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CRANE

# D5.14. Demonstration of the test products resulting from the R&D

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| **** Deliverable Type:** | *R=Document, report; DEM=Demonstrator, pilot, prototype; DEC=Websites, patent fillings, videos, etc; ETHICS=Ethics requirement; ORDP=Open Research Data Pilot; DATA=data sets, microdata, etc.; OTHER* |

**Document Summary**

Public showcase of the validated solutions: demonstration materials, videos, and validation results presented in a communicable format for external audiences.

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# Glossary

| Acronym | Meaning |
|---|---|
| **CA** | Consortium Agreement |
| **DAO** | Decentralised Autonomous Organisation (term used by the Data for Good Foundation to describe their multi-stakeholder governance model) |
| **DDA** | Data Disclosure Agreement |
| **DfC** | Data for Care |
| **DGA** | EU Data Governance Act |
| **dHDSI** | Decentralised Health Data Space Infrastructure |
| **DISP** | Data Intermediation Service Provider |
| **DPIA** | Data Protection Impact Assessment |
| **EBSI** | European Blockchain Services Infrastructure |
| **EHDS** | European Health Data Space |
| **eIDAS** | Electronic Identification, Authentication and Trust Services |
| **FAIR** | Findable, Accessible, Interoperable, Reusable |
| **FHIR** | Fast Healthcare Interoperability Resources (HL7 standard) |
| **GDPR** | General Data Protection Regulation |
| **HCP** | Healthcare Professional |
| **ISO 27560** | International standard for privacy technologies, consent record information structure |
| **LPID** | Legal Person ID |
| **MHE** | MyHealthEnabler |
| **MPC** | Multiparty Computation |
| **PCP** | Pre-Commercial Procurement |
| **PDS** | Personal Data Space |
| **PII** | Personally Identifiable Information |
| **PPI** | Public Procurement of Innovation |
| **R&D** | Research and Development |

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# 1. About CRANE

CRANE (Comprehensive Treatment of Chronic Patients in Rural Areas) is a Horizon 2020 Pre-Commercial Procurement project funded under Grant Agreement No. 965277. It brings together seven partners from four European countries to address a shared and urgent challenge: how to deliver better, more integrated health and care to citizens living in rural areas, where ageing populations, a growing burden of chronic conditions, and fragmented data systems create a pressing need for innovation.

Rural regions across Europe face a common structural problem. Health data is scattered across hospitals, primary care services, social care systems, wearable devices, and personal health records. It is rarely connected, rarely controlled by the citizen, and rarely used to its full potential. CRANE set out to address this through competitive R&D across three phases, producing validated citizen-centred innovations that make health data accessible, controllable, and useful for all stakeholders.

**This is the enabler of actual integrated care.**

## 1.1 The CRANE Vision

The CRANE vision is to move from reactive treatment to preventive care and lifelong wellbeing. It rests on four interconnected pillars:

- From healthcare to true wellbeing: enabling personalised, preventive, data-driven health management beyond the clinical setting.
- Through citizen empowerment: putting citizens in genuine control of their data and its use.
- Unlocking open health data economies: creating governed, interoperable infrastructure for primary and secondary use of health data.
- Through trust by design: ensuring that privacy, consent, and transparency are built into the foundations of each solution, not added as an afterthought.

## 1.2 The CRANE Consortium

CRANE unites three rural buyer regions (Region Västerbotten in Sweden, Extremadura in Spain, and Agder in Norway) with four expert partners: EUROBcreative, PPCN, Valde Innova, and Centre for Connected Care C3.

# 2. The CRANE PCP Journey

CRANE is the result of a five-year project running from 2021 to 2026. It follows a Pre-Commercial Procurement (PCP) approach, with a total R&D budget of 4.7 million euros distributed across three competitive phases.

| Phase | Period | Milestone | Competing solutions |
|---|---|---|---|
| **Design** | June 2021 to August 2022 | Challenge definition and tender preparation, publication and awarding | n/a |
| **Phase 1** | August 2022 to February 2023 | Final design solution | 5 |

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| | | | |
|---|---|---|---|
| **Phase 2** | February 2023 to October 2024 | First working prototype | 3 |
| **Phase 3** | October 2024 to April 2026 | Validation concluded | 2 |

*Table 1: CRANE PCP phases, from concept to validated solution*

# 3. The CRANE Demonstration Day

On 17 March 2026, the CRANE consortium hosted its Demonstration Day, the milestone event marking the conclusion of Phase 3. The event brought together representatives from the three buyer regions, the two R&D supplier consortia, CRANE consortium partners, and invited stakeholders from across Europe.

The content presented in this deliverable is based on the live demonstrations delivered during the CRANE Demonstration Day on 17 March 2026, supplementary presentation materials provided by the two supplier consortia, and validation evidence gathered during Phase 3 activities across the three buyer regions. Where statements relate to supplier claims about their solutions, these are attributed explicitly to the respective consortium.

## 3.1 Event Details

| | |
|---|---|
| Date | 17 March 2026 |
| Format | Online event |
| Host | Region Västerbotten and the Swedish Centre for Rural Health |
| Organiser | Niclas Forsling, Region Västerbotten |
| Participants | 75 participants: buyer region representatives, R&D supplier consortia, CRANE consortium partners, and invited stakeholders |

*Table 2: CRANE Demonstration Day, event details*

## 3.2 Agenda

| Time | Session |
|---|---|
| 10:00 | Welcome and Introductions, CRANE Consortium |
| 10:15 | Presentation of solution 1: Data for Care. Speaker: Annemette Broch (Data for Good Foundation) |
| 10:45 | Questions and answers, Data for Care |
| 11:00 | Short break |

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| | |
|---|---|
| 11:10 | Presentation of solution 2: dHDSI. Speaker: Lotta Lundin (iGrant.io) |
| 11:40 | Questions and answers, dHDSI |
| 11:55 | Wrap-up, CRANE Consortium |
| 12:00 | End of session |

*Table 3: CRANE Demonstration Day agenda, 17 March 2026*

### 3.3 Full Event Recording

The complete video recording of the CRANE Demonstration Day (17 March 2026), including both solution presentations and the Q&A sessions, is available at the link below.
This video recording is restricted to European Commission members and reviewers, as it includes confidential information from contractors, and is therefore not included in this public version of the deliverable.

## 4. Solution 1: Data for Care

*Figure 1: The Data for Care consortium. Data for Good Foundation, Cardiolyse, Tech4Care, METEDA,* Partisia

### 4.1 Solution Overview

Data for Care (DfC) is a data sharing infrastructure designed around citizen consent and neutral governance. The consortium refers to its approach as "EHDS as a Service". Rather than aggregating data centrally, DfC aims to provide the consent infrastructure and data intermediation layer that allows existing health systems and applications to exchange data under citizen-controlled conditions.

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The solution is led by Data for Good Foundation (DfG), a Danish not-for-profit organisation acting as a neutral data intermediary and governance body. DfG operates as a neutral multi-stakeholder governance structure, designed so that no single actor can control the ecosystem. The consortium also includes:

- Cardiolyse (Norway): heart health analytics and cardiovascular risk stratification.
- METEDA (Italy): MySmaCa, an mHealth app for chronic patients living with COPD, cardiovascular disease, or diabetes.
- Tech4Care (Italy): project management, administration, and technical and training support.
- Partisia (Denmark): multiparty computation (MPC), decentralised identities, and cryptographic privacy enforcement.

DfG structures its governance model around six dimensions: Business, Legal, Ethics and Education, Society, Technology, and Culture and Communication. The consortium argues that effective citizen data sharing requires alignment across technical, legal, ethical, and social dimensions, and that technology or regulation alone are insufficient.

