DPP4EU Conference

June 01 – June 03, 2026

ABSTRACT BOOKLET

In Honour of Professor Heinz Preisig

The DPP4EU Conference 2026 is organized in honour of Professor **Heinz Preisig**, in recognition of his sustained contributions to systems engineering, data-centric industrial modeling, and the development of interoperable digital infrastructures for complex technical systems.

Professor Preisig has been a key contributor to the advancement of formal methods in engineering practice, with a particular focus on bridging the gap between mathematical system representations and real-world industrial applications. His work spans systems modelling, process integration, and the structuring of information in engineering environments where heterogeneity, scale, and long lifecycle complexity present significant challenges.

A central theme of his contributions is the development of data-driven and model-based approaches that enable consistent interpretation and reuse of engineering information across tools, organisations, and domains. In this context, he has actively contributed to research and applied initiatives related to digital transformation in industry, including efforts connected to Digital Product Passports (DPP) and and semantic interoperability frameworks.

Within collaborative environments such as DigiPass, VIPCOAT and MODENA, Professor Preisig has supported the integration of systems engineering principles with modern data technologies, including knowledge graph approaches and semantic web standards. His work has helped advance the conceptual foundations required for interoperable dataspace architectures, particularly in the context of circular economy applications and regulatory-driven data ecosystems.

Beyond his technical contributions, Professor Preisig is recognised for fostering interdisciplinary collaboration between engineering, computer science, and industrial stakeholders. His ability to connect theoretical rigour with practical implementation has made him a valued contributor to European initiatives aimed at building scalable, trustworthy, and semantically consistent data infrastructures.

In recognition of his scientific and community contributions, the DPP4EU Conference 2026 is dedicated to Professor Heinz Preisig as a tribute to his enduring impact on the field and his role in shaping the foundations of next-generation industrial data systems.

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Programme Overview

1 June 2026 — Satellite Meetings

Pre-Conference Sessions: Community Clustering Meetings
Focus: DPP Standardization & Norms, DPP for Electronics and Batteries, Materials Informatics.

Time	Room: Bristol 1	Room: Bristol 2 & 3	Room: Bristol 4
09:00–10:00	CE-RISE focused Workshop *Chairs: Cristina B.B. Guerreiro and Miguel Las Heras Hernandez*	JTC-24/ Standardization community meeting *Chairs: Martin Schreck, Thomas Knothe & Thomas Rödding*	EUMINE - Materials informatics for DPP *Chairs: Fancesco Mercuri and Salim Belouettar*
10:00–10:30	*Coffee Break and Networking*		
10:30–11:30	CE-RISE focused Workshop *Chairs: Cristina B.B. Guerreiro and Miguel Las Heras Hernandez*	JTC-24/ Standardization community meeting *Chairs: Martin Schreck, Thomas Knothe & Thomas Rödding*	DPP for advanced battery materials *Chairs: Martin Thomas Horsch and Mesfin Haile Mamme*
11:30–12:30	*Lunch*		

1 June 2026 — Main Conference: Day 1

Time	Activity / Session Topic	Lead
12:30–12:40	**Opening and Welcome**	**HaDEA, DigiPass**
12:40–13:10	**Keynote: DPP for circular economy. ESPR policy context and methodology**	Wojtek Sitarz and Alejandro Lopez Olmedo (**DG ENV/JRC**)
13:10–14:10	**Session 1: Eco-design Methodology for DPP Data**	N. Konchakova & Joana Francisco Morgado
14:10–14:30	*Coffee Break and Networking*	
14:30–14:40	**Session 2: Standardisation & Implementation Status**	Thomas Knothe
14:40–14:55	**Keynote: DPP Framework and Implementation Status**	Alexandru Ion (**DG GROW**)
14:55–15:55	**Session 2 Part I: Sector specific research**	Thomas Knothe
15:55–16:25	*Coffee Break and Networking*	
16:25–17:45	**Session 2 Part II: Solution for challenges**	Thomas Rödding
17:45–18:15	*Coffee Break and Networking*	
18:15–18:50	**Session 2 Part III: Globalisation**	Stefka Dzhumalieva
18:50–19:20	**Pannel Discussion: Global Alignment of DPP Standards**	Stefka Dzhumalieva
19:20–19:30	**Close Day 1 and Introduction of Day 2**	Martin Schreck & Natalia Konchakova

2 June 2026 — Main Conference: Day 2

Morning Session

Time	Activity / Session Topic	Speaker / Lead
09:00–09:30	**Keynote: Why research and innovation is key for the deployment of circular economy solutions**	Martin Policar (**DG RTD**)
09:30–11:00	**Session 3: Barriers, Challenges, and Opportunities for Uptake of DPP Systems**	Marvin Böll & Stefano Merciai
11:00–11:30	*Coffee Break and Networking*	
11:00–12:30	**Session 4: DPP in practice - preliminary Platforms & Software solutions**	Salim Belouettar & Martin T. Horsch
12:30–13:45	*Lunch*	

Afternoon Session

Time	Activity / Session Topic	Speaker / Lead
13:45–14:00	**Keynote: Advanced Materials Policy and Digital Infrastructure**	Wide Hogenhout (**DG RTD**)
14:00–15:00	**Session 5: Digital Infrastructure / Materials Commons**	Peter Klein & Heinz A. Preisig
15:00–16:00	**Session 6: Connection of SSbD and DPP / Technological Challenges**	Cristina Guerreiro & Franz Pirker
16:00–16:15	*Coffee Break and Networking*	
16:15–17:15	**Session 7: Industry data ecosystem for DPP**	Arnaud Langle & Marvin Böll
17:15–17:45	**Honor Lecture: A view on DPP handling**	Heinz A. Preisig
17:45–18:00	**Pan-European Materials Informatics Network**	Fancesco Mercuri
18:00–20:00	**Poster Session and COST Action Networking**	Miguel Las Heras Hernandez & Fancesco Mercuri

3 June 2026 — Main Conference: Day 3

Morning Session

Time	Activity / Session Topic	Speaker / Lead
09:00–09:20	**Keynote: Advanced Materials Need Advanced Diversity: A Materials Scientist's Leadership Journey through R&D and Digitalisation**	Nuria Cinca
09:20–10:35	**Session 8: Women in Materials and Digitalization**	Amila Akagic & Yvonne Barcelona
10:35–11:00	*Coffee Break and Networking*	
11:00–12:00	**Session 8: Panel Discussion "Women in Materials and Digitalization"**	Yvonne Barcelona
12:00–13:00	*Lunch*	

Afternoon Session

Time	Activity / Session Topic	Speaker / Lead
13:00–13:20	**Keynote: How can the European Business Wallet support the DPP?**	Alina Radu (**DG CNECT**)

13:20–14:20	**Session 9: From Research to Commercial Valorisation - Digital Business Models**	Franz Pirker & Salim Belouettar
14:20–14:30	*Break*	
14:30–15:50	**Panel Discussion on the Future of DPPs: Common Insights and Cross-cutting Challenges**	Natalia Konchakova
15:50–16:10	**Open microphone session: Future collaborations discussion**	Salim Belouettar
16:10–16:30	**Plenary Dialogue: Towards Shared Recommendations and Future Actions**	M. Schreck (JTC-24) & N. Konchakova (DigiPass)
16:30	*Wrap-up of Day 3 and End of the Conference*	

DPP Conference 2026: Complete Programme

1 June 2026 — Satellite Meetings

CE-RISE focused Workshop
Chairs: Cristina B.B.Guerreiro and Miguel Las Heras Hernandez

Time	Room: Bristol 1 / Topic	Speaker / Lead
09:00–09:05	**Welcome & Introduction**	Cristina Guerreiro
09:05–09:10	**Introduction to Circularity Principles**	Elise Vermeersch and Elena Fernandez
09:10–09:20	**Introduction to R-Indicators**	Setenay Saglam
09:20–09:30	**Introduction to DPP-Enabled Life Cycle Assessments**	Berend Mintjes
09:30–10:00	**Sandboxed Life Cycle Assessment Calculation**	Francesco Barilli
10:00–10:10	**Discussion & Reflection With the Audience**	Cristina Guerreiro
10:10–10:30	*Coffee Break and Networking*	
10:30–10:50	**PODIUM DISCUSSION: How Research Applies DPPs to Real Sustainability Challenges** CE-RISE (Setenay Saglam, Empa and Berend Mintjes, Leiden University), DACE (Helen Brüggmann, Wuppertal Institute), BatCat and DigiPass (Maria Bashir, Norwegian University of Life Sciences), DigInTraCE (Lucyna Lekawska-Andrinopoulou, I-SENSEGroup/ICCS)	Miguel Las Heras Hernandez
10:50–11:20	**Podium Debate**	Miguel Las Heras Hernandez
11:20–11:30	**Discussion Including Audience Participation**	Miguel Las Heras Hernandez & Cristina Guerreiro
11:30–12:30	*Lunch*	

JTC-24/ Standardization community meeting
Chairs: Martin Schreck, Thomas Knothe & Thomas Rödding

Time	Room: Bristol 2 & 3 / Topic	Speaker / Lead
09:00–09:20	**Welcome** **Keynote: European DPP from Commission perspective**	Stefka Dzhumalieva, Thomas Knothe
09:20–09:40	**Status update on European DPP system (introduction to the standards)**	Thomas Rödding - Co-Chair JTC24
09:40–10:00	**JTC 24 Standards applicable for everyone – Open Source Implementation of essential Parts**	Thomas Knothe
10:00–10:30	*Coffee Break and Networking*	
10:30–10:50	**Lessons learned from management aspect**	Thomas Knothe
10:50–11:10	**Lessons learned - Elaborate standards under high pressure**	Otto Handle
11:10–11:30	**What are the next steps in JTC 24**	Martin Schreck
11:30–12:30	*Lunch*	

EUMINE - Materials informatics for DPP
Chairs: Fancesco Mercuri and Salim Belouettar

Time	Room: Bristol 4 / Topic	Speaker / Lead
09:00–09:20	**Welcome** **Talk 1: Materials informatics for DPP**	Francesco Mercuri & Emilja Fidanchevska
09:20–09:40	**Talk 1: EuMINE-Materials informatics for DPP**	Huanyu Li & Dimitra Tsimpli
09:40–10:00	**Talk 2: EuMINE-Materials informatics for DPP**	Alexandra Farcas & Jesper Friis
10:00–10:30	*Coffee Break and Networking*	

DPP for advanced battery materials co-organsied by **BatCAT and FULL-MAP** projects
Chairs: Martin Thomas Horsch and Mesfin Haile Mamme

Time	Room: Bristol 4 / Topic	Speaker / Lead
10:30–10:50	**Opening by the co-organizing projects**	Martin Thomas Horsch and Mesfin Haile Mamme
10:50–11:10	**Impulse talk**	Cyrine Soufi
11:10–11:30	**Impulse talk**	Sudeepika Liyanapathiranage
11:30–12:30	*Lunch*	

1 June 2026 — Day 1: Policy & Foundation

Time	Activity / Session Topic	Speaker / Lead
11:30–12:30	**Registration**	Event Staff
12:30–12:40	**Opening and Welcome**	Giuseppe Giovanni Daquino (**HaDEA**) Natalia Konchakova (**DigiPass CSA**)
12:40–13:10	**Keynote: DPP for circular economy.** **ESPR policy context and methodology.**	Wojtek Sitarz Alejandro Lopez Olmedo (**DG ENV/ JRC**)
13:10–14:10	**Session 1: Eco-design Methodology for DPP Data**	*Chairs: J. F. Morgado & N. Konchakova*
13:10–13:25	TRUSTex: DPP Data Requirements for Textiles	Paul Breiner
13:25–13:40	DPP Requirements for Sustainable Textile Design	Raquel Santos
13:40–13:55	Digital Product Passports as a Tool for Digitalisation	Berend Mintjes
13:55–14:10	Operationalising ESPR for Data Spaces	Setenay Saglam
14:10–14:30	*Coffee Break and Networking*	
14:30–14:40	Introduction of the Moderator: CEN/CENELEC JTC-24	Thomas Knothe
14:40–14:55	**Keynote: DPP Framework Implementation Status**	Alexandru Ion (**DG GROW**)
14:55–15:55	**Session 2 Part I: Sector specific research**	*Chair: Thomas Knothe*
14:55–15:10	Quishing at Scale: EN 18246 ESDC Framework	Laurent Tonnelier
15:10–15:25	Consumer Interests and Multi-Stakeholder Consensus in DPP Standardisation	Bruce Farquhar

15:25–15:40	From DPP Frameworks to Real-World Implementation: Lessons Learned from Early PoC and Digital Assurance Models	Marco Palumbo
15:40–15:55	DPP for construction projects – Data space Construct-X	Paul Seifert
15:55–16:25	*Coffee Break and Networking*	
16:25–17:45	**Session 2 Part II: Solution for challenges**	*Chair: Thomas Rödding*
16:25–16:30	Introduction of the Moderator	Martin Schreck
16:30–16:45	GS1 Standards for DPP Generation and Maintenance	Hadley Beeman
16:45–17:00	Realizing JTC 24 DPP Standards with Asset Administration Shell	Juilee Tikekar
17:00–17:15	Bridging different technologies - From Standard to Solution	Peter Krummenacher
17:15–17:30	Cross-Sector DPP Framework Comparison	Francesco Sollitto
17:30–17:45	BatteryPass-Ready: Creating a Test Environment for the EU Battery Passport	Johannes Simböck & Jonathan Fritz
17:45–18:15	*Coffee Break and Networking*	
18:15–18:50	**Session 2 Part III: Globalisation**	*Chair: Stefka Dzhumalieva*
18:15–18:20	Introduction of the Moderator	Stefka Dzhumalieva
18:20–18:35	ITU's Role in Cross-Border Interoperability	Reyna Ubeda
18:35–18:50	UN/CEFACT Recommendations	Nancy Norris
18:50–19:20	**Panel: Global Alignment of DPP Standards** Nancy Norris (UN/CEFACT), Benjamin Helfritz (DIN), Jens Gayko (DKE), Adrian von Muehlenen (BASF), Thomas Knothe (JTC24).	Stefka Dzhumalieva
19:20–19:30	**Close Day 1 and Introduction of Day 2**	Martin Schreck & Natalia Konchakova

2 June 2026 — Day 2: Implementation & Innovation

Time	Activity / Session Topic	Speaker / Lead
09:00–09:15	**Keynote: Why research and innovation is key for the deployment of circular economy solutions**	Martin Policar (**DG RTD**)
09:15–11:00	**Session 3: Barriers & Opportunities for Uptake**	*Chairs: M. Böll & S. Merciai*
09:15–09:30	SHACL-Based Model Assessment Workbench	Riccardo Boero
09:30–09:45	Critical Materials Information Exchange	Kiran Kumaraswamy
09:45–10:00	Modelling Frameworks for DPP System Behaviour	L. S. Wajirakumari Samarathunga
10:00–10:15	DPP as an Accompanying System	Aiman Al Masoud
10:15–10:30	SME Readiness & ESPR Alignment	Simon Yoyo Zink
10:30–10:45	Reducing Barriers to DPP Adoption	Stephan Schaefer
10:45–11:00	Accelerating Regulatory Compliance for SMEs	Natalia Konchakova
11:00–11:30	*Coffee Break and Networking*	
11:30–12:30	**Session 4: DPP in Practice - Platforms**	*Chairs: S. Belouettar & M.T. Horsch*
11:30–11:45	DPP Research & Innovation in Austria	Andreas Herbst
11:45–12:00	Consumer Demand & Regulatory Pressure	Sophie Preisig
12:00–12:15	DPP for Remanufacturing & Circularity	Abdelrahman Abdalla
12:15–12:30	The Digital Material Passport Proof of Concept	Adrian von Mühlenen
12:30–13:45	*Lunch Break*	

13:45–14:00	**Advanced Materials Policy & Infrastructure**	Wide Hogenhout (**DG RTD**)
14:00–15:00	**Session 5: Digital Infrastructure / Materials Commons**	*Chair: P. Klein & H.A. Preisig*
14:00–14:15	MaterialsCommons4EU Semantic Infrastructure	Simon Stier
14:15–14:30	FAIR Materials Knowledge in DPP	Jesper Friis
14:30–14:45	Trustworthiness for Secondary Markets	Raul Carlsson
14:45–15:00	Interoperability in DPP Info Exchange	Martin T. Horsch
15:00–16:00	**Session 6: SSbD and DPP Challenges**	*Chair C. Guerreiro & F. Pirker*
15:00–15:15	Characterising Transformations	Steffi Friedrichs
15:15–15:30	Integrating SSbD Principles	Cyrille Durand
15:30–15:45	Digital Product Passports Deep-Dive	Thomas Exner
15:45–16:00	Shaping ESPR-Ready Products	Lya Soeteman-Hernandez
16:00–16:15	*Coffee Break and Networking*	
16:15–17:15	**Session 7: Industry Data Ecosystem**	*Chair: A. Langle & M. Böll*
16:15–16:30	AAS/RDF Interoperability Solutions	Carolynn Bernier
16:30–16:45	FACTORY-X: Open Ecosystem for Manufacturing	Christoph Attila Kun
16:45–17:00	Battery Passports under EU Regulation	Cyrine Soufi
17:00–17:15	Addressing SME Barriers to Adoption	Maximilian Kühn
17:15–17:45	**Honor Lecture: A View on DPP Handling**	Heinz A. Preisig
17:45–18:00	Pan-European Materials Informatics Network (COST Action)	Francesco Mercuri
18:00–20:00	**Poster Session & COST Action Networking**	F. Mercuri & M. Hernandez

3 June 2026 — Day 3: Transformations & Business Models

Time	Activity / Session Topic	Speaker / Lead
09:00–09:20	**Keynote: Advanced Materials Need Advanced Diversity**	Nuria Cinca
09:20–10:35	**Session 8: Women in Materials and Digitalization (Part 1)**	*A. Akagic & Y. Barcelona*
09:20–09:35	Copper Life Cycle Efficiency	Miriam Eisenbart
09:35–09:50	Compliance Document Realities	Anna Elert
09:50–10:05	Women Empowerment in Standardization	Fatoumata Sangare
10:05–10:20	DPP for Recycled Content	Burcu Adsay
10:20–10:35	The Construction sector's DPP	Cecilia Groth
10:35–10:50	*Coffee Break*	
10:50–12:00	**Session 8: Panel - Women in Materials and Digitalization (Part 2)**	Y. Barcelona
10:50–11:10	**Input Talk: Research questionnaire "Women in Materials Science and Digitalisation"**	Yvonne Barcelona
11:10–12:00	**Panel Discussion on Power of Women for Advanced Digital Society** Nuria Cinca (HYPERION Materials & Technologies), Amila Akagic (EUMINE, University of Sarajevo), Cristina B.B. Guerreiro (CE-RISE project, NILU), Miriam Eisenbart (Kupfer-Digital Project).	Yvonne Barcelona
12:00–13:00	*Lunch Break*	

13:00–13:20	**Keynote: How can the European Business Wallet support the DPP?**	Alina Radu (**DG CNECT**)
13:20–14:20	**Session 9: From Research to Commercial Valorisation**	*F. Pirker & S. Belouettar*
13:20–13:35	EcoPlast: Integrated Solution for Automotive	Farhadur Arifin
13:35–13:50	PSS-Pass: Product-Service Systems	Marta Calderaro
13:50–14:05	Digital Business Models for DPP Platforms	Franz Pirker
14:05–14:20	Printed Electronics Commercial Valorization	Argiris Laskarakis
14:20–14:30	*Break*	
14:30–15:50	**Panel Discussion on the Future of DPPs: *Common Insights and Cross-cutting Challenges*** Sophia Fantechi (DG RTD, European Commission), Alexandru Ion (DG GROW, European Commission), Thomas Ebert (DG CNECT, European Commission), Hans-Christian Eberl (DG RTD, European Commission), Giuseppe Giovanni Daquino (HaDEA, European Commission), Paolo Bondavalli (EISMEA, European Commission), Eva-Kathrin Schillinger (IAM-I / IAM4EU Partnership), Thomas Knothe (JTC-24).	Natalia Konchakova
15:50–16:10	**Open Microphone Session**	Salim Belouettar
16:10–16:30	**Plenary Dialogue & Recommendations**	N. Konchakova & M. Schreck
16:30	**Wrap-up & End of Conference**	—

POSTER TALK PROGRAMME

Supported by EuMINe COST Action Networking Event.

