' preferences of last-mile delivery alternatives. We investigate the potential of using drone delivery and the challenges the consumers face during tracking their order delivery. We conducted a survey with 174 participants exploring their online shopping behavior, which delivery options they prefer, what delivery challenges they face (e.g. home delivery without prior notice) and which factors influence their delivery decisions (e.g. delivery time-flexibility and time saving). **Keywords:** Last-mile delivery, Drones, pick-up point

## I. INTRODUCTION

Electronic commerce (e-commerce) has a vital role in today's global economy. Over the years, e-commerce has evolved in profound ways and COVID-19 pandemic has accelerated e-commerce transactions and a massive shift in consumers' behavior is noticed [1]. Consumers have embraced on-line ordering of services and products during the COVID-19 breakout and it seems that in the post COVID-19 era consumers are not willing to switch back to the traditional commerce activity [2]. As consumers progressively turn to e-commerce for all their shopping needs, requirements such as on time delivery and delivery cost saving are of major importance. Consumers have become more demanding and expect their deliveries to take place in the quickest possible time, in a reliable manner and at their location.

Therefore, distribution and retail companies struggle to find strategies that offer a successful and fast order delivery that satisfies consumers' expectations and have identified last-mile

distribution services as a key differentiator [3]. By 2027 the global last-mile delivery market is expected to grow to more than 200 billion U.S. dollars from 108.1 billion U.S. dollars in 2020. The growth of the last mile delivery market is led by the increased number of online orders [4].

Logistics companies provide several last-mile delivery options such as pick-up from the store (in-store click and collect) and home delivery. However, after COVID-19 outbreak, a strong emphasis is placed on consumers' preferences, ensuring that consumers are satisfied. Innovative solutions, time and money saving delivery options are examined and introduced in the market, lockers for picking up the orders and several pick-up points (e.g. established stores that provide delivery service - for example a small store that sells newspapers, cigarettes, snacks and beverages). Moreover, drone deliveries, are not too far down the line from becoming a globally acceptable solution. Amazon [5], and Israeli start-up Flytrex [6] have started operating drone delivery service. Nevertheless, last mile delivery is a prospect as well as a challenge for e-commerce retailers and logistics companies because it needs to consider customers' preferences and expectations, offering the best customer experience. Consumers' preferences are considered to be major and complex criteria for selecting the last-mile delivery option [3] and they are also difficult to assess since the consumers behavior constantly change. Simultaneously, the effectiveness of the last-mile delivery options offered by stakeholders in the retail industry contribute significantly to their success and profitability since they have a direct impact on their customers' experience and satisfaction.

In this context, this paper explores the preferences of Greek consumers of last-mile delivery alternatives; and is mostly interested in the potential of using drone delivery and the challenges the customers face during tracking their order delivery. We conducted a survey with 174 participants exploring their online shopping behavior, which delivery options they prefer and what challenges they face (e.g. home delivery without prior notice) and which factors influence their delivery decisions (e.g. delivery time-flexibility and time saving). The rest of

the paper is structured as follows: Section II presents last-mile delivery background, Section III summarizes the survey procedure and Section IV includes the survey results. Section V presents and analyzes the results of the survey and Section VI concludes the paper.

## II. BACKGROUND

Last-mile delivery is the last link in the supply chain, i.e. the delivery from the retailer/distributor to the final consumer. Most studies highlight this link as one of the most costly, possibly accounting for 30%-40% of the transport cost of service. Thus, its management is particularly important since it is the driver of both e-commerce and omni-channel retail supply chains [7].