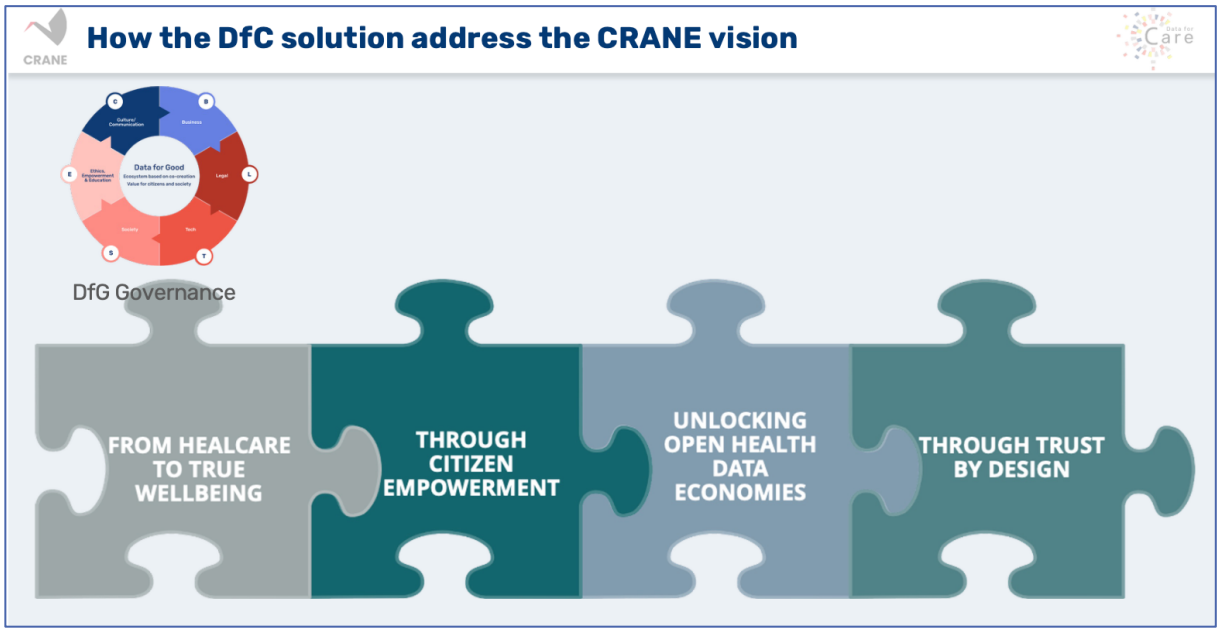


*Figure 2: DfG governance model, an ecosystem built on co-creation*

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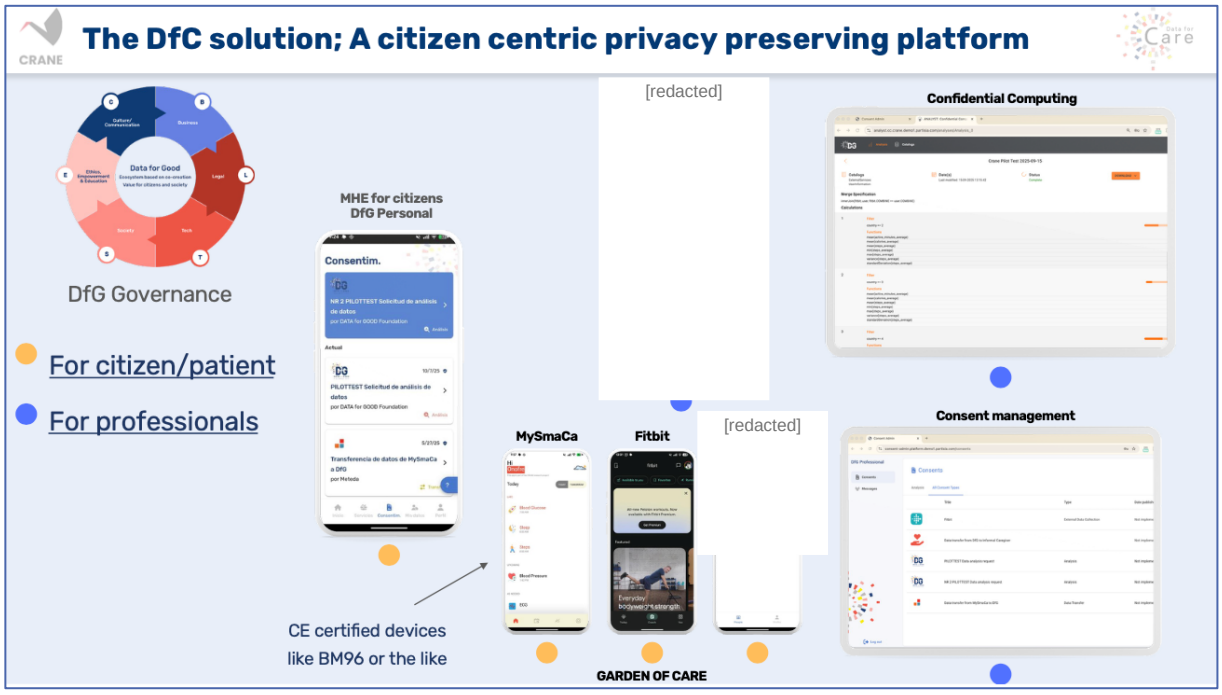


*Figure 3: DfC solution architecture. Citizen side (DfG Personal) and professional side (MHE for HCPs)*

## 4.2 Citizen Application: DfG Personal

The DfG Personal application is the citizen's single interface for managing health data, consents, and interactions with healthcare professionals and informal caregivers. It integrates Single Sign-On via MitID and eIDAS, a real-time consent dashboard, a Personal Data Space aligned with EHDS requirements, data transparency tools, and QR-based data sharing. The application was validated with citizens across Sweden, Norway, and Spain throughout the home-testing phases of the pilot.

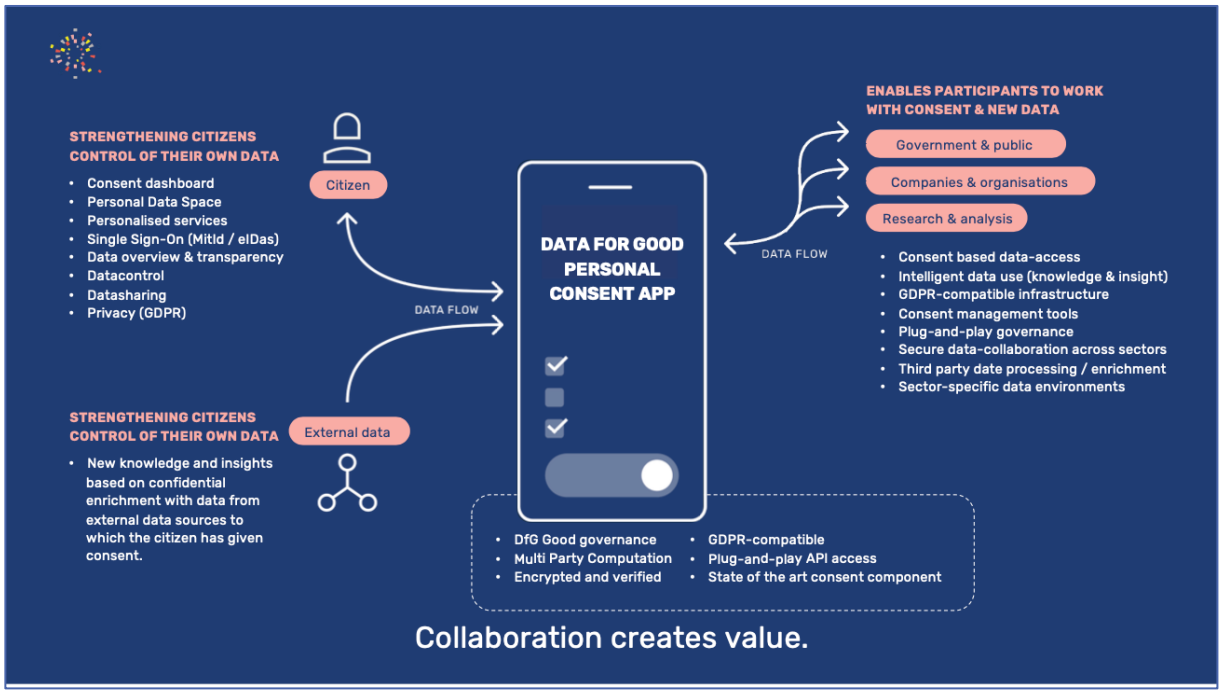


*Figure 4: DfG Personal, home screen showing recent consent requests and available services*