June 02, 18:00 - 20:00

Note: Due to the high number of presentations, talks will proceed strictly at 2-minute intervals. Presenters are requested to be ready at the podium 1 minute before their slot.

BLOCK 1: Architecture & Interoperability

18:00	High-Level Architecture Design of DATA4CIRC	**Wan Li**
18:02	DPP Implementations: Technical Components	**Behzad Behdani**
18:04	From MaterialDigital to European Materials Commons	**Jörg Schaarschmidt**
18:06	RDF/OWL Vocabularies for Standardisation	**K. Boutillier**
18:08	Handling Missing Data in Digital Systems	**Amir Taherkordi**
18:10	Semantic Interoperability Barriers - Textile DPP	**Jerome Dierickx**
18:12	STREP: Strengthening Traceability and Data Transparency	**Mette Kirk**

BLOCK 2: Sector Applications

18:14	Construction Sector: Lessons Learned	**Jose Lucas Masero**
18:16	Steel Sector: DPP and Green Steel	**Boriana Rukanova**
18:18	Fashion Industry Practice & Compliance	**Sara Ongaro**
18:20	Technical Plastics Implementation	**Roman Wurz**

BLOCK 3: Policy, Economy & Strategy

18:22	Minimum Viable Ecosystem for Neodymium Circularity	**Viola Gallina**
18:24	Implementation Pathways for the DPP	**Niklas Hoffmann**
18:26	Journey to Operational Readiness	**L. Lekawska-Andrinopoulou**
18:28	Emerging EU Sustainability Regulations	**Doruk Sahinel**
18:30	Producer Responsibility Organizations	**Amelie Gombeaud**
18:32	Potential of DPP for Authorities	**Susana Wong-Chan**
18:34	DPP as a Strategic Asset	**Rebecca Blach**

BLOCK 4: Materials, Products & Readiness

18:36	Smart Recycling: EFRE Research Project	**Julian Hassl**
18:38	The Data Paradox in SME Textile Companies	**Jakub Jamný**
18:40	Cross-Project Use Case Assessment	**Bernhard Bergmair**
18:42	ARGONAUT: Environmental Impact Assessment	**Milenko Tosic**
18:44	DPP Standardisation for SMEs: DPP4CD project	**Jirka Rajme**
18:46	Steel Sector DPP: Scalable, Enforceable, and Economically benefits	**Stefan Grüll**
18:48	Company-Level DPP Implementation Readiness	**Eva Koenders**
18:50	Data Foundations for Digital Product Passports	**Sebastian Ch. Szczudlo**

BLOCK 5: Discussion & COST Action Networking Event

18:50	Discussion of Posters & COST Action Networking Event	**20:00**

Day 1 - Session 1: Eco-design Methodology for DPP Data

ID: S1-1

Title: Actor-Specific Data Requirements for Circular Textile Value Chains under the ESPR

Time: 13:10-13:25

Project Reference: TRUSTex Research

Paul Breiner
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Abstract: Recital 1 of the Ecodesign for Sustainable Products Regulation (ESPR) highlights the transition towards circular economy business models, aiming to "make sustainable products the norm". Data availability and traceability are key enablers of this shift from a linear to a circular textile value chain. Achieving this transition requires behavioural changes among relevant actors, supported by reliable Digital Product Passport (DPP) data.

The third milestone of the JRC Preparatory Study for Textiles suggests that future DPP requirements will depend not only on defining relevant indicators (e.g. robustness), but also on establishing actor-specific data generation and communication practices that make these indicators operational, verifiable, and relevant for decision-making across the textile life cycle.

Based on this background, the contribution addresses actor-specific data needs through the question: "Which actor needs to provide which information, when, to whom, and in what form, in order to enable Circular Economy Business Models aligned with the EU Textiles Strategy?"

To answer this question, the TRUSTex research team analysed cases derived from central circular business model logics discussed in Coscieme et al. (2022), complemented by cross-cutting cases addressing transversal data dependencies.

The results show that achieving circularity objectives depends on sufficiently granular and verifiable data, as well as on how this data is structured and exchanged. The DPP therefore functions not merely as a compliance repository but as an infrastructure for contextualised information exchange that increases accountability and trust across the value chain. Although the ESPR does not explicitly require a "Bill of Materials" or "Bill of Chemicals", its traceability provisions effectively imply such datasets, forming the informational basis for circular strategies and enabling eco-modulated Extended Producer Responsibility (EPR) schemes. This turns DPP data into economic incentives, thereby connecting the information layer with EPR logic.

Keywords: Digital Product Passport (DPP), ESPR, Circular Economy, Textile Value Chain, Data Traceability, Extended Producer Responsibility (EPR), Sustainability, Data Governance

ID: S1-2
Time: 13:25-13:40

Title: Integrating Ecodesign Methodology and Digital Product Passports for Sustainable Textile Systems

Raquel Santos
CITEVE - Technological Centre for the Textile and Clothing Industry of Portugal, Portugal
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Abstract: The transition towards more sustainable textile systems requires design methodologies capable of translating emerging sustainability and circularity requirements into practical product development processes. European policy frameworks, including the EU Strategy for Sustainable and Circular Textiles and the Ecodesign for Sustainable Products Regulation (ESPR), place product design at the centre of this transition by promoting durability, repairability, recyclability, and improved product information across the lifecycle. In this context, the Digital Product Passport (DPP) emerges as a key instrument to support transparency and traceability across textile value chains.

This study develops an ecodesign methodology for textile product development, integrating circularity requirements at the design stage while structuring product information for DPP implementation. The methodology is organised around five interconnected decision domains: client requirements, product purpose and use context, design and development options, supply chain configuration, and alignment with circular business models.

Grounded in existing ecodesign strategies, the framework incorporates waste reduction, recycled content utilisation, low-impact and proximity production, durability, material compatibility for recycling, and biodegradability/compostability. Pilot case studies in apparel, home/interior textiles, and technical textiles test the methodology using industry performance criteria, circularity indicators, and product data relevant for DPP systems. Preliminary results show a mutually reinforcing relationship, whereby integrating ecodesign and DPP data supports more informed circular design practices and generates structured product information.

Keywords: Digital Product Passport, Ecodesign, Circularity, Sustainable Textiles, Product Development, Lifecycle Data, Traceability

ID: S1-3
Time: 13:40-13:55

Title: Integrating Life Cycle Assessment Data into Digital Product Passports: Methodological and Structural Considerations
Project Reference: Leiden University Study

Berend Mintjes
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Abstract: Digital Product Passports (DPPs) are tools for digitally transferring information along value chains. DPPs can support Life Cycle Assessments (LCAs) by improving data availability and reducing the burden of data collection along supply chains. Embedding life cycle inventory (LCI) data within DPPs has the potential to enhance transparency and standardisation of product sustainability reporting. However, integrating LCI and LCA data into DPPs raises methodological and structural questions regarding how environmental information should be collected, organised, and communicated.

This study investigates potential pitfalls and solutions for incorporating environmental footprints in DPPs. Data requirements for Product Environmental Footprint (PEF)-compliant LCA studies are outlined for both output data (PEF results) and input data (unit process LCIs and product system parameters), and translated to a DPP system. From this, a comprehensive data structure for unit process LCI data (inputs) and LCA results (outputs) is derived, enabling standardisable, PEF-compliant environmental impact calculation.

The relevance of this data structure is demonstrated through two case studies: printer cartridges and heat pumps. By comparing applications across these product categories, the study shows the general applicability of the data structure and concludes with recommendations for implementing sustainability indicators in DPP regulations and infrastructure.

Keywords: Digital Product Passport (DPP), Life Cycle Assessment (LCA), Product Environmental Footprint (PEF), Life Cycle Inventory (LCI), Sustainability Indicators, Data Structure, Environmental Reporting, Value Chains

ID: S1-4
Title: Operationalizing ESPR Requirements Through the Digital Product Passport
Time: 13:55-14:10

Setenay Saglam
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Abstract: The Ecodesign for Sustainable Products Regulation (ESPR) introduces the Digital Product Passport (DPP) as the instrument to implement, communicate, and monitor product requirements such as durability, repairability, recyclability, recycled content, and overall environmental performance in the EU market.

Regulatory requirements alone do not guarantee impact; their effectiveness depends on how they are translated into measurable, traceable, and structured data. Making data available is insufficient unless performance can be assessed consistently over time.

This presentation outlines a methodological approach to operationalize ESPR requirements. Regulatory provisions are analyzed and broken down into specific elements, from which product-level parameters are identified. These parameters are structured into measurable metrics, enabling quantification, comparison, and follow-up. Based on these metrics, the required DPP data fields are defined and organized.

By embedding regulatory objectives into product data, the DPP enables measurement, verification, and transparency along the value chain, supporting implementation, enforcement, and trust among manufacturers, repairers, recyclers, regulators, and consumers. The approach also addresses challenges in translating horizontal regulatory requirements into product-specific applications, highlighting bottlenecks and demonstrating how structured ecodesign practices strengthen synergy between ESPR and DPP implementation.

Keywords: Digital Product Passport, ESPR, Ecodesign, Traceability, Circular Economy, Product Metrics, Regulatory Compliance

Day 1 - Session 2A: Sector specific research

ID: S2-1-1

Title: Quishing at Scale and the DPP Trust Paradox: Ensuring Secure QR Codes for SMEs

Time: 14:55-15:10

Laurent Tonnelier, MOBILEAD, France
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Abstract 1: DPP Architecture and Framework — Quishing at Scale

The ESPR will mandate QR codes on all EU market products. As DPP adoption scales to billions of items, quishing — fraudulent redirection via tampered QR codes — becomes a systemic risk. Current QR standards (EN 18220, EN 18219) ensure data carrier type and identifier uniqueness but do not guarantee content authenticity. FprEN 18246 addresses this gap with the Electronically Signed Data Construct (ESDC), embedding verifiable digital signatures (DigSig, VDS, W3C VCs) within QR codes. This multi-scheme approach maintains interoperability, prevents vendor lock-in, and enables SME participation as service providers and economic operators.

Abstract 2: Obstacles, Challenges and Opportunities — The DPP Trust Paradox

QR codes, the physical interface of DPPs, are inherently vulnerable. Mandatory QR implementation paradoxically expands the attack surface, particularly affecting SMEs. They are simultaneously economic operators (exposed to attacks on their products) and service providers (risking exclusion if trust infrastructure is monopolized). This contribution draws on mobiLead's experience co-writing FprEN 18246 to highlight: (1) real-world quishing scenarios at DPP scale; (2) ESDC foundations and remaining gaps, including affordable tooling and SME-accessible certificate infrastructure; (3) the necessity of a diverse SME trust-provider ecosystem as a structural security requirement.

Keywords: Digital Product Passport, QR Code Security, EN 18246, ESDC, SME Trust, Quishing Prevention, Interoperability

ID: S2-1-2

Title: Consumer Engagement and Multi-Stakeholder Participation in Digital Product Passport Standardisation

Time: 15:10-15:25

Project Reference: CEN CENELEC JTC 24 – Digital Product Passport Framework and System

Bruce Farquhar
ANEC, the European consumer voice in standardisation *mvu@anec.eu*

Abstract: The success of European standardisation derives from multi-stakeholder consensus reflected in European Standards. Direct participation from economic operators, SMEs, trade unions, environmental groups, and consumer organisations provides diverse critical viewpoints and expertise, forming the foundation of credibility in European Standards.

This presentation demonstrates, through ANEC's involvement in CEN CENELEC JTC 24 'Digital Product Passport, Framework and System', how diverse stakeholder engagement adds value beyond the narrow interests of individual participants. ANEC, including national members, contributed to ensure that the DPP framework and system is open, interoperable, and consumer-centric, promoting accessible protocols, identifiers, data carriers, storage, and security. Improvements were suggested during the Enquiry, and a position paper was prepared on meeting consumer needs as DPP implementation advances.

Through consensus-building among consumer groups and collaboration with sister organisations, including Consumers International (CI), ANEC advanced open, interoperable, and consumer-centric DPP standards. Broader participation, especially from underrepresented groups, is critical to ensuring acceptability of results at both European and future international standardisation levels.

Keywords: Digital Product Passport (DPP), Standardisation, Consumer Engagement, Multi-Stakeholder, Interoperability, CEN, CENELEC, JTC 24, Governance, Inclusion

ID: S2-1-3
Time: 15:25-15:40

Title: From Digital Product Passport Frameworks to Real-World Implementation: Lessons Learned from Early PoC and Digital Assurance Models

Project Reference: RINA DPP Initiatives

Marco Palumbo
RINA *marco.palumbo@rina.org*

Abstract: The Digital Product Passport (DPP) is emerging as a cornerstone of the EU sustainable product policy framework, enabling transparency, traceability, and data-driven circularity across product value chains. While regulatory principles and high-level architectures are increasingly defined, the transition from conceptual frameworks to operational DPP implementations remains a critical challenge for industry stakeholders.

This paper presents insights gained from early Proofs of Concept (PoC) and pilot initiatives focused on the practical implementation of DPP solutions across multiple industrial sectors. The contribution explores how DPP concepts can be translated into scalable, interoperable, and regulation-ready digital systems, emphasizing the role of digital assurance in ensuring data reliability, consistency, and trust throughout the product lifecycle.

Key aspects addressed include the definition of minimum viable DPP datasets in the absence of fully finalized delegated acts, the integration of existing technical and sustainability documentation into DPP environments, and the orchestration of data flows among manufacturers, suppliers, and downstream actors. Particular attention is given to governance models that balance data accessibility with responsibility, clarifying roles and liabilities among data providers, platform operators, and independent assurance bodies.

The paper also discusses common barriers encountered during early DPP deployments, such as data heterogeneity, legacy system integration, and uncertainty around future regulatory requirements, while highlighting opportunities enabled by modular digital platforms and assurance-by-design approaches. By grounding the analysis in concrete use cases and operational experience, the contribution aims to support both policymakers and industry players in bridging the gap between DPP policy objectives and effective market adoption.

Keywords: Digital Product Passport (DPP), Traceability, Interoperability, Digital Assurance, Proof of Concept (PoC), Data Governance, Circular Economy, Sustainability

Day 1 - Session 2B: Globalisation

ID: S2-2-1
Title: Reference Architecture for Digital Product Passports in Apparel
Time: 16:30-16:45

Hadley Beeman, GS1 Global Office, Belgium
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Abstract: As Digital Product Passports (DPPs) transition from concept to implementation, companies require standards-based, interoperable architectures that function across complex, international value chains. This presentation introduces a reference case from the apparel sector, highlighting the Fiber Traceability Initiative conducted with Filippa K and partners across multiple EU Member States and third countries.
The initiative demonstrated the DPP journey, from capturing wool origin data to enabling consumer access via QR code, while aligned with JTC 24 standards. The architectural pattern proved effective in fragmented, cross-border value chains with actors of varying size and digital maturity.
Although primarily focused on production and upstream transparency, with limited end-of-life coverage, the case provides transferable lessons for other sectors. It validates architectural choices in horizontal DPP standards and demonstrates practical scalability across Europe's diverse industrial landscape.

Keywords: Digital Product Passport, Reference Architecture, Traceability, Apparel, JTC 24, Cross-Border Supply Chains

ID: S2-2-2
Title: Realizing JTC 24 DPP Standards with the Asset Administration Shell
Time: 16:45-17:00

Juilee Tikekar & Birgit Boss
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Abstract: The EU's Ecodesign for Sustainable Products Regulation (ESPR) requires a Digital Product Passport (DPP), with foundational standards defined by CEN-CENELEC JTC 24. This paper demonstrates how the Asset Administration Shell (AAS), the standardized digital twin for Industrie 4.0 (IEC 63278), provides a mature solution to implement these standards.
The AAS's modular architecture, using submodels, is ideal for diverse DPP data requirements. Its suitability is recognized in standards like prEN 18216. The AAS framework directly addresses JTC 24's domains: its data model enables interoperability via facades, mandates unique identification, and supports granular security.
Submodels provide the required semantics for specific regulations, such as the EU Battery Passport, with standardized templates (e.g., DIN SPEC 99100) already available. As an enabling service in dataspaces like Catena-X, the AAS allows economic operators to pull required data from suppliers, enabling the assembly of a complete and compliant DPP.
Adopting the AAS provides a clear implementation path for ESPR compliance, transforming a regulatory burden into a value-generating digital asset that enhances supply chain transparency and sustainability.

Keywords: Digital Product Passport, Asset Administration Shell, JTC 24 Standards, ESPR Compliance, Digital Twin, Interoperability, Supply Chain Transparency

ID: S2-2-4
Time: 17:15-17:30

Title: Lessons Learned from DPP Implementation in the Textile, Clothing, Leather, and Footwear Sector

Francesco Sollitto, Amsterdam University of Applied Science, Netherlands
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Abstract:
As the Digital Product Passport (DPP) approaches large-scale implementation across industries, lessons from the Textile, Clothing, Leather, and Footwear (TCLF) sector illustrate the technical and organizational complexities involved. This work analyzes two nationally funded projects in the Netherlands, addressing DPP information flows in both early textile production and use-phase data collection.
The study introduces a holistic framework visualizing the DPP-enabled data exchanges among diverse stakeholders in the TCLF ecosystem. Life cycle stages—production, use, and post-use—pose distinct challenges in data collection, verification, and interoperability. The DPP facilitates access to previously unavailable or fragmented data, including granular product details, geographic supply-chain routes, user interactions (e.g., design feedback, product longevity), and recycled material volumes.
The essay emphasizes the importance of multi-stakeholder collaboration between manufacturers, recyclers, and IT service providers. By enabling transparent and standardized information flows, the DPP supports stronger local industrial hubs, encourages circularity in textile production and recycling, and promotes equitable participation across businesses of varying sizes.

Keywords: Digital Product Passport, Textile Industry, TCLF, Data Exchange, Supply Chain Transparency, Circular Economy, Multi-Stakeholder Collaboration

ID: S2-2-4
Time: 17:15-17:30

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Francesco Sollitto, Amsterdam University of Applied Science, Netherlands
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Keywords: Digital Product Passport, Textile Industry, TCLF, Data Exchange, Supply Chain Transparency, Circular Economy, Multi-Stakeholder Collaboration

ID: S2-2-5
Time: 17:30-17:45

Title: BatteryPass-Ready: Creating a Test Environment for the EU Battery Passport

Manuela Hafner, Johannes Simböck & Jonathan Fritz, acatech / BatteryPass-Ready, Germany
hafner@acatech.de

Abstract:
The BatteryPass-Ready project develops a test environment to support the implementation of the EU Battery Passport, a Digital Product Passport (DPP) mandated for batteries above 2 kWh in electric vehicles, light transport, and industrial applications from February 18, 2027.
The project translates regulatory and technical DPP requirements into practical, testable scenarios, enabling manufacturers, IT service providers, and other stakeholders to assess compliance with data completeness, structure, format, and interoperability specifications. The environment is informed by user stories and test scenarios that reflect current legislative and standardization developments.
With contributions from over 100 international partners, the test environment supports validation of battery passport data attributes and ensures readiness for real-world deployment. The project plans to publish user stories and make the test environment publicly available in June 2026. The presentation highlights the design rationale, foundational assumptions, challenges in development, and practical demonstration of the test environment, offering organizations a concrete tool to prepare for EU DPP compliance in the battery sector.

