Digital Transformation of EU Customs: eCommerce VAT Legislation and a Proposed Customs Clearance Application

Irene Gkoni [1, 2], Maria Rigou [2], Georgios Thanasas [2*], Stefanos Balaskas [2]

[1] *Directorate for Digital Transformation & Digital Competencies, GRNET, Athens, Greece.*

[2] *Department of Management Science and Technology, University of Patras, Patras, Greece.*

Abstract

In the digital world, borders between countries are fading, and many people keep making more and more online purchases, often from offshore vendors. Cross-border e-commerce is a game-changer for international trade but poses serious challenges for traditional customs procedures. As the number of parcels continues to grow rapidly, customs authorities around the world strive to balance between effective revenue collection, trade facilitation, and proper safety controls. At the EU level, significant revenue losses and competition distortion have led to changes in VAT rules with a key policy objective to fight tax fraud in e-commerce and reduce the administrative burden of VAT collection. The VAT e-commerce package that came into force on July 1, 2021, includes measures on imports of low-value goods from third countries. The adopted solution imposes liability on digital platforms that play a crucial role in the rise of B2C internet sales. This article provides an overview of e-commerce global trends and challenges, international organizations' initiatives, emerging technology pilots, as well as best practices. It also offers a critical description of the new EU VAT provisions that have a severe effect on customs. Moreover, it describes the design, functional, and interoperability specifications of a proposed web-based application that enables buyers to lodge customs declarations themselves, aiming for improved transparency on import-related charges and more effective e-government at a more general level through the digital transformation of customs clearance.

1- Introduction

Information and communication technologies are fundamentally changing our daily lives, the way we work and do business, how we move, communicate, and relate to each other. Social media interaction, e-commerce and all kinds of digital services are steadily transforming our world. E-commerce is at the heart of the internet and is transforming commerce globally as it grows four times faster than the global economy, as reported by the World Bank [1]. Consumers from all countries choose cross-border online shopping mainly for reasons related to better product availability, wider product range, attractive prices, trust in the brand and the reliability of the online store [2]. One of the main benefits of e-commerce is that it brings customers and sellers in direct interaction with each other, while digital platforms which facilitate online sales allow smaller businesses to effectively reach millions of consumers in a global marketplace.

It is necessary to clarify that when importing goods both the VAT and the corresponding duties are mainly collected by customs authorities. This is true in most countries of the world. There are no customs formalities for transactions within the single market of the European Union, thus import of goods for the EU countries means receiving goods from

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* **CONTACT**: thanasasgeo@upatras.gr

third (non-EU) countries. In addition, customs authorities at import are entrusted with many other critical functions, such as legal trade facilitation, anti-smuggling enforcement of intellectual property laws and, above all, protection of health, cultural heritage, the environment and nature through product safety and compliance controls [3].

Crossing a parcel across the borders involves a series of steps, from preparing and submitting the necessary commercial documents to customs clearance. The more complex the customs authorities' procedures are, the more difficult it is to clear the ever-increasing volumes of parcels. For fast customs clearance of a package, information about the consignor, the recipient, the country of dispatch and its contents are of great importance. The specific information is particularly important both for the purposes of public revenue collection (duties and taxes), as well as for conducting effective safety and security controls. Information quality issues remain major challenges for customs authorities. E-commerce, inherently time-sensitive (on-time delivery, fast turnaround), leverages advanced technology in both logistics and large-volume data management, unlike traditional forms of trade. Consequently, an opportunity is provided for customs authorities to potentially exploit this information and technologies to their advantage. The EU-mandated solution imposes liability on digital platforms that play a key role in increasing B2C online sales.

The topic of digitally transforming customs' operations has attracted the interest of both the technological and the policy-making audiences working in the customs domain. Related research has delved into both related technologies and how they can be deployed and organizational changes that need to occur so that customs can move to the digital age without the burdens imposed by bureaucratic processes. Smith [4] highlights the importance of data and its relevance in modern customs operations, as they play a central role to a proactive customs that can conduct intelligent targeting and make decisions based on evidence. Ababneh et al. [5] emphasize the positive impact of blockchain technology on Jordan's sustainable supply chains and stress the importance of efficient customs port practices. Adherence to environmental standards enhances the success of blockchain in achieving sustainability goals, while technology skills are crucial for promoting sustainability in customs ports. Tsolakis et al. [6] highlight the essential roles of artificial intelligence (AI) and blockchain technology in managing digital supply chains, with their impact on sustainability and data monetization contingent on stakeholder-defined parameters. The convergence of digitization, AI, and other digital technologies in customs intelligence has the potential to positively reshape supply chains, enhancing productivity, reducing environmental impact, improving security, and generating financial gains [7].

This study provides an overview of global e-commerce trends and challenges, the legislative and policy initiatives of international organizations, pilot applications of emerging technologies, as well as best practices. The focus is on the new EU VAT provisions, which have serious implications for customs. To this end, the article proposes a usable web-based application design that allows buyers to self-declare their consignment to customs with the aim of improving transparency on import-related charges and enhancing e-governance in general. In addition, the study concludes with interoperability consideration so that such a system can be effectively integrated in the wider technological infrastructure of the digital services of the Greek government and the existing information systems operated by Customs personnel. The study concludes by highlighting the foreseen technological trends able to foster the smooth transformation of Customs' offices to the digital era.

2- Related Work

2-1- The Challenges for Tax and Customs Authorities

The sheer volume of e-commerce micro-parcels poses certain challenges for tax and Customs authorities, who are called upon to deal with the fiscal and non-fiscal risks inherent in such imports. From a tax point of view, in principle, it is difficult to enforce the tax rules as the true value of each micro-parcel can only be verified by physical inspection and at the same time the fiscal impact per item is negligible, given that the majority of e-commerce shipments are of low value: below of €100 in 85% of cases, according to the IPC annual survey for 2020 [8].

In addition, the ability to connect smaller and larger businesses as well as non-entrepreneurs with customers around the world, through digital platforms that facilitate online sales, undoubtedly puts the traditional rules of VAT enforcement and collection to the test, as Scarcella argues [9]. Especially the existence of platforms that facilitate C2C transactions, allowing private individuals to turn into entrepreneurs (since they are in fact carrying out commercial transactions) have made it much more difficult to determine the person who is liable for the tax. In addition, the opportunity to exploit the online market and take advantage of the discrepancies among States allowed new tax evasion and avoidance schemes, which consequently resulted in a discrimination towards traditional businesses.

