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Cross-Border e-Commerce Customs Risk Management: Exploring the Potential of Linking Digital Product Passport Data, X-Ray Scanned Images, and AI

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Abstract: Cross-border e-commerce is continuously growing with rapid speed which poses issues for authorities to monitor and control the large volumes of goods entering the EU via postal and express services. Digital Product Passports (DPP) are seen as a digital tool that can enable the e-commerce monitoring, however what roles DPPs can play is not yet fully understood. In this research, based on real-life piloting with scanned x-ray images of 10 packages with textiles and toys and based on product data, we gained insights and defined further research directions for exploring further the potential of DPPs and AI and scanned images for customs risk management in the context of cross-border e-commerce.

1 INTRODUCTION

Cross-border e-commerce is continuously growing with rapid speed which poses issues for authorities to monitor and control the large volumes of goods entering the EU via postal and express services. As indicated in a Communication of the European Commission, *"Approximately 4.6 billion low-value items were imported into the EU in 2024, which is more than tripled since 2022 (1.4 billion), corresponding to up to 12 million small items per day [COM, 2025, p 2]"…"The surging volume of products that are unsafe, counterfeit or otherwise non-compliant leads to serious safety and health risks for consumers, has an unsustainable impact on the environment, and fuels unfair competition for legitimate businesses, with a significant impact on EU competitiveness in different sectors. The sheer number of products imported directly by consumers in the EU also puts an unsustainable strain on authorities" (COM, 2025, p.2).*

The communication also suggests that digital solutions can be key enablers for the supervision of e-commerce, and an emphasis is put on prioritizing the effective implementation of Digital Product Passport (DPP) (COM 2025, p.18). However, how exactly DPP could help in the e-commerce context is not yet fully understood.

Earlier studies have suggested some possible links and potential between DPP and e-commerce customs risk management (Rukanova et al., 2025) where one identified area of further research is to explore the possible link between detection technology (e.g. x-ray images) and DPP. This is particularly interesting in the context of cross-border e-commerce where volumes are high, and detection technologies can be used as a fast way to screen large volumes of e-

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commerce items. As the e-commerce volumes go with high speed through conveyer belt, any solution of using DPP and scanned images would need to address also the issues of speed; therefore, artificial intelligence (AI) becomes important as well. The main question that we set to explore in this paper is: *What is the potential of DPP, AI, and scanned images of e-commerce packages for cross-border e-commerce risk management and what are potential further research directions?*

This study is of an exploratory nature and is conducted in the context of the PARSEC [1] and BORDERLINK[2] EU-funded projects. The remaining part of this paper is structured as follows. Section 2 provides background information. Section 3 presents our method. The results are discussed in section 4, and the paper ends with discussion and conclusions.

2 BACKGROUND

While there are many definitions of Digital Product Passports (DPP) for the purpose of this paper, we will use the CIRPASS definition where a Digital Product Passport is seen as "a structured collection of product related data with pre-defined scope and agreed data ownership and access rights conveyed through a unique identifier and that is accessible via electronic means through a data carrier. The intended scope of the DPP is information related to sustainability, circularity, value retention for re-use, remanufacturing, and recycling"[3]. What is interesting about the DPPs is that regulatory developments such as the Eco-design for sustainable products regulation (ESPR[4]) will make the use of DPPs mandatory for specific product groups, and textiles are one of the priority product groups to obtain mandatory DPPs. Textiles are interesting for e-commerce as many cross-border e-commerce packages that are delivered to the end consumer contain textiles.

The legislation still needs to define which data will be mandatory. Next to that we still need to see how DPPs may evolve as a vehicle not only for mandatory, but also other voluntary data that parties may decide to share. Nevertheless, DPPs can be seen as providing opportunities for additional data sources that may offer opportunities for advancement in monitoring and control of cross-border e-commerce flow of goods as well. More specifically, the ESPR states that DPPs "are intended to allow customs authorities to enhance and facilitate risk management and enable the controls at the border to be better targeted," [5] hereby providing customs with a new dataset to leverage on. Customs risk management refer to "the systematic identification, assessment and prioritisation of risks related to the movement of goods across borders, based on set risk criteria.[6]"

Focusing more closely on the customs domain, significant advancements have been made over the years. Research has reflected a changing role of customs, where customs is aligning with supply chain and information management and exploring aspects such as differentiated risk management, automated detection, and advancement in the use of data (Heijmann et al., 2020). Especially of interest is the differentiated customs risk management which builds upon business government partnership, showing more transparency by companies to customs for trade facilitation in return. These developments play also an important role in the new Customs Reform developments[7] under the trust-and-check concept.