Keywords: Digital Product Passport, Battery Passport, EU Regulation, Test Environment, Data Validation, Interoperability, Battery Lifecycle, BatteryPass-Ready Project

Day 1 - Session 2C: Solution for challenges

ID: S2-3-1
Time: 18:20-18:35

Title: Enabling Globally Interoperable Digital Product Passports for ICT Goods via ITU Standards

Project Reference: ITU-T Standardization Initiatives, Study Groups 5 20

Reyna Ubeda
International Telecommunication Union *reyna.ubeda@itu.int*

Abstract: The transition toward a circular and sustainable digital economy requires interoperable Digital Product Passports (DPPs) supported by globally harmonized standards. The International Telecommunication Union's Telecommunication Standardization Sector (ITU-T) contributes to this effort through the development of international standards enabling transparent lifecycle information, circularity metrics, and scalable data infrastructures for ICT goods.
Within ITU-T Study Group 5 (Environment, EMF, Climate Action and Circular Economy), standards such as Recommendations ITU-T L.1070 and L.1071, developed in collaboration with ETSI, provide a globally aligned framework for product-related digital information and circularity data models for ICT goods. Complementing these standards, ongoing work addresses the development of Digital Product Information Systems (DPIS) and consumer-oriented Digital Product Passports, while additional standards on eco-design and circular economy assessment support material efficiency, circularity performance metrics, and design-for-circularity principles.
In parallel, ITU-T Study Group 20 develops system architecture and implementation perspectives for Digital Product Passports for ICT goods, including requirements for interoperable platforms and open-source implementations.
Together, this work contributes to a globally interoperable ecosystem for Digital Product Passports, supporting alignment with regulatory frameworks such as the EU Ecodesign for Sustainable Products Regulation (ESPR) while enabling international scalability. By linking eco-design methodologies, lifecycle sustainability data, and digital infrastructures, ITU standards aim to support industry, policymakers, and stakeholders in implementing robust DPP systems that accelerate circularity and sustainable digital manufacturing.

Keywords: Digital Product Passport (DPP), ICT, ITU-T, Circular Economy, Interoperability, Standards, Lifecycle Information, ESPR, DPIS

ID: S2-3-2
Time: 18:35-18:50

Title: Enabling Global Interoperability of Digital Product Passports through UNECE Recommendation-49 and the UN Transparency Protocol

Nancy Norris
UN Center for Trade Facilitation and E-Business (UN/CEFACT), Canada
nancy.norris@gov.bc.ca

Abstract: This session explores how Digital Product Passport (DPP) systems can interoperate across sectors and borders to achieve global adoption and support the transition to a circular, sustainable economy. UNECE Recommendation-49 provides a governance framework for transparency at scale—from credible sustainability claims to reliable data enabling risk-based due diligence, positioning DPPs as a key instrument for these outcomes.

In Europe, DPPs have become the structured, machine-readable carrier of all regulated product information, driven by the Circular Economy Action Plan, Batteries Regulation, and the Ecodesign for Sustainable Products Regulation. The Competitiveness Compass further highlights the DPP's strategic importance within EU industrial and trade policy.

To ensure global alignment and interoperability, the EU DPP requires integration of high-integrity, standardized, verifiable supply chain data beyond EU borders. The UN Transparency Protocol (UNTP), developed in alignment with Recommendation-49, provides the technical architecture for interoperable, verifiable data exchange, enabling globally sourced, high-integrity supply chain data to feed into the EU DPP.

Implementing this alignment positions the EU DPP to meet expectations of global trading partners—including Canada, Mercosur economies, India, China, and Japan—while reducing friction for exporters and importers. Convergence of policy, standards, and harmonized implementation is essential as governments strengthen transparency and circularity requirements worldwide.

Keywords: Digital Product Passport, Interoperability, UNECE Recommendation 49, UN Transparency Protocol, Circular Economy, Supply Chain Data, Global Trade

Day 2 - Session 3: Barriers & Opportunities for Uptake

ID: S3-1

Title: Digital Passport Model Assessment Workbench: SHACL-Based Metrics for Comparative Assessment of Digital Passport Data Models and Use-Case Coverage

Time: 09:15-09:30

Riccardo Boero, NILU – Norwegian Institute for Air Research, Norway
Miguel Las Heras Hernández, NILU – Norwegian Institute for Air Research, Norway
ribo@nilu.no, mher@nilu.no

Abstract:
Digital Product Passports (DPPs) and Digital Material Passports (DPs) share converging data model requirements, yet development often lacks reproducible methods to monitor evolution, compare alternatives, and prioritize improvements. This bottleneck affects initiatives maintaining many interconnected models with thousands of data points.
We present the Digital Passport Model Assessment Workbench, a SHACL-based approach that computes a multi-metric instrument panel from SHACL model specifications (shapes, properties, datatypes, constraints), enabling transparent comparison of model variants and releases without needing representative datasets. Key metrics include:

- Size and structural complexity.
- Explicitness/constraint readiness (typed, cardinality-bounded vs. open).
- Structural interoperability in modular ecosystems (cross-module references, shared vocabulary overlap).
- Maintainability signals (contradictions, dangling references, redundancy candidates).

The approach also assesses selected use cases via SHACL-only coverage mapping: required information items and concept links ("joins") are evaluated for representability, datatype/format adequacy, and constraints. Results provide prioritized improvement targets and a roadmap for optional data-driven extensions, including instance-based validation and mapping preservation metrics.

Keywords: Digital Product Passport, Digital Material Passport, SHACL, Data Model Assessment, Interoperability, Metrics, Use-Case Coverage, Model Validation

ID: S3-2

Title: Leveraging Semantic Materials Models for Digital Product Passport Integration

Time: 09:30-09:45

Kiran Kumaraswamy & Yoav Nahshon, Fraunhofer Institute for Mechanics of Materials (IWM), Germany
yoav.nahshon@iwm.fraunhofer.de

Abstract:
Current exchange of materials information across companies relies heavily on emails, PDFs, and proprietary tools, causing duplicated effort, inconsistent data, and delays. European regulations, including Digital Product Passports (DPPs), demand structured, trustworthy, and machine-readable data along the value chain.
This contribution demonstrates how semantic technologies can bridge the gap between materials innovation and DPP implementation. Using the Materials Commons concept, data from experiments and simulations are semantically encoded to enable interoperability across organizations. Asset Administration Shell (AAS) frameworks, implemented via platforms such as Eclipse BaSyx, provide standardized technical structures, while semantic models capture properties, processes, and testing conditions in machine-understandable form.
Insights from the PMD-X-MAPRO project show integration of semantic materials models into AAS-based data spaces, enabling reuse of R&I data for compliance, sustainability reporting, and DPP provisioning. This reduces manual effort, accelerates innovation, and offers a scalable pathway from lab-generated materials data to DPP-ready products.
The session also addresses gaps in standards and governance, and outlines steps toward a coherent European framework for semantic enablement in materials data and DPP infrastructures.

Keywords: Digital Product Passport, Semantic Interoperability, Materials Data, Asset Administration Shell, PMD-X-MAPRO, Compliance, R&I Data, Materials Commons

ID: S3-3

Title: Integrating Machine Learning and Dynamic Modelling for Battery Digital Product Passports

Time: 09:45-10:00

Liyanapathiranage Sudeepika Wajirakumari Samarathunga
NMBU, Norway *sudeepika.wajirakumari.samarat.liyanapathiranage@nmbu.no*

Abstract: The transition toward Digital Product Passports (DPPs) requires more than regulatory alignment and data standardization; it demands modelling frameworks that translate complex real-time system behaviour into actionable insights for decision makers across the battery value chain. This work presents ongoing research integrating machine learning formalisms for dynamic systems with actionable modelling in real-time digital environments, highlighting relevance for DPP initiatives.
Current discussions emphasize data interoperability and compliance architectures, yet limited attention is given to dynamic system models that capture degradation, performance evolution, and operational variability. We develop approaches bridging data-driven and physics-informed representations of battery systems, enabling real-time interpretation of lifecycle states. These models support actionable outputs for sustainability metrics, second-life assessment, and circularity strategies.
In parallel, collaborative activities facilitate experience exchange on commercialization pathways for DPPs. By linking dynamic modelling, digital infrastructure, and governance considerations, this work strengthens materials digitalization and advances scalable, robust passport ecosystems for battery technologies. Architectural implications, interoperability challenges, and opportunities for embedding machine-learning-enabled digital twins within future European passport frameworks are discussed.

Keywords: Digital Product Passport, Battery Modelling, Machine Learning, Digital Twins, Circular Economy, Lifecycle Assessment

ID: S3-4
Time: 10:00-10:15

Title: Graph-Based Retrieval-Augmented Generation for Supporting JTC24 Standards Implementation in Digital Product Passports
Project Reference: CEI (Comitato Elettrotecnico Italiano) - Università di Pavia

Aiman Al Masoud
CEI (Comitato Elettrotecnico Italiano) - Università di Pavia, Italy
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Abstract: Digital Product Passports (DPPs) require structured product information across the value chain, as mandated by the Ecodesign for Sustainable Products Regulation (ESPR). Understanding the JTC24 standards and their extensive references is critical for implementers.
This work presents a tool based on Retrieval-Augmented Generation (RAG) to support engineers in navigating and implementing JTC24 standards. The tool visualizes interdependencies among existing standards, providing an intuitive interface to explore the complex web of normative documents.
While standard vector-based RAG relies on semantic similarity, technical standards pose challenges due to domain-specific lexicons and dense cross-references. We explore Graph RAG, which encodes standards as nodes and edges, enabling relation-aware retrieval rather than simple similarity-based search. Various graph-based indexing strategies are evaluated to identify low-latency approaches that embed document structure into retrieval workflows.
The resulting tool provides a lightweight, practical, and transparent mechanism for stakeholders to access, navigate, and understand the European DPP framework efficiently, supporting compliance and effective system implementation.

Keywords: Digital Product Passport, JTC24 Standards, Retrieval-Augmented Generation, Graph RAG, Technical Standards, Interoperability, Knowledge Navigation

ID: S3-5
Time: 10:15-10:30

Title: Assessing SME Readiness for Digital Product Passport Implementation under the ESPR
Project Reference: BAM DPP Readiness Study

Simon Yoyo Zink
Bundesanstalt für Materialforschung und -prüfung (BAM) *simon-yoyo.zink@bam.de*

Abstract: The Ecodesign for Sustainable Products Regulation (ESPR) mandates Digital Product Passports (DPPs) for most physical products, with first implementations expected from 2027. While DPPs promise verified lifecycle information, interoperability, and support for circular economy strategies, their implementation requires small and medium-sized enterprises (SMEs) to develop new capabilities for collecting, managing, and sharing product-related information. However, there is limited empirical evidence on how firms are preparing for this transition and which conditions support successful implementation.
This study addresses this gap through a survey targeting SMEs in DPP-relevant sectors across Europe. The questionnaire collects general firm information and captures the current status of DPP-related activities. It further assesses firms' readiness to implement DPPs and examines drivers, barriers, and practical implementation challenges related to technological, organizational, and external conditions. In addition, the survey explores firms' support needs, potential strategic uses of DPPs, and the digital technologies considered necessary for implementation.
The study analyses how different factors influence SMEs' readiness and capability development. The results aim to provide (i) a structured framework for assessing SME readiness for DPP implementation, (ii) empirical evidence on key challenges and enabling conditions, and (iii) practical insights for policymakers, standards bodies, and industry support initiatives. The project also seeks to develop a practical DPP readiness score that enables firms to assess their preparedness and identify improvement pathways.

Keywords: Digital Product Passport (DPP), ESPR, SMEs, Readiness Assessment, Circular Economy, Data Management, Interoperability, Digital Transformation

ID: S3-5
Time: 10:15-10:30

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Simon Yoyo Zink
Bundesanstalt für Materialforschung und -prüfung (BAM) simon-yoyo.zink@bam.de

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Keywords: Digital Product Passport (DPP), ESPR, SMEs, Readiness Assessment, Circular Economy, Data Management, Interoperability, Digital Transformation

ID: S3-6
Time: 10:30-10:45

Title: Reducing Barriers to Digital Product Passport Adoption through Role- and Maturity-Based Learning Pathways

Stephan Schaefer, HTW Hochschule für Technik und Wirtschaft Berlin, University of Applied Science, Germany
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Abstract:

The Ecodesign Regulation (EU) 2024/1781 introduces substantial challenges for SMEs implementing Digital Product Passports (DPPs). Key barriers include insufficient product and lifecycle data, lack of interoperable IT infrastructures, and limited organizational competencies. Compliance obligations, system integration requirements, and resource constraints further exacerbate adoption difficulties.

This contribution identifies three core gaps impeding DPP implementation: 1. **Data gap:** Complete, quality-assured lifecycle data are often unavailable. 2. **System gap:** Interoperable, standardized IT infrastructures for seamless data integration are lacking. 3. **Competency gap:** Organizations frequently lack qualified personnel and implementation capabilities.

To address these barriers, the paper introduces role- and maturity-based learning pathways. These pathways, previously applied successfully in digital twin knowledge transfer, are adapted for cross-domain DPP adoption. By aligning learning interventions with organizational roles and maturity levels, SMEs can systematically reduce the legal, technical, and expertise-related challenges associated with DPP deployment.

The approach emphasizes that DPP adoption is a company-wide transformation rather than a simple IT implementation, providing a structured framework to enable SMEs to meet regulatory requirements and enhance lifecycle data management capabilities.

Keywords: Digital Product Passport, SME Adoption, Ecodesign Regulation, Data Gap, System Gap, Competency Gap, Role-Based Learning, Maturity-Based Learning

ID: S3-7
Title: Needs to Accelerate Regulatory Compliance for European SMEs
Time: 10:45-11:00
Project Reference: DigiPass Project

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Abstract: Accelerating the design, development, and upscaling of advanced materials should be a regulatory priority under the Advanced Materials Act. This requires cost-effective, cloud-based, and interoperable digital solutions such as digital product passport platforms, digital twins, predictive lifetime modelling tools (AI and physics-based), and AI-driven systems for automated regulatory updates.

The EU has defined strategic goals under the European Green Deal, many reflected in legislation. Key initiatives driving the accelerated roll-out of clean energy and manufacturing include the Data Act, AI Act, TEN-E Regulation, Critical Raw Materials Act, and Net Zero Industry Act. Relevant elements also appear in the Ecodesign for Sustainable Products Regulation (ESPR), particularly the forthcoming Digital Product Passports, which will soon need implementation across industrial sectors to support the circular economy. The twin green and digital transition is therefore becoming the foundation of future economic activity.

Companies in export-oriented European industry operate within complex European and global supply networks. Due to Europe's raw material shortages, securing industrial value creation requires continuous innovation in materials, manufacturing, and production, supported by imports of raw and recycled materials and intermediate products. This is essential for maintaining and regaining industrial leadership in a rapidly changing international context.

The DigiPass project emphasizes that advancing the development and production of advanced, safe, and sustainable chemicals and materials demands collaboration across value networks to enhance durability, R-strategies, and recyclability. This talk presents a proposal for SME support implemented on the DigiPass platform.

Keywords: Digital Product Passport (DPP), SMEs, Regulatory Compliance, Advanced Materials, DigiPass, Circular Economy, AI Tools, Interoperability

Day 2 - Session 4

ID: S4-1
Time: 11:30-11:45

Title: Digital Product Passport Research and Innovation in Austria: Insights from the PASSAT and PACE DPP Lighthouse Projects

Andreas Herbst, Association Industry 4.0 Austria – the Platform for Smart Production, Austria
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Abstract:
The Digital Product Passport (DPP) is becoming a central tool in Europe's circular economy strategy. Austria is advancing DPP implementation through two complementary lighthouse projects: PASSAT and PACE DPP.
PASSAT – Digital Product Passport Austria & Beyond – supports Austrian companies in adopting the DPP, promoting sustainable growth via circular economy principles and data-driven production. It provides practical solutions, regulatory recommendations, and training materials, piloting applications in textile, electronics, and ski industries. PASSAT ensures reliable lifecycle product data, laying the foundation for broad DPP adoption and national readiness for upcoming regulatory requirements.
PACE DPP focuses on the technological and regulatory realization of DPP-based data service ecosystems. Industrial use cases in electronics and wood/pulp/paper sectors leverage data spaces and digital twins to deliver lightweight, accessible DPP services, unlocking circular economy business models and accelerating market uptake aligned with the European Green Deal.
This contribution consolidates Austria's research and innovation activities in DPP, highlights synergies between PASSAT and PACE DPP, and situates these efforts within the broader European regulatory context, particularly the Ecodesign for Sustainable Products Regulation (ESPR).

Keywords: Digital Product Passport, Circular Economy, Austria, PASSAT, PACE DPP, Data Spaces, Digital Twins, ESPR, Industry 4.0

ID: S4-2
Time: 11:45-12:00

Title: Exploring Digital Product Passports in the Fashion Industry

Sophie Preisig
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Abstract: Increasing regulatory pressure and consumer demand for transparency are accelerating the adoption of Digital Product Passports (DPPs) in the fashion industry.
This study explores how a fashion retailer investigates potential DPP solutions to support regulatory compliance, supply chain traceability, and circular business models. The research examines technological and operational considerations for implementing DPP systems within existing retail infrastructure, focusing on data management and supplier integration.
Preliminary findings highlight opportunities such as improved supply chain visibility and consumer transparency, alongside challenges including data standardization, supplier participation, and integration with existing product information systems.

Keywords: Digital Product Passport, Fashion Industry, Supply Chain Traceability, Circular Business Models, Regulatory Compliance, Data Integration

ID: S4-3

Title: Remanufacturing-Oriented Digital Product Passports under the ESPR

Time: 12:00-12:15

Abdelrahman Abdalla, Politecnico di Milano, Italy
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Abstract:

Digital Product Passports (DPPs) are positioned as key enablers for circular economy strategies within the Ecodesign for Sustainable Products Regulation (ESPR). Remanufacturing, as a high-value circular strategy, requires detailed product information to manage subassembly and component variability. Current DPP approaches have not fully addressed operational support for remanufacturing workflows or generation of new DPPs for remanufactured parts.

This contribution presents a remanufacturing-oriented DPP data model developed in the Horizon Europe rEUman project. The model is structured around an Observation–Decision–Strategy–Evidence (ODSE) framework, capturing inspection results, routing decisions, and component transformations. It ensures consistent representation and persistence of data across interoperable DPP datasets and factory-level models.

The approach integrates lifecycle traceability, remanufacturing workflows, and product-centric datasets, aligned with emerging European DPP architectures and the CoreEUDPP ontology. It supports multi-level traceability across products, subassemblies, and components while preserving factory-level data ownership. Developed using industrial use cases in electronics and mechatronics, the model provides a reference architecture for implementing DPP-enabled remanufacturing systems and DPP-compliant data management platforms.

Keywords: Digital Product Passport, Remanufacturing, ESPR, Lifecycle Traceability, ODSE Framework, Interoperability, Electronics, Mechatronics

ID: S4-4
Time: 12:15-12:30

Title: From Idea to Proof of Concept – The Digital Material Passport as Upstream Product Information Exchange Tool and Enabler of DPPs

Project Reference: Chem-X Initiative

Adrian von Mühlenen
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Abstract: The chemical industry is present in about 95
Chem-X aims to meet these new product information requirements and support value chain actors in adopting a data-centric, not document-centric, approach based on the following principles:

- Common principles to define and describe core terms for the chemical industry to ensure compliance ("the right to sell") and communicate sustainability and circularity figures ("the right to win"), fostering semantic interoperability.
- A common technological understanding of identifying economic actors and chemical products and verifying their identities to establish trust.
- A shared understanding of the value added and benefits that Chem-X can generate in B2B product information exchange.
- Recognition of hurdles in data gathering and exchange by implementing proof-of-concept demonstrators based on industry-specific use cases (e.g., construction, textile, and packaging).

This paper highlights insights gained from the development of the digital material passport (DMP) as a machine-readable, semantically interoperable tool for product information exchange. A minimal set of product information was selected from Chem-X guidelines on Environmental Sustainability, Circularity, and Material Declaration to build the "Interoperability Test Case (ITC)" and demonstrate product information exchange across member companies. The transition from idea to concept revealed ambiguities in definitions and clarified the support businesses need to provide accurate product information.
To support technical implementation, Chem-X uses an information engineering approach: guidelines are atomized into entities, attributes, and relationships using Crow's Foot notation, with clear definitions, examples, and references to standards, directives, or regulations. This paper showcases the ITC DMP information engineering model, illustrating the method's principles, clarifying single-point definitions (SPoD), and engaging with the scientific and standardization expert community.