Two last-mile transport options are commonly offered to consumers when they order products online: home delivery (or at any other address of choice) and in-store Click-and-Collect [8]. The evolving consumer expectations have boosted the competition and innovation in the delivery market; thus, new delivery options have been introduced covering the wide spectrum of consumers' preferences and making delivery a more "self-service" option. "Lockers" is a network of smart boxes that are usually installed in shops or other places (e.g. gas stations), and from which the consumer can pick-up the order 24 hours a day, 7 days a week. A fully contact-less process with an inbox unlock code is received in an email/message [9]. respectively, pick-up points are stores in a collection point network that operate beyond usual hours (e.g. mini markets, flower shops, gas stations, wineries, photocopying centers, etc.) and provide order pick-up service as well [1]. Last, drones allow delivery companies to provide extremely fast and flexible delivery service, with less environmental impact and potentially at a lower price. Drones may also facilitate the delivery of goods to remote locations [10].

Last-mile delivery market is formed by consumers preferences, therefore several papers focused on them. In [11], a survey among 709 respondents in urban Australia was conducted. The purpose of the survey was to indicate the consumer preferences of innovative last-mile delivery services, using unmanned aerial delivery drones, in comparison to traditional postal delivery and parcel lockers in Australia. Based on the results, the respondents preferred traditional postal delivery over drone delivery. In addition, a locker was a more attractive solution when there was no safe place to leave the parcel. In [12], authors examined if consumers environmental attitude was captured in their stated preferences for last-mile delivery options for clothing rentals. Preferences were analyzed in terms of income and demographics characteristics. An internet panel survey was conducted among Norwegian females between 18 and 70 years of age. Based on the findings, females consumers were willing to accept increased delivery time if it suggested reduced emissions. Moreover, females with higher income and more frequent online shoppers were negative to clothing rentals and strongly believed in change for the environment.

Finally, a survey on the use of parcel courier services and the recording of consumer experience was conducted by the National Telecommunications and Posts Commission (EETT) between January and March 2022 [13]. The research was

carried out through telephone and online interviews with a sample of 2,004 people aged 18 and over, using a structured questionnaire. Based on the results, speed of delivery was the main reason for using last mile services across all demographic groups, This was followed by additional services such as the ability to track the shipment and better service.

## III. CUSTOMERS SURVEY

We conducted a survey of on-line shoppers with the goal to explore: their shopping behavior (their shopping frequency, what they buy and why they prefer on-line shopping); their preferences of last-mile delivery options and the reasons/factors that influence their choices (e.g. time-saving, convenience etc.) with an emphasis on the potential to select drone-delivery, as well as the significance of the delivery tracking information and capability for the consumer and the difficulties they deal with based on their delivery experiences.

### A. Survey Instrument, Participants and Procedure

To conduct the survey, we designed a questionnaire that consisted of 58 questions divided into three parts. The first part elicited the demographic data of the respondents; part two included items related the online shopping behavior (e.g. online shopping frequency and the e-device used while shopping) and part three focused on the order's delivery option the respondents prefer, the factors that contribute to their decision of delivery mode (e.g. courier service or pick-up from the store) and the challenges while tracking the delivery. All the items in the questionnaire, except from the ones about the demographics and the frequency of online-shopping, were rated on a 5-point Likert scale.

The questionnaire was designed with Google Forms (in greek) and participants from Greece were informed through email, Viber application and social networking applications. The survey was carried out between July and August 2022 and we collected 174 valid responses in total. We performed descriptive statistics to gain insights into the consumers' perceptions of last-mile delivery alternatives, which factors drive their preferences and what delivery tracking information and capabilities they need. The survey results are summarized in the next section.

## IV. RESULTS

### A. Demographics

Based on the collected answers, females outnumbered males (66% vs. 34%) and the participants were aged in the majority between 18 and 44 years (80.45%). The highest percentage of the respondents (39.08%) belonged to the (25-34) age range. The education level of the respondents was generally high with the majority of them (47.13%) to hold a bachelor degree and 29.31% of them had a master's degree while 20.11% were high school graduates. In addition, the majority of the participants (75.29%) lived in urban centers and almost one fourth of them (23.99% - 14.94% lived in mainland Greece and 8.05% in Greek islands); 1.72% did not provide residence info.