On the Customs side, the range of Customs operations is broadened from the processing and control of large sea and road cargo (mainly in containers but also in bulk), to the management of many small consignments of low value and weight, the majority of which are transported by air, without a corresponding increase in the available control resources. Based on research carried out in 2017 by the World Customs Organization, the main challenges identified by Customs administrations in Europe, regarding the facilitation of Customs clearance of parcels are the manual procedures of postal operators, insufficient information on parcels, shortages in human resources and undervaluation [10].

Generally, cross-border shipments, whether from e-commerce or traditional business transactions, are subject to VAT and import duties, unless exempted by special provision. The level of import duties is linked to the category of goods, country of origin and their value. The average tariff rates for cargo originating outside the EU Customs union range between 2 and 13%. Also, import VAT is directly linked to the category and value of the goods and is calculated on the Customs value and duties. VAT is levied on certain goods imported from countries outside the EU and when they are imported into one EU country via another.

To achieve an ideal balance between the cost of calculation and the benefit of collecting Customs duties and VAT, minimum duty, and VAT exemption thresholds, the so-called de minimis thresholds, have been established in most countries of the world. The rationale for establishing the thresholds is that in the case of low-value goods, the administrative cost of enforcing the tax exceeds the actual amount of the tax. Indeed, the calculation and collection of VAT and import duties entails additional costs not only for Customs and tax authorities, but also for economic operators in the supply chain, importers, and consumers. In addition, it causes time delays with an impact on the cost of goods. Consequently, the application of de minimis thresholds is estimated to reduce costs for all parties involved, while improving the rapid flow of goods [11].

In the EU, relief from import duties is granted to all goods of negligible value, the total value of which does not exceed €150 per consignment, in accordance with article 23 (1) of Regulation 1186/2009 (L 324/10 -12-2009) setting up a community system of reliefs from Customs duty. Regarding VAT, before the implementation of the new e-commerce VAT legislative package effective from 1 July 2021, it was possible for member states to grant an exemption for imported goods with a value between 10 and 22 euros, according to the provisions of Directive 2009/132/EC, (L 292/10-11-2009). In most M-S, though, the upper limit of 22 euros applied [11, 12].

However, in recent years, the aforementioned thresholds for imports of low-value goods have become increasingly controversial and need to be reviewed under the light of the growing digital economy, as data suggest that imports of low-value goods account for the vast majority of e-commerce packages reaching the borders and pose increasingly significant logistical challenges for Customs authorities to process [9, 13].

2-2- OECD Collection Models

The Organization for Economic Co-operation and Development (OECD) is made up of the 38 most developed countries, with a significant influence on global economic development. As early as 2015, the OECD examined the impact of e-commerce on taxation in the Base Erosion and Profit Shifting (BEPS) Action Plan agreed with the twenty largest economies (G20). With a view to reducing the administrative cost of VAT collection, the report explores, inter alia, four import VAT collection models for duty-free imports: the traditional model, the purchaser model, the vendor model and the intermediary model. The distinction between these collection models is essentially based on the person liable to account for the VAT. Building on the conclusions of this report, the OECD further proceeded to an in-depth analysis of the liability that digital platforms can assume and in 2019 published a report entitled "The role of digital platforms in the collection of VAT on online sales", which provides practical guidance to tax administrations on the design and implementation of relevant measures [14]. In particular, the report analyzes the full-VAT liability model for platforms while emphasizing data sharing and enhanced cooperation between tax authorities and digital platforms. The main points of this model are the following [3, 14]:

- The time when the tax liability arises (taxing point) is defined as the time when the payment is accepted.

- Two possible scenarios are conceivable for the practical process of collecting and remitting the VAT. The main distinction is between the scenario where the customer pays the VAT-inclusive price to the platform and the scenario where the customer pays directly to the supplier. When the customer pays the purchase price inclusive of VAT through the digital platform, the digital platform will in principle remit the VAT component to the tax authorities in the taxing jurisdiction and the balance (sales price minus any fees and commissions) to the underlying supplier. If the customer pays the purchase price inclusive of VAT directly to the underlying supplier, the digital platform will need to recuperate the VAT component from the supplier (plus any fees and commissions).

- Proper interaction of such a simplified tax registration and compliance regime with Customs processes and systems should be ensured. At this point the OECD proposes that the registration of a digital platform in a taxing jurisdiction that forms part of a group of countries bound by a common tax and/or Customs framework (e.g. the European Union) could be further facilitated through a "one-stop-shop" arrangement. Under such an arrangement, the digital platform could register in one member state to fulfil its compliance obligations under the full VAT liability regime in all member countries, including remitting the tax in the country of registration followed by a transfer of the tax to the country of registration to the country of consumption (e.g. the country of final destination of the imported item).

- A key advantage of the full liability model is that the Customs authorities intervene less or not at all in the collection processes for low-value imports that are not subject to Customs duties, since digital platforms are responsible for

collecting and remitting VAT. As a result, collection costs (administrative costs) will decrease, allowing Customs authorities to use the saved resources for other key tasks, such as security controls, illicit and counterfeit products, health protection and the fight against undervaluation, as Scarcella [9] points out.

- However, the implementation of the full liability model requires adjustments to tax and Customs procedures as well as to the systems of the economic operators involved (digital platforms) to ensure effective VAT collection [3].

As a necessary safeguard for the successful operation of the collection model by the platforms and the minimization of the risk of double taxation, i.e. paying it both at the time of online sale and at importation, Battiau [15] recognizes the timely exchange of information needed throughout supply and delivery process, primarily via the exchange of pre-arrival electronic data (electronic advance data-EAD) with Customs authorities.

2-3- Case Studies

This section selectively presents some case studies of countries that have implemented innovative policies regarding the management of cross-border e-commerce and are included in the WCO Compendium of Case Studies on E-Commerce. They can be considered as best practices either in terms of taxation (Australia) or in harnessing emerging technologies for Customs control and data sharing (China, Korea).