Keywords: Digital Material Passport (DMP), Digital Product Passport (DPP), Chem-X, Information Engineering, Semantic Interoperability, Circular Economy, Product Information Exchange, Sustainability

Day 2 - Session 5

ID: S5-1

Title: MaterialsCommons4EU: Linking Materials R&I Data Spaces with DMPs and DPPs

Time: 14:00-14:15

Simon Stier, Fraunhofer ISC, Germany
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Abstract: MaterialsCommons4EU, a Horizon Europe project, builds a federated digital infrastructure connecting isolated European materials R&I platforms to accelerate lab-to-fab transition. A key technical component is Object-Oriented Linked Data (OO-LD), merging JSON-SCHEMA and JSON-LD to enable structural validation, semantic annotation, code generation, and RDF export. Semantic interoperability leverages established ontologies (EMMO, PMDco), and a MaterialsDCAT-AP is developed for data cataloguing.
For industrial integration, OO-LD schemas align with Asset Administration Shell (AAS) and SAMM aspect models, using SHACL, OWL, LinkML, and DLite mappings. Complete process chains—from materials design and synthesis to manufacturing and product validation—are semantically modelled. Digital Product Passports (DPPs) and Digital Materials Passports (DMPs) are generated as snapshots of this enriched process data, enabling ESPR-compliant DPP creation as a by-product of rigorous R&I data management. Domain-specific implementations include battery and steel passports, with integration to openLCA for life cycle assessment and OPC-UA/LADS for IoT connectivity.
This contribution emphasizes semantic interoperability and integration, illustrating how deep process chain modelling bridges European materials R&I data spaces with DPP/DMP infrastructures.

Keywords: Digital Product Passport, Digital Materials Passport, Semantic Interoperability, OO-LD, Asset Administration Shell, Materials R&I, ESPR

ID: S5-3

Title: A Semantic Framework for Materials Knowledge in Digital Product Passports

Time: 14:15-14:30

Project Reference: EuMINe (CA22143), MatCHMaker (101091687), PINK (101137809), SFI PhysMet (309584)

Jesper Friis
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Abstract: This work presents a semantic framework for organising and documenting materials knowledge in a form suitable for Digital Product Passports. It spans all levels of semantic representation, from basic cataloguing to structural, contextual and semantic-level documentation, enabling materials data to become FAIR, explicitly interpretable, and ready for machine-actionable reuse. Documentation is stored in a knowledge base, while datasets and other resources remain distributed at their original locations. All resource types (materials, manufacturing processes, characterisation and modelling results, analysis, etc.) are semantically linked using the Elementary Multiperspective Material Ontology (EMMO) and its domain ontologies, ensuring alignment with established materials science knowledge structures. Datasets and executed workflows are additionally described using the widely adopted DCAT and PROV-O vocabularies for enhanced interoperability, complemented by the richer semantics provided by EMMO.
The framework is designed from the perspective of data producers, minimising effort while ensuring semantic richness. Users interact through a familiar spreadsheet-based interface, where column names are selected from a well-defined set of keywords. These keywords are internally mapped to ontological properties through a JSON-LD context, which can be extended to incorporate domain-specific terminology. Provided that the underlying data and associated resources are well-structured, spreadsheet generation and knowledge base population can be largely automated.
Funding from the EU's Horizon 2020 and Horizon Europe programmes is acknowledged via EuMINe (CA22143), MatCHMaker (101091687), and PINK (101137809), as well as from the Research Council of Norway via SFI PhysMet (309584).

Keywords: Digital Product Passport (DPP), Materials Informatics, Semantic Framework, FAIR Data, Ontologies, EMMO, Interoperability, Knowledge Base

ID: S5-3

Title: ABSolEU: Digital Material Traceability for ABS in Circular Economy

Time: 14:30-14:45

Raul Carlsson, RISE - RISE Research Institutes of Sweden, Sweden
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Abstract:
The Circular Economy Act (CEA) promotes the increased use of secondary materials, but market trust remains a challenge in both B2B and B2C contexts. For a Material Digital Product Passport (DPP) to serve as regulatory infrastructure under ESPR, material data must remain interpretable, comparable, and legally robust across all lifecycle stages. Unverified or outdated entries must be treated as claims pending verification according to ISO CASCO quality standards.
The ABSolEU data model addresses this need for Acrylonitrile Butadiene Styrene (ABS) by integrating standardized ISO ABS designation (EN 18064-7:2025) with a digital architecture that enables incremental requalification updates throughout the ABS lifecycle without overwriting material origin or history. Individual ABS components can be traced through circular loops and recycling stages, explicitly separating measured data, conformity assessment, and regulatory or market acceptance.
Implemented via ISO 10303 (STEP) product data exchange libraries, ABSolEU acts as a dynamic material memory rather than a static declaration. By combining standard-bound properties with parameter-level traceability and structured requalification, it ensures recyclate trust, cross-cycle comparability, and informed decisions for future use in alignment with the CEA framework.

Keywords: ABS, Digital Product Passport, Circular Economy, Material Traceability, Recycled Materials, ESPR, ISO Standards, Data Requalification

ID: S5-4

Title: Digital Product Passport Information Exchange Interoperability Infrastructure

Time: 14:45-15:00

Project Reference: DigiPass CSA

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Abstract: For Digital Product Passports (DPPs), it is essential to operate within a linked data environment that includes connections between DPP systems, as well as links to data sources, modelling tools, and platforms for key metrics required by the Ecodesign for Sustainable Products Regulation (ESPR) and other sector-specific regulations, such as the Batteries Regulation and delegated acts. Relevant platforms include the common European data spaces and the European Materials Commons.
DPP systems must support diverse data schemas and enterprise architectures used by manufacturers and responsible economic operators. This necessitates knowledge graph or data and metadata schema transformations and can greatly benefit from machine learning techniques for assisted annotation.
This contribution illustrates the DigiPass CSA perspective on building such an interoperability infrastructure, highlighting technical and organizational approaches to enable seamless exchange of DPP information across heterogeneous systems while supporting compliance with regulatory and sector-specific requirements.

Keywords: Digital Product Passport (DPP), Interoperability, Linked Data, Knowledge Graph, Machine Learning, Data Exchange, ESPR, DigiPass CSA

Day 2 - Session 6

ID: S6-1
Time: 15:00-15:15

Title: Identifying and Characterising Transformations Along the Material Life Cycle for Digital Product Passports
Project Reference: MACRAMÉ Project

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Abstract: Identifying and characterising transformations along the material life cycle is essential for their integration into Digital Material and Product Passports. The risk assessment of chemicals has traditionally focused on the pristine state of substances. However, the emergence of nanomaterials and advanced materials has introduced regulatory requirements that consider transformations occurring throughout the material life cycle. These include the need for detailed physicochemical characterisation and the assessment of structural, chemical, and physical changes as materials are integrated into products and interact with biological systems.
At the same time, policies promoting sustainability and circularity of chemicals, materials, and products call for a holistic life cycle perspective. This is reflected in frameworks such as Life Cycle Assessment (LCA), the Safe-and-Sustainable-by-Design (SSbD) framework, and the Ecodesign Regulation, all of which are closely linked to the implementation of Digital Product Passports (DPPs).
This presentation reports on results from the MACRAMÉ project, which developed methods for the identification, characterisation, and assessment of advanced materials within complex product and biological matrices representing different life cycle stages. These include production processes, use phases (including exposure to humans and the environment), and end-of-life treatments. Combined with systematic documentation of material histories, these methods enable the identification of key transformation stages that can be shared through Digital Material and Product Passports, provided by material producers and tier suppliers and integrated into the DPP of the final product.

Keywords: Digital Product Passport (DPP), Advanced Materials, Lifecycle Assessment (LCA), Safe and Sustainable by Design (SSbD), Material Transformation, Risk Assessment, Circular Economy, Sustainability

ID: S6-2
Time: 15:15-15:30

Title: Integrating SSbD Principles and DPP Requirements in the Development of Printable Electronics: Case Study of the ELEGANCE Project
Project Reference: EU ELEGANCE Project

Cyrille Durand
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Abstract: This study integrates the Safe-and-Sustainable-by-Design (SSbD) framework with Digital Product Passport (DPP) requirements defined under the Ecodesign for Sustainable Products Regulation (ESPR). Applying these frameworks during the early stages of innovation generates structured, lifecycle-relevant datasets that support safe and sustainable design while enabling comprehensive traceability for printable electronics.
DPP-relevant data were collected through SSbD and eco-design workflows. Over 80 chemicals and 10 processes were screened to identify hazardous substances, solvent-intensive steps, and operations with high exposure potential, leading to concrete improvements such as chemical substitution, process optimization, and enhanced worker protection. A set of 24 measurable eco-design indicators—covering human health, environmental sustainability, circularity, material and energy efficiency, critical raw materials, recyclability, and device functionality—were defined with minimum and optimal thresholds to guide design decisions. Design options were evaluated against these indicators to achieve optimal demonstrator performance, followed by a lifecycle assessment (LCA) to finalize the DPP dataset.
The study demonstrates that integrating SSbD principles with DPP requirements enables innovators to design safer, more sustainable products while producing traceable and transparent datasets documenting safety and sustainability performance across the value chain.

Keywords: Safe-and-Sustainable-by-Design (SSbD), Digital Product Passport (DPP), Printable Electronics, Eco-Design, Circularity, Lifecycle Assessment (LCA), Traceability, Sustainable Innovation

ID: S6-3
Time: 15:30-15:45

Title: Leveraging Digital Product Passports for Responsible Research and Innovation: Integrating SSbD Data Flows
Project Reference: PINK Projects

Thomas Exner
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Abstract: Although Digital Product Passports (DPPs) were initially introduced under Ecodesign regulations with limited safety and sustainability coverage, the supporting digital infrastructure offers an opportunity to transform DPPs into a tool for Responsible Research and Innovation (RRI), especially when complemented by Digital Material Passports (DMPs) that provide additional RRI-related information. Safe-and-Sustainable-by-Design (SSbD), recommended by the European Commission, can guide the content of this supplementary information.
SSbD takes a holistic view of the material life cycle and value chain, providing safety and sustainability profiles for raw materials, production, use, and end-of-life stages including recycling in circular systems. Collecting comprehensive SSbD data is challenging for individual value chain actors, making secure and trustworthy data/knowledge exchange essential. A DPP should contain the minimum information needed to enable recycling, remanufacturing, repair, refurbishing, and related activities. This includes details on chemicals, materials, and components used throughout production, which relies on effective information sharing via DPPs and DMPs.
The presentation will showcase how the technical, semantic, and quality assurance frameworks developed in the PINK projects can automate the provision of SSbD data to DMPs/DPPs for chemicals, materials, and intermediate products, while enabling extraction of relevant information to support SSbD-driven material and product development and optimization.

Keywords: Digital Product Passport (DPP), Digital Material Passport (DMP), Safe-and-Sustainable-by-Design (SSbD), Responsible Research and Innovation (RRI), Data Sharing, Circular Economy, Material Traceability

ID: S6-4
Time: 15:45-16:00

Title: Shaping ESPR-Ready Products Through Safe and Sustainable by Design: A Pathway to Circular, and Future-Ready Products

Project Reference: Safe and Sustainable by Design (SSbD), JRC Framework

Lya Soeteman-Hernandez
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Abstract: Safe and Sustainable by Design (SSbD), as defined in the European Commission's Joint Research Centre (JRC) revised framework, provides a comprehensive, anticipatory methodology that directly supports the implementation of the Ecodesign for Sustainable Products Regulation (ESPR). By embedding safety, sustainability, and circularity considerations at the earliest stages of product and material development, SSbD generates the evidence base needed to meet and operationalize ESPR's key product parameters.

The JRC framework guides innovators in designing products with greater durability, reliability, and repairability, while also enabling reusability, upgradability, remanufacturing, and refurbishment through early identification of design barriers and opportunities. Its structured assessment of hazards and sustainability impacts helps reduce substances of concern, improve resource and energy efficiency, and lower the environmental footprint across the full life cycle. SSbD also supports enhanced recyclability, increased recycled content, and reduced waste generation by aligning material choices and product architectures with circular end-of-life pathways.

By providing a transparent, science-based process for evaluating design options, SSbD strengthens regulatory preparedness, supports compliance with ESPR requirements, and accelerates the shift toward safer, more sustainable, and circular products across EU value chains. It therefore acts as a critical bridge between innovation, industrial strategy, and regulatory ambition—ensuring that products placed on the EU market are designed for long-term value retention, reduced environmental impact, and alignment with Europe's circular economy objectives.

Keywords: Safe and Sustainable by Design (SSbD), Ecodesign for Sustainable Products Regulation (ESPR), Circular Economy, Sustainability, Product Design, Regulatory Preparedness, Material Lifecycle

Day 2 - Session 7

ID: S7-1
Time: 16:15-16:30

Title: Building AAS/RDF Interoperability Solutions Thanks to Cross-Project Collaboration

Carolynn Bernier
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Abstract: The Digital Product Passport (DPP) serves diverse purposes: tracking and tracing products and raw materials, providing value chain information, simplifying reporting, enabling Circular Economy strategies, supporting customs and market surveillance, and informing procurement decisions. Achieving these goals depends on seamless access to relevant information, but breaks in data transfer or lack of access make these objectives difficult or costly to realize. Challenges multiply when considering non-European regions, each with distinct systems and technical standards.
Interoperability is thus a critical feature for successful DPP implementation. Two complementary approaches support semantic interoperability:

- **Asset Administration Shell (AAS)** – an international standard (IEC 63278) defining software structure, interfaces, and semantics for digital twins.
- **RDF-based Semantic Web technologies (W3C)** – leveraging controlled vocabularies and knowledge engineering for semantic alignment.

To foster convergence between AAS and RDF, a volunteer task force comprising members from 13 EU- and MS-funded projects (including DATA4CIRC, CIRPASS-2, CIR4FUN, RAASCEMAN, bi0SpaCE, EcoTCO, Semiconductor-X, ENCIRCLE, R-Evolve, PASSAT, DACE, PSS-Pass, Digipass CSA) was established. The task force aims to:

1. Understand the motivations and goals of each team,
2. Build a collective understanding of the current research landscape,
3. Support and accelerate ongoing efforts,
4. Provide an organized set of shared resources to aid interoperability work.

This collaborative approach demonstrates how cross-project engagement can strengthen DPP interoperability, reducing duplication and fostering technical alignment across international initiatives.

Keywords: Digital Product Passport, Interoperability, Asset Administration Shell, RDF, Semantic Web, Cross-Project Collaboration

ID: S7-2

Title: FACTORY-X: Developing a Sovereign B2B Data Ecosystem for Digital Product Passport Exchange

Time: 16:30-16:45

Christoph Attila Kun, Digital Data Chain Consortium, Germany
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Abstract:
The FACTORY-X project, funded by NextGenerationEU and the German Ministry for Economic Affairs and Energy, develops an open, sovereign B2B data ecosystem for product data exchange, with emphasis on factory outfitters and circular economy strategies. The consortium includes over 40 partners from SMEs, large corporations, and research institutions collaborating to optimize supply chains and enhance circularity.
Two key use cases highlight DPP implementation:
1. **Collaborative Information Logistics:** Establishes an industrial dataspace for secure, scalable product data exchange. Leveraging Industrial Digital Twins (AAS, IEC 63278-series) and Identification Links (ID-Link, IEC 61406-series), this architecture conforms with eight CEN/CENELEC DPP standards, enabling cross-company DPP exchange.
2. **Circular Economy:** Addresses missing end-of-life product data required by component manufacturers, machine builders, and factory operators to implement circular strategies. The use case focuses on transparent assessment of product condition, identification of suitable circular measures, and development of data-integrated services to support sustainable and economically sound lifecycle decisions.
The project is entering its final phase, providing insights into scalable B2B DPP deployment via digital twins and industrial dataspace architectures. The contribution also encourages knowledge exchange with other DPP initiatives to strengthen networks and accelerate circular economy adoption across industries.

Keywords: Digital Product Passport, Industrial Dataspace, Digital Twin, Circular Economy, B2B Data Exchange, Factory-X, Lifecycle Transparency, DPP Standards

ID: S7-3

Title: Semantic Architecture for Digital Battery Passports

Time: 16:45-17:00

Cyrine Soufi
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Abstract: The EU Battery Regulation (2023/1542) mandates Digital Battery Passports (DBPs) from February 2027, requiring complete lifecycle traceability for mobility and industrial batteries. Current DPP implementations face interoperability challenges, heterogeneous data formats, and limited automated support for circular economy decisions.
This work presents a modular semantic architecture for DBPs built on the Battery Life Cycle Ontology (BLCO), integrating domain-specific ontologies for each lifecycle stage. The Battery Production Ontology (BPO) comprises 100+ classes and 40+ relations covering materials, processes, agents, spatial and temporal contexts, leveraging W3C standards (RDF, OWL, SHACL) and AI-assisted data integration. The architecture extends to end-of-life processes via the BattReLife ontology, enabling cradle-to-cradle lifecycle modeling.
The system performs ontology-based, real-time Life Cycle Assessment, generating auditable carbon footprint calculations without external software. Automated reasoning supports optimal circular strategies (reuse, refurbishment, recycling) based on usage history. A federated knowledge graph ensures data sovereignty while supporting cross-actor queries via SPARQL endpoints. This approach demonstrates how semantic technologies combined with AI can transform regulatory compliance into actionable enablers for circular economy and European industrial sovereignty.

Keywords: Digital Battery Passport, Battery Life Cycle Ontology, Semantic Architecture, Circular Economy, Life Cycle Assessment, AI, Ontology-Based Reasoning

ID: S7-4
Time: 17:00-17:15

Title: Practical Implementation of Digital Product Passports for Consumer Electronics

Maximilian Kühn, Fraunhofer IOSB, Germany
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Abstract:
The Digital Product Passport (DPP) introduced by the ESPR aims to facilitate circular economy practices by providing accessible lifecycle information across value chains. However, many companies, particularly SMEs, lack feasible implementation strategies. This work presents an ongoing project focused on practical DPP deployment for consumer electronics, designed to benefit manufacturers, refurbishers, and consumers alike.
The approach integrates Asset Administration Shell (AAS)-based DPPs with a semi-automated generation process. DPP types are created via AI-assisted data extraction, while individual DPPs are instantiated through rule-based connections to existing product databases. Data exchange between stakeholders leverages a data space infrastructure that enforces role-specific access and retention policies.
A demonstrator using a refurbished laptop validates the system across the full DPP lifecycle, including automated creation, discovery, updates, and end-of-life handling via a role-dependent dashboard. The project also identifies circular business opportunities enabled by the DPP, analyzing the data, technology, and process requirements for these use cases.
Preliminary results show that combining AI-assisted type creation with rule-based instantiation reduces manual effort while maintaining robustness and efficiency. Data spaces provide a viable mechanism to balance transparency and confidentiality across stakeholders, allowing the DPP to not only meet regulatory requirements but also enable new service- and circularity-oriented business models.

Keywords: Digital Product Passport, Consumer Electronics, Circular Economy, Asset Administration Shell, AI-assisted Data Extraction, Data Spaces, Role-based Access, Lifecycle Traceability

Day 3 - Session 8

ID: S8-1
Time: 09:20-09:35

Title: Enhancing Efficiency and Sustainability of the Copper Life Cycle through Digital Representation of an Electrical Connector

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Abstract: Copper is a critical raw material with strategic importance, and demand is expected to double or triple by 2050 due to decarbonization, electrification, and digitalization. Enhancing copper circularity is therefore essential. This presentation introduces the "KupferDigital2" project, which develops a digital representation along the process chain of a demonstrator product, a bronze-alloy electrical connector, modeling its full life cycle.
The digital representation leverages tools from the "Platform MaterialDigital" project and includes domain-specific application ontologies, process modeling, material data, and sustainability data captured in knowledge graphs. One core goal is to develop a prototype Digital Product Passport (DPP) for the connector, including a suggested content structure and a unique material ID.
The talk summarizes the current project status, implemented technical solutions, and conceptual designs for the DPP prototype, aiming to support enhanced circularity and sustainability of copper through digital lifecycle representation.