## B. On-line shopping behaviour

37.40% of urban residents make online purchases once or twice a month, 28.24% purchase product online once or twice in three months and 14.50% of them buy online more sparsely (once or twice in six months). The respondents living in the Greek mainland have similar online buying behavior, 34.62% perform on-line purchases once or twice a month, 26.92% once or twice in three months and 15.38% conduct online shopping once or twice in six months.

However, more residents of Greek islands prefer online purchases, since 42.86% shop online once or twice a month and 15.38% shop online once or twice in six months. This can be attributed to the difficulty of islanders to often visit commercial centers, especially in the winter, where there is higher availability and variety of products.

The participants responded that they "often to always" buy travel services (e.g. travel tickets and hotels) (61.49%), tickets (e.g. for movies) (50.57%) and clothing products (43.68%). We highlight that only one third of the sample (31.03%) buy "often to always" technology products (software/hardware devices) and the majority "never" or "rarely" buys books/magazines (65.52%) and food products (71.84%).

Concerning the device/mean they use for on-line shopping, most consumers use mobile devices (smartphones or tablets) for product searching and buying. 30.50% of the sample answered that they "always" use a mobile device for their purchases and 25.30% answered that they "often" use the mobile device. Namely, more than half of the respondents (55.8%) "often" or "always" use a mobile device while on-line shopping.

It is interesting to see the use of mobile device combined in terms of place of residence. On the one hand, the majority of urban residents (58.01%) "often" to "always" on-line shop by a mobile device, "rarely to never" 23.66% and 18.32% "sometimes". Most of the residents of Greek mainland Greece (53.84%) also answered that they "often to always" buy with a mobile device, "rarely to never" 30.76% and 15.38% "sometimes". On the other hand, fewer (42.86%) of the Greek islanders answered that they "often to always" perform mobile shopping, "rarely to never" 28.58% and 28.57% "sometimes". It is evident that the majority of urban and mainland residents use the mobile device more often than the islanders, almost one third of the residents of Greek mainland and islands "rarely to never" perform mobile shopping.

Exploring whether the participants use price comparison engines (e.g. skrouz.gr), 62.64% of the respondents answered that they use "often" or "always" use them and 24.71% "sometimes". The mean frequency of using such comparison services was relatively high (3.73/5.0) indicating that such services are popular among the respondents. We underline that both urban and mainland residents are fond of comparison services; indeed, almost 65% "often" or "always" use them, while the islanders are not so frequent users (42.85% "often" or "always").

Then, the respondents rated the significance (1-not significant, 5-very significant) of several factors that influence them to prefer on-line shopping. 83.30% find ease of access and time saving the two most important factors/reasons (they

rate them "significant" or "very significant"). The rest of the factors under study (24-hour shopping opportunity, products variety, comparing prices, seeking better prices and bigger offers) also play a crucial role (more than 66% per factor find them as "significant" or "very significant"). The possibility of buying products from abroad is also "important" or "very important" (62.10%) for consumers. More specifically, the mean significance per reason for on-line shopping is high for 7 out of 10 factors ( $\geq 4.0/5.0$ ) and relatively high for 3 factors (3.63 to 3.93/5.0), i.e. possibility of buying products from abroad, bigger offers and better prices). The aforementioned results are presented in Figure 1.

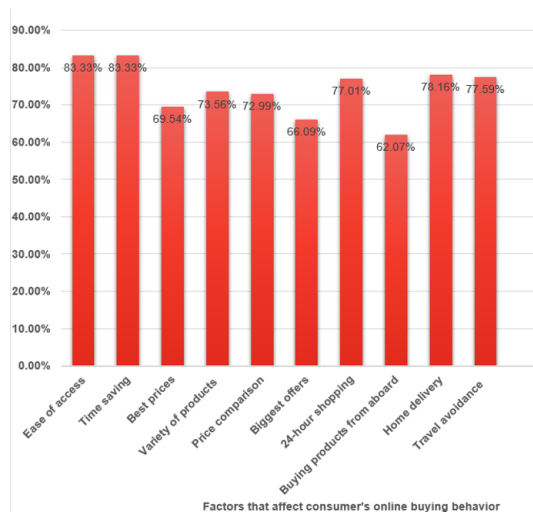


Fig. 1: Factors influencing consumers to prefer on-line shopping

Finally, 71.80% of the respondents are satisfied ("very satisfied or satisfied") with the on-line buying process but fewer of them are "satisfied or very satisfied" (57.50%) with the delivery of their orders. Then, 52.90% "agree or strongly agree" that, in the future, they will buy more products on-line.