Research also suggests that AI can strengthen customs enforcement by enhancing both risk assessment and non-intrusive inspections using x-ray and similar technologies. Machine learning, natural language processing, and intelligent automation enable more precise risk profiling to identify suspicious shipments, while machine vision and machine learning support automated threat and anomaly detection during non-intrusive inspections (Männistö 2025).

As the DPP legislation, data sharing infrastructures, in combination with detection technologies and AI capabilities are still under development and little is known about how they potentially could contribute to addressing the e-commerce challenges, in this paper we set to perform an early exploration on the topic.

3 METHOD

Cross-border e-commerce flows are characterised with large volumes. In this study we take the point of

[1] https://www.parsec-project.eu/
[2] https://www.borderlink.eu/
[3] https://cirpassproject.eu/faq/
[4] https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng
[5] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202401781, p. 11.
[6] https://taxation-customs.ec.europa.eu/customs/customs-risk-management_en
[7] https://taxation-customs.ec.europa.eu/customs/eu-customs-reform_en

view of differentiated customs risk management which allows facilitation of flows of companies that are willing to be transparent and collaborate with customs authorities. These e-commerce flows have been considered under the names of trusted traders, trusted trade lanes and as discussed in the previous section in the Customs Reform are linked to concepts such as trust- and-check. The goal of such differentiated risk management is to derisk the incoming flows and separate the more trusted shipments (and control them via other means, including system-based audit) and focus the scarce resources on further checks and physical inspections of the less transparent and less known trade flows (see Heijmann et al., 2020). For this study, we focus on exploring DPP and scanned images in the context of how they could potentially support the trust-and-check concept in the e-commerce context. Therefore, we are interested in how DPP and scanned images can help in derisking.

For this study, we focus on textiles and toys as product groups. Textiles are one of the priority product categories for which it will be mandatory, in the near future, to have DPPs. Textiles are one of the products that is often sold via cross-border e-commerce. The second product group that we selected is toys. Toys are also often subject of cross-border e-commerce and in the Toys regulation[8] DPPs are introduced. The exact data requirements for textiles and toy DPPs are still to be defined.

For this exploratory study we performed a three-phase approach to identify areas of opportunities for DPP, AI, and use of detection technology and scanned images in the e-commerce risk management context.

3.1 Phase 1. General Orientation and Identification of AI-Relevant Methods

General orientation based on the overall problem domain description, as well as deeper understanding of legislative documents, and portals used by the authorities. In this phase we looked into legal documents such as the ESPR regulation, the toys regulation, the Customs Reform and other documents that could potentially serve as a basis for Large Language Model analysis. We also examined information available on the SafetyGate[9] portal where market surveillance authorities share information and reports about unsafe products on the EU market. These insights in combination with the high-level idea of combining DPP and scanned images data led to identification of an initial list of AI possibilities in combination with DPP that may be useful to further explore in the context of DPP and AI and cross-border e-commerce risk management. The findings from this phase are presented in section 4.1.

3.2 Phase 2. Generating a Sample Data with Scanned Images

This phase was focussed on generating a sample data set with sample products with product data, product images and scanned images. This sample data was used to further refine our understanding and to enable the elaboration of research directions on DPP and AI and scanned image data for e-commerce risk management, based on the insights from real-life examples based on this sample data set and the corresponding x-ray scans.

In this phase the focus was on:

a) Selecting and purchasing products and identifying product-relevant information
b) Packing the products in boxes and making photos of the boxes
c) Performing scanning of the boxes with products with x-ray dual view scanner
d) Documenting the sample data set to be used for further analysis and consultation with experts

For this study, as discussed, we selected textiles and toys. The goal was to generate an exploratory small sample data set that can provide a more concrete basis for discussions for the identification of further opportunities and research directions. We selected a mix of products. For some of them there was more extensive product information, including images on the web shop. For others there was more limited information. We also included one textile product for which a prototype DPP was available. All the products were bought on the EU market. We collected the available information about the products based on product labels and additional information. Next to that we made photos of the products and when available considered also images of the products from the web shop.

