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POBOLJŠANJE ODRŽIVOSTI: UVOĐENJE DIGITALNOG PASOŠA PROIZVODA KAO KATALIZATORA ZA POZITIVNE PROMENE

ENHANCING SUSTAINABILITY: INTRODUCING THE DIGITAL PRODUCT PASSPORT AS A CATALYST FOR POSITIVE CHANGE

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Oblast – INDUSTRIJSKO INŽENJERSTVO

Kratak sadržaj – *Digitalni pasoš proizvoda je inovativan koncept koji ima za cilj unapređenje održivosti u procesima proizvodnje i potrošnje. Digitalni pasoš proizvoda podstiče pružanje tačnih i transparentni informacija o proizvodima u skladu sa međunarodnim zahtevima za održivost. Uspostavljanje digitalnog pasoša proizvoda je važna mera za promovisanje održivosti i podizanje ekološke svesti među kompanijama i potrošačima, što doprinosi očuvanju prirodnih resursa i smanjenju štetnih uticaja na životnu sredinu.*

Ključne reči: *Digitalni pasoš proizvoda, Cirkularna ekonomija, Održiva proizvodnja, Evropska komisija*

Abstract - *The Digital Product Passport is an innovative concept that aims to improve sustainability in the production and consumption processes. The Digital Product Passport encourages the provision of accurate and transparent product information in accordance with international sustainability regulations. Establishing a Digital Product Passport is an important measure to promote sustainability and environmental awareness among companies and consumers, which contributes to the conservation of natural resources and the reduction of harmful environmental impacts.*

Keywords: *Digital Product Passport, Circular economy, Sustainable production, European Commission*

1. INTRODUCTION

The consumption of raw materials is one of the drivers of biodiversity loss, which in turn affects ecosystem functioning and has socio-economic consequences worldwide. Industry and business have an impact on nature, but they also produce important innovations, partnerships and expertise that can help address biodiversity loss and other effects on the environment.

The current economic model is still based on "take-make-replace". It depletes/consumes our resources, pollutes our environment, and damages biodiversity and climate.

The UK government has proposed product passport as a policy base to advocate compliance as part of its waste and resource strategy. This important rule was challenged and initiated by the European Commission (EC) and included in the Product Sustainability Regulations 2022 and the Product Battery Regulations 2022 [1].

While addressing the clear meaning of a product passport, we find that it is a policy change in consumer behaviour to buy and own the product and to reach maximum transparency of all aspects of the sustainability of the product life cycle, to achieve a circular economy. Including waste reduction, resource efficiency, environmental impact, product durability and reparability, premature obsolescence, hazardous chemicals, and recycling and recycled content.

2. EU NEW REGULATION

From the standpoint that calls for contributing to supporting economic growth, job creation and social integration, making resources last longer, and promoting the use of recycled materials, the European Commission proposed creating an approach to ecological product design based on sustainability and recycling embedded in the work of the circular economy.

2.1 European policy for development

When the European Resource Efficiency Platform instigated initial discussions on a Digital Product Passport (DPP) in 2014. They focused on the reuse of materials in the production process. Since then, the circular economy and product sustainability as thematic topics have shot up the political agenda. The introduction of a DPP was overshadowed by the European Green Deal in 2019 and the circular economy, products for society and organizations and improving them to develop a stronger and cleaner economy by delving into the gaps in a systematic way to reach effective standards for each stage of product life cycle [2].

2.1.1 Policy frameworks

The EC's 2020 Single Market Enforcement Action and the updated New Industrial Strategy stress the role of digital tools in market surveillance.

Improved identification of products that do not comply with market rules creates a fairer EU market and protects consumers from counterfeit or dangerous products.

The EC intends to encourage market surveillance authorities to step up the digitalisation of product inspections and data collection by using state-of-the-art technologies to trace non-compliant and dangerous products. In the longer term, a DPP could become a

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game-changer, if it can confirm product information and whether certain standards are met. The 2020 EU Consumer Agenda seeks to empower consumers to make more informed purchasing decisions.