## C. Last-mile delivery options

Concerning the participants preferences of last-mile delivery mode, 81% of the respondents prefer "often" or "always" home-delivery (courier service company). Click Collect delivery mode from the store (in-store CC) or the courier company distribution point are less popular (per mode, almost 21% prefer it "often" or "always"). We highlight that the majority (71.8%) of the participants "rarely" use a locker as a pick-up point and 59.80% of the respondents "rarely" prefer a pick-up point (i.e., a store from a chain of already established stores (e.g., pharmacies) that also function as a pick-up-point; in Greece such a store is called clever-point). Only 9.80% and 6.90% use "often" or "always" pick-up points and lockers, respectively. Especially for the lockers, such results could be explained because their installation and use in Greece is rather recent, no more that two years. Calculating the mean level of usage frequency per distribution mode, consumers generally prefer to collect their order via a courier service company (4.20/5.0) and, then, they select in-store picking (2.56/5.0). The survey results for the last mile delivery options are presented in Figure 2.

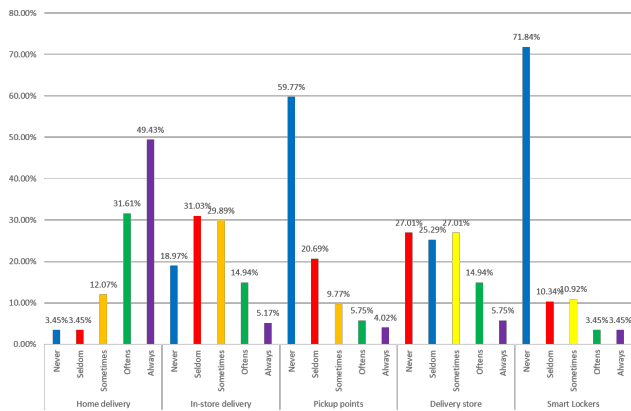


Fig. 2: Last mile delivery options: what consumers prefer

Exploring the reasons/factors due to which participants prefer home-delivery, time saving is considered to be the most determinant factor ("significant" or "very significant" for 86.20%) and convenience (82.20% - "significant" or "very significant") and online payment (58.60% find it "significant" or "very significant") follow. In addition, consumers find home-delivery money saving, since they receive their order without paying their corresponding transportation cost for visiting the physical store (55.70%). Finally, the COVID-19 factor is still considered "important" or "very important" (48.30% support social distancing). Indeed, the mean importance level is high for time saving factor (4.42/5.0) and convenience (4.29/5.0) and moderate to high for online payment and saving from avoiding transportation cost (almost 3.70/5.0 per each). How significant the consumers perceive these factors when they prefer home-delivery is depicted in Figure 3.

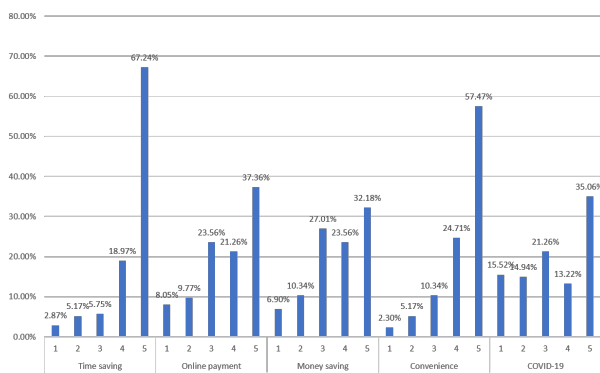


Fig. 3: Factors behind selecting home delivery

Respectively, for in-store CC, free shipping is considered to be the most determinant factor ("significant" or "very significant" for 68.40%) and ease-of-picking (63.20% - "significant" or "very significant") and time-flexibility of picking