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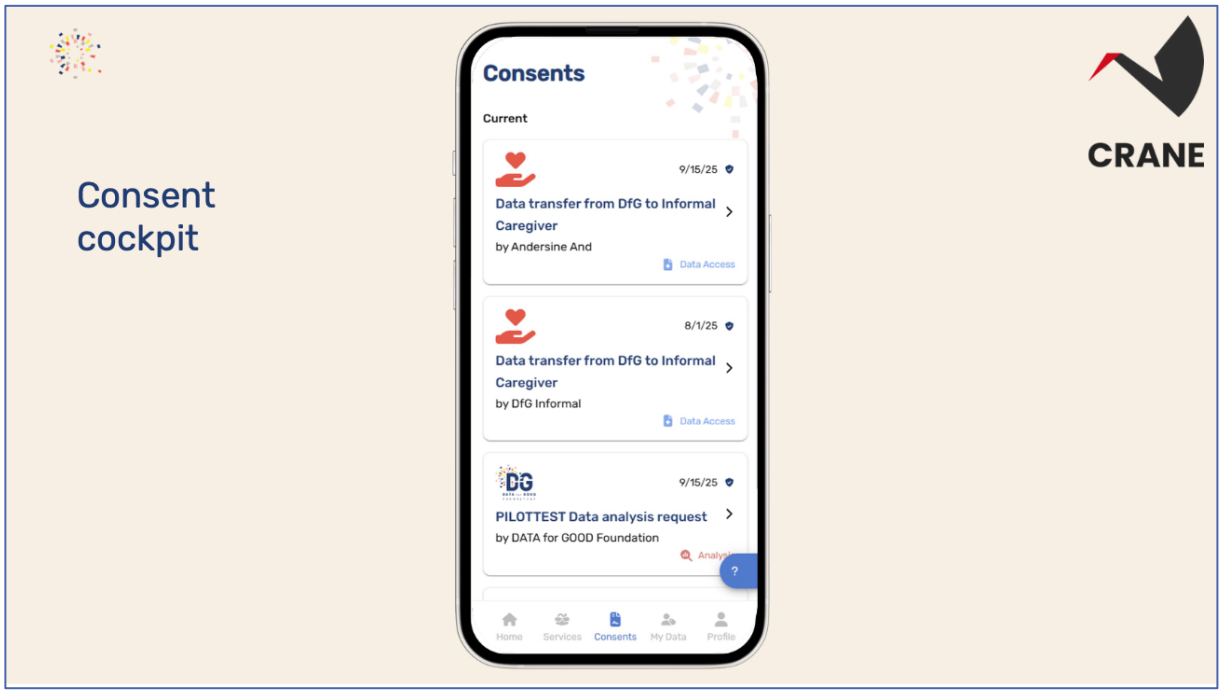


*Figure 5: Consent Cockpit, where citizens manage all active consents in one place, with a full audit log*

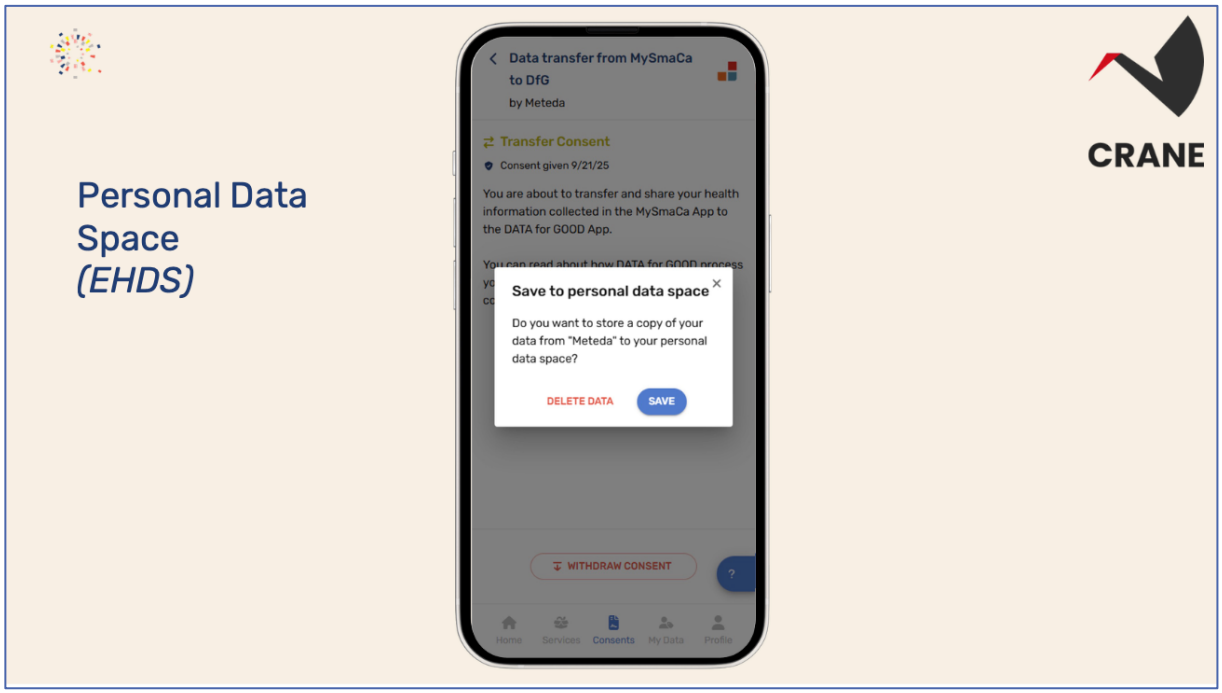


*Figure 6: Personal Data Space. When withdrawing consent, citizens are offered the option to retain a local copy of their data, in line with EHDS Article 3*