2.1.2 The blueprint for DPPs in the EU

In late 2020, the EC published the EU Batteries Directive [3] to reduce negative environmental and social impacts throughout all life cycle stages. The Directive proposed the establishment of an electronic exchange system and a DPP (or 'Battery Passport') for rechargeable industrial and electric vehicle batteries.

3. DIGITAL PRODUCT PASSPORT (DPP)

Digital Product Passport is the digital twin that each physical product carries data about itself and enables it to collect more data along its journey by providing tracking information about the origin, installation, repair and disassembly of the product, as well as end of life handling.

In terms of this approach, reliable information will increase and consumer confidence and sustainable consumption decisions will be enhanced by creating a sustainable, low-carbon, resource-efficient and competitive economy.

Where the primary objective of DPP is to promote and support a low carbon economy in the sense of relying on renewable energy resources to mitigate the effects of climate change.

3.1 The purpose of the digital product passport

The passport of the product is one of the modern technologies through which we will learn about its purpose by addressing several points:

- Transition towards a sustainable economy.
- Strategic support for the circular economy.
- Business-level decarbonisation.

3.1.1 Transition towards a sustainable economy

Digital transformation is one of the technologies that seeks to achieve climate neutrality and transition to a more sustainable economy, to achieve a circular economy and to enhance sustainability, it must be based on renewable and recycled raw materials to preserve products and materials for as long as possible.

3.1.2 Strategic support for the circular economy

DPPs could inform manufacturers about the nature and qualities of secondary materials, including purity, substances of concern, materials used, additives, fillers, dyes. Clear and reliable information is essential when recycled materials needed to fulfil the same criteria as primary materials for performance or product safety.

For example, the expected capabilities of DPPs to significantly improve transparency and knowledge, and will provide deeper insights into the circular economy regarding the content, attributes and use of products and materials.

DPPs could support circular economy strategies in:

1) Repair and predictive maintenance, by enabling the determination of advice for repair, maintenance needs and timeframes.
2) Reuse, by better determining a product's residual value another properties, including expected number of rotations, travel and remaining lifespan.
3) Refurbishment, by providing insight on use, abuse and abrasion, as well as on reparability and identification of spare parts.
4) Remanufacturing, by determining which parts of a discarded product can still be used and in which applications.
5) Recycling and recovery of materials, by providing information on product composition, additives and substances of concern.
6) Appropriate, safe and environmentally friendly disposal at the end of life of unavoidable residues.
7) General reduction of environmental impacts through renewable/recycled feedstock's, and energy and resource efficiency.

3.1.3 Business-level decarbonisation

DPP system could significantly improve the communication of a product's sustainability and other criteria for customers, investors or other stakeholders for reporting and auditing processes. Businesses urgently need to offer climate neutral products as an alternative choice for companies and customers. DPPs could automatically generate CO_2 footprint calculations for companies and the wider value chain. Value chain measurement and reporting of CO_2 emissions could be another core application of DPPs, with the ultimate.

Goal is to redesign products and value chains. An additional application would be to facilitate compliance with social governance criteria, including on modern slavery and child labour. Such information could be stored in DPPs for materials and products, and then passed along supply chains throughout their production and use phases. DPPs could become the single point of truth for such data.

3.2. Consolidated requirements for DPP Systems

Uniform requirements are an essential foundation for understanding digital passport system where it includes the following:

- legal obligations
- functional suitability
- security, confidentiality, and IP protection
- accessibility
- interoperability
- modularity and modifiability
- availability and time behaviour
- portability.

3.3 Design of a DPP for products

The design and implementation of a DPP can be categorized into the following principles:

- ensuring coherence and consistency

- embracing adaptability
- transparency and traceability.

3.4 Requirements for digital product passports

To understand the requirements for a product passport, we will touch on several points:

The DPP must include the following conditions:

1) It shall be connected through a data carrier to a unique product identifier.
2) The data carrier shall be physically present on the product, its packaging or on documentation accompanying the product.
3) The data carrier and the unique product identifier shall comply with standard ('ISO/IEC') 15459:2015.
4) All information included in the product passport shall be based on open standards, developed with an interoperable format and shall be machine-readable, structured, and searchable.
5) The information included in the product passport shall refer to the product model, batch, or item.
6) Access to information included in the product passport must be organized in accordance with the basic and specific requirements of the required standards [4].