Since 1 July 2018 Australia has implemented the vendor model to collect goods and services tax (GST) on "low value" imported goods, i.e., those whose value does not exceed AUD 1,000. This collection model requires certain suppliers, including platforms, merchants, and re-distributors to register in order to collect and remit GST on low-value goods sold to consumers in Australia (B2C transactions only). The taxing point is the moment of the online sale and not the importation of the goods (excluding alcohol and tobacco products). As for the success of the model, based on official statistics published in the WCO Case Study Collection [16], the net GST revenue collected from low value imported goods was AUD 348 million in 2018-2019. This amount significantly exceeded the initial projection of AUD 70 million over the first year of the measure.

After years of extensive research and leveraging the WCO toolbox in its strategic planning, China's Customs administration has developed a mechanism to obtain EAD for all inbound cross-border e-commerce items, regardless of value, directly from the source and in real time. This model, according to the WCO Compendium of Case Studies on E-Commerce, is a best practice in big data analysis and more effective risk management. The mechanism relies on the cooperation of all parties that play an active role in cross-border e-commerce and balances the two countervailing forces: Customs control on one hand and trade facilitation on the other, without compromising the existing institutional framework for the protection of personal data [16]. Most importantly, automated checks and cross-checks of data collected from all sources are performed at the individual transaction level, e.g., for each item the taxable value is the actual transaction value derived from the payment amount and cross-checked against the order details. When discrepancies occur, a risk is identified by the system and specific shipments are indicated for control (physical inspection). By applying big data analytics technology, China Customs has been able to improve the effectiveness of risk analysis, traceability, ex-post control and anti-smuggling.

Korea Customs Service (KCS) has in recent years been leveraging emerging technologies: blockchain, artificial intelligence and big data analytics to improve the targeting of controls on e-commerce items. In the blockchain system, all parties to a transaction or nodes, i.e., sellers, courier companies, delivery service providers and Customs brokers, send their information (block of data) directly to the Customs authority in real time. The use of blockchain helps to reduce controls on low-risk consignments, thus facilitating the overall Customs clearance process. Also, a lesson learned from the pilot project is that the initial investment cost for the installation and operation of the private blockchain is higher compared to other types of data exchange systems as a dedicated server and specialized experts were required. In conclusion, according to Choi [17], before choosing a blockchain solution, it is important to consider issues such as maintenance, data privacy, sustainability and scalability. Regarding the adoption of artificial intelligence in image processing, Choi reports that KCS is working on the development of algorithms that will allow scanners to identify objects, link to the automated risk analysis system and display the identity of objects over the scanned image to assist image analysts. Finally, KCS is leveraging big data analytics to compare retail prices of goods provided by a digital platform with the corresponding values declared for the same goods on Customs declarations. This method detects any undervaluation and speeds up the Customs clearance process for shipments that do not show a significant discrepancy.

2-4- The European Context

At EU level, significant revenue losses and distortion of competition have led to the modernization of VAT rules with the main objective of combating tax fraud in e-commerce and reducing the administrative burden of VAT collection. The VAT e-commerce legislative package that entered into force on July 1st, 2021 includes measures for the importation of low value consignments - up to €150 from third countries. In particular, the following changes were introduced:

1. The VAT exemption for imports of goods with a value of up to €22 is abolished, so that all imports of goods, regardless of value, are subject to VAT. It should be noted that the abolition of the VAT threshold does not affect the duty relief for goods up to a value of €150, which remains in force.

2. Two new special VAT schemes on import are established:

    i. Special regime for distance sales of goods imported from third countries with payment of the tax through the import one-stop-shop (IOSS) by the vendor or an intermediary on behalf of the vendor (vendor collection model). The vendor of the goods (located inside or outside the Union) is liable for VAT. In cases where a digital platform facilitates the online sale of goods, it becomes liable to pay the tax. According to Papis-Almansa [13], the IOSS model adopted by the EU corresponds to the full-VAT liability regime proposed by the OECD (presented in section 2-2 above) for the imposition of obligations on platforms, with a key policy focus on reducing the costs and risks for tax authorities of VAT administration, enforcement and collection (Figure 1).
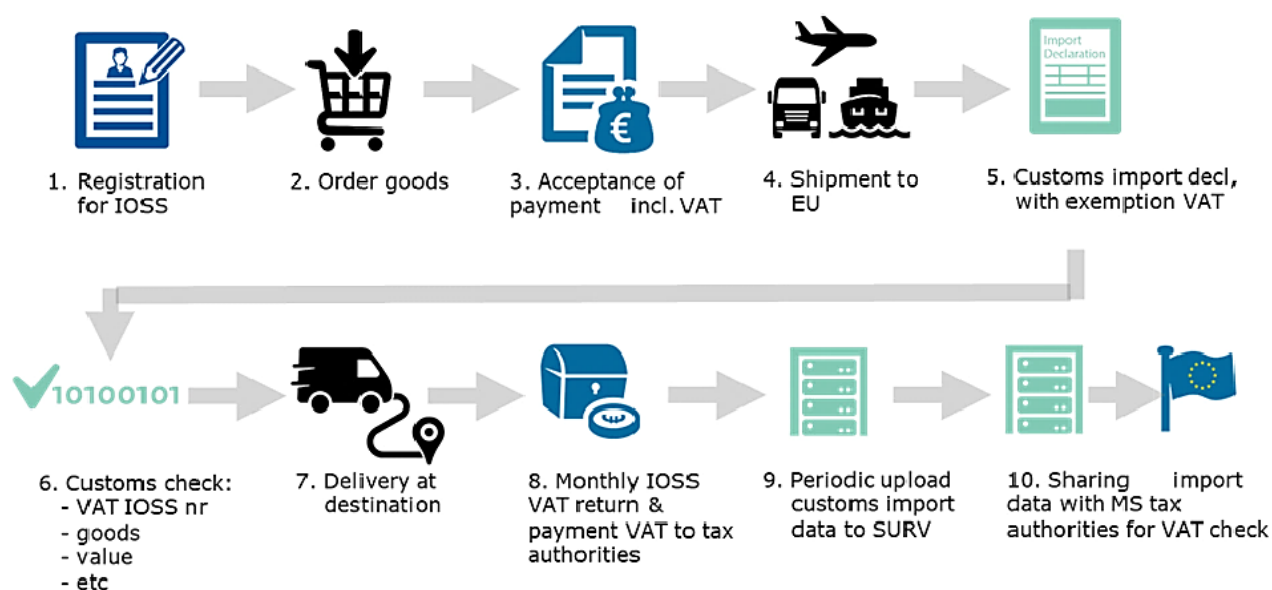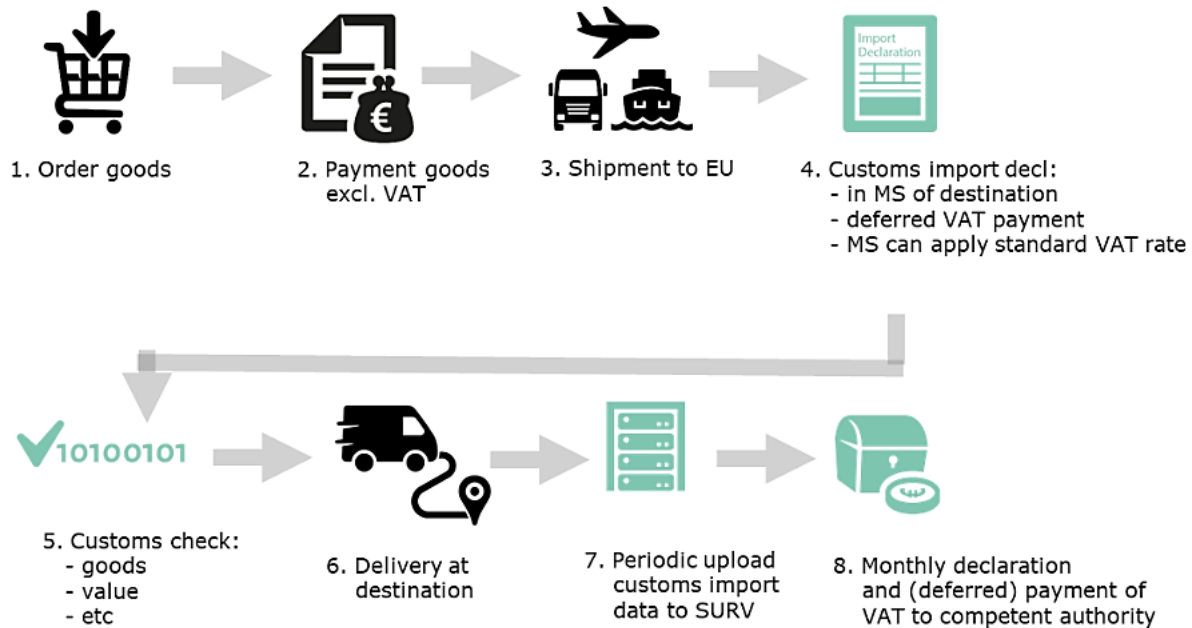