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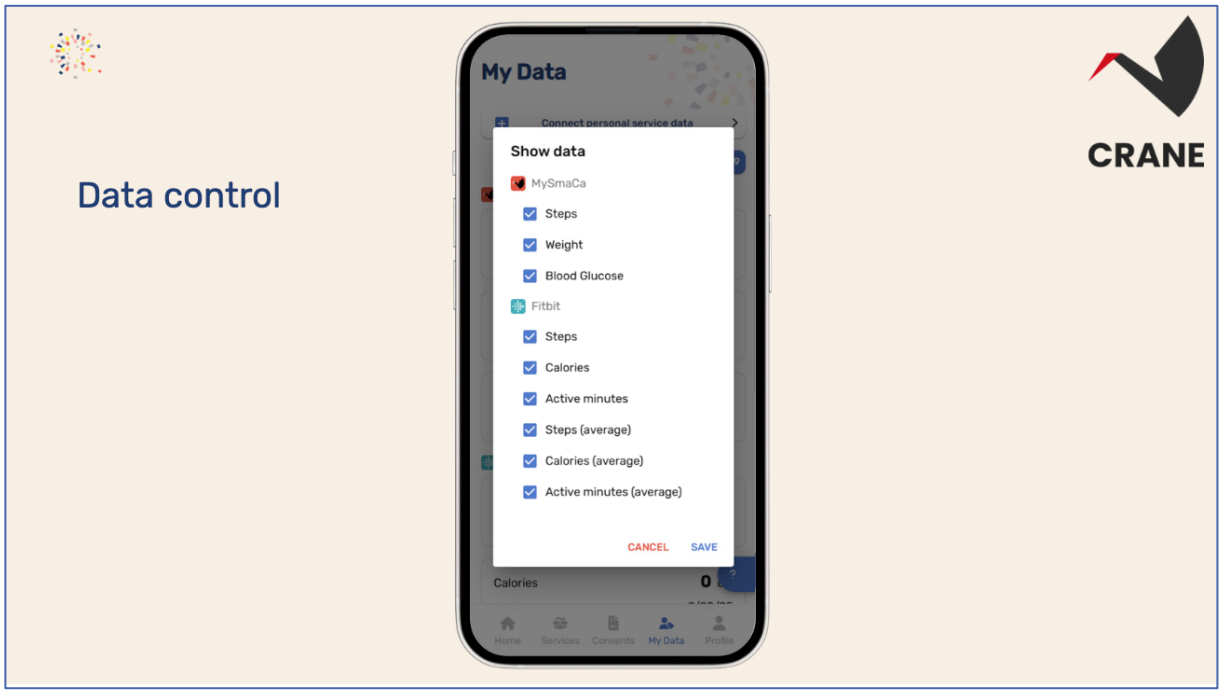


*Figure 7: Data control, where citizens view and control which health metrics are shared across Fitbit, MySmaCa, and other connected sources*

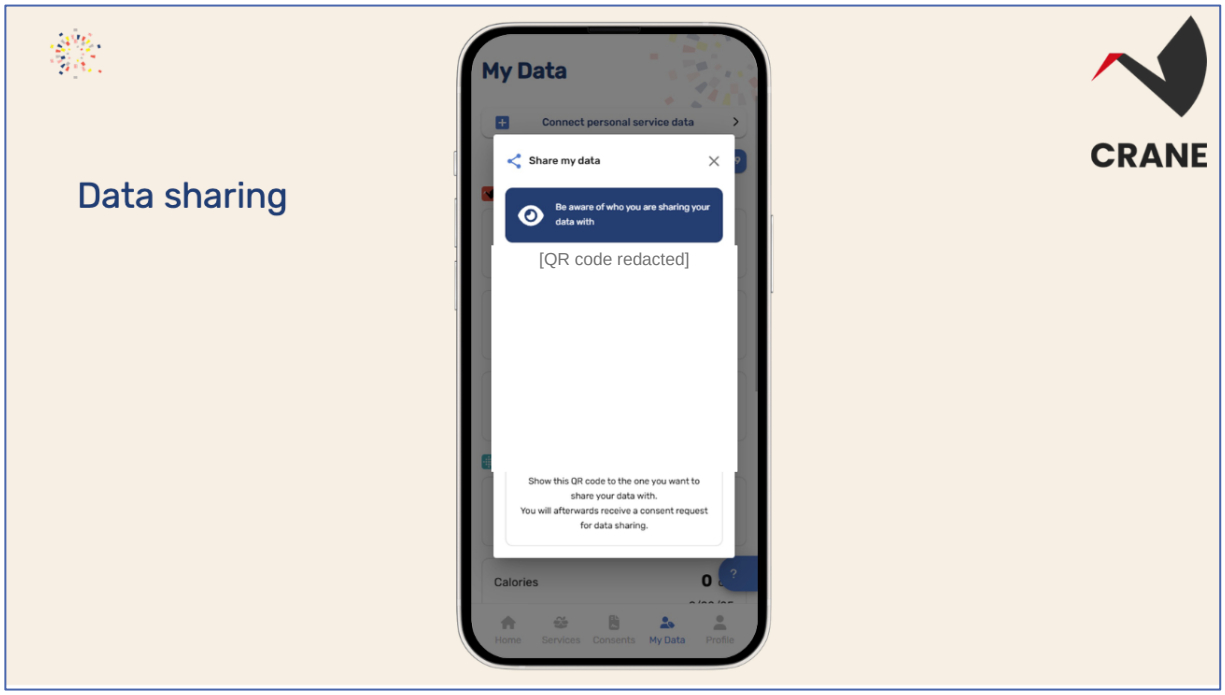


*Figure 8: Data sharing via QR code, initiated by the citizen and triggering a consent request to the* recipient

## 4.3 Professional and Research Platform: DfG Professional

Healthcare professionals access patient data through a secure portal. For secondary use such as research, analysis, and policymaking, the platform relies on confidential computing powered by Partisia's Multiparty Computation (MPC) technology. This runs analytical queries across citizen-contributed data without centralising or extracting any raw personal data. The researcher configures

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the query and publishes a consent request to eligible citizens. Once enough consents are received, the computation runs. Citizens are notified afterwards that their data contributed to a specific analysis.

The consortium describes this architecture as a 'Virtual Data Lake'. It is intended to achieve the FAIR data principles (Findable, Accessible, Interoperable, Reusable) while preserving full data sovereignty for each individual citizen.

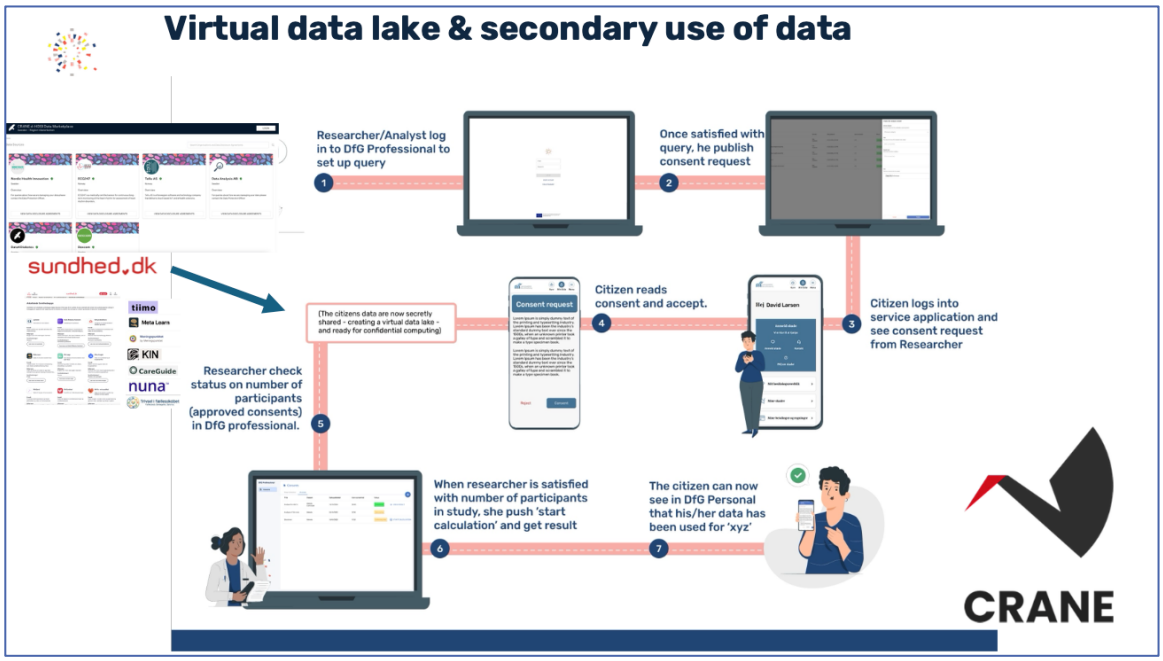


*Figure 9: Virtual data lake and secondary use, the 7-step flow from researcher query to citizen notification*