Keywords: Copper, Digital Product Passport, Circular Economy, Lifecycle Modeling, Knowledge Graphs, Sustainability

ID: S8-2
Time: 09:35-09:50

Title: Enhancing Trust in Digital Product Passports through Verifiable Compliance Data
Project Reference: —

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Abstract: Relying solely on compliance documents does not ensure product safety or conformity. Certificates and EU Declarations of Conformity may be incomplete, inaccurate, or falsified if not based on verifiable testing and proper conformity assessment. With the introduction of Digital Product Passports (DPPs) as instruments for transparency in digital and circular value chains, ensuring trustworthy compliance information is critical.
A reliable DPP ecosystem requires a verifiable TIC (Testing, Inspection, Certification) trust domain that links actors—such as accreditation authorities and conformity assessment bodies (CABs), with product compliance data via cryptographically secured Verifiable Credentials (VCs). In this trust chain, accredited CABs perform TIC services and issue digitally verifiable conformity statements referenced in the DPP.
This framework reflects a Global Quality Infrastructure Trust Stack with three layers: 1) Quality Infrastructure – standards, metrology, accreditation, conformity assessment, and market surveillance; 2) Trust Infrastructure – digital identities, verifiable credentials, and trust registries enabling cryptographic validation; 3) Applications – Digital Product Passports and automated compliance checks.
By integrating quality and trust infrastructures, traditional trust marks are transformed into machine-verifiable evidence. The presentation outlines a trust architecture linking DPPs with verifiable credentials within the global Quality Infrastructure, enabling automated compliance validation, reducing fraud, and strengthening enforcement in digital and circular value chains.

Keywords: Digital Product Passport (DPP), Trust Infrastructure, Verifiable Credentials (VCs), Conformity Assessment, Testing, Inspection, Certification (TIC), Global Quality Infrastructure, Compliance Automation

ID: S8-3

Title: Women Empowerment: Amplifying Voices in Standardization and Conformity Assessment
Time: 09:50-:10:05
Project Reference: IEC 2024 Young Professionals Programme

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Abstract: The transformation of industry through digitalization, sustainability requirements, and new regulatory frameworks is profoundly reshaping technical ecosystems. Initiatives such as Digital Product Passports are redefining how products are designed, tracked, and regulated throughout their lifecycle. In this context, technical standards play a central role in enabling interoperability, trust, and global collaboration.
However, gender imbalance in technical decision-making spaces remains a major challenge, particularly within engineering sectors and standardization bodies. Despite growing attention to diversity and inclusion, women remain underrepresented in leadership positions and standardization committees, affecting the quality and inclusiveness of technical governance.
The Women Empowerment in Standardization and Conformity Assessment project was developed to address this challenge. The initiative combines three components:

1. Understanding barriers to participation: Insights were gathered from women leaders in international technical communities to identify challenges such as lack of visibility, unconscious bias, limited network access, and confidence barriers. These insights also highlight strategies and role models to inspire future generations.

2. Developing practical empowerment tools: An interactive e-learning module was created, focusing on leadership skills including professional confidence, unconscious bias mitigation, assertive communication, conflict navigation via Nonviolent Communication, and increasing visibility in technical discussions.

3. Encouraging cultural change in technical ecosystems: The project emphasizes the need for institutional commitment to inclusive participation, demonstrating that diverse perspectives enhance innovation and decision-making, particularly in digital and sustainability initiatives like Digital Product Passports.

By sharing the lessons learned, this presentation aims to contribute to the dialogue on building inclusive technical ecosystems, ensuring that digital transformation and sustainability efforts integrate diverse perspectives and leadership.

Keywords: Women Empowerment, Standardization, Conformity Assessment, Digital Product Passport (DPP), Leadership, Diversity and Inclusion, Technical Governance, IEC Young Professionals

ID: S8-4

Title: Digital Product Passport for Advanced Accurate Recycled Fiber Verification in Textiles

Burcu Adsay
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Abstract: Global textile fiber production is growing rapidly, yet recycled fiber usage remains below 1% of the total market, highlighting sustainability and traceability challenges. Current certification systems for recycled textiles largely rely on manufacturer declarations and cannot precisely determine recycled content or its source—plastic bottles, pre-consumer, or post-consumer textile waste. This leads to transparency gaps, quality inconsistencies, and enforcement difficulties.
This study introduces an innovative Digital Product Passport (DPP)-based identification and traceability system for textiles. By integrating analytical measurement methodologies, RFID tracking, and AI-driven polymer analysis, the system enables precise determination of recycled fiber ratios (3% accuracy) and identification of raw material sources throughout the value chain, from polymer to finished garments. The approach addresses both regulatory compliance and commercial reliability, supporting R&D, quality control, and global standardization.
The methodology is adaptable to other sectors within the recycling industry, offering scalable solutions for traceable, measurable, and verifiable product information. This initiative aligns with sustainability, digitalization, and quality management objectives, bridging gaps in current practices and enhancing trust in recycled textile products.

Keywords: Digital Product Passport, Recycled Fiber, Textile Traceability, Analytical Verification, Sustainability, AI Modeling, RFID Tracking

ID: S8-5
Time: 10:20-10:35

Title: The Construction Sector's Digital Product Passport – A Prototype

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Abstract:
Fragmented sustainability data in the construction sector limits informed decision-making and compliance with EU Digital Product Passport (DPP) regulations (ESPR and CPR). The project "The Construction Sector's Digital Product Passport" (funded by Smart Built Environment) developed a foundational digital platform that integrates open and free data from multiple sustainability information systems into comprehensive DPPs for construction materials.
In its initial pilot, the prototype consolidated data from over 500 suppliers and more than 200,000 products, sourced from the BASTA-system, eBVD, the Swedish National Board of Housing, Building and Planning, and other open databases. The platform provides a holistic view of each product's sustainability attributes, supporting stakeholders across the construction value chain in making informed, sustainability-driven choices from procurement to end-of-life.
By visualizing and packaging data in a user-friendly interface, the platform enhances transparency, promotes circular economy practices, and prepares the industry for forthcoming EU DPP requirements. Leveraging an open data-sharing infrastructure and standardized life-cycle sustainability formats ensures cross-platform interoperability, filling a critical gap in the sector where no comparable multi-source sustainability passport currently exists.

Keywords: Digital Product Passport, Construction, Sustainability Data, Circular Economy, Interoperability, BASTA, eBVD

Day 3 - Session 9

ID: S9-2
Time: 13:35-13:50

Title: Extending Digital Product Passports to Digital Product Service System Passports (DPSSP)

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Abstract:
The PSS-Pass project explores the integration of servitization and Product-Service Systems (PSS) into Digital Product Passports (DPPs), creating a Digital Product Service System Passport (DPSSP). The DPSSP aims to enhance circularity, sustainability, and support new business models across the manufacturing industry.
The DPSSP enables value chain actors to access services such as AI- and Digital Twin-based simulations, LCA/LCC computations, and context-sensitive data analytics within Data Spaces ecosystems. A comprehensive methodological framework is proposed for creating and updating DPSSPs, including: a service model within an AAS-based DPP4.0 architecture, a digital environment for hosting the DPSSP, and a semantic layer with a DPSSP ontology to improve interoperability across organizations and supply chains.
By leveraging DPSSP data—including usage conditions, refurbishment activities, CO2 emissions, and other ESG factors—stakeholders gain actionable insights to drive circularity and develop innovative business models. The project is demonstrated in three sectors: home appliances, complex industrial equipment, and textiles. This work transforms the DPP from a compliance tool into a decision-support system empowering actors to exploit data-driven opportunities across the product lifecycle.

Keywords: Digital Product Passport, Product-Service Systems, Circular Economy, Data Spaces, Digital Twin, Sustainability, DPSSP, PSS-Pass Project

ID: S9-4
Time: 14:05-14:20

Title: Printed Electronics Commercial Valorization through Digital Product Passports

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Abstract:
The rapid advancement of Organic and Printed Electronics (OEs) is enabling a new generation of lightweight, flexible, low-cost, and energy-efficient devices for applications across the Energy (Organic Photovoltaics), Automotive, Healthcare, Wearables, Internet of Things (IoT), and Agriculture sectors, among many others. At the same time, the increasing complexity of global supply chains and the growing environmental impact of conventional electronic waste create an urgent need for transparent, traceable, and circular product ecosystems. In this context, Digital Product Passports (DPPs), introduced under the European Ecodesign for Sustainable Products Regulation (ESPR), have the potential to become a transformative framework for enhancing sustainability, interoperability, and commercial scalability within the OE sector.
This presentation explores the commercial valorization potential of Organic and Printed Electronics through the implementation of DPPs. It highlights how DPPs can provide comprehensive lifecycle information, including material composition, manufacturing origin, environmental footprint, repairability, recyclability, and end-of-life management. For OE technologies, which increasingly rely on novel organic semiconductor materials, flexible polymer substrates, and additive manufacturing processes, DPPs can significantly improve manufacturing and commercialization transparency, and facilitate compliance with emerging European sustainability and circularity requirements.
Furthermore, the presentation discusses how the integration of DPP frameworks can accelerate the commercialization of OE products by enabling secure data exchange, enhanced digital traceability, circular business models, and improved supply-chain interoperability. The adoption of DPPs can support manufacturers, technology providers, recyclers, policymakers, and consumers by creating standardized digital identities for products and materials throughout their lifecycle. Finally, this work outlines future perspectives for combining Organic and Printed Electronics, digital twins, and DPP ecosystems to establish resilient, data-driven, and circular electronic value chains in Europe, contributing to both the green and digital transitions.

Keywords: Flexible electronics, Internet of Things (IoT) Sustainability, Digital Product Passport (DPP),

Session-EUMINE COST Action: Poster Session

ID: 1
Time: 00

Title: The European Materials Informatics Network (EuMINe)
Project Reference: COST Action CA22143

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Abstract: The European Materials Informatics Network (EuMINe), COST Action CA22143, is a pan-European initiative dedicated to advancing the digital transformation of materials research and engineering through the integration of data-centric infrastructures and state-of-the-art artificial intelligence. It brings together a multidisciplinary community from academia, research organizations, industry, large-scale facilities, and policy domains to address the need for coordinated and scalable digital approaches across the European materials ecosystem.
A key driver of this effort is the increasing relevance of frameworks such as Digital Product Passports, which rely on high-quality data, interoperability, and advanced analytics. In this context, EuMINe promotes FAIR data environments, automated and reproducible workflows, and AI-enabled methodologies for predictive modelling, materials design, and lifecycle assessment. The initiative emphasizes the creation of a distributed and cross-sectoral network that supports alignment among diverse application fields, including manufacturing and sustainable innovation, while addressing fragmentation through the co-design of shared standards and interoperable digital protocols.
To maximize impact, EuMINe actively engages a wide spectrum of stakeholders, from industry and regulatory bodies to standardization organizations and end users, fostering dialogue and convergence toward common practices at the European level. The Action is inherently open and continuously expanding, encouraging new participants to join its Working Groups and offering dedicated funding schemes to facilitate networking, mobility, and collaborative activities across Europe.

Keywords: Materials Informatics, Artificial Intelligence (AI), FAIR Data, Digital Product Passport (DPP), Interoperability, Lifecycle Assessment, Sustainable Innovation

ID: P4-8
Time: 18:50

Title: Harmonizing Product Composition Data for EN 45555 Recyclability Assessments: A Disassembly-Driven BoM Approach

Project Reference: CE-RISE Project

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Abstract: The transition toward a circular economy and the emerging requirements of the EU Ecodesign for Sustainable Products Regulation (ESPR) highlight the need for Digital Product Passports (DPPs) capable of carrying standardized product composition data in the form of Bills of Materials (BoMs). For complex products such as laptops, reliable R-strategy assessments depend on highly granular, hierarchical BoMs that comply with the material efficiency calculation requirements defined, e.g., in the EN 45555 "General methods for assessing the recyclability and recoverability of energy related products". However, industrial BoMs stored in Enterprise Resource Planning Systems (ERP) like SAP are frequently optimized for manufacturing processes and typically use unstructured, non-harmonized material classification, preventing automated mapping of material classes and the calculation of recyclability indicators according to EN 45555. This work demonstrates an approach to generate EN 45555-compatible BoMs for laptops using an empirically derived, disassembly-oriented data structure for material composition. A simplified component specification is developed to structure assemblies, sub-assemblies, and materials in accordance with EN 45555 requirements for recyclability, recoverability, and reusability assessments using a background dataset of material compositions of components. This material classification is aligned with state-of-the-art recycling processes and links material data to recycling output fractions defined in the "WF-RepTool", a WEEE compliance reporting tool.
We address three key questions:

- Which data attributes must a BoM provide to enable EN 4555X-compliant assessments?
- How can a hierarchical product composition data structure be derived that reflects empirical disassembly procedures?
- How can background data be integrated to automate BoM specifications and recyclability rate calculations?

Two Excel tools are developed in the context of the CE-RISE project that allow (a) BoM generation for laptops and (b) recyclability calculation according to EN 45555 adapted to end-of-life scenarios.
Future work will extend the methodology to further ErP categories and align the data structures with upcoming ESPR and DPP interoperability requirements to support fully automated material efficiency assessments under EN 4555X standards.

Keywords: Digital Product Passport (DPP), Bill of Materials (BoM), EN 45555, Recyclability Assessment, Circular Economy, ESPR, WEEE, Material Efficiency

ID: 6

Title: DPPeasy®: Operationalising Secure and Scalable Digital Product Passports
Time: 00

Project Reference: DPPeasy® Platform

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Abstract: How to implement and operationalise a digital system that simultaneously meets Digital Product Passport (DPP) requirements, secures value chain actors' confidential and sensitive information, and overcomes the challenges faced by economic operators and auditing authorities? Leveraged by an innovative digital platform and AI-based systems, DPPeasy® addresses these challenges by incorporating experience in Eco-Design methodologies applied to the global textile and apparel value chain, as well as the operationalisation of the Safe and Sustainable by Design framework for Advanced Materials. Originating from a research project focused on developing a multi-circular territorial cluster virtual twin, a novel IT infrastructure based on a centralized web-service and Service-Oriented Architecture (SOA) was developed. This infrastructure achieves cybersecurity levels aligned with financial system standards through a Zero Trust Security framework and a Secure Data Presentation Layer.

By enabling real-time event capturing with tracked and recorded platform access, DPPeasy® is recognized by economic operators as a reliable solution for downstreaming attributes across the value chain, from raw material sourcing to final product commercialization, while preserving confidential and sensitive information. At the same time, it ensures compliance with DPP data requirements.

DPPeasy® encompasses a distributed digital ecosystem composed of interconnected nodes with independent AI-based operational capacity, supporting distributed computation and storage of attributes derived from raw data and real-time events. Through event-based attribution and traceability, the platform reduces the burden on auditing authorities by facilitating efficient and consistent verification of declared attributes across value chain actors.

Keywords: Digital Product Passport (DPP), Traceability, Cybersecurity, Zero Trust Security, Artificial Intelligence (AI), Value Chain, Sustainability, Data Governance

ID: P4-3
Time: 18:40

Title: Cross-Project Collaboration on DPP Use Case Assessment in Electronics – Update and Call for Participation

Project Reference: PACE DPP Project / CIRPASS 2

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Abstract: Ideating and assessing Digital Product Passport (DPP) use cases remains a complex task for innovators and researchers. Cross-project collaboration offers a promising approach to jointly identify and compare DPP use cases and extract success factors from high-impact applications.

At the DPP4EU Conference 2025, the PACE DPP project proposed creating a collaboration group dedicated to DPP use cases in electronics. Launched in collaboration with CIRPASS 2, the group now meets monthly and brings together representatives from multiple DPP research projects.

The group's first joint activity focused on reviewing and applying the DPP use case assessment framework developed by PACE DPP. This presentation introduces the framework and outlines planned next steps, including: i) Testing the assessment framework in a set of electronics case studies across multiple DPP-related research projects. ii) Performing a joint content analysis to identify patterns, success factors of high-impact economic and environmental applications, and relevant regulatory requirements. iii) Analysing the suitability of the assessment framework as a tool for identifying DPP-enabled innovation opportunities and regulatory needs. iv) Preparing a joint publication presenting the findings.

The presentation will also serve as an outreach to invite additional projects to join these collaboration activities.

Keywords: Digital Product Passport (DPP), Use Case Assessment, Electronics, Cross-Project Collaboration, Innovation, Regulatory Requirements, PACE DPP, CIRPASS 2

ID: P2-4
Time: 18:20

Title: Implementing Digital Product Passports for Technical Plastics in Electronic Products: Mapping Actor-Specific Data Requirements and Normative Frictions

Project Reference: University of Applied Sciences St. Pölten Study

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Abstract: Digital Product Passports (DPPs) are a key instrument of European circular economy policy under the Ecodesign for Sustainable Products Regulation (ESPR). For technical plastics in electronic products, the challenge lies less in data availability than in determining which data create operational value for which actors at which stage of the lifecycle.

This contribution develops an actor-specific matrix of minimum critical data elements for DPP implementation and links these to regulatory drivers to identify normative frictions that limit practical usefulness across the value chain. The study applies a lifecycle and gate-based analysis from upstream material supply through component and product manufacturing to downstream End-of-Life operations, combining regulatory analysis, a company survey, stakeholder workshops, and an illustrative demonstrator case.

Results show systematic discontinuities between upstream and downstream information logics. Upstream actors primarily provide composition, specification, and compliance evidence, whereas downstream actors require aggregated and validated information for sorting, recycling, and secondary material qualification. At End-of-Life, physical transformation shifts the relevant reference from item level to batch-level outputs, so continuity cannot rely solely on persistent product identity. The findings suggest that DPP implementation should first focus on actor-specific minimum data sets that support real decisions and verifiable claims, rather than assuming that broader data disclosure automatically creates value.

Keywords: Digital Product Passport (DPP), Technical Plastics, Electronics, Actor-Specific Data, Normative Frictions, Lifecycle Analysis, End-of-Life, Circular Economy

ID: 20
Time: 00

Title: Operationalising Circular Economy Indicators for Digital Product Passports
Project Reference: Teesside University Study

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Abstract: Digital Product Passports (DPPs) are a key instrument within the European Ecodesign for Sustainable Products Regulation (ESPR), enhancing transparency, traceability, and circular decision-making across product life cycles. Implementation challenges include heterogeneous data sources, inconsistent indicator definitions, and limited interoperability between digital construction environments and sustainability assessment frameworks.

This study proposes an interoperable framework integrating Building Information Modelling (BIM), domain ontology modelling, and Multi-Criteria Decision Analysis (MCDA) to operationalise circular economy indicators for DPP applications in the built environment. Circular economy indicators were derived from stakeholder inputs and life-cycle impact categories, ensuring each has a defined unit, data source, and normalisation logic. Social indicators, including labour conditions and gender equality, are converted into measurable metrics using balanced labour indices reflecting equity in construction and demolition waste management.

Indicators are formalised within a domain ontology linking materials, stakeholders, and assessment results through semantically defined classes and properties. BIM parameters and external datasets, including DPPs, Environmental Product Declarations, and GIS data, are mapped to ontology entities for machine-readable integration. The framework enables MCDA-based aggregation of normalised indicators, producing a composite circularity score to support decision-making. This approach contributes to interoperable infrastructures for scalable Digital Product Passport systems.

Keywords: Digital Product Passport (DPP), Circular Economy, Building Information Modelling (BIM), Multi-Criteria Decision Analysis (MCDA), Ontology Modelling, Decision Support, Sustainability Indicators

ID: 21
Time: 00

Title: BASE: Developing a Digital Battery Passport Ecosystem for Circularity and Sustainability in the EU Battery Value Chain

Project Reference: Horizon Europe Project BASE (Grant Agreement No. 101157200)

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Abstract: The European Union Battery Regulation (EU 2023/1542) positions the Digital Battery Passport (DBP) as a central enabler of transparency, sustainability, and circularity across the battery value chain. The Horizon Europe project BASE develops and validates a comprehensive DBP ecosystem to support trusted lifecycle data exchange and data-driven circular battery management.