The products were subsequently put in boxes. We used boxes that are also used for e-commerce shipments. In total 10 packages were created- 9 boxes and one envelope containing products. The ten packages were subsequently scanned with a dual view

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202502509

[9] https://ec.europa.eu/safety-gate-alerts/screen/search

x-ray scanner. Subsequently, an exploratory analysis was done by examining (a) the product data that may in the future be part of a DPP (either as mandatory or voluntary data); (b) the photos of the product from the web shop or photos taken by the research team; (c) the x-ray images.

We expect that only a limited number of data elements will become mandatory in the DPPs. However, for this study we look at the broad range of product data that is available currently in product labels or on e-commerce platforms that may be potentially useful from the authorities monitoring perspective and may in the future be beneficial if shared on voluntary basis in the trust- and -check scenarios. In particular, we also paid attention on product images that are available on e-commerce platforms and are included in different prototypes of DPP. As DPPs are also meant to be used by consumers, we see that different apps developed by DPP service providers also include product images. Although it is likely that such image information may not form the part of the mandatory DPP, experimentation in DPP prototypes show that such data can be captured in a DPP on at least a voluntary basis.

3.3 Phase 3. Insights from the Initial Analysis of the Data Sample with Scanned Images

As the topic of DPP is new and it was difficult to find one expert who is an expert on DPP, AI, x-ray image analytics, e-commerce, and customs risk management, we performed the initial analysis and reflection by involving different members of the research team who provided their perspective. We provide an overview of the results from this phase in section 4.2.

More specifically, the insights captured reflect the insights were gained by:

a) Analysis by the research team by researchers with DPP knowledge and compliance monitoring knowledge but with limited expertise on AI and x-ray image analytics. This resulted in a list of general observations based on the data set including the data about the products, as well as the scanned images.

b) Analysis by the research team by an AI expert with expertise in modern AI techniques from different application domains but with limited expertise in x-ray AI analysis for customs. In addition, the insights also allowed to perform a targeted literature review of relevant AI literature and available relevant data sets and latest research insights based on AI and x-ray images. Therefore, the insights form the small real-life sample set allowed to perform more targeted literature search and to identify more targeted further research directions on possible use of AI.

4 RESULTS

This section provides an overview of the results and insights gained.

4.1 General Directions AI- DPP Research for e-Commerce Risk Management

In this section, we provide an overview of AI methods relevant for the context of DPP, AI, and scanned images in the context of cross-border e-commerce risk management based on the conceptual analysis of Phase 1. We have not yet applied such AI methods to the sample set with scanned images.

One avenue is to explore the combination of unstructured data and image data from the scans through pre-trained AI models. In particular, one could either fine-tune a pre-trained vision-language model (VLM) or to conduct retrieval in combination with a VLM. Sources of data that could be fed to the models include: (1) data from the Safe Gate portal; (2) data from the toys regulation proposal and the related annex; (3) data from the Eco-design for Sustainable Products Regulation (ESPR) and related annexes and forthcoming delegating acts on textiles where further data requirements would specified in the future; (4) product information of the products in the packages (based on data from the labels), including images of the products available on the e-commerce platforms; (5) scanned images.

More specifically, AI may be positioned as an enabler to connect Digital Product Passport (DPP) data with scanned image data in the cross-border e-commerce risk analysis. In particular, three complementary AI directions were considered relevant for this context:

4.1.1 Multimodal Fusion of Text and Image Data

In this context, research may:

- Explore vision-language models (VLMs) that can process both scanned images (X-ray, CT) and textual data from (simulated[10]) DPPs.
- Pre-trained large-scale models (e.g. CLIP, BLIP, Flamingo) may be adapted to customs-relevant contexts.
- Fine-tuning or prompting may allow alignment of product label/DPP attributes (material, chemical composition, warnings, HS codes) with visual cues in scans (e.g., density, shape, packaging configuration).

This multimodal approach may support automated hypothesis generation: e.g., does the scanned image plausibly correspond to data about the toys or textiles in the package?

4.1.2 Risk Detection and Categorisation Models

AI models may be trained or adapted to classify scanned items according to risk categories derived from the EU Safety Gate database (e.g., choking, chemical risks, flammability). Zero-shot or few-shot classification may be investigated to handle limited data availability. A critical question is whether VLMs can generalise risk recognition from small-scale datasets. AI may highlight discrepancies between the DPP data and scan results, signalling potential risks such as hidden objects, undeclared components, or packaging anomalies.