## 4.4 Validation: Phase 3 Results

Data for Care ran its Phase 3 validation pilot across three buyer regions using a four-step field-testing setup: pre-pilot testing, initial workshops and onboarding, home-testing, and follow-up workshops and offboarding. The validation was designed together with municipalities, healthcare professionals, local trial managers, informal caregivers, and dynamizers in Spain.

| Pillar | Status | Evidence from Phase 3 |
|---|---|---|
| **User behaviour and engagement** | **Validated** | Sustained use throughout the pilot period across the three buyer regions (Västerbotten, Agder, Extremadura). Onboarding and follow-up workshops were conducted in each region, with participation from citizens, informal caregivers, healthcare professionals, local trial managers, and dynamizers. Engagement levels remained high from initial onboarding through to the offboarding phase. |
| **Usability and functional testing** | **Validated** | Real-world testing of device integrations (Fitbit, MySmaCa, CE-certified BM96), onboarding flows, consent flows, data sharing via QR code, and app navigation across all three buyer regions. Iterative refinements were introduced during the pilot, including a redesigned Home tab with improved communication channels, based on feedback gathered during the onboarding workshops. |

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| | | |
|---|---|---|
| **Trust and consent** | **Validated** | Positive feedback was documented on transparency mechanisms, consent granularity, and the ability to withdraw consent and retain a copy of personal data. Consent flows and data sharing mechanisms were validated through stakeholder workshops across all three buyer regions. An independent Ethical White Paper was produced, which forms the basis of the DfG Manifesto governance framework. |
| **DPIA and data protection** | **Validated** | A full Data Protection Impact Assessment (DPIA) was completed. Ethical and data-processing procedures were validated through dedicated workshops with stakeholders in all three buyer regions. The findings were incorporated into the DfG governance model and the Ethical White Paper on data sharing platforms. |
| **Culture and communication** | **Critical finding** | Identified as the most decisive success factor beyond technology. Regional differences in digital literacy, language, and trust culture required distinct communication strategies in each pilot region. |

*Table 4: Data for Care, Phase 3 validation results by pillar*

The following testimonial, gathered from a citizen participating in the Norwegian pilot, captures the long-term promise of the DfC approach:

> *I truly believe this is the future. Just think how convenient it would be to go to the doctor and have everything ready, with measurements and AI assistance. I have faith in that.*
>
> Citizen participating in CRANE, Norway

*Figure 10: DfC pilot validation, onboarding and follow-up workshops across the three buyer regions*

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### 4.5 Future Plans

Data for Care sees two distinct routes to market. The public route requires deploying EHDS as a Service through a Public Procurement of Innovation process or through alternative EU funding. The consortium proposes DfC as a candidate implementation model for any region or Member State seeking to operationalise EHDS requirements. The private route operates through the DfG wallet on a case-by-case basis, with lighthouse use cases in wellbeing platforms, finance and insurance, prevention and wellbeing, and sport and civil society organisations.

The consortium identifies the EHDS and eIDAS 2.0 regulatory frameworks as key enablers for the next phase of development and deployment.

**More information video:** https://vimeo.com/1173181593/7adf5e010d

## 5. Solution 2: Decentralised Health Data Space Infrastructure (dHDSI)

The second solution validated in Phase 3 of CRANE addresses the infrastructure layer of the health data challenge. Where Data for Care focused on the citizen consent and governance model, dHDSI provides the underlying technical infrastructure that enables multiple organisations to share health data in a consented, governed, and auditable way. The solution is built around the concept of a Data Intermediation Service Provider: a neutral technical layer between data holders and data users that enforces consent, validates identity, and logs every access event. This approach is intended to reflect the data intermediation service framework set out in the EU Data Governance Act, and the secondary use infrastructure envisaged under the European Health Data Space Regulation. The Phase 3 validation demonstrated that this infrastructure can be deployed in an operational public health context across three buyer regions with different national regulatory environments.

*Figure 11: The dHDSI consortium. From left: Nordic Health Innovation, iGrant.io, Redpill Linpro*

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## 5.1 Solution Overview

The dHDSI solution provides the infrastructure layer for consented, federated health data exchange across organisations, regions, and borders. It is built entirely on open, interoperable standards including eIDAS 2.0, ISO 27560, the EU Data Governance Act, and HL7 FHIR. The design is intended to be replicable across European health systems, with scalability cited as a core design requirement.

The solution connects data sources such as health apps, IoT devices, and clinical systems with data-using services such as research bodies, analytics providers, and regional health authorities. Between them sits a citizen-governed intermediation layer called the Data Intermediation Service Provider (DISP). Three organisations deliver the solution together:

- Nordic Health Innovation (Sweden): clinical integration, governance lead, and liaison with the buyer regions.
- iGrant.io (Sweden): the DISP platform, consent management infrastructure, the Data Marketplace, and digital identity wallet technology.
- Redpill Linpro (Norway): MyHealthEnabler citizen application development and technical integration.

The structure of the dHDSI consortium reflects a deliberate division of roles: a clinical and governance lead working directly with the buyer regions, a technology provider supplying the DISP and consent infrastructure, and a development partner responsible for the citizen-facing application. This arrangement was designed to allow each component to be maintained, extended, or replaced independently, avoiding dependency on any single supplier for the continued operation of the infrastructure.

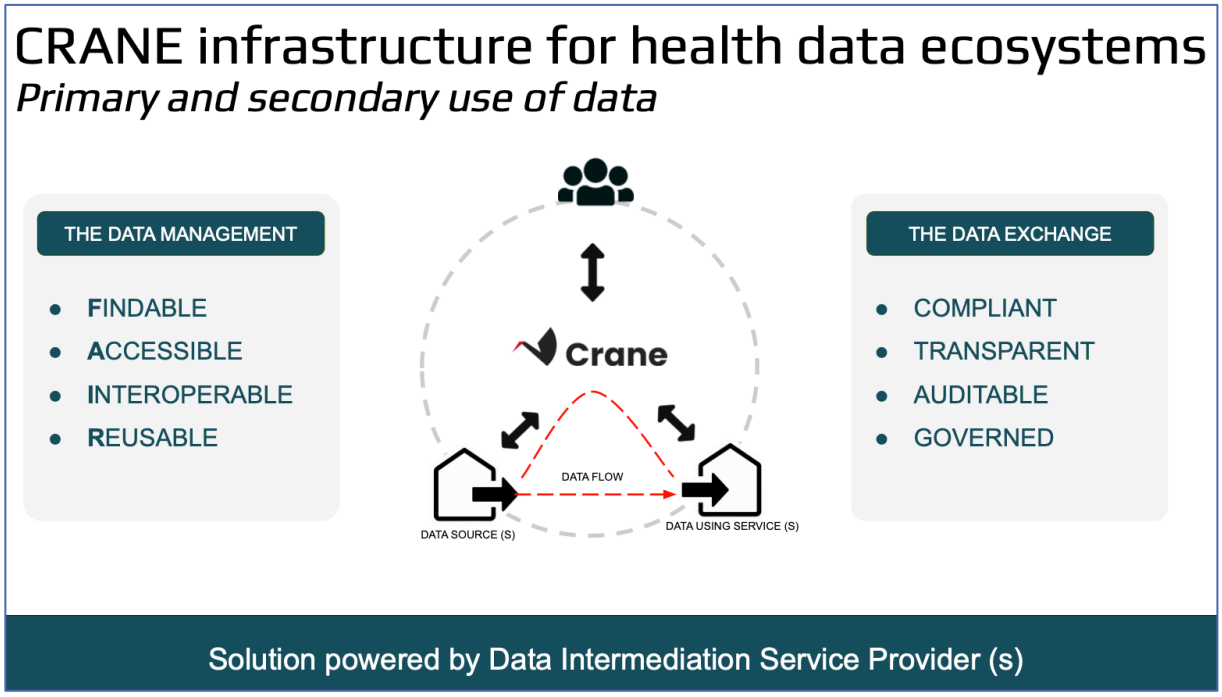


*Figure 12: CRANE infrastructure for health data ecosystems, showing FAIR data principles, governed* data exchange, and *the role of the DISP*