BASE combines a secure and interoperable federated data space with semantic technologies, knowledge-graph-based information management, and open-source building blocks, enabling confidential and sovereign data sharing among suppliers, manufacturers, OEMs, repairers, and recyclers. The framework aligns with European initiatives such as Catena-X, GAIA-X, and International Data Spaces (IDS) to strengthen interoperability, trust, and scalability.

Beyond data exchange, BASE advances DBP functionalities through intelligent lifecycle analytics. Artificial intelligence and data-driven methods estimate key battery indicators, including State of Health (SoH), State of Safety (SoS), and Remaining Useful Life (RUL), supporting predictive maintenance, safety monitoring, and lifetime extension. A Battery Circularity Index (BCI) and harmonized Environmental, Social, and Governance (ESG) indicators assess circularity and sustainability performance according to regulatory and market needs.

The framework is validated via industrial pilots in automotive, maritime, and stationary energy storage applications. By integrating federated infrastructures, AI-based analytics, and sustainability assessment within a unified DBP ecosystem, BASE supports practical implementation of the EU Battery Regulation and promotes transparent, resilient, and circular battery value chains in Europe.

Keywords: Digital Battery Passport (DBP), Circular Economy, Sustainability, Artificial Intelligence, Knowledge Graph, Lifecycle Analytics, Battery Circularity Index (BCI), EU Battery Regulation, Federated Data Space

ID: P2-4
Time: 18:14

Title: RECONSTRUCT: Digital Product Passport for Circular Value Chains in Construction
Project Reference: RECONSTRUCT DPP Project, ITeC

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Abstract: The Digital Product Passport (DPP) is emerging as a key instrument to support circular value chains and regulatory compliance in the construction sector. This abstract presents the evolution of the RECONSTRUCT DPP, highlighting its technical architecture and integration within a broader digital ecosystem.

Developed in response to EU frameworks such as the Ecodesign for Sustainable Products Regulation, the Circular Economy Action Plan, and the European Green Deal, the DPP addresses fragmented supply chains, long product lifespans, and diverse regulatory pathways. Its architecture captures standardized product information, including unique identifiers, regulatory declarations, environmental indicators (LCA), material composition, and circularity attributes (repairability, recyclability, end-of-life management), structured in a machine-readable format for interoperability, compliance, and new data-driven circular services.

RECONSTRUCT's DPP relies on an XML-based architecture aligned with European and international standards, including EN ISO 23386 and EN ISO 23387 for construction data dictionaries, EN 22057 for structured environmental product declaration data, and ISO 59040:2025 Product Circularity Data Sheet (PCDS) for interoperable circularity reporting and alignment with emerging ESPR-based DPP infrastructures.

Recent developments extend the concept beyond a standalone document toward a distributed digital ecosystem. BIM models generated during design are combined with traceability data to support automated DPP generation, while machine learning techniques are explored to extract relevant material and component information. By connecting BIM systems, traceability platforms, and standardized product data models, the RECONSTRUCT approach demonstrates how DPPs can evolve into operational components of a digital construction ecosystem, providing practical insights for scaling DPP infrastructures across the European built environment.

Keywords: Digital Product Passport (DPP), Circular Economy, Construction, BIM, Traceability, ISO Standards, Interoperability, RECONSTRUCT Project, Sustainability

ID: 25

Title: The Digital Product Passport for Cement: Navigating Challenges Unlocking Opportunities
Project Reference: —

Stefan Kubens
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Abstract: The Digital Product Passport (DPP) is poised to enable more sustainable purchasing decisions across the EU by enhancing product transparency, including repair information. This approach supports extended product lifecycles and a greener, circular economy. The construction sector, responsible for 60

Cement, a harmonized EU product, is undergoing standardization updates via EN 197-1, incorporating Annex ZA.4 to ensure interoperability between human- and machine-readable DPP formats. These requirements are linked to JTC24 DPP initiatives. Key challenges include extensive technical and compositional data requirements, absence of proven DPP implementation models, and potential risks from third-party platform operators.

Opportunities include streamlined regulatory reporting, a fully digitized cement value chain, and new use cases enabled by structured digital data, such as BIM integration, searchable product databases, automated ordering, and digital delivery tracking. Properly implemented, the DPP could position cement as a cornerstone of Europe's sustainable construction future.

Keywords: Digital Product Passport (DPP), Cement, Construction, Standardisation, EN 197-1, Circular Economy, Sustainability, Value Chain, BIM, Data Interoperability

ID: P3-4
Time: 18:30

Title: Scaling Digital Product Passports in France and Europe: Lessons from the Ecosystem PRO Initiative

Project Reference: —

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Abstract: Ecosystem, a French Producer Responsibility Organization (PRO), is leading a large-scale Digital Product Passport (DPP) initiative across France and Europe. The project connects manufacturers, retailers, and repairers to trace two million appliances over two years, monitoring key lifecycle stages including production, sales, repair, reuse, and end-of-life recycling. The initiative also evaluates environmental performance by quantifying impacts avoided via lifetime extension enabled through repair, reuse, and remanufacturing.
Key insights from 18 months of implementation include:

- Engaging all stakeholders across the value chain and aligning objectives
- Establishing a common language for repair and reuse activities
- Collecting reliable product data, including composition and environmental impact
- Navigating data governance and early circular economy implementation
- Assessing the environmental performance of DPPs
- Addressing financing challenges and defining a sustainable business model
- Operational issues including IT integration and QR code deployment
- Clarifying the role of PROs in DPP management

Despite challenges and regulatory uncertainties, the DPP initiative is gaining traction and aims to scale across the entire Electrical and Electronic Equipment (EEE) sector in France.

Keywords: Digital Product Passport (DPP), Producer Responsibility Organization (PRO), Circular Economy, Lifecycle Tracking, Environmental Performance, Data Governance, EEE, Repair, Reuse, Remanufacturing

ID: 27
Title: From Concept to Operational Reality: Digital Product Passports for Circular Value Chains
Time: 00
Project Reference: —

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Abstract: Digital Product Passports (DPPs) are increasingly recognized as critical instruments to support circular economy strategies and regulatory compliance under frameworks such as the EU Ecodesign for Sustainable Products Regulation (ESPR). Effective DPP implementation requires addressing technical, governance, and collaboration challenges across supply chains.
The presentation highlights how DPPs enable lifecycle traceability, linking material sourcing, production, and downstream use. Reliable product information is essential for reuse, remanufacturing, and recycling, making the DPP the operational backbone of circularity. While interoperability standards such as Digital Link, EPCIS, and the UN Transparency Protocol establish the technical foundation, adoption depends on fair data governance, multi-stakeholder participation, and trust in shared information.
The case study of eraTrace, a DPP developed for Eramet's low-carbon manganese alloy brand eraLow using the Tilkal Supply Chain Transparency Platform, demonstrates practical implementation. This platform delivers auditable lifecycle data for each order—from raw material sourcing to cradle-to-gate CO2 emissions verified by third parties, enabling industrial customers to access reliable ESG data and support decarbonization strategies.
This example illustrates how DPPs move from regulatory concept to operational reality, supporting trusted transparency, sustainability objectives, and market confidence across industrial value chains.

Keywords: Digital Product Passport (DPP), Circular Economy, Traceability, Supply Chain Transparency, ESG, Regulatory Compliance, Interoperability, Data Governance, Sustainable Industrial Practices

ID: 31
Title: Blockchain-Enabled Digital Traceability for Luxury Real Estate
Time: 00
Project Reference: —

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Abstract: Horae provides luxury property owners with an elegant and operational infrastructure that enhances post-purchase engagement, services, and property insights. Central to this approach is full traceability of ownership, maintenance, and service data, backed by blockchain technology to ensure security, transparency, and trust across the property lifecycle.
By combining digital traceability with user-centric tools, the platform allows real estate operators and service providers to better know, serve, and engage owners while maintaining verifiable, tamper-proof records. This digital approach supports operational efficiency, personalized services, and a long-term value proposition for luxury properties.

Keywords: Digital Traceability, Blockchain, Luxury Real Estate, Post-Purchase Engagement, Property Lifecycle, Owner Insights

ID: 32
Title: From DPP Concept to Operational Adoption: Lessons from Modular Implementation
Time: 00
Project Reference: HydraDPP, Launch4

Luna Gutiérrez Castro
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Abstract: Digital Product Passports (DPPs) are often framed as the key deliverable of circular economy and sustainability initiatives. Launch4's experience with HydraDPP highlights that the passport itself is only the visible tip of a broader operational and commercial system. Successful adoption depends on structured supplier data collection, evidence transformation, ongoing data quality maintenance, and generation of actionable sustainability indicators such as product-level carbon footprints.

This contribution shares lessons from modular DPP implementation across battery and textile use cases, identifying three recurring bottlenecks: supplier chasing, reducing DPPs to standalone tools rather than modular infrastructures, and evolving regulatory frameworks. Effective commercialisation occurs when supplier workflows are organized, evidence is traceable, and data is reusable across compliance and business processes.

The approach emphasizes creating operational and business value for brands and suppliers, enhancing efficiency, collaboration, and trust. SaaS models alone are often insufficient; modular infrastructure, layered implementation, add-ons, and market-validated white-label deployments improve viability. Advances in AI accelerate data structuring when combined with domain expertise and practical implementation efforts.

This presentation aims to provide a practitioner's perspective on moving DPP research toward scalable, credible, and commercially viable solutions.

Keywords: Digital Product Passport, Modular Infrastructure, Sustainability Metrics, Operational Adoption, Data Governance, Circular Economy

ID: P1-1
Time: 18:00

Title: High-level Architecture Design of the DATA4CIRC DPP Framework
Project Reference: DATA4CIRC, RWTH Aachen University

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Abstract: Digital Product Passports (DPPs) are key enablers of the EU circular economy, providing structured and interoperable lifecycle data across complex industrial value chains. Current implementations face limitations due to fragmented data landscapes, insufficient interoperability, misalignment with user and regulatory requirements, and lack of secure cross-company data sharing.
The EU-funded DATA4CIRC project addresses these challenges through a human-centred and data-driven digital framework enabling secure and interoperable information exchange. The framework integrates federated data spaces, DPPs, lifecycle assessment, and digital models (digital twins and digital threads) within a standards-based approach to enhance circularity in manufacturing.
This contribution presents the high-level architecture of the DATA4CIRC Framework. At its core, DPPs serve as the foundation for interoperable data exchange across product lifecycles. The DPP module is built on the Asset Administration Shell (AAS) as the core information model, comprising a DPP Builder and Service supported by dedicated security, persistence, API, presentation, and deployment layers. This design ensures modularity, scalability, secure data exchange, and integration with internal enterprise systems and external ecosystems via standardised interfaces.
The AAS-based DPP implementation uses structured AAS submodels, aligns with DPP4.0 concepts, and considers emerging EU DPP standards to ensure interoperability and regulatory compliance. Overall, DATA4CIRC provides a standards-aligned, user-driven framework supporting cross-sector circular manufacturing and practical DPP deployment.

Keywords: Digital Product Passport, Circular Economy, DATA4CIRC, Asset Administration Shell, Interoperable Data Exchange, Standards-Based Framework

ID: 35
Time: 00

Title: Blobfish: AI-Assisted Platform for Semantic Data Documentation and Interoperability
Project Reference: SINTEF Ocean, Norway

Casper Andersen
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Abstract: We have developed a technology and platform that enhances data documentation with semantic understanding, enabling interoperability across diverse data systems and end users. Building on FAIR data principles (Findable, Accessible, Interoperable, Reusable), we add an additional layer of semantic knowledge.
Our platform supports both domain experts and other users seeking to leverage data for improved insight, for example by integrating modeling tools and digital twins, identifying connections between data sources, and supporting decision-making processes. Unlike many established platforms (e.g., Snowflake, Power BI, AWS), it offers AI-assisted documentation and digitization of lab journals and protocol histories, accelerating documentation while maintaining high quality. Blobfish, our AI Agent framework, comprises specialized agents that automate key documentation tasks, such as converting handwritten lab journals into processable text or generating full provenance knowledge graphs from lab reports, scientific articles, or internal presentations. Human-in-the-loop tools allow users to inspect and refine results to ensure alignment with desired documentation standards. This approach significantly streamlines data management, improves traceability, and strengthens interoperability across industrial and research contexts.

Keywords: Digital Product Passport, Data Documentation, AI-Assisted Platform, FAIR Data, Semantic Interoperability, Knowledge Graphs

ID: P2-2
Time: 18:16

Title: Exploring the Role of Digital Product Passports in the Green Steel Transition
Project Reference: Growing with Green Steel (GGS), TU Delft

Boriana Rukanova
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Abstract: The steel sector faces increasing demand while remaining a major source of greenhouse gas emissions, accounting for approximately 7% globally. Maintaining high-value steel quality across circular loops is challenged by material mixing and downcycling during shredding processes. In parallel, EU policy and regulations, including the Green Deal and the Ecodesign for Sustainable Products Regulation (ESPR), create incentives for recycled content and circularity.
The Growing with Green Steel (GGS) program fosters collaboration among universities, research institutes, and industry to accelerate the transition to a circular, CO2 neutral, high-tech steel sector by 2050. A horizontal working group within GGS focuses on Digital Product Passports (DPPs) to explore their value for green steel. Key research questions include:

- How DPPs add business value beyond regulatory compliance, enabling new ecosystem-level circular business models, evaluated through tools such as e3value.
- The role of DPPs in compliance monitoring for businesses and authorities, exploring business-government collaboration, incentive models, and regulatory burden reduction.
- Conditions under which DPPs are perceived as legitimate instruments to improve sustainability, and pathways to voluntary adoption.

Beyond content-specific research, the GGS DPP group emphasizes embedding its activities in national, EU, and international DPP networks to ensure rapid knowledge exchange and integration with wider DPP developments.

Keywords: Green Steel, Digital Product Passport, Circular Economy, Sustainability, Regulatory Compliance, Business Models, Ecosystem Approach

ID: P3-2
Time: 18:24

Title: Implementation Pathways for the Digital Product Passport (DPP) in Industrial Practice: From Compliance to Circular Economy

Niklas Hoffmann
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Abstract: As the European Digital Product Passport (DPP) regulatory framework matures, manufacturers face challenges in translating its concept into operational IT architectures and organisational processes. This research presents company-level implementation pathways, based on an industrial pilot conducted in the DualStrat project with the Böllhoff Group, a global joining technology manufacturer. A functional DPP prototype for three products of increasing complexity was developed using requirements derived from expert interviews and desk research, translated into a scalable architecture based on interoperable data standards and the Asset Administration Shell (AAS).
The minimum viable prototype was iteratively refined in collaboration with the industrial partner. Insights highlight the importance of system readiness, structured data governance, and a central data hub consolidating product information from multiple enterprise systems. These capabilities form the foundation for extending DPP use beyond regulatory compliance towards circular economy applications.
Current research focuses on three areas: machine-readable disassembly instructions to support end-of-life processing, lifecycle data collection and analysis to inform circular R-strategies, and detailed bills of materials and spare-part structures to facilitate repair and maintenance. The pilot illustrates how DPPs can evolve into key infrastructure supporting circular, data-driven product systems.

Keywords: Digital Product Passport, Circular Economy, Industrial Pilot, Asset Administration Shell, Lifecycle Data, Data Governance, Repairability, Disassembly

ID: 41
Time: —

Title: A Framework for Quantifying the Economic Benefits of the Digital Product Passport (DPP) for Manufacturing Companies

Martin Perau
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Abstract: Although the Digital Product Passport (DPP) will soon be mandatory for a broad range of products, current discourse is dominated by regulatory burdens and technical implementation challenges. While the DPP's potential to increase economic efficiency is frequently mentioned, it typically remains limited to qualitative descriptions without concrete specifications or quantitative evidence. This lack of measurable benefits prevents companies from perceiving the DPP as a value-adding strategic asset, viewing it instead as a mere administrative burden.
This research bridges the gap by developing a framework to determine and quantify the economic benefits of the DPP for manufacturing companies. The framework is informed by exploratory interviews, initially focusing on the furniture industry due to its advanced readiness for DPP application under imminent regulatory requirements.
The framework incorporates use cases comparing value-creation processes with and without DPP integration. For each use case, specific quantification approaches are defined, covering the full value chain from design, procurement, production, and sales to logistics and circular economy activities. Exemplary use cases include automated integration of supplier information and acceleration of disassembly processes. The framework enables companies to systematically evaluate the economic advantages of DPP implementation, supporting a shift from reactive compliance toward value-driven digital transformation.

Keywords: Digital Product Passport, Economic Benefits, Manufacturing, Value Chain, Circular Economy, Furniture Industry, Quantification Framework

ID: P3-6
Title: Exploring Digital Product Passport Applications in Customs and Border Control Contexts
Time: 18:32

Susana Wong-Chan
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Abstract: Digital Product Passports (DPPs) are being introduced as mandatory for specific product groups under EU legislation. They aim to enable circularity, monitor circular economy flows, enhance competitiveness, reduce administrative burdens, and address cross-border eCommerce challenges. Customs and market surveillance authorities are key users of DPPs, and their awareness and readiness are critical for successful implementation.
The PARSEC and BORDERLINK projects involve customs administrations, technology providers, and research organizations to explore the role of DPPs in customs operations. PARSEC, focusing on Parcel and Letter Security, investigated potential applications of DPP in customs workflows and the integration of detection technologies, x-ray scanning, and AI for risk assessment. Insights from this work inform research questions for further exploration in BORDERLINK.
BORDERLINK develops an educational game simulating a DPP environment for customs training. This tool demonstrates DPP use in enforcement, compliance verification, and operational integration into border control workflows. It also supports capacity building through scenario-based training, preparing officers to handle diverse product categories, including batteries, electronics, and textiles, that will increasingly require DPPs.
By combining research, training, and stakeholder engagement, these projects contribute to raising awareness among customs authorities and exploring practical use cases, fostering readiness for DPP adoption across EU borders.

Keywords: Digital Product Passport, Customs, Border Control, Circular Economy, Compliance, Training, Cross-Border eCommerce

ID: Honor Lecture
Title: A View on DPP Handling
Time: 17:15-17:45

Heinz A. Preisig
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Abstract: The increasing demand for Digital Product Passports (DPPs) reflects the need for transparency across product lifecycles—from production to end-of-life—to support recycling and reduce environmental impact. The European Commission's Sustainable Products Regulation (ESPR) mandates the implementation of DPPs, while JTC24 defines technical standards to ensure interoperability and compliance.
This presentation provides a process systems perspective on DPP handling, analyzing product flows, data requirements, and logical consequences for industrial and regulatory contexts. The discussion highlights structural considerations for DPP implementation, addressing challenges posed by evolving standards and the fast-moving regulatory landscape.
The contribution is informed by practical insights from the DigiPass Horizon Europe project (Grant Agreement No 101138510), emphasizing system-level understanding and strategic alignment with ESPR objectives.

Keywords: Digital Product Passport, ESPR, JTC24 Standards, Process Systems, Circular Economy, Transparency

ID: P1-2
Time: 18:02

Title: Digital Product Passport Implementations: Architecture Models, Technical Components, and Engineering Challenges

Behzad Behdani
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Abstract: The Digital Product Passport (DPP), introduced under the Ecodesign for Sustainable Products Regulation, is rapidly transitioning from regulatory concept to technical deployment across multiple industrial sectors. Emerging implementations display diverse architectural approaches, including centralized registries, federated data infrastructures, blockchain-based, and platform-centric solutions. A structured engineering comparison of these models remains limited. This paper systematically reviews DPP implementation architectures, examining core technical components such as product identification schemes, data storage models, interoperability interfaces, semantic alignment mechanisms, and access control frameworks. It identifies cross-cutting challenges in semantic standardization, scalability, lifecycle data synchronization, cybersecurity, and governance of distributed data ownership.
By comparing architectural trade-offs regarding scalability, interoperability, trust, and regulatory compliance, the study derives design considerations to guide robust and sustainable DPP deployment. Findings emphasize that governance alignment and interoperability maturity, rather than individual technological choices, determine long-term DPP infrastructure viability.