3.5 The practicalities of Digital Product Passport implementation

From an operational perspective, it's not as difficult as it may first seem. Once a framework is defined for the information to be included in digital product passports, traceability software can be used to standardise data sets coming from existing ERP systems. The required unique product identifiers can use existing technologies such as barcodes, QR codes, RFID tags, or similar, for digital product passport data submission. In the end, this process can be almost entirely automated. We can explain more in the following data:

- Data Digital Product Passport
- Data Collection
- Block chain

3.6 IOT enables data acquisition

The current linear economy is causing excess consumption and waste of natural resources and energy. The Circular Economy (CE) proposes a new innovative approach, supporting restorative and regenerative operations, but it also requires the alignment of government policy, business practices, and consumer preferences. The CE is positioned to decrease new materials consumption by 32% within 15 years and by 53% by 2050. Just moving towards a CE could eliminate 100 million tons of waste globally in the next five years.

3.7 Storing and accessing DPP

According to Europe's technology industries, the DPP should follow the data minimisation principles as much data as needed. As little data as possible have a decentralised approach to be designed in a flexible and feasible manner, and the data model should reflect the mechanisms of experts and not mirror and copy data in centralised databases.

EC is willing to manage the registry containing track and tracing identifiers and attributes on the dedicated products. EC will have backup storage of distributed local data storage in the event of bankruptcy. In future, the DPP will be mandatory for the products for which there is a dedicated act (identified in ESP).

Two possible scenarios are foreseeable with reference to EU DPP access rights: "Need-to-know" or "Open access." In access granted on a "need-to-know" basis, the sensitive information will only be seen by public authorities and other companies in the value chain—like recyclers—beyond the manufacturer.

3.8 How Digital Product Passports will work

Digital product passports rely on a combination of technologies and processes to create a secure and verifiable record of product information. The implementation typically involves the following components:

- Digital product passports rely on a combination of technologies and processes to create a secure and verifiable record of product information. The implementation typically involves the following components: At each stage of the supply chain, relevant data about the product is captured and stored. This can include information about manufacturing, sourcing, ingredients, quality inspections, certifications, and more.
- The data can be collected through various means, such as manual entry, barcode scanners, RFID/NFC readers, or integration with existing systems like ERP. To uniquely identify each product, a digital identifier is assigned. This identifier can take the form of a serial number, QR code, barcode, or RFID tag. It acts as a reference point for accessing the product information stored in a database or block chain.
- The captured product data is stored in a centralized database or block chain platform. The choice of storage depends on factors like security requirements, scalability, and the need for decentralized consensus. These technologies ensure that the data is securely stored and accessible when needed.
- To access and verify the authenticity of a product, consumers, retailers, or other stakeholders can use a designated interface, such as a mobile application or web portal. They input the digital identifier, such as scanning a QR code, which retrieves and displays the relevant product information from the database or block chain. Verification mechanisms can be employed to ensure the integrity and authenticity of the retrieved data [5, 6].

4. CONCLUSION

Through our study, we learned about the new whirlwind of development in the transformation of industry towards a sustainable economy. This event relies on transparency and reliability in order to collect information and data. It is a major challenge for digitization and to support economic transformation to advance a sustainable economy forward. A DPP is a digital record of a product's value chain. It collects data about the product's journey from raw materials to finished goods, including information on the energy used, the emissions generated, and the waste produced. The data is stored on a block chain, a distributed database that allows for transparent and tamper-proof data sharing.

The digital product passport can verify the sustainability of a product and ensure that it meets environmental and social standards. By tracking a product's entire journey from manufacture to purchase to disposal, we can gain a much more comprehensive understanding of its environmental and social impacts. Here are some reasons to implement digital product passports.

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Fatma Fantazi was born in Zuwara, Libya. She graduated from the Faculty of Engineering, Sabratha University, specializing in industrial engineering. She works as a lecturer in the Faculty of Industrial Engineering, Sabratha University. She received a delegation to study a master's degree outside Libya. She enrolled in master academic studies of Industrial Engineering in Serbia, University of Novi Sad, Faculty of Technical Sciences, Department of Industrial Engineering and Management in Novi Sad.
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