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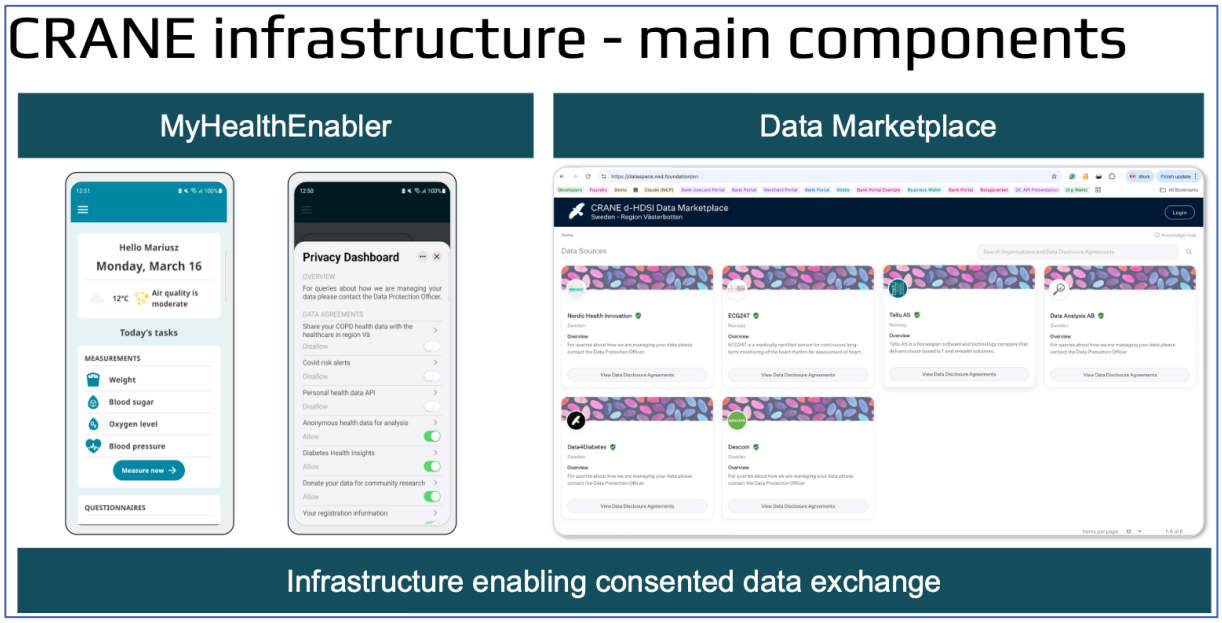


*Figure 13: CRANE infrastructure main components*

## 5.2 MyHealthEnabler: Citizen Application

The MyHealthEnabler (MHE) app is the citizen-facing component of the dHDSI stack. It enables citizens to measure and monitor health vitals through integrated Bluetooth devices, view and respond to daily health tasks, manage a Privacy Dashboard by granting or revoking per-dataset consent in real time, access connected health services from the Service Listing, and store and share verifiable health credentials through an integrated EUDI-compatible Data Wallet compliant with eIDAS 2.0.

Authentication is via BankID in Sweden and equivalent national eIDAS-compliant identity providers in other countries. Consent changes made in the Privacy Dashboard are propagated to the DISP, so that access control reflects the citizen's current consent status.

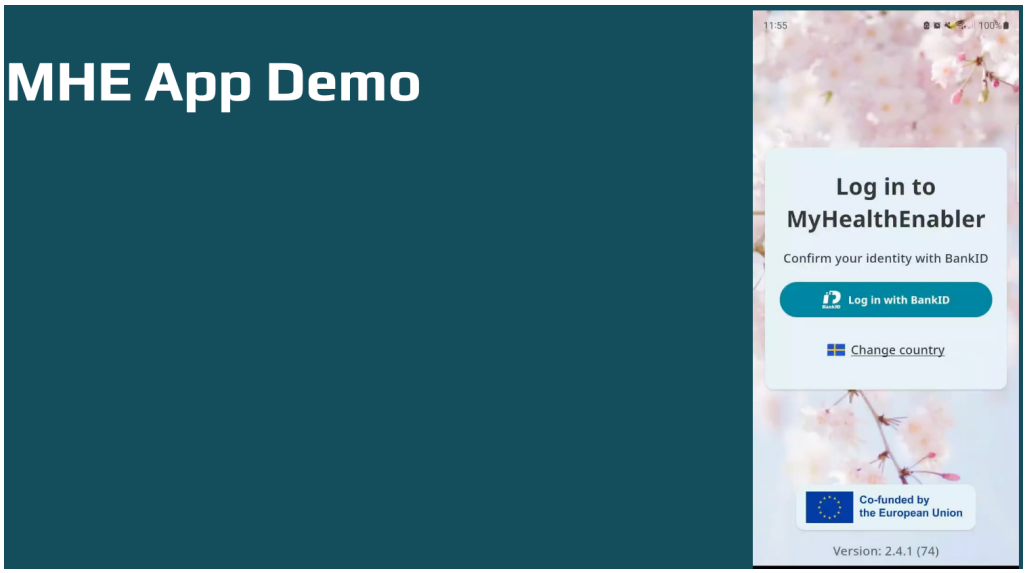


*Figure 14: MHE citizen app. Login with BankID, daily health tasks, and Privacy Dashboard*

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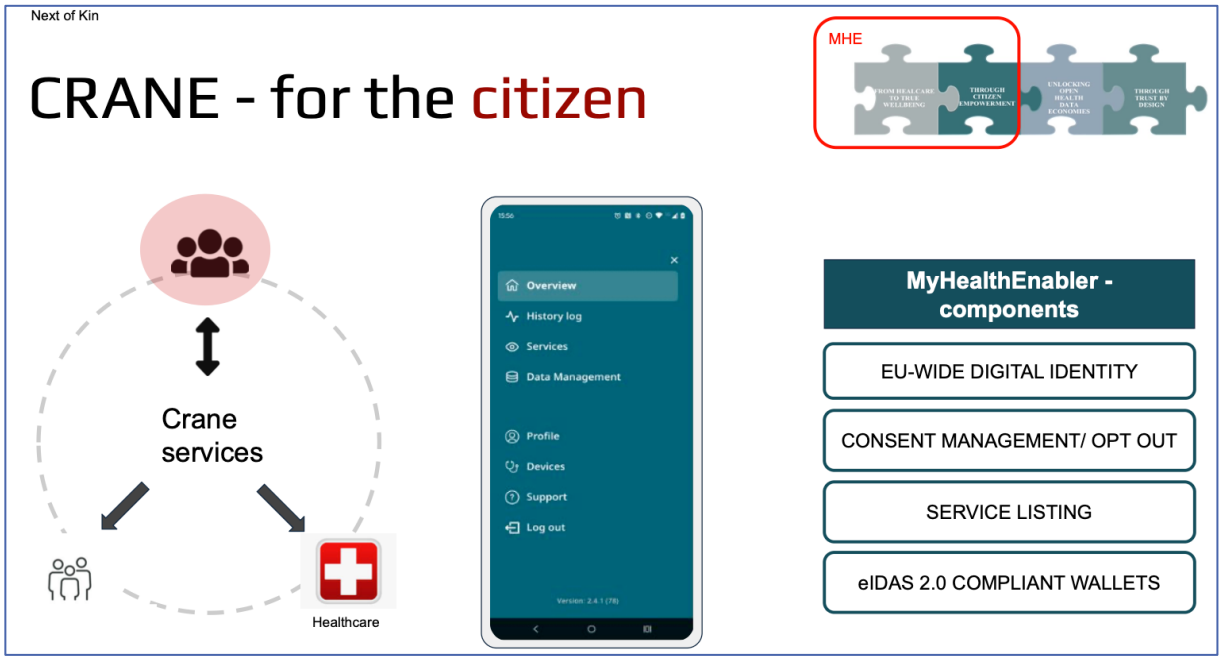


*Figure 15: MHE components. EU-wide digital identity, consent management and opt-out, service listing, eIDAS 2.0-compliant wallets*

From the perspective of the three buyer regions, the MHE application addresses a practical challenge common to rural and semi-rural health systems: citizens in dispersed areas often interact with multiple care providers across different organisations and systems, with no single view of their data or consents. The MHE aims to provide that unified interface, enabling citizens in Västerbotten, Agder, and Extremadura to manage their health data and control its use from a single, standards-compliant application.