and capability-to-see-the-order (almost 60% (per factor) find it "significant" or "very significant") follow. Generally, the mean level of importance per factor is moderate to high for almost all factors (free shipping (3.88/5.0), ease-of-picking (3.73/5.0), time-flexibility (3.6/5.0) and capability-to-see-the-order (3.25/5.0). Why consumers may select in-store delivery (CC) is shown in Figure 4.

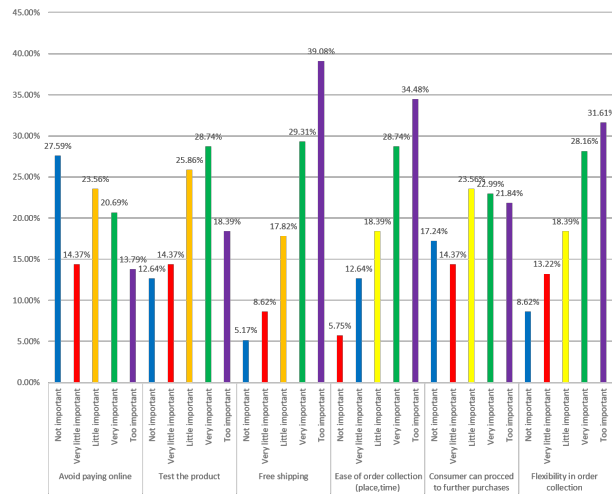


Fig. 4: Factors behind selecting in-store Click and Collect

For the pick-up points (called clever points in Greece) that are not popular among the respondents, the participants believe that time-flexibility and money-saving are the two most important reasons to select this delivery option (46.60% and 42% respectively - "important" or "very important"). Which factors affect the consumers' preference of the "pick-up point" option is illustrated in Figure 5.

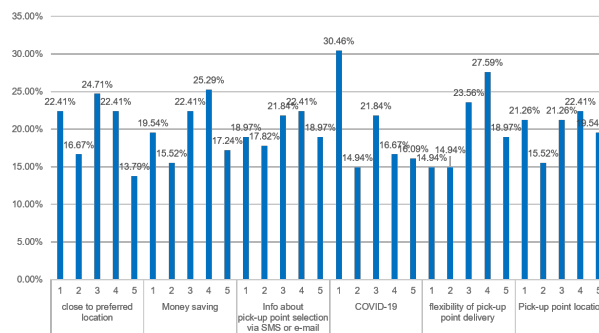


Fig. 5: Factors behind selecting "Pick-up point" delivery option

When selecting a locker for picking-up the order, 24/7 access to the locker is the most determinant factor (49.4% of the respondents find it "important" or "very important") and money-saving is next (48.3%). Which factors influence the consumers to select a locker is illustrated in Figure 6.

Then, we explored the potential of drone-delivery in Greece. Only 9.2% of the participants answered that they