Figure 1. **IOSS process overview [18]**

    ii. Special arrangements for declaration and payment of import VAT, with payment of the tax to the Customs authorities (traditional Customs model). The person responsible for paying the tax is the person for whom the goods are intended (consignee of the parcel). However, VAT is paid, on behalf of the final consignee, by the person presenting the goods to Customs, usually international courier companies and postal operators, with an option for deferred payment (until the 16th of next month).

It is clarified that regardless of the tax scheme that will be chosen, Customs import formalities are compulsory and private consumers are charged the VAT rate applicable in their country, normal or reduced, depending on the item. An obligation to submit a declaration for release into free circulation for each consignment (parcel/small package) is therefore introduced. To enable the smooth application of VAT rules in cross-border e-commerce, the Customs provisions concerning the importation of low-value consignments were adapted accordingly.

Recognizing the expected exponential increase in the volume of micro parcels that are now subject to Customs import formalities and VAT collection, the European Commission has established a new declaration - the so-called "super-reduced" data set H7 dataset) for goods valued up to €150. The Independent Authority for Public Revenue in Greece (IAPR) implemented the new declaration, with the possibility of submitting it before the arrival of the goods, to the Imports Subsystem of the ICISnet integrated Customs IT system. Thus, from 1/7/2021, the use of the H7 declaration was established for the Customs clearance of goods with a value up to the amount of €150, with the aim of facilitating the implementation of the Customs aspects of the VAT e-commerce package of measures, in the form of (i) pre-arrival declaration – type D lodged before the arrival of the goods, with the aim of faster processing of Customs import formalities and the immediate release of small parcels and (ii) full declaration – type A lodged upon presentation of the goods. Pre-arrival data is currently available mainly for goods transported via courier companies, while its availability is gradually improving for goods transported via postal operators (Figure 2).

Figure 2. Special arrangement process overview [18]

In general, and apart from a few problems during the initial period, the implementation of the new rules progressed smoothly [19]. Despite late implementation in their systems, Member States reported no significant difficulties to the Commission.

3- Proposed Design of myParcel Application

This section discusses the key features of the proposed Customs clearance application named myParcel, which will allow users in Greece to self-declare shipments worth up to 150 euros, whether they are B2C or C2C, subject to Customs formalities (self-declaring application). The aim of myParcel is to allow users to complete Customs clearance and VAT payment online without the need for physical presence at the Customs office. The recent years after COVID, people are used to the transformation of traditional face-to-face transactions into their online equivalents that allow the flexibility of 14x7 availability, convenience, and speed. The acceptance of such changes is evidently high in various e-government sectors [20]. Such a system must comply with usability and accessibility standards so that users can simply follow the instructions to fill out the online forms without requiring any pre-existing knowledge. Moreover, it is crucial to make sure that the system is displayed correctly and operates smoothly on PC and mobile devices (tablets and smartphones). The system is proposed to be integrated into the range of services provided to citizens by the central Greek government portal available at https://www.gov.gr/.

The proposed app will improve transparency and citizens will avoid the unexpected additional Customs clearance charges imposed by transport companies, which often cause protests, as they tend to be disproportionate to the value of the goods. The volume of returned goods (due to the refusal of consignees to accept them) is also reduced. The possibility for the consignees to submit the declaration directly would significantly reduce both the delivery time and the workload of the postal operator, especially in cases they lack pre-arrival data. At the same time, by providing high quality digital services to citizens, with a focus on usability, digital governance and citizens' trust in the state is enhanced. The overall feeling from using this self-declaring application is that Customs are now aligning with the global trend of using technology as a driver to promote efficiency and growth within public services.