## 5.3 Data Intermediation Service Provider and Data Marketplace

The organisational infrastructure is provided by the DISP portal and the CRANE dHDSI Data Marketplace, operated by Region Vasterbotten as the buyer region. The Marketplace covers four functions.

- Data Source onboarding: any organisation registers using a cryptographically verifiable Legal Person ID (LPID) issued by Bolagsverket in Sweden through the Business Wallet (eIDAS 2.0 and EBSI). Identity is cryptographic and auditable from end to end, with no manual paperwork.
- Data Disclosure Agreements (DDA): every dataset is published with a machine-readable agreement specifying purpose, retention, and individual rights under the ISO 27560 standard. The agreement is reviewed and approved by the Marketplace operator (the buyer Region) before publication.
- Data User access: any verified Data Using Service browses the Marketplace, signs the DDA digitally, and receives an access token. Only data from citizens who have actively opted in is released. Opt-outs are excluded automatically.
- Immutable audit trail: every access event is logged, providing a full lineage trail compliant with GDPR Art. 7 and DGA requirements.

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The Virtual Data Lake principle means data never leaves the originating system. Federated queries run at source, only the result is returned, and the architecture scales across borders without data replication or vendor lock-in. At the Demonstration Day, the live Marketplace displayed six verified data sources: Nordic Health Innovation, ECG247, Tellu AS, Data Analysis AB, Data4Diabetes, and Dexcom.

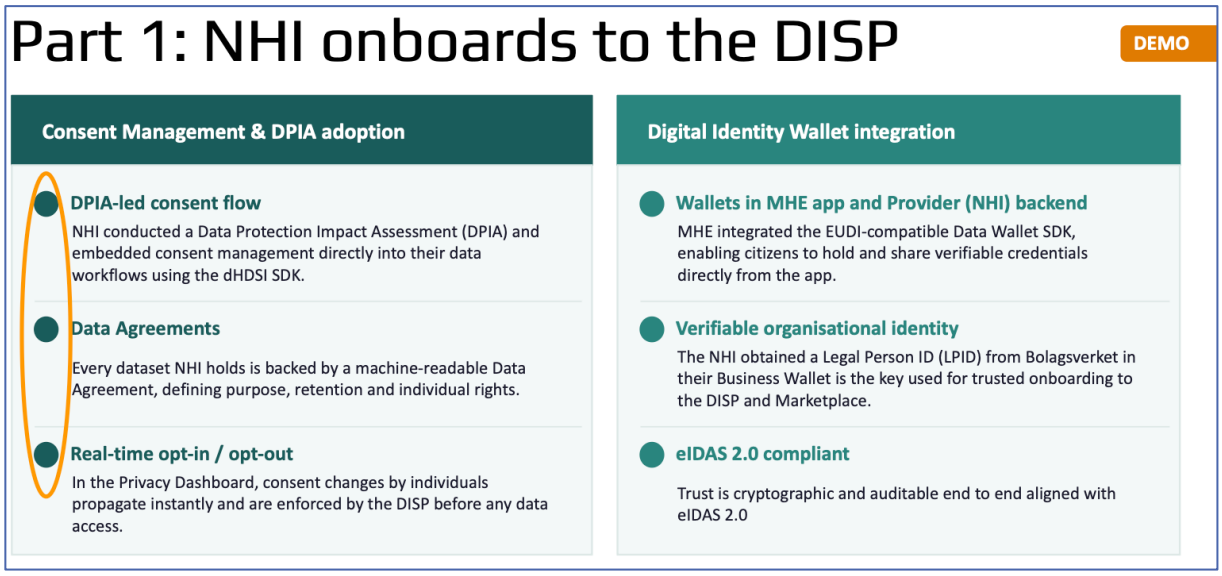


*Figure 16: DISP onboarding. Part 1: NHI onboards with DPIA-led consent flow, Data Agreements, real-*time opt-in and *opt-out, and digital identity wallet*

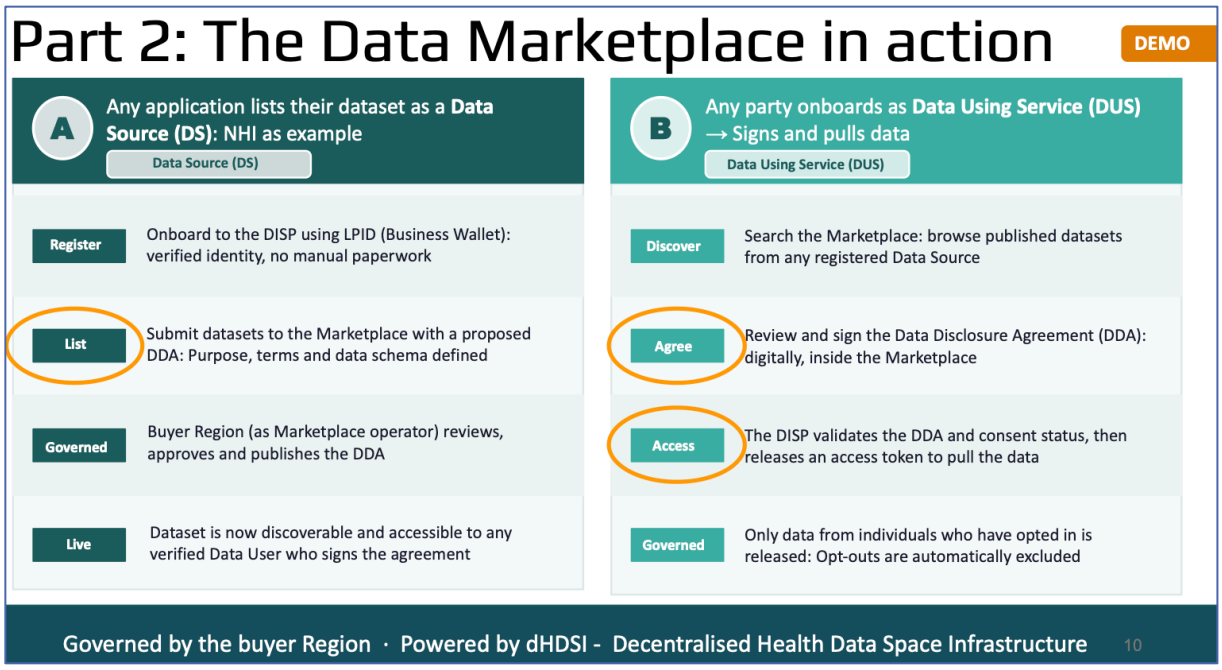


*Figure 17: Data Marketplace in action. Part 2: data source listing, DDA governance, and data user access flow*