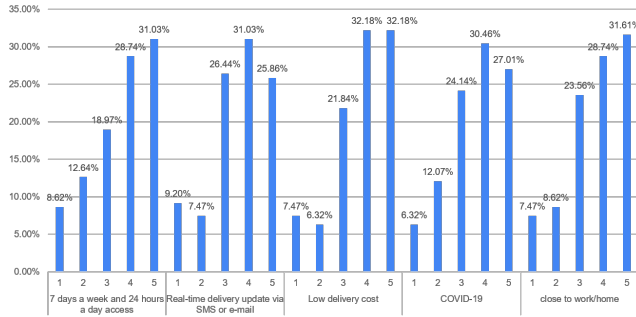


Fig. 6: Lockers as pick-up points: Why consumers prefer them

would definitely select drone-delivery ("strongly agree") and 17.8% agree to use it. Based on the answers, more than one third of the respondents (37.40%) neither disagree nor agree and almost one fourth of them (23.60%) strongly disagrees. Indeed, the mean level of agreement to drone utilization is low (2.77/5.0). In terms of place of residence of the participants, the answers are similar except for the islanders where 71.43% strongly disagree to usage of drones (they are more than twice the ones in urban areas and mainland that also object to drone delivery). About the safety of drone delivery, only 5.2% of the participants find drone-delivery in a city safe ("strongly agree") and almost half of them show a neutral attitude ("neither disagree nor agree"). Figure 7 illustrates consumers' attitude towards drone delivery service.

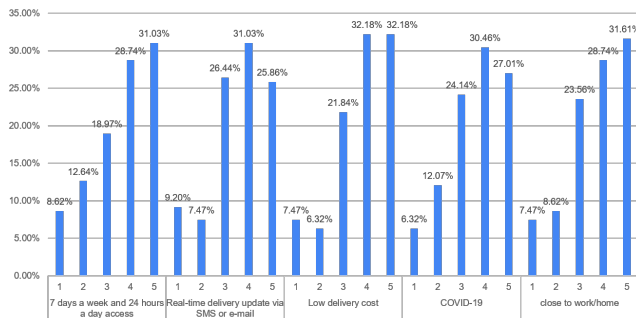


Fig. 7: Consumers attitude towards drone delivery service

*D. Delivery tracking for consumers: provided capabilities and difficulties*

When an online order is complete, the consumers usually receive an order confirmation email where there is information that confirms the order (such as order date, product's details, the total purchase cost, the delivery method, the estimated delivery date) and more delivery tracking capabilities (e.g. a link to track the order). Since the quality and reliability of delivery is crucial to consumers, we requested from the participants to rate the significance of information found and capabilities provided after their order is confirmed. 85.60% of

the consumers find order-tracking-capability "very important" or "important" with return options and business contact details to follow (85.10% and 83.3% respectively). Indeed, the mean level of importance for tracking capability, return options and business contact details is high (4.47/5.0, 4.39/5.0 and 4.32/5.0). Figure 8 illustrates what tracking information and capabilities the consumers' value after order confirmation.

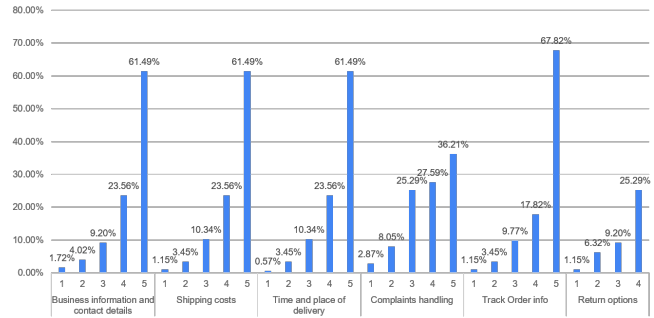


Fig. 8: Delivery Tracking info and capabilities that consumers value after order confirmation

Considering if the respondents want to track their order through a smartphone, tablet or personal computer, the majority of them perform tracking of their order (87.9% in total - 66.1% "totally agree" and 21.8% "agree") with the tracking number of their order. There are similar results independently of the residence location of the participants. Respectively, 64,90% of the participants strongly agree that they want to receive information during every stage of their order delivery and 27,60% agree.

During home-delivery, customers may need to call the courier service company for several reasons. The majority of the respondents contact the courier service company to be informed about the status of the delivery (40.20% "often" and "always"), followed by 37.40% to change the delivery date-and-time due to delivery failure (the customer was not in the delivery location). In addition, 29.30% of the participants "often" or "always" want to change the date-and-time of delivery. We highlight that delivery failure is a main reason to contact the courier provider and 63.80% stated that rarely or never contact courier company for changing the delivery location. The next Figure illustrates the aforementioned results 9.