3-1- Methodological Approach

The current study applied an 8-steps methodology comprising theoretical research and practical application phases (Figure 3). More specifically, the study began with a desk research for collecting information on the related EU legislative framework and the VAT rules for cross-border e-commerce. Then, a second desk research was conducted to gather case studies of Customs offices that already made the shift to becoming digital with a focus on identifying best practices. The next 3 steps concerned the definition of the necessary steps in the process of self-declaring low-value goods bought online from non-EU countries. After the steps identification, the design and implementation of the interactive graphical user interface (GUI) mockups for the proposed application took place, which also included the selection of a prototyping tool. Along with the mockups design we defined the required interoperability aspects of the system and in the last step we conducted with a desk research to identify future technological trends foreseen for the Customs Offices' domain.
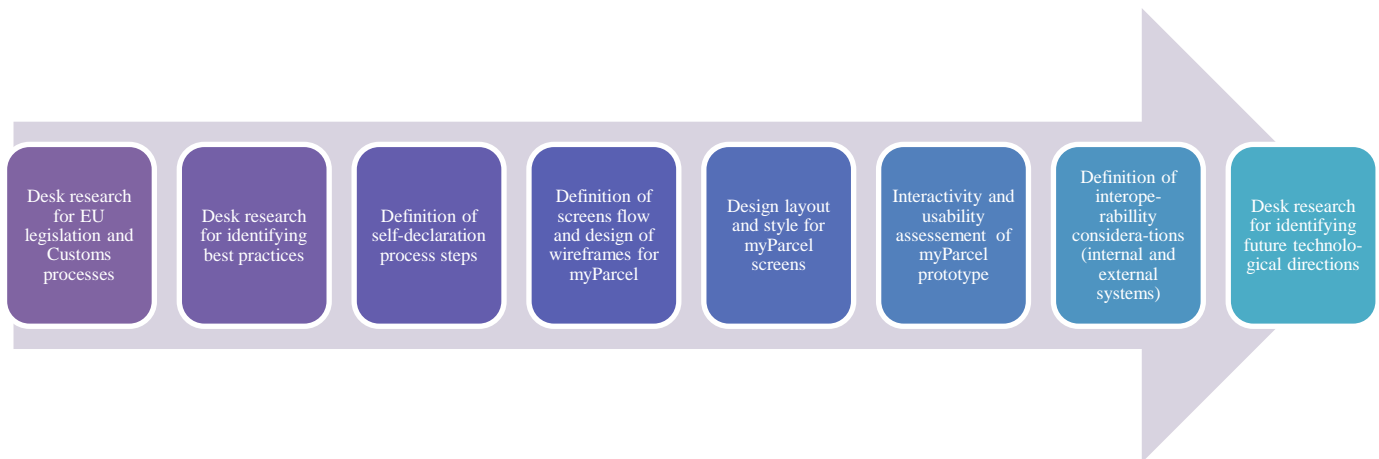
Figure 3. Methodological approach

3-2- Design Considerations

The requirements and assumptions taken into consideration when designing myParcel are as follows:

(1) Carriers engaged in cross-border e-commerce (ELTA and courier companies) will communicate with each recipient as soon as the shipment arrives and before proceeding with the clearance on their behalf. It is proposed to send a standardized message called "Notice of Arrival," which contains essential information required for filling out the clearance form in myParcel, including the parcel tracking number, reference number of the previous document, item number, and shipment weight (in kilograms).

(2) There should be a published list of excluded categories of goods that cannot be cleared through this process (i.e. using myParcel), such as excise products (tobacco, electronic cigarettes, etc.), and goods subject to restrictions or prohibitions, such as plant seeds, drugs, cultural items, weapons, and furs.

(3) User authentication will be done using TAXISnet credentials (following the single sign-on principle), thus users will not have to fill-in personal details (VAT number, residential address) already available in the taxpayers' registry. Users will only need to enter their mobile phone number and email address in case they need to communicate with the Customs office.

(4) For simplicity, it is assumed that the recipient who submits the declaration is also the declarant. However, if deemed necessary by Greek Customs authorities during implementation, a checkbox for confirmation of dual roles could be added in the system along with the option to also foster other conditions.

(5) Submitting the declaration implies accepting responsibility for the accuracy and completeness of the information provided. If in the Customs authorities' inspection, inaccuracies or violations are detected, the penalties prescribed by the National Customs Code (Law 2960/2001, as amended) will apply.

(6) The proposed application does not allow the user to amend or invalidate the declaration after VAT payment, as this could disrupt the delivery of packages by postal providers. The right to make changes could be exercised at the Customs office, and inclusion in the application requires further examination.

(7) The application must incorporate all necessary functions for secure data storage and management to protect data at every level. It should be fully compliant with the General Data Protection Regulation (GDPR), and necessary encryption, authentication, and protection against malicious programs must be implemented.

(8) myParcel will offer the option for direct payment using the electronic payment code RF (supported by IAPR) or a card payment through the ePOS application. The widespread use of direct payments is expected to facilitate citizens' daily interactions with the government and enhance its efficiency.

Apart from the functional design considerations, myParcel also adheres to usability design principles and guidelines, as it is an application that will be used by the general population and its design should offer effectiveness, efficiency, learnability, and error tolerance [21, 22]. To this end, the steps of self-declaration process where thoroughly studied and a sequence of 5 main screen was designed, with each screen asking for information about a discrete part of the process. Screens share the same layout, same navigation buttons at stable places, a steps bar at the top where the current step is clearly indicated, short help texts where needed (in yellow highlight) and "i" buttons for more details on specific fields. User control and freedom was prioritized, along with clear system feedback, error avoidance and support to overcome them. The design of the system was evaluated by a usability expert who applied heuristic evaluation [23] on the interactive screen mockups of the system.

3-3- myParcel Walkthrough and Functionality

The submission of the declaration in myParcel will be completed in 5 steps, namely (1) Consignment data, (2) Consignor, (3) Goods, (4) Additional Info and (5) VAT calculation (Figure 4). The first 4 steps ask the user in respective screens (see Figures 5 and 6) to enter the basic information required for Customs clearance. In the 5th step (see Figure 7a), the automatic calculation of VAT is displayed without any entry by the user. A progress bar at the top indicates the current step of the process. At any time, users have the option to: (a) temporarily save their application for editing at a later time (in this case no MRN number is assigned), (b) clear filled fields, (c) exit the application, which puts their declaration in a "temporarily saved" state. Users can continue the submission of a temporarily saved declaration by selecting "My Declarations" on the initial screen and clicking the edit button for the specific declaration from the displayed list.