Keywords: Digital Product Passport, Architecture Models, Technical Components, Interoperability, Lifecycle Data, Governance, Ecodesign

ID: P2-3
Time: —

Title: Practical Insights on Implementing Digital Product Passports at Scale

Sara Ongaro
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Abstract: Renoon operates at the intersection of compliance, IT infrastructure, and digital product experience, supporting over 30 fashion brands and pioneering brands in other sectors to translate Digital Product Passport (DPP) requirements into scalable, API-based systems in live deployments, including clients such as Tod's and Dondup.
This contribution focuses on operational DPP implementation: transforming regulatory requirements into structured data models, integrating DPPs with enterprise systems (PIM, ERP, LCA tools), and enabling DPPs as interoperable digital infrastructures rather than isolated compliance tools.
Drawing from hands-on experience, the presentation highlights challenges in supplier data collection, data standardization, system integration, governance models, and cross-functional alignment between legal, sustainability, and IT teams. Lessons learned include:

- Designing adaptable DPP architectures aligned with evolving delegated acts.
- Structuring product-level data to support interoperability across systems.
- Managing cross-functional alignment while addressing budget and operational constraints.
- Understanding different implementation pathways for SMEs versus large enterprises and the impact of scale, resources, and organizational complexity.

Renoon has activated Digital Product Passports across over 40,000 SKUs, providing insight into real-world deployment challenges, data structuring requirements, and strategies for sustainable DPP adoption at scale.

Keywords: Digital Product Passport, Implementation, Scalability, Interoperability, Data Governance, Fashion Industry

ID: P4-2
Time: 18:38

Title: The Data Paradox in SME Textile Companies: They Know Their Products, But They Can't Prove It

Jakub Jamný
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Abstract: Most discussions on Digital Product Passports (DPPs) focus on large companies, overlooking micro- and small enterprises. This study presents findings from 33 structured interviews with micro-enterprises and small textile brands (1–10 employees) in the Czech Republic and Slovakia, complemented by a live pilot with Czech manufacturer Odex.
The main insight is a "data paradox": SMEs have detailed knowledge of their products—visiting tanneries, hand-selecting certified yarns, and knowing exact compositions—but store this information in paper notebooks, spreadsheets, or personal memory, rendering it incompatible with ESPR-compliant DPPs. Twenty-three of the 33 participants were willing to pay for DPP solutions, highlighting a need for accessible infrastructure rather than knowledge deficits.
Three key tensions are identified:

- **Transparency vs. competition protection:** Companies hesitate to disclose supplier locations for fear of losing competitive advantage.
- **Traceability of upcycled inputs:** Brands using second-life materials (e.g., airbags) face difficulties in determining original origins.
- **Supplier resistance:** Even basic material data from second-tier suppliers can take weeks to obtain due to skepticism over data sharing.

The proposed solution applies a hierarchical fallback aligned with PEFCR Apparel & Footwear: primary data is used when available; PEFCR defaults fill gaps. Each value is scored 1–5 per the PEF Data Quality Rating. Validated on 170+ passports and now automated, this approach enables regulatory compliance while encouraging incremental data quality improvements.

Keywords: Digital Product Passport, SMEs, Textile Industry, Data Paradox, PEFCR, Traceability, Data Quality

ID: P1-7

Title: Scalable Data Architectures for Digital Product Passport Implementation in Textiles

Time: 18:12

Mette Kirk
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Abstract: The STREP initiative, an EU-funded project, aims to enhance traceability, data transparency, and circular practices within the textile value chain. By integrating industry and technology partners, STREP develops practical solutions to support regulatory compliance, including the Digital Product Passport (DPP), while improving collection, sorting, and recycling of post-consumer textiles.

A dedicated work package addresses the system framework and backend IT architecture for DPP implementation, incorporating RFID integration. The project investigates data requirements necessary to support end-of-life textile management and improve the operational and economic feasibility of fiber-to-fiber recycling.

Through qualitative interviews with sorting and recycling companies, key data elements were identified as essential for enabling efficient recycling pathways, including: fiber composition, blend ratios, chemical treatments, product construction, prior-use information, and certification data. Accurate capture of these elements enhances sorting precision, reduces processing costs, and ensures material suitability across recycling technologies.

Additionally, a Digital Material Passport (DMP) framework was developed, defining structured data layers across the textile value chain, from collection and sorting to fiber manufacturing and yarn production. This layered architecture enables systematic capture and transfer of material and process data before consolidation into the final DPP.

The findings inform the development of a scalable, industry-aligned data architecture for DPP implementation, bridging regulatory objectives with practical recycling requirements, and supporting higher recycling rates and improved circularity in textiles.

Keywords: Digital Product Passport, Digital Material Passport, Textile Recycling, Traceability, Circular Economy, Data Architecture

ID: 57

Title: EcoPlast: A Digital Product Passport-Enabled Platform for Circular Automotive Plastics

Time: —

Mohammad Anis Uz Zaman, Technovative Solutions Ltd. (TVS), UK
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Abstract: The EcoPlast project delivers an integrated digital solution to make automotive plastics circular, safe, and commercially viable. Its goals are to enhance the quality, safety, and durability of secondary materials; increase recovery, recycling, and upcycling rates; and promote high-value applications of recycled plastics.

The platform combines Digital Twins (DTs), AI, and lifecycle tools with a Digital Product Passport (DPP) infrastructure. Key modules include an ecoDesign assistant, Circularity Index (CI) calculator, Life-Cycle Assessment (LCA) and Cost Modelling Framework (CMF), AI-enabled DTs for extrusion and injection-molding, purification and upcycling workflows, and advanced sorting and robotics for end-of-life vehicles (ELVs). DPPs, blockchain immutability, zero-knowledge privacy, and batch-level chain-of-custody ensure interoperability, trust, and data governance. A DPP-enabled digital marketplace supports verified trading of recycled/upcycled plastics and enables reuse, repair, refurbishment, and remanufacture.

Commercial uptake is supported via modular services such as DPP-as-a-Service, certification and verification APIs, marketplace products, DT/AI subscriptions, and training/IPR/licensing offerings. Nine industrial use cases validate the approach, demonstrating outcomes like ultra-pure recycled polypropylene, intact glass-fiber recovery, monomer recovery via upcycling, and circular automotive part redesign. EcoPlast translates DPP research into scalable, market-ready business models and value chains for OEMs, recyclers, and regulators.

Keywords: Automotive Plastics, Circular Economy, Digital Product Passport, Digital Twin, AI, Upcycling, Recycling, Sustainability

ID: P3-4

Title: MaDiTraCe: A Digital Product Passport Architecture for Critical Raw Materials

Time: 18:28

Doruk Sahinel, Spherity GmbH, Germany
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Abstract: Digital Product Passports (DPPs) are central to emerging EU sustainability and due-diligence requirements under ESPR and CRMA. However, large-scale uptake is limited by fragmented multi-tier data, interoperability gaps, and unresolved trust/confidentiality issues. In critical raw material supply chains, digital provenance records are particularly exposed to "decoupling risks," while commercial sensitivity restricts evidence sharing.
The MaDiTraCe Proof-of-Concept architecture addresses these barriers through implementable building blocks:

- Physical–Digital Anchoring: Material fingerprinting using analytical isotopic and chemical signatures issued as verifiable credentials linked to batch DIDs, providing probabilistic country-of-origin evidence.
- Chain-of-Custody (CoC) Continuity: UNTP-aligned traceability events and certificate attachments support verifiable material lineage.
- Cross-Tier Interoperability: Linked DPPs allow downstream passports to reference upstream batch DIDs, enabling traversable provenance without ad-hoc document exchange.
- Fine-Grained Access Control: Sensitive evidence disclosure is restricted to authorized stakeholders.
- CAHRA-Oriented "Red-Flag" Credentials: Country-of-origin risk indicators and evidence inconsistencies trigger enhanced due diligence without compromising traceability.

This approach maps technical, regulatory, and organizational barriers to a deployable DPP architecture, providing a transferable pathway to accelerate adoption in regulated industrial ecosystems.

Keywords: Digital Product Passport, Critical Raw Materials, Traceability, Provenance, Verifiable Credentials, Supply Chain, Interoperability

ID: P4-6

Title: Deployment Pathways for Digital Product Passports in the Steel Sector

Time: 18:46

Stefan Grüll, S1Seven GmbH, Germany
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Abstract: The rollout of Digital Product Passports (DPPs) for intermediary products like steel is transitioning from policy design to practical implementation. This session evaluates scalable, enforceable, and economically viable deployment pathways rather than advocating a single model.
The steel sector operates within a structured regulatory environment: EN 10204 inspection documents (Type 2.2 for model-based declarations, Type 3.1 for batch-level verified data), EN 10021 for authorized declaration issuance, and EN 10168 standardizing inspection document content—potentially serving as a DPP data baseline.
The session compares multiple rollout scenarios: product-level model-based, batch-based, hybrid approaches, and greenfield digital models independent of current certification standards. For each scenario, the discussion covers governance and liability, data reliability, integration complexity, cost impact across company sizes, and interoperability potential.
S1Seven leverages hands-on experience from live steel supply chains and engagement in CEN-CENELEC JTC 24 standardization, including exchanges with DG GROW, to translate regulatory ambitions into practical deployment models. The session aims to clarify what each pathway enables and its limitations, supporting informed DPP rollout decisions in the steel sector.

Keywords: Digital Product Passport, Steel, Deployment Pathways, JTC 24, Regulatory Compliance, Interoperability

ID: 62

Title: Accelerating Circularity and Compliance in Plastics via CircPlastX DPPs and Data Spaces

Time: —

Theodor-Christian Chirvasuta, TNO, Netherlands
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Abstract:

The plastics industry faces increasing societal, regulatory, and economic pressure to ensure circularity, yet challenges remain around manufacturability (quality consistency with recycled materials), availability (market and business model constraints), and transparency (traceability of substances and microplastics). These issues affect sectors including automotive, textiles, consumer electronics, and packaging. A key barrier is the lack of accessible and high-quality data across the value chain.

The CircPlastX project investigates how Digital Product Passports (DPPs) and Data Spaces can address these challenges. Interviews with stakeholders — from material providers to recyclers, eco-organizations, and regulators — identify opportunities for trusted data sharing, improved visibility of recycled content, optimized substance information, and enhanced lifecycle analysis (LCA) data quality. CircPlastX aims to standardize material and process data in plastics, structuring it in ways that support DPPs and accelerate circularity, regulatory compliance, and transparency across diverse stakeholders in the European plastics value chain.

Keywords: Digital Product Passport, Data Space, Circular Economy, Plastics, Traceability, Recycled Materials, Lifecycle Analysis

ID: P1-3

Title: Enabling Semantic Interoperability for Materials Data and Digital Product Passports through Platform MaterialDigital

Time: 18:04

Jörg Schaarschmidt, Karlsruhe Institute of Technology (KIT), Germany
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Abstract:

Materials innovation increasingly relies on data-driven approaches, but a lack of shared semantics, interoperable workflows, and scalable cross-organizational data-space integration limits progress. The German BMFTR initiative MaterialDigital addresses these challenges by providing a semantically grounded framework for FAIR materials data encompassing experiments, simulations, and industrial processes.

The Platform MaterialDigital (PMD) integrates ontology-based data modeling, modular IT architectures, and executable digital workflows to create machine-interpretable descriptions of material states and lifecycle transformations. This enables traceable generation and cross-domain integration of knowledge across heterogeneous materials classes.

The PMD-X projects extend these concepts into operational, cross-company industrial data-space ecosystems, including Manufacturing-X–related environments. These efforts validate semantic interoperability in supply-chain scenarios relevant to circularity strategies and Digital Product Passport (DPP) implementation.

At the European level, MaterialsCommons4EU (in grant preparation) aims to federate national semantic infrastructures into a European materials data ecosystem aligned with EOSC principles. MaterialDigital thereby contributes to enabling sovereign data exchange, lifecycle transparency, and accelerated innovation across materials sectors.

Keywords: Digital Product Passport, Semantic Interoperability, FAIR Data, Materials Data Management, MaterialDigital, PMD, PMD-X, MaterialsCommons4EU, Circularity

ID: P4-7

Title: Overcoming SME Data Collection Challenges for Digital Product Passport Implementation

Time: 18:48

Eva Koenders, HAN University of Applied Sciences, Netherlands
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Abstract:
The Ecodesign for Sustainable Products Regulation (ESPR) mandates Digital Product Passports (DPPs) for regulated products, supporting Europe's circular economy goals by ensuring transparency, traceability, and sustainability across supply chains. While most research focuses on supply chain-level implementations, individual companies—particularly SMEs—face significant challenges in collecting and structuring product data.
This work presents a case study in an SME to investigate how technical solutions can facilitate DPP data collection. Relevant systems and data sources were mapped, including structured and unstructured inputs, to identify bottlenecks in automation and efficiency. Feasibility and reliability of technological solutions were assessed, and a data collection pipeline was designed to extract data from multiple sources, transform it into the required DPP format, and integrate it efficiently.
The findings highlight technologies that can significantly reduce the cost and manual labor burden for SMEs, enabling them to comply with DPP requirements and positioning them as early adopters driving the circular economy transition.

Keywords: Digital Product Passport, SME, Data Collection, Automation, DPP Implementation, Circular Economy, ESPR, Technical Solutions

ID: P1-1

Title: High-level Architecture Design of the DATA4CIRC DPP Framework

Time: 18:00

Wan Li, RWTH Aachen University, Germany
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Abstract:
Digital Product Passports (DPPs) are critical enablers of the EU circular economy, providing structured and interoperable lifecycle data across complex industrial value chains. Current implementations, however, face fragmented data landscapes, insufficient interoperability, and limited secure mechanisms for cross-company data sharing.
The EU-funded DATA4CIRC project addresses these challenges by delivering a human-centred, data-driven framework that integrates federated data spaces, DPPs, lifecycle assessment, and digital models (digital twins and digital threads) within a standards-based architecture. This contribution presents the high-level architecture of the DATA4CIRC DPP module, which uses the Asset Administration Shell (AAS) as the core information model.
Key components include a DPP Builder and DPP Service, supported by security, persistence, API, presentation, and deployment layers. The layered design ensures modularity, scalability, secure data exchange via data spaces, and integration with both internal enterprise systems and external ecosystems through standardized interfaces. Structured AAS submodels align with DPP4.0 concepts and emerging EU DPP standards to guarantee interoperability and regulatory compliance.
Overall, DATA4CIRC provides a standards-aligned, user-driven framework that supports cross-sector circular manufacturing and facilitates practical DPP deployment in industrial ecosystems.

Keywords: Digital Product Passport, DATA4CIRC, Asset Administration Shell, Circular Economy, Federated Data Spaces, Interoperability, Lifecycle Assessment, Digital Twins

ID: P1-6

Title: Standardizing Circularity Data for Textile DPPs: PCDS and TRUSTEX

Time: 18:10

Jérôme Dierickx & Xavier-François Verni, Luxembourg Institute of Science and Technology (LIST), Luxembourg
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Abstract:
The textile sector's diversity and lack of harmonized standards complicate the implementation of Digital Product Passports (DPPs). Initiatives like the Product Circularity Data Sheet (PCDS, ISO 59040) provide standardized disclosure of circularity attributes—recycled content, repairability, and end-of-life options—in a structured format compatible with DPPs (PDF/JSON/REST APIs). PCDS promotes transparency, SME adoption, and ESPR compliance, but gaps in taxonomy and sector-specific complexity remain.
The TRUSTEX project addresses these limitations by developing standardized APIs to convert fragmented inputs into interoperable outputs, integrating emission-factor databases, LCA engines, and verified batch-level data. Automated visualizations and scalable, regulation-ready DPPs are generated, while blockchain-based architecture with Factory Patterns (OpenZeppelin Minimal Proxies, EIP-1167) and ERC-1155 tokens ensures traceability. Role-Based Access Control (RBAC) secures provenance and circularity claims.
By combining AI-driven data validation with blockchain-enabled trust mechanisms, TRUSTEX reconciles primary supply-chain data with industry-verified secondary sources, overcoming gaps without relying on generic averages. The work demonstrates that digitalization is essential to surmount barriers in DPP adoption, enabling credible, actionable, and scalable circularity data in the textile industry.

Keywords: Digital Product Passport, Circularity Data, PCDS, TRUSTEX, Blockchain, AI Validation, Textile Sector, ESPR Compliance

ID: 73

Title: Intelligent Digital Product Passports and Digital Marketplaces for Circular Household Appliances

Time: —

Nikolaos Dimitriou, CERTH/ITI, Greece
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Abstract:
In modern manufacturing, Digital Product Passports (DPPs) are key enablers of sustainability and circularity. Within the ENCIRCLE project, DPPs are integrated with an intelligent industrial IoT network of sensors and blockchain technology to ensure transparency, traceability, and secure data sharing across stakeholders. A Digital Marketplace (DM) connects manufacturing companies and consumers, facilitating eco-responsible consumption and circular business models.
For end-of-life household appliances, the DPP contains detailed product and digital twin information, enabling companies such as Arçelik to assess remaining lifespan, propose remote support, recycling, or replacement offers. Consumers interact via an AI-supported DPP wallet app, retrieving, updating, and enriching DPP data (usage patterns, repairs, malfunctions), while receiving guidance through a multimodal LLM providing maintenance instructions and recommendations in natural language.
Users resolving minor issues receive discounts, and appliances reaching end-of-life trigger offers for replacement or recycling incentives. This approach encourages active appliance maintenance, prolongs product lifespans, and promotes responsible consumption, demonstrating a scalable integration of IoT, AI, blockchain, and DPPs in circular economy workflows.

Keywords: Digital Product Passport, Circular Economy, IoT, Blockchain, Digital Marketplace, LLM, Appliance Lifecycle, ENCIRCLE Project

ID: P3-1

Title: Enabling Neodymium Circularity through Minimum Viable Ecosystems and UNTP DPP

Time: 18:22

Viola Gallina, Fraunhofer Austria Research GmbH, Austria
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Abstract:

Despite policy efforts, global circularity remains insufficient, largely due to gaps in coordination and trusted information exchange across organizations. This work focuses on neodymium (Nd) magnet recycling, a critical sector given the strategic importance of rare earth elements in renewable energy, mobility, and advanced manufacturing.

The study develops a structured approach to define a Minimum Viable Ecosystem (MVE) for Nd circularity, operationalized using the UN Transparency Protocol (UNTP) framework and Digital Product Passport (DPP). By combining ISO circular-economy standards, MVE theory, and the UNTP DPP, the framework identifies the minimal set of actors, governance rules, and information flows needed to ensure measurable value retention and recovery of Nd across extraction, manufacturing, use, dismantling, and recycling stages.

The proposed MVE includes magnet producers, equipment manufacturers, collection points, dismantlers, recyclers, and data or certification actors, coordinated via standardized governance rules. The UNTP DPP anchors information exchange, enabling traceability, lifecycle transparency, and performance measurement. This approach supports incremental participation, reduces uncertainty, and facilitates economically viable rare-earth circularity, providing a conceptual foundation for operationalizing circular ecosystems with standardized DPP-enabled coordination.

Keywords: Digital Product Passport, Neodymium, Rare Earths, Circular Economy, Minimum Viable Ecosystem, UNTP, Lifecycle Traceability, Recycling

ID: P4-4

Title: ARGONAUT: AI-Assisted Environmental Assessment via DPPs for Bio-Based Circular Value Chains

Time: 18:42

Milenko Tosic, VizLore Labs Foundation, Austria
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Abstract:

ARGONAUT is a Horizon Europe project developing digital solutions for environmental impact assessment of bio-based products across circular value chains, implemented in six pilots spanning biomaterials and agrifood applications. At the core is JASON, an AI-assisted tool supporting Life Cycle Assessment (LCA) and Environmental Footprint (EF)-based analysis under defined methodological guardrails.