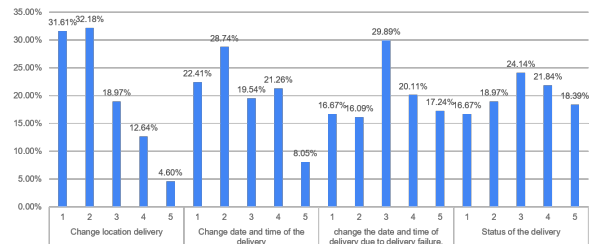


Fig. 9: Why Consumers' contact the courier service company

As the above results showed, the consumers often face delivery failure. We requested from the participants to think the frequency of difficulties they face during order delivery. Delivery to their chosen location without notice while customer is not there is the predominant delivery problem (36,20% face it "often" or "always"), followed by delivery to the chosen location without notice while customer is present (34.50% - "often" or "always"). It is worth mentioning that consumers do not usually deal with delivery of wrong product (average level of frequency 1.59/5.0) and wrong/higher delivery costs (1.78/5.0). Next, we see the frequency of delivery problems.

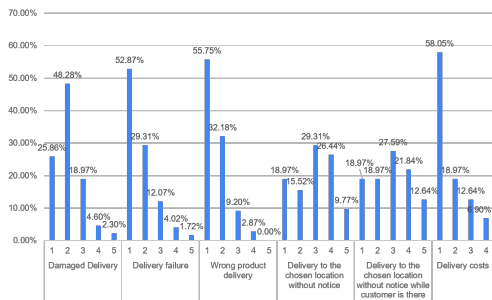


Fig. 10: Frequency of problems during delivery

Finally, 58% of the respondents answered that they disagree or strongly disagree with paying for delivery within 24 hours regardless of delivery costs; and also 42.50% also disagree or strongly disagree with paying for delivery within 24 hours. Only 24.10% would pay extra money for delivery within 24 hours (agree and strongly agree) and 14.40% stated that they would pay for delivery within 24 hours regardless of delivery cost (Figure 11).

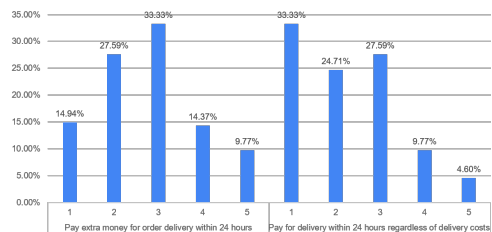


Fig. 11: Consumers' attitude towards delivery within 24hours

## V. CONCLUSIONS

We conducted a survey among Greek consumers to find out how they perceive on-line shopping and order delivery. More specifically, we wanted to realize if they insist on traditional delivery options (home delivery and in-store collect) or they have started to use lockers and pick-up points. We also explored their attitude towards drone delivery and wanted to learn more about the challenges they face especially during home delivery. We did not overlook of the factors/ reasons (e.g. money saving and time saving) that influence their choice of delivery option.

In sum, Greek consumers are hesitant to adopt drone delivery and they do not trust it (they are not convinced of drones' safety). Home delivery is still the predominant delivery option and the majority of the respondents do not prefer pick-up points and smart locks. Delivery to the selected location without notice is the predominant delivery problem and most participants need to track their order in every stage. Residents of urban centers and Greek mainland present similar online shopping behavior and delivery options. Ease of access and time saving are considered to be the most important factors that affect consumers online behavior.

Considering the exploratory nature of this research, we intend to perform another survey that it will be designed based on the literature utilizing valid constructs. We aspire to investigate thoroughly the last-mile delivery options, especially the drone delivery, and the factors that drive their adoption (e.g. safety and trust for drones).

## ACKNOWLEDGEMENT

This research has been co-financed by the European Union and Greek national funds through the Competitiveness, Entrepreneurship and Innovation Operational Programme, under the Call "Research – Create – Innovate", project title: "Optimizing Logistics with Backpressure Control Algorithms", project code: T2EDK-03302, MIS code: 5131365

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