The information entered by the user on all screens is based on the H7 dataset with the following fields omitted: (a) fields related to the intermediary for Customs clearance (representative, representative identification number, type of representation code), (b) technical fields not relevant to citizens (LRN, declaration type), and (c) fields inferred from other data, such as the location of goods related to the choice of carrier or supporting documents that do not require their details to be declared since they are attached. Also, the "additional status code" field has been omitted, as special arrangements do not apply in the case of self-declared consignments, and IOSS is supported by the application. As typical, mandatory fields are marked with an asterisk (*) and in all fields that have specific requirements according to legislation, there is an "*i*" button with guidance on how to fill them out.

In case a user detects an error, there is option to cancel by clicking the "Cancel" button either in step 5 (Figure 7a) where the VAT calculation is displayed, or after submission and before payment. This action will terminate the process and delete the temporarily saved or completed declaration, thus a confirmation is required where the user is informed that a new declaration must be submitted to clear the goods through Customs. In addition, the carrier may need to be contacted, as any delay may incur charges such as storage costs. If a user identifies an error after payment, Customs assistance will be required.

Regarding the classification of products with a six-digit HS code and providing an acceptable product description, it is suggested to include a smart keyword search feature in the "Description" field (as shown in Figure 6a). On the relevant information screen, there will be a link to a classification guide, displaying categories of goods and opening a "tree" of choices, following the patterns of "HS Browse & Check" [24], a mobile application designed by WCO to provide Customs professionals and international traders with convenient access to the Harmonized System (HS) 2022 [25]. In the "Six-digit code" field, the user selects the appropriate code from a dropdown list. To facilitate users, the integration of an automated commercial classification solution could also be considered. Since a consignment can contain more than one type of goods (e.g., shoes and books) shipped together with the same barcode, the "Goods" tab provides the option to add or remove items (refer to Figure 6a).

The application automatically calculates the VAT due (Figur.e 4). For B2B transactions, it supports both the IOSS regime and direct payment of VAT. For C2C transactions, it supports the applicable exemption still in force, in case the value of the shipment does not exceed 45 euros. The following operational rules apply concerning the "Shipment type" field:

- If "Online Purchase" is selected and a valid IOSS VAT number is entered in the "Seller's IOSS Number" field, an exemption is granted, and no VAT is calculated. The payment process is skipped, and the declaration directly transitions to the "Accepted" state without passing through the "Under Payment" state. A prerequisite is for the customer to know the seller's IOSS number, typically mentioned on the invoice or order confirmation. Otherwise, the customer needs to obtain this information from the seller.

  o Otherwise, if the "Seller's IOSS Number" field is left empty or its validity is not confirmed, the VAT calculation is done automatically based on the reference table containing the current VAT rates (standard rate of 24% for all products, except for specific products such as books, which have a 6% rate).

- If "From Private Individual" is selected and the shipment's value is less than 45 euros, no VAT is calculated as an exemption is granted.

  o Otherwise (i.e., value more than 45 euros), the automatic VAT calculation is applied as usual.

- Important fields for calculating the taxable value include the value, the six-digit HS code, and the transportation costs, which are declared in a separate field only if they are not included in the good's value and are listed separately on the purchase invoice. In cases where the value is specified in a currency other than euro, the application automatically converts it based on the exchange rate registered in the Customs system.

- Users can track the progress of the Customs clearance process through the application by monitoring the status of their declaration. Emails are not sent to the declarant unless the competent authority, during the verification

stage, requires additional information related to the consignment, such as a PayPal payment confirmation. A parcel declaration can be in one of the following statuses: Temporarily Saved, Accepted, Not Accepted (changes required), Under Payment (if there is an outstanding payment and until it is completed), Under Control, Released, Import Not Allowed, or Invalidated. Also, users can access details about their declarations, they can sort them by date, carrier, or status. Search filters based on acceptance date (range from... to) or status are also available.
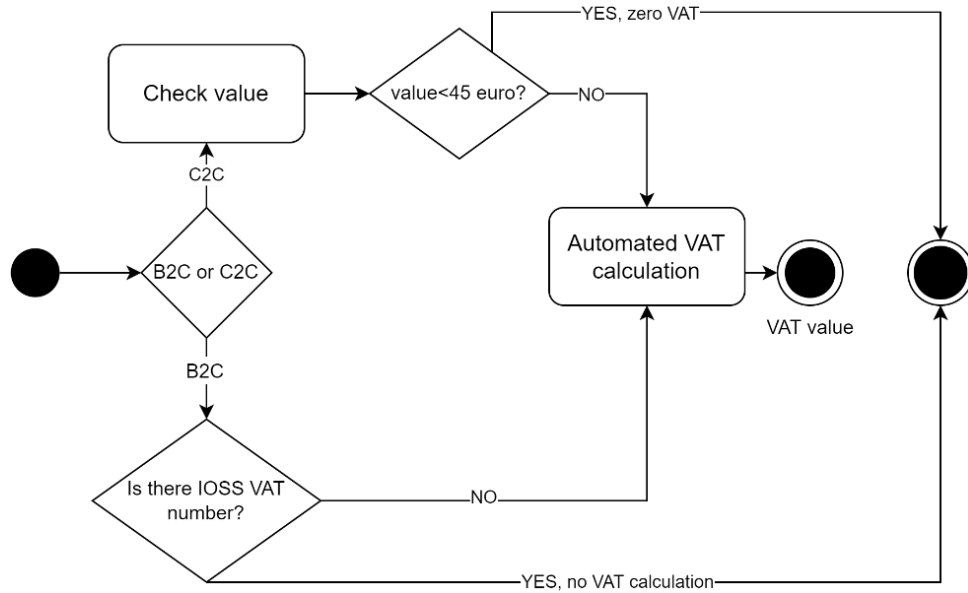
Figur.e 4. VAT calculation process

(a)	(b)

Figure 5. myParcel mock-up design for (a) filling in shipment details (consignment data) in step 1 and (b) providing sender (consignor) information in step 2 of the process