The project integrates a Digital Product Passport (DPP) approach to generate versioned, auditable, and interoperable product/batch records. DPP profiles include identifiers, origin data, EF 3.0 indicators, method metadata, dataset references, and data quality indicators. The DPP exposes both human- and machine-readable views (e.g., JSON-LD/QR endpoints), preserving technical traceability while facilitating stakeholder communication.

The architecture combines data-space principles with a permissioned blockchain layer. Data spaces enable sovereign, policy-controlled exchange of DPP data, while Hyperledger Fabric ensures tamper-evident logging of hashes, timestamps, signatures, and lifecycle events without revealing sensitive datasets.

Bidirectional integration between JASON and the DPP allows the AI tool to read prior DPP headers and EF data to initialize scope and comparability checks, and to write back updated impact indicators and provenance results. ARGONAUT positions the DPP as both a trusted disclosure layer and an operational backbone for AI-assisted environmental management in the circular bioeconomy.

Keywords: Digital Product Passport, Bioeconomy, Circular Value Chain, Environmental Footprint, Life Cycle Assessment, AI, Blockchain, Data Spaces, Traceability

ID: 79

Title: An Open-Source Interoperability Test Suite for EU Digital Product Passports (DPPs)

Time: —

Carolynn Bernier, CEA-List, France
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Abstract:

The CIRPASS-2 project introduces an open-source test suite designed to support pilot interoperability testing for EU Digital Product Passports (DPPs). The suite enables early experimentation with mock-up implementations of future EU services and covers both JSON and JSON-LD DPP representations. The toolset is publicly available on GitHub and intended for exploration rather than as a normative standard.

The suite consists of four integrated tools:

1. **DPP Validation Service:** REST API for validating DPP data against JSON schemas or SHACL templates, returning structured validation reports.
2. **Mock EU Registry:** Configurable mock implementation of the future EU DPP Registry for submitting DPP metadata and obtaining registration identifiers, adaptable to evolving standards.
3. **Mock EU Web Portal:** Prototype portal for searching, rendering, and comparing DPPs across decentralized repositories, leveraging semantic information for richer visualization.
4. **DPP Search Keys Extractor:** Retrieves DPPs from URLs, extracts configurable search fields, and populates a cache for the mock Web Portal to enable model-level searches.

This toolset supports early validation of DPP implementations, encourages experimentation across decentralized architectures, and provides a foundation for interoperable EU-wide DPP adoption.

Keywords: Digital Product Passport, Interoperability, EU Standards, JSON-LD, Open Source, Pilot Testing, CIRPASS-2

ID: P4-5

Title: DPP4CD: Digital Product Passport for Circular Denim

Time: 18:44

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Abstract:

Digital Product Passports (DPPs) under the EU Ecodesign for Sustainable Products Regulation (ESPR) aim to facilitate reuse, repair, and recycling. The DPP4CD project addresses operational challenges in multi-tier textile supply chains, piloting a circular denim implementation in collaboration with MUD Jeans, a circular denim brand offering leasing and take-back models.

Three critical implementation gaps were explored: (1) **Legal-to-Data Feasibility:** Nine DPP data categories, including environmental and manufacturing data, revealed limited primary data and inconsistent upstream collection. Standard operating procedures were developed, and AI-assisted screening was introduced to validate sustainability data coherence, provenance, and robustness. (2) **Circular Supply Chain Traceability:** Item-level identifiers were frequently lost during sorting. Dialogue with sorters and stakeholders is ongoing to enhance end-of-life traceability. (3) **DPPs with Added Value:** An extended DPP model provides operational dashboards to support data-driven decision-making across the supply chain, fostering value creation and increasing SME engagement.

DPP4CD demonstrates how a structured DPP architecture can be adapted for circular textile supply chains, bridging regulatory compliance with practical operational insights.

Keywords: Digital Product Passport, Circular Denim, Textiles, Sustainability, Traceability, SME Engagement, AI-assisted Data Validation

ID: P3-3

Title: From Ambiguity to Operational Readiness: Developing the Digital Product Passport

Time: 18:26

Lucyna Lekawska-Andrinopoulou, Institute for Communication and Computer Systems, Greece
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Abstract:
The European Circular Economy Action Plan (2020) and subsequent Ecodesign for Sustainable Products Regulation (ESPR, 2024) established the Digital Product Passport (DPP) as a legally binding instrument. Anticipating regulatory adoption, the ICCS team initiated the development of DPP frameworks within Horizon Europe projects such as DigInTraCE and THEROS (starting January 2023).
This work traces the transition from conceptual ambiguity to operational readiness, highlighting methodological and architectural choices, with a particular focus on traceability integration. Lessons were systematically drawn from ongoing and completed projects: DigInTraCE, THEROS, IS2H4C, SMARTchain, THESEUS, and Reconstruct.
Complementing technical development, a DPP event series was launched to foster cooperation, knowledge exchange, and identification of shared challenges, strategic approaches, and innovations supporting harmonized DPP implementation. The abstract also outlines next steps and innovation pathways in upcoming projects, offering a practical perspective on evolving DPP methodologies and cross-project learnings.

Keywords: Digital Product Passport, Traceability, Circular Economy, ESPR, Methodology, Horizon Europe, Project Coordination, Operational Framework

ID: P3-7

Title: Embedding Digital Product Passports through Governance: Insights from the Furniture Sector

Time: 18:34

Rebecca Blach, University of Applied Sciences Darmstadt, Germany
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Abstract:
The effective implementation of Digital Product Passports (DPPs) requires embedding them as strategic instruments supported by governance, data stewardship, and aligned incentives. In the furniture sector, fragmented supply chains, low transparency, and unclear data responsibilities intensify these challenges.
Using a scenario process and cross-impact analysis with industry actors from the R-evolve project, the study shows that insufficient governance results in fragmented data flows, low trust, and limited progress towards circular economy objectives. Overcoming these barriers requires coordinated action at multiple levels: macro (EU legislation), meso (sector-specific governance), micro (company-level implementation), and nano (individual capacity building).
Focusing on the meso level, R-evolve develops a Governance Framework (GF) to operationalize DPPs as strategic enablers of Circular Economy-Based Business Models (CEBMs), rather than solely compliance instruments. Clear interaction patterns, harmonized practices, and incentives bridge the gap between regulatory ambition and practical execution in fragmented, global value chains.
Initial pilot applications highlight the complexity of implementing the GF in isolation, pointing to the need for a Community of Practice to share experiences, address challenges, and support continuous development of a shared GF.

Keywords: Digital Product Passport, Governance Framework, Furniture Sector, Circular Economy, Supply Chain Transparency, R-evolve Project, Community of Practice

ID: 84

Title: From Structural to Semantic Interoperability: Operationalizing ECLASS for AAS in Semantic Web Environments

Time: —

Margit Kranner, AIT Austrian Institute of Technology, Austria
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Abstract:
Digital Product Passports (DPPs) must operate across heterogeneous digital ecosystems, including Asset Administration Shell (AAS) infrastructures and data spaces increasingly reliant on RDF and JSON-LD. While AAS provides a robust structural framework, semantic interoperability across domains remains limited, primarily due to non-dereferenceable identifiers for classification systems such as ECLASS.
This work proposes four key steps to bridge AAS-based DPPs and RDF/Linked Data environments:

1. Introducing persistent, dereferenceable HTTP URIs for ECLASS concepts.
2. Providing a formal RDF representation of ECLASS semantics for machine-interpretable concept hierarchies and properties.
3. Systematically referencing these URIs within AAS as semantic IDs.
4. Applying SHACL constraints to ensure semantic consistency and validation across AAS instances.

Grounding AAS submodel elements in RDF-based definitions enables querying and integration across organizational and domain boundaries without altering the AAS meta-model. This approach transforms structurally harmonized but semantically isolated DPP data into interoperable knowledge graphs, supporting graph-based supply chain analytics, material flow aggregation, cross-product comparisons, and advanced circular economy evaluations.

Keywords: Digital Product Passport, Semantic Interoperability, Asset Administration Shell, ECLASS, RDF, SHACL, Knowledge Graphs, Data Spaces, Circular Economy

ID: P1-4

Title: Semantic Building Blocks for Digital Product Passports: RDF/OWL Vocabularies for Interoperability and EU Compliance

Time: 18:06

Kévin Boutillier, Verisav, France
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Abstract:
Verisav provides open RDF/OWL vocabularies to standardize Digital Product Passport (DPP) and after-sales service (SAV) data, enabling interoperability and EU regulatory compliance. Three complementary vocabularies are published and validated: 1. A DPP vocabulary aligned with EU ESPR 2024/1781, UNTP, and GS1 Digital Link, covering product lifecycle, granularity (model/batch/serial), and conformity claims. 2. An RMA vocabulary for return and service-ticket workflows. 3. A WTY vocabulary for machine-readable warranties and payment automation.
All vocabularies are FAIR, dereferenceable (W3ID persistent URIs), registered in Linked Open Vocabularies (LOV), and available in JSON-LD and Turtle. They support EU Business Wallet and W3C Verifiable Credentials (VCDM 2.0).
This contribution demonstrates how these semantic building blocks facilitate practical DPP implementation, reduce proprietary lock-in in SAV systems, and align with ongoing convergence efforts between AAS/RDF and UNTP frameworks.
References: Zenodo 10.5281/zenodo.18352147; `https://w3id.org/verisav`

Keywords: Digital Product Passport, Semantic Web, RDF, OWL, FAIR Data, UNTP, AAS, Interoperability, After-Sales Service

ID: 89

Title: Cross-Border Digital Product Passports for EV Batteries: Insights from Marklytics

Time: —

Jessica Green, Marklytics, UK
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Abstract:

Electric vehicles (EVs) are central to the net-zero energy transition, but material intensity creates supply constraints, making circularity essential. Digital Product Passports (DPPs) provide the infrastructure for traceability, lifecycle intelligence, and recovery optimisation. As DPPs for batteries become mandatory in Europe in 2027, cross-border execution and interoperability with EU and non-EU digital identity frameworks and regulatory systems are critical.

Marklytics' DPP4EU initiative addresses these challenges by: 1. Sharing practical insights from the BatteryPass-Ready testing environment, including early validation against EU registry technical and data standards to reduce compliance risks for 2027. 2. Presenting interoperability models for cross-border DPPs, harmonising EU and non-EU digital identity and regulatory infrastructures, informed by lessons from India's Battery360 Alliance on passport schema alignment. 3. Demonstrating scalable DPP architectures that integrate end-to-end traceability with AI-driven ESG reporting and advanced battery analytics. 4. Highlighting cross-sector insights and emerging circular business models, drawing lessons from textiles and other industries navigating regulatory and supply chain complexity.

The session emphasises practical execution at scale, global alignment, and enabling trusted, interoperable, and transparent DPP ecosystems across borders.

Keywords: Digital Product Passport, EV Batteries, Circular Economy, Cross-Border Interoperability, BatteryPass-Ready, ESG Reporting, AI Analytics, Regulatory Alignment

ID: 90

Title: Scalable Implementation of Digital Product Passports with Transpareo AG

Time: —

Kevin Lancashire, Transpareo AG, Switzerland
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Abstract:
Implementing Digital Product Passports (DPPs) at scale requires more than data storage; it demands a robust ecosystem for global operations. Transpareo AG presents a practical framework leveraging the Transpareo-Application-Manager (TAM) and the Transpareo-DPP-Website (T-DPP).
The TAM acts as a central hub, automating the import, harmonization, and validation of heterogeneous material data from ERP, PLM, and supplier systems, establishing a single source of truth. The T-DPP connects this harmonized information to the workforce via physical carriers (QR codes, NFC), bridging the physical and digital worlds and enabling immediate access across global operations, from manufacturing to recycling.
Key presentation points include:

- **Efficient Data Import:** Aggregation, validation, and harmonization of complex data streams to meet DPP standards.
- **Physical Integration:** Context-aware access through on-product carriers for worldwide teams.
- **Operational Excellence:** T-DPP as a functional work tool to support real-time compliance.
- **Scalable Orchestration:** Maintaining data integrity from ingestion to global distribution via APIs.

This framework demonstrates a scalable circular economy infrastructure, ensuring operational readiness and regulatory compliance for DPP implementation at a global scale.

Keywords: Digital Product Passport, Scalable Implementation, TAM, T-DPP, Circular Economy, Data Harmonization, ERP/PLM Integration, Physical-Digital Interfaces

ID: 91

Title: Reference Architecture and Open-Source Implementation for Distributed Digital Product Passports

Time: —

Jose Manuel Cantera Fonseca, IOTA, Germany
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Abstract:

While standards and regulations define the backbone of Digital Product Passport (DPP) systems, implementing robust DPPs across global value chains remains challenging due to multiple distributed actors—including manufacturers, importers, distributors, repairers, refurbishers, and authorities. Simple cloud-based silos managed by a single manufacturer are insufficient to realize DPP potential.

This contribution presents a reference architecture and accompanying open-source implementation for future-proof, distributed DPP systems. Central to the design is the **TWIN Node**, a software agent serving as gatekeeper for all product-related data within an organization, ensuring data sovereignty and verifiability via a Distributed Ledger Technology (DLT).

Key features include:

- **Decentralized Data Exchange:** Organizations access product data from other actors using the Eclipse Dataspace Protocol on a need-to-know basis.
- **Data Discovery:** A decentralized catalogue compliant with W3C DCATv3 allows value chain participants to find data providers without prior relationships.
- **Data Verifiability:** Verifiable credentials wrap DPP data with cryptographic proofs timestamped on the DLT, which also acts as a verifiable registry of digital identities.
- **Global Ecosystem Enablement:** Distributed actors can produce, share, discover, and verify product data, promoting circular economy objectives and sustainability across the value chain.

The architecture demonstrates how combining distributed ledger technology, decentralized data exchange, and verifiable credentials can operationalize DPPs in heterogeneous, global supply chains.

Keywords: Digital Product Passport, Distributed Ledger, TWIN Node, Eclipse Dataspace Protocol, Verifiable Credentials, Data Sovereignty, Circular Economy, Sustainability

ID: 92

Title: Mini DPP Platform: Open-Source Full-Stack Reference Implementation for Industry 4.0 Digital Product Passports

Time: —

Mohammad Hadi Khori Jannatabadi, Chair of Information and Automation Systems for Process and Material Technology, RWTH Aachen University, Germany
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Abstract:
Digital Product Passports (DPPs), mandated under the Ecodesign for Sustainable Products Regulation (ESPR), provide machine-readable access to product sustainability information. The Industrial Digital Twin Association (IDTA) DPP for Industry 4.0 (DPP4.0) defines an Asset Administration Shell (AAS)-based structure and template set for standardized electronic passports. The **Mini DPP Platform** delivers an open-source, full-stack reference implementation for template-driven DPP authoring, multi-tenant governance, controlled publication, and optional integration with dataspace connectors and resolvers. Core architecture components include:

- Backend: FastAPI framework for RESTful services.
- Frontend: React/Vite single-page application.
- Authentication & Authorization: Keycloak OpenID Connect (OIDC) and Open Policy Agent (OPA) policy-as-code.
- Persistence & Caching: PostgreSQL database, Redis caching, rate limiting.
- Object Storage: MinIO for AASX packages and binary artifacts.

The platform exposes public viewer routes for published DPPs and provides export functions to generate AASX packages for interoperability. By operationalising ESPR-aligned DPP publication using IDTA AAS and DPP4.0 templates, the Mini DPP Platform maintains clear integration boundaries for registries, resolvers, and Eclipse Dataspace Components (EDC), enabling secure, scalable, and standardized DPP management within Industry 4.0 ecosystems.

Keywords: Digital Product Passport, Industry 4.0, Asset Administration Shell, DPP4.0, Open-Source Platform, FastAPI, React, MinIO, Dataspace Integration

ID: P1-5

Title: Scalable and Explainable Handling of Missing Data in Digital Product Passports

Time: 18:08

Amir Taherkordi, University of Oslo, Norway
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Abstract:
Digital Product Passports (DPPs) are key enablers of the EU circular economy, ensuring product transparency, traceability, and lifecycle accountability. Practical deployment of DPPs is challenged by missing or incomplete data arising from heterogeneous sources, distributed value chains, multilingual documentation, and limited coverage across production, use, and end-of-life phases. Missing data undermines regulatory compliance, lifecycle assessment accuracy, traceability, and stakeholder trust.
This contribution presents an **AI-driven approach** to address missing DPP data by leveraging transformer-based representation learning and autoencoder architectures. Key elements include:

- Generating condensed semantic representations of complete and partial DPPs that capture cross-field dependencies and contextual relationships across lifecycle stages.
- Expanding and inferring missing values while preserving semantic consistency and aligning with downstream applications such as environmental impact assessment.
- Supporting heterogeneous and multilingual DPP datasets.
- Incorporating explainable AI mechanisms to ensure transparency and interpretability of inferred values, crucial for regulatory and industrial decision-making.

By treating missing data as a fundamental design challenge rather than a post-processing problem, this work establishes a foundation for **reliable, scalable, and regulation-ready DPP deployment**, enhancing trust, compliance, and lifecycle insights across complex value chains.

Keywords: Digital Product Passport, Missing Data, Explainable AI, Transformer Models, Autoencoders, Circular Economy, Lifecycle Assessment, Data Imputation

ID: 94

Title: Scaling Battery Digital Product Passports with Hybrid Infrastructure and SSbD Evidence

Time: —

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Abstract:
Digital Product Passports (DPPs) under the EU Ecodesign for Sustainable Products Regulation (ESPR) require interoperable, verifiable IT infrastructures that enable product and material information exchange across complex value chains while supporting circularity. This contribution presents an industry reference architecture for Battery DPPs combining:

- **Decentralized Identifiers (DIDs) and Verifiable Credentials:** For stakeholder onboarding, role governance, and trusted identity management.
- **Audit-Ready Event Layer:** Captures critical lifecycle updates, material provenance, and compliance events.
- **Schema-Driven Off-Chain Services:** Supports high-volume datasets including carbon footprint, material composition, due diligence evidence, performance metrics, and end-of-life data.

The contribution also identifies open challenges for the DPP community:

1. Interoperability patterns across evolving DPP schemas, APIs, and data spaces.
2. Governance models for selective disclosure, access control, and verification of sustainability claims across OEMs, suppliers, recyclers, and regulators.
3. Methods to connect DPP datasets to Safe-and-Sustainable-by-Design (SSbD) evidence and material modeling/characterization inputs without overburdening industrial workflows.

The approach demonstrates how hybrid DPP architectures can scale from pilot projects to production deployments while remaining reusable and interoperable across industrial sectors, supporting circular economy objectives and regulatory compliance.

Keywords: Battery Digital Product Passport, DPP, Safe-and-Sustainable-by-Design, Hybrid IT Architecture, Decentralized Identifiers, Verifiable Credentials, Circular Economy

ID: 94

Title: Building Interoperable and Trust-Based Digital Product Passports: From Infrastructure to Real-World Deployment

Time: —

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Abstract:

As Digital Product Passports (DPPs) transition from policy concepts to mandatory EU implementations, scalable, interoperable, and trust-based technical architectures are essential. This session presents practical strategies to realize compliant and future-proof DPPs across complex supply chains. Key aspects include:

- **Decentralized Identity and Verifiable Data Exchange:** Ensuring secure, transparent, and verifiable data sharing between stakeholders.
- **Public Permissionless Infrastructure:** Anchoring DPP data in decentralized networks while maintaining compatibility with enterprise systems and standards.
- **Interoperable and Modular Architectures:** Demonstrated through real-world deployments by IOTA Business Innovation Program (BIP) partners, including Orobo, enabling circularity-ready solutions for manufacturers and recyclers.
- **Governance and Long-Term Data Availability:** Balancing decentralized trust with regulatory compliance and operational scalability.

The session emphasizes lessons from operational deployments, showcasing how DPPs can be implemented today with modular, scalable architectures that integrate decentralized identity, verifiable credentials, and secure data exchange, supporting transparency, circular economy objectives, and EU compliance.

Keywords: Digital Product Passport, DPP, IOTA, Decentralized Identity, Verifiable Credentials, Circular Economy, Interoperability, Trust Frameworks