4.1.3 Explainable AI for Risk Insights

Since regulatory and operational adoption requires trust, another direction of research is to apply explainability techniques (e.g., saliency maps, attention heatmaps, natural language rationales) to provide interpretable results for customs officials. This ensures that AI does not act as a "black box" but produces outputs that can be audited, challenged, and integrated into decision-making processes.

4.1.4 Synthetic Data and Data Augmentation

To overcome the small number of available scans, synthetic data generation may be explored (e.g., simulating X-ray imagery of toys and textiles under different configurations). Data augmentation (noise, rotations, varying densities) will help stress-test AI robustness and improve generalisation to real-world customs environments.

4.1.5 Integration with Regulatory Data Sources

AI workflows may leverage external sources such as ESPR annexes, Toys Regulation annexes, and Safety Gate alerts as knowledge bases. Retrieval-augmented generation (RAG) pipelines may be tested, where AI models query these sources in real time to contextualise the scan analysis with relevant regulatory requirements.

4.1.6 Possible Expected Outcomes

The above-mentioned possibilities related to AI sketch a wide range of exploration opportunities. They could lead to a range of expected outcomes, including:

- Proof-of-concept demonstration of how multimodal AI can combine DPP and scan data.
- Insights into feasibility of AI-enabled classification of risks with very limited training data.
- Early evidence of the value of explainable AI for customs decision-making.
- Foundation for scaling to larger datasets and operational pilots across EU border points.

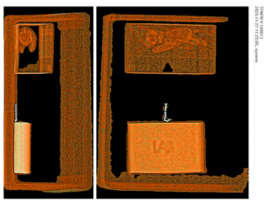
The above possibilities sketch the range of opportunities based on expert insights into state-of-the-art available methods and techniques and how they can potentially be explored in the context of DPP, scanned images and cross-border e-commerce risk management. In the next section we will present insights into the data sets with scanned images created, followed by additional insights into more specific AI research inspired by insights from the more concrete real-world examples of x-ray scanned data.

4.2 Results from the Scanning

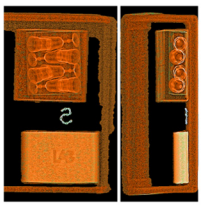
In Table 1 below we provide sample images where products were scanned. The examples of scans include scans of: soft toy tiger (Sample 1), drinking glasses toys (Sample 2); 4 wooden toy mini cars (Sample 3); and a kid's textile body jacket with a zipper (Sample 4). Other examples of products that were included in the sample set included products such as jeans trousers and a sweater and other textiles and toys.

[10] As DPPs will be only mandatory in a few years from now, here we refer to simulated DPPs as data sets about the products that are available on the products or the platform, including also voluntary data.

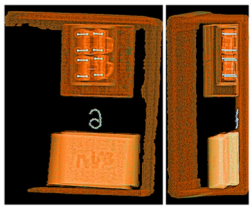
Table 1: Examples of scanned images.



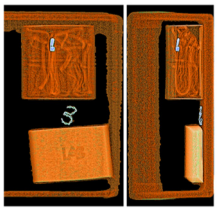
Sample 1: Scan of soft toy tiger



Sample 2: Scan of drinking glasses toys



Sample 3: Scan of 4 mini cars



Sample 4:Sscan of baby jacket with a zipper

In terms of the product data that may potentially be considered as mandatory or voluntary product data that may be share via DPP in the future, we took a wide range of available data to explore what is available. For the selected products, a range of data was available, for example:

- Material information in the product description (e.g. 100% combed cotton; Axles- steel galvanized; Polypropylene plastic)
- Product description (e.g. a police car, school bus, recycling truck and sports car, all in a mini format; mini drinking glass and goblet for play)

These show a wide range of available information that in the future may become part of mandatory or voluntary DPP.

4.3 Insights Based on the Scanned Images and Product Data

4.3.1 Insights Based on Visual Analysis by a non X-Ray Expert

By examining the sample set of the 10 packages and only looking at the photos of the sample products and the x-ray images with a non-trained eye in x-ray image analysis, and performing a quick scan a number of observations were made:

- For some of the products (e.g. Sample 1), for the human eye it is easy to recognize the shape of the object from the x-ray image and to compare it with the image of the object.
- For some of the packages, especially those with textiles, the images show some shapes and materials but they are less sharp. Still some shapes are visible. And especially for textiles with metal or plastic buttons, zippers and ropes, elements of these can be seen on the x-ray scans (see e.g. Sample 4).
- For some of the images, it was clear that there are multiple materials including metals.
- In packages with textiles, even though the shapes are more difficult to see, the images seem to be similar in some way in view of how they exhibit textile composition.