(a)	(b)

Figure 6. myParcel mock-up design for (a) filling in goods' details in step 3 and (b) providing additional information in step 4 of the process

(a)   (b)
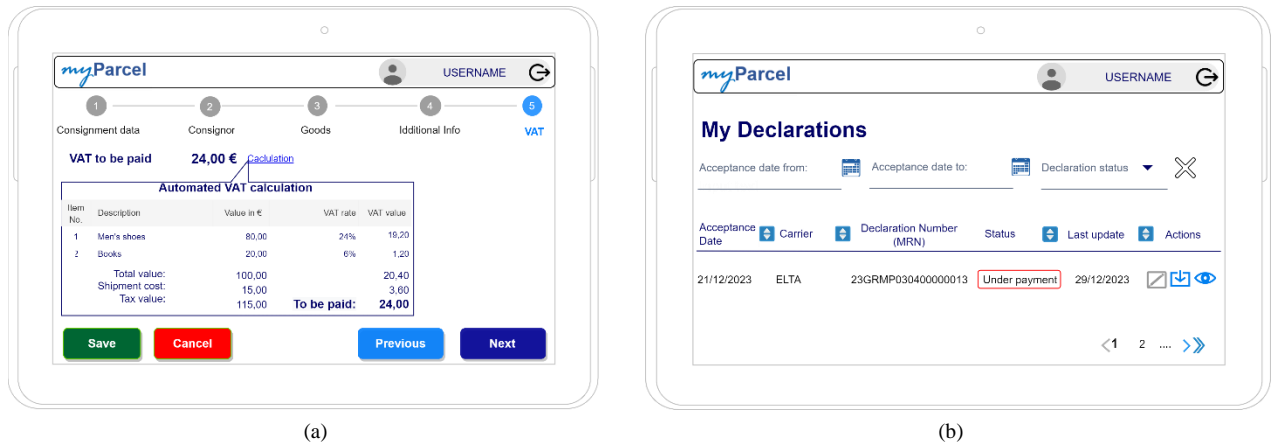
Figure 7. myParcel mock-up design for (a) displaying the calculated VAT in step 5 of the process and (b) viewing all past declarations

3-4- Process Flow

The flow of the process follows these steps (Figure 8):

(1) As soon as the user presses "Submit", a validation check is performed to verify that:

     a. The declaration complies with the formal specifications (checks in the filled-in fields, e.g. that the value of the shipment as derived from the sum of the value of items does not exceed 150 euros),

     b. The information submitted with the declaration agrees with data acquired through interoperability of myParcel with other internal (Customs) subsystems or external systems of the economic operators involved (validity of the IOSS VAT number, barcode and unique identifier of the previous document, payment verification).

(2) If the validation is successful, the declaration is "Accepted" and assigned a unique MRN (movement reference number) and date of acceptance. If there are errors, the declaration is not accepted, does not receive an MRN and changes its status to "Not accepted - changes required".

(3) The package remains at the "Pending payment" stage until it is cleared through the interbank system. If it is not paid within 3 days, it is automatically invalidated, i.e., it changes to "Invalidated" status.

(4) Once the payment is validated, an automatic risk analysis is performed, and a risk score is assigned.

(5) If it is indicated for a control, a control command is issued, and it automatically switches to the "Under Control" state.

(6) After the control (inspection) is complete and is successful (or if it was initially classified as low risk), it goes to "Released" status. The user is waiting for the package to be delivered by the carrier.

     a. If the control concludes that the import is not allowed (e.g., the package contains prohibited items or counterfeit products), the Customs procedure is stopped and the declaration changes to "Import not allowed" status. Further management is done outside the application.

Figure 8. The flow of the process

3-5- Interoperability with Internal and External Systems

An important advantage of web services is their reusability. For the proper functioning of myParcel application, it is necessary to ensure interoperability with both internal (administrative) and external systems. At the level of internal interoperability, myParcel will connect with the existing infrastructure of the General Secretariat for Information Systems and Digital Governance (oAuth2– Open Authentication Service) for user authentication. For the validation of the IOSS VAT number, the application will call the service of the ICISnet's Market Participant Register, which, in turn, calls the EU-provided information services for the synchronization of national IOSS databases with the central IOSS-DR (distributed registry) through SOAP. In addition, after assigning the MRN (Movement Reference Number), the ICISnet's Risk Analysis Subsystem (DSS) will be called to provide the results of risk analysis. Risk analysis is based on criteria defined at the national level, followed by an assessment of information/data analysis, as well as fiscal criteria and risk standards defined at the EU level to protect the financial interests of the Union and the Member States.

Regarding interoperability with external systems, myParcel will need to exchange messages with DIAS AE (interbank systems) for immediate confirmation of the payment, allowing the progression of the declaration's status. Moreover, the system will need to exchange messages with the carrier systems, as it will call the selected provider's external system using web services to verify the validity of the barcode and the unique number of the previous document. Upon acceptance of the declaration and with any change in its status, myParcel will send a status update message to the carrier's system for corresponding updates to its own shipment tracking system and necessary actions.

myParcel will also require communication with the Surveillance System of the European Commission, for mapping the data of the declaration fields with the mandatory elements required for the Surveillance system. Checkbox fields in the application will be transformed into codes specified by legislation so that they can be sent in an acceptable format. For example, if the user has selected IOSS in the checkbox that represents the type of shipment, it should be transmitted as code F48 to the Surveillance System. Additionally, if an IOSS VAT number has been declared, the file sent to the Surveillance System should be filled with the FR5 code.

4- Conclusions

While electronic commerce facilitates access to global markets, especially for small and medium-sized enterprises, Customs authorities worldwide are faced with the challenge of finding a balance between facilitation and effective supervision to prevent various tax and non-tax-related risks. As the 'guardians of the borders,' they play a significant but challenging role. Consequently, cross-border e-commerce needs to be understood and accepted as a whole, rather than an extension to traditional Customs procedures. This approach focuses on finding a balance between Customs control and facilitation by using information and communication technology, electronic data, and performance measurement indicators to promote compliance with regulations rather than just enforcing them. Given the high volume of e-commerce packages entering the EU from various countries around the world, the ability of Customs authorities to electronically receive and process data before the arrival of goods is of critical importance.