Potential questions that arise include:

- Based on insights form images where similarity of the shapes of the photo and the scanned image seems high for human, can such a similarly easily be establish automatically based on AI algorithms? Such analysis can be useful in case of trust-and-check model (not to be used in isolation but as one input that may facilitate derisking).
- While the images of textiles were more unclear, it may be that, based on the scan, the scan may indicate whether the package contains textiles or not. This may be interesting as in the future textile products will need to have DPP. If an image indicated that it is likely that the package contains textile but the import declaration does not have a link to a textile DPP this may be interesting for the risk analysis.

Adding the additional product/ DPP data

Now next to that, textile products and toys will have in the future also Digital Product Passports and can carry mandatory but potentially also voluntary data. Based on the additional product data some other aspects may be of interest and additional questions may arise:

- Based on the product description (e.g. cars; or mini drinking glass) and the scanned images, can some matching be done?
- Based on the material composition description of the product and the x-ray image (e.g. sample contains galvanized steel), can some matching be done?

Ideally, the information may allow to combine and to arrive at several check points where images of the product from the e-commerce platform, x-ray image and the textual description of the product or its material composition may form the basis for derisking. This may be particularly interesting for exploring possibilities for business-government collaboration in e-commerce and trust-and-check concepts.

4.3.2 AI Further Directions Based on Insights from Scanned Images and Targeted Literature Review

Based on the insights from the samples and scanned images, a literature review was performed to identify potential more detailed research directions compared to the generic potential AI topics that were identified in section in Phase 1 and presented in section 4.1.

A central technical challenge for comparing data from images of a product and X-ray scanned images of that product is cross-modal image matching, in order to ensure that an x-ray scan of an item (e.g., electronics, apparel, machinery) can be correctly matched to its corresponding visible-light (RGB) photograph. This is a non-trivial task due to the stark modality gap (X-ray images reveal internal structure and material density, whereas photos show external appearance) (Caldwel & Griffin, 2019). Early studies on photographic data to aid X-ray recognition highlighted the limited but tangible transferability of features between these modalities (Caldwel & Griffin, 2019).

Datasets and Benchmarks

To facilitate research on this problem, earlier research has developed specialized datasets. One noteworthy dataset is COMPASS-XP, which contains ~1,9k paired X-ray and photo images spanning 369 object classes (Griffin et al., 2019). More recently, Garcia-Fernandez et al. (2025) introduced DET-COMPASS, an extension of COMPASS-XP with ~370 categories of objects and bounding-box annotations on aligned X-ray/RGB image pairs (Garcia-Fernandez et al., 2025). These datasets provide a broad benchmark, i.e., from knives and bottles to electronics and shoes, reflecting the diversity of consumer products relevant to DPP applications. Indeed, ensuring an X-ray scan matches the correct product entry in a passport could aid in authentication and anomaly detection (for instance, by confirming that the internal X-ray "fingerprint" of a device matches the expected model) (Gupta et al., 2025; Gaus et al., 2025)

These datasets are released under open licenses and may be instrumental for developing DPP-oriented models. Such data may help researchers to train dual-encoder networks or transformers that generalize across many product categories and to evaluate retrieval performance in a standardized way.

Notable Open-Source Projects

Several open-source research projects have contributed code and pretrained models that can accelerate development of X-ray/photo matching systems for DPPs:

- RAXO (2025)- Retrieval-Augmented X-ray Open-Vocabulary Detection (Garcia-Fernandez et al., 2025). This training-free framework adapts off-the-shelf RGB open-vocabulary detectors to X-ray imagery by building X-ray class descriptors through a dual-source retrieval strategy. RAXO's approach could be repurposed for product verification by retrieving known product images from a DPP database and comparing their features to an input X-ray scan.
- XoFTR (2024)- Cross-Modal Feature Matching Transformer (Tuzcuoğlu et al., 2024). This open-source codebase implements a transformer architecture for local feature matching between different modalities (tested on thermal IR vs. visible images). It includes components like coarse-to-fine feature matching and data augmentation to simulate modality gaps. For X-ray vs. photo matching, XoFTR offers a template for how to design attention layers that align structural details between the two image types. Researchers can adapt its PyTorch implementation to work with datasets like COMPASS-XP, potentially fine-tuning the model to learn correspondences between X-ray and optical features of products.
- SLX (2023)- Similarity Learning for X-ray (Dionelis et al., 2023). This paper focuses on metric learning within the X-ray domain (originally to detect concealed firearm parts across varied X-ray scans). It is noteworthy for its use of contrastive loss on top of a deep CNN to learn an embedding where similar objects cluster together. While SLX's released code is geared towards X-ray-X-ray similarity, its architecture (ResNet-based Siamese network with feature normalization and dual losses) is directly applicable to X-ray/RGB matching. By training on paired cross-modal data, a similar setup could learn a joint embedding space for DPP verification tasks. SLX underscores the effectiveness of contrastive dual-encoder training, which is a technique at the core of many cross-modal matching systems.

In summary, cross-modal image matching between X-ray and visible-light imagery may be crucial capability for future Digital Product Passports (especially if they hold also voluntary product images data), enabling an "X-ray fingerprint" to accompany the usual visual and textual product data. Recent advances in machine learning provide multiple

pathways to this goal: from dual-encoder CNNs with contrastive learning, to transformer-based alignment models, to retrieval-augmented frameworks that leverage web data. Open datasets like COMPASS-XP and DET-COMPASS have made it possible to train and benchmark these systems across hundreds of product categories (Garcia-Fernandez et al., 2025), and early results show that well-designed models can generalize across diverse objects. As highlighted by recent surveys on computer vision and deep learning for X ray security imaging (Akcay & Breckon, 2022), this field is rapidly evolving. Implementing cross-modal matching will allow a DPP system to automatically verify that a given X-ray scan truly belongs to a particular product, enhancing anti-counterfeiting measures and supply chain transparency. The combination of rich multimodal data and state-of-the-art models in combination with Digital Product Passports data may offer a range of new opportunities in the context of e-commerce risk management.

5 DISCUSSION AND CONCLUSIONS

As visible in EU policy documents, e-commerce is becoming an ever-increasing challenge for the EU, and the numbers of goods coming to the EU via e-commerce channels is only growing. This poses major challenges for customs authorities on how to monitor these flows. Monitoring of these e-commerce flows is of key importance for a number of reasons. Next to the safety and security and revenue collection aspects which are of key concern to customs, there are also issues of product safety and sustainability of products. These aspects are of specific concern for market surveillance authorities. There is also the issue of level playing field, that if products that do not meet EU standards and enter the EU via e-commerce channels and are not stopped then these products compete with products produced in the EU that are strictly monitored to meet all the standards and EU legal requirements. There is also the issue of speed, that e-commerce is about goods moving fast. In this challenging environment digital tools like Digital Product Passports have been suggested in EU policy documents as potential instruments that can play a role in monitoring e-commerce flows. However, how and what role DPP may play in cross-border e-commerce risk management is not well understood. In this paper, in the context of EU customs research projects, and in view of the large volumes of e-commerce flows which require more and more automated solutions such as detection technologies and AI, we set to explore the question: *What is the potential of DPP, AI, and scanned images of e-commerce packages for cross-border e-commerce risk management and what are potential further research directions?*

In this paper, we analytically explore possible role of AI and DPP and scanned images in this context. But next to that, we also generated an example data set and derived more informed observation about potential research directions, building on the insights from real-life products, containing information and scanned images of these products. As a result, we have provided deeper understanding into the topic and have outlined possible further research directions.

This all needs to be viewed in a context that is very dynamic, where mandatory DPP data requirements are still to be defined, where it is still to be seen what the role of voluntary data would be and which data would be valuable if shared on voluntary basis. And how this may feed into further discussions on business-government collaborations, models such as trust-and-check and differentiated risk management. Nevertheless, just because there are so many unknowns and uncertainties, we find it important to provide a deeper understanding on the potential role of DPP, AI and detection technologies and scanned images, as such deeper understanding can further lead to more informed engagements and discussions. Therefore, we also aimed to capture as broad spectrum of possible research directions as possible to fuel the discussion, rather than limiting ourselves or focusing on specific method or direction. Therefore, this paper should not be seen as providing answers but more as opening a wide range of opportunities to further explore and evaluate in the attempts to address the e-commerce monitoring challenges.

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AI STATEMENT

For the parts of the paper, namely the parts concerning the AI methods, ChatGPT was used to generate an initial draft of a brief literature review. The responsible author for this part then substantially edited and supplemented the draft, and takes full responsibility for the final content. References suggested by ChatGPT were reviewed; relevant sources were kept and irrelevant ones were removed.

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