This article discusses the implications imposed by current conditions of cross-border e-commerce, which is a game-changer for international trade but poses serious challenges for traditional Customs procedures, with the number of parcels growing fast. The proposed design of myParcel application aims to provide a usable option for effectively implementing the VAT e-commerce package that came into force in July 2021 and concerns measures on imports of low-value products bought from third countries. myParcel enables buyers to lodge Customs declaration themselves, aiming at improved transparency on import-related charges and more effective e-government in a more general level. The methodological approach adapted in this study allowed for gathering necessary information regarding the new legislative framework for VAT for cross-border e-commerce and best practices from Customs offices that already implemented their digital transformation. The next phase comprised steps for designing the screen wireframes, the mockups, as well as the transition between them and as a last step, myParcel design was complemented with interoperability requirements and the most prevailing technological trends foreseen for the Customs Offices' domain. Moreover, usability guidelines were taken into consideration when designing the mockups and myParcel interactivity to assure its effectiveness, efficiency, learnability, and error tolerance.

From the above analysis it is evident that a holistic and harmonized Customs approach is required to balance the facilitation of new developing trade channels on the one hand and address the associated border risks on the other. In this context, the role of international organizations such as the World Customs Organization and the Universal Postal Union in developing and disseminating know-how and promoting innovative solutions is particularly important. This modern approach focuses on finding a balance between Customs control and citizen facilitation, using information and communication technology, data and performance metrics aimed at promoting compliance, not just enforcement. Given the high volume of e-commerce packages, the ability of Customs authorities to receive and process electronic data before goods arrive, deriving actionable information, is critical. Although this approach has led to significant reforms internationally, e-commerce itself and new technologies such as big data analytics, artificial intelligence and blockchain have given new impetus to many countries to continue their digital transformation.

The expected impact of the new VAT rules on imports of low-value goods and the resulting weaknesses have preoccupied the academic community and have been the subject of studies by e-commerce consultancies. Despite the initial concerns, according to the European Commission, the data on the revenue collected and the acceptance of IOSS at EU level during the first half of implementation are quite encouraging. A key problem remains the ongoing undervaluation due to poor data quality, which according to the next steps of the EU, includes sending data to Customs authorities directly from the "source", i.e., the digital platforms. At the national level, the key issue remains that the additional revenue is not offset by the administrative costs of collection, especially when complete electronic data are not available and manual Customs procedures are required by the involved bodies handling the consignments (postal operators and courier companies) with consequent delivery delays and complaints about additional Customs clearance costs. In this light, the development of a user-friendly online application (government service) was proposed, which would provide the possibility to submit the declaration-declaration directly by the citizens (recipients) and pay the VAT due, according to the standards of the respective government services provided by other Member States. It is estimated

that it would significantly reduce both the delivery time of low-value items and the workload of postal providers, while strengthening digital governance and citizens' sense of trust in the state.

In May, 2023, the European Commission put forward proposals for the reform of the EU Customs Union [26]. The current reform shifts responsibility from individual consumers to online platforms, making them key in ensuring goods sold online to the EU comply with Customs obligations. Platforms will now handle Customs duties and VAT during purchase, eliminating hidden charges and ensuring purchases align with EU standards. As also proposed by Blegen [27], e-commerce platform could handle clearance directly, with full control of supplier access to process, increasing certainty for customer in cross-border ordering processes. Detailed parcel data required by Customs would be collected from e-commerce platforms which would act as intermediary declarant pre-arrival (as early as transaction confirmation), enabling preclearance (green channel treatment) for Customs-approved parcels. This is considered as a realistic possibility for EU with platforms selling goods from non-EU countries would also in future be responsible for ensuring Customs duties and VAT are paid at purchase [28]. This digital transformation streamlines Customs duty calculation for frequently purchased low-value goods from outside the EU, condensing numerous categories to just four. This simplification facilitates the calculation of Customs duties for small parcels, aiding platforms and Customs authorities in efficiently handling the one billion e-commerce purchases entering the EU annually, while also reducing the risk of fraud. Towards the same direction is the aforementioned announcement of the World Customs Organization [24] for the launch of the "HS Browse & Check" app designed to offer quick verification of any H.S. code and easy navigation within the entire HS 2022. The app provides a user-friendly platform to quickly access the content of HS 2022, including Legal Notes, Explanatory Notes, and Classification Opinions.

Regarding the near future, among the main conclusions of the second WCO Global Conference on Cross-Border e-Commerce [29] about the role of new technologies in e-commerce, was that the role of data and their sources is crucial. Data can be collected from different sources and will allow Customs authorities to cross-check in real time and when the data from different sources does not match, then a control of the goods and transactions (verification of digital information) is required. Furthermore, digital transformation strategies and capabilities play a significant role in shaping the future of Customs processes. Digital transformation involves using new digital technologies like blockchain and smart contracts to enable significant business improvements, streamline operations, and create new business models [30]. Considering the proposed Customs clearance application based, it would be essential to explore the potential of blockchain in trade supply chain solutions, an approach already adopted by the tourism industry [31]. This exploration can provide valuable insights into the design and optimization of blockchain solutions for Customs processes by adopting big data technologies [32], aligning with enhancing transparency and efficiency in Customs clearance.

In addition, digitization as well as technology will play a key role on another level that regards scanning technology that allows goods to be screened at strategic points in the supply chain to detect illegal goods upon entry (to ensure that illegal goods do not enter the country). But when massive amounts of data are gathered from both digital avenues and supply chain controls (data from physical controls), artificial intelligence is essential. The use of artificial intelligence will allow Customs authorities to cross-check data coming from digital highways with scans of goods on a continuous basis and establish continuous surveillance and control. Legislation should be adapted as it is no longer suitable for e-commerce, however this is not easy to implement. The key is to make it transparent, useful and affordable for e-commerce stakeholders to provide the required data.

5- Declarations

5-1- Author Contributions

Conceptualization, I.G. and M.R.; software, I.G.; resources, I.G.; writing—original draft preparation, I.G. and M.R., and S.B.; writing—review and editing, M.R. and G.T.; supervision, M.R. All authors have read and agreed to the published version of the manuscript.

5-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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5-4- Institutional Review Board Statement

Not applicable.

5-5- Informed Consent Statement

Not applicable.

5-6- Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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