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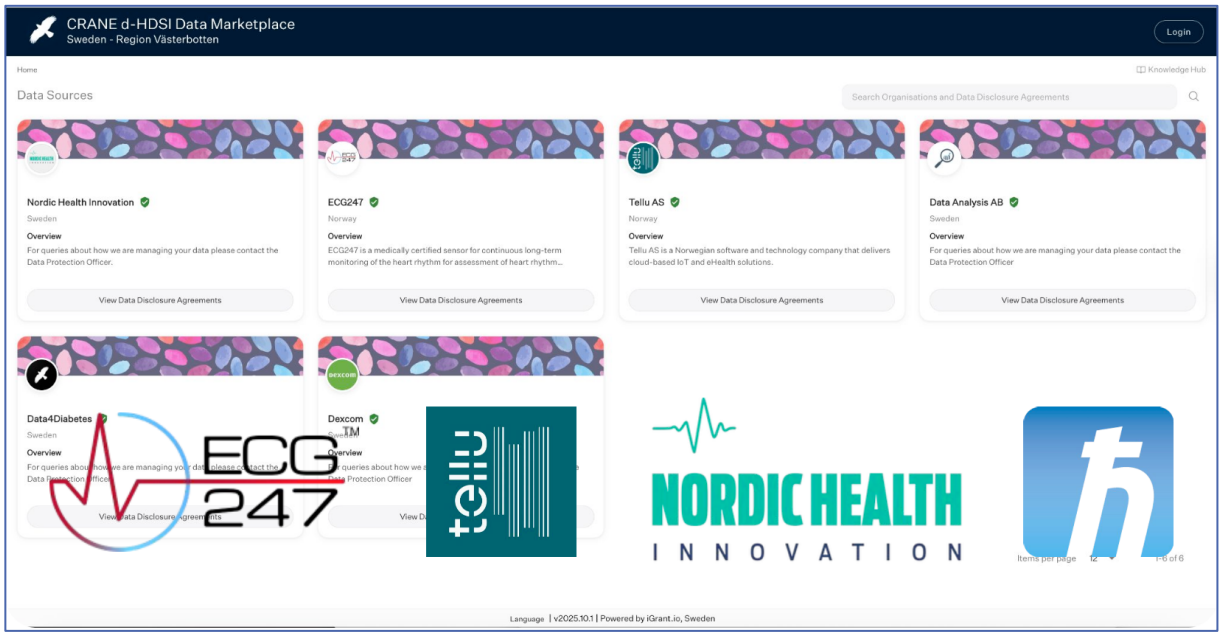


*Figure 18: CRANE dHDSI Data Marketplace showing six verified data sources, governed by Region Västerbotten (Sweden)*

For the buyer regions, the Marketplace model offers a practical governance mechanism: Region Västerbotten operated the Marketplace as procuring region during the pilot, reviewing and approving Data Disclosure Agreements before publication. This arrangement places the governance responsibility with the public authority rather than with the technology provider, which is consistent with the requirements of the EU Data Governance Act and the intended structure of the EHDS. The six verified data sources active at the Demonstration Day indicate that the model is capable of attracting participation from multiple independent health data holders within a single ecosystem.

## 5.4 Validation: Phase 3 Results

The dHDSI Phase 3 validation ran across Sweden, Norway, and Spain from summer through autumn 2025. It covered three distinct pillars, each validated independently.

| Pillar | Status | Evidence from Phase 3 |
|---|---|---|
| **Consent management by design** | **Validated** | Live pilot with approximately 70 citizens across Region Västerbotten (Sweden), Agder (Norway), and Extremadura (Spain) in Villanueva de la Vera. Field tests ran for two to three months per region, with onboarding workshops held on-site in each location. Consent propagation, opt-in and opt-out flows, real-time privacy dashboard updates, and ISO 27560 machine-readable consent receipts were all validated in a real operational context. |
| **Privacy by design (5 foundational principles)** | **Validated** | An independent privacy analysis was conducted by an external reviewer and a full GDPR self-assessment was completed by the consortium. All five privacy-by-design principles were assessed and evidenced during the validation: privacy by default, data minimisation, decentralised identity with no central PII store (eIDAS 2.0 and EBSI compliant), end-to-end encryption in transit and at rest, and automated DPIA support with DPA-ready audit exports. |

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| | | |
|---|---|---|
| **Virtual Data Lake and zero data aggregation** | **Validated** | Cross-organisational federated queries were executed successfully across four ecosystem partners (Nordic Health Innovation, ECG247, Tellu AS, and a data analysis provider). Data remained at source in all test cases. HL7 FHIR was used to ensure semantic interoperability across systems. Every access event was logged in an immutable lineage trail, providing a full and auditable data access record. |

*Table 5: dHDSI, Phase 3 validation results by pillar*

The MHE application was used in field tests of two to three months per region, with onboarding workshops held on-site.

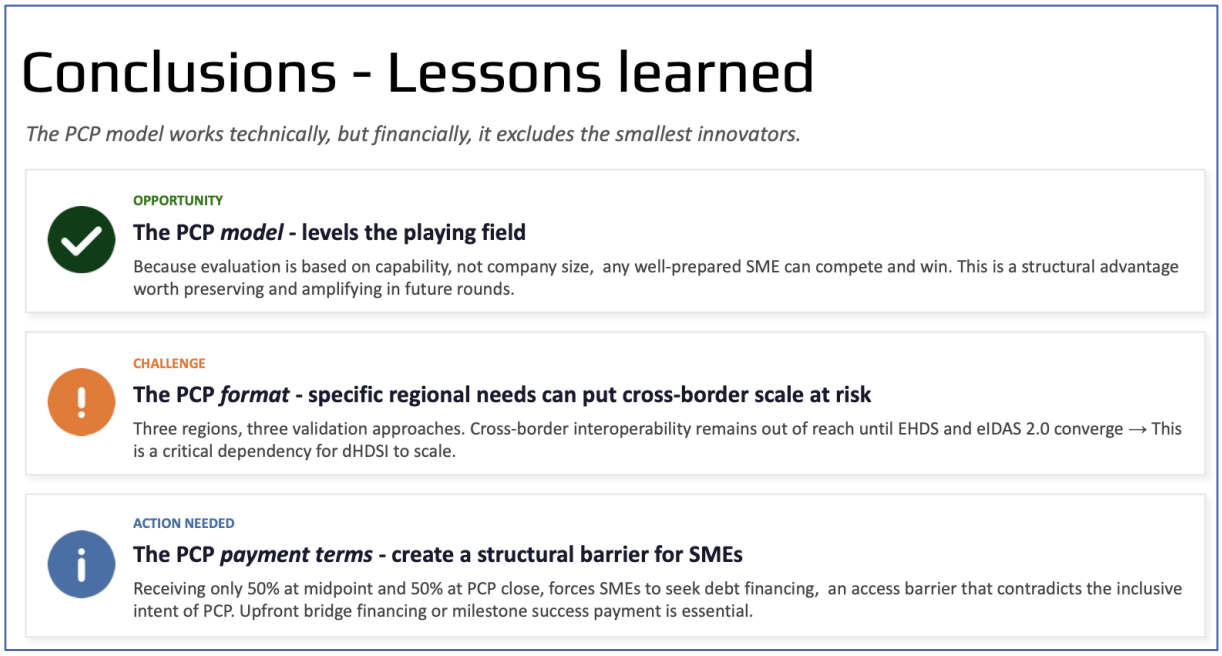


*Figure 19: dHDSI validation conclusions and lessons learned, presented at the CRANE Demonstration Day, 17 March 2026*

Taken together, the three validation pillars demonstrate that the dHDSI solution demonstrated operational capabilities beyond a laboratory prototype. The consent management pillar confirms that citizen-facing data governance tools can be deployed at scale in a public health context. The privacy-by-design pillar provides evidence that the technical architecture is designed to meet GDPR and DGA requirements, as confirmed through an independent privacy analysis and GDPR self-assessment. The Virtual Data Lake pillar demonstrates that federated data access across multiple organisations is technically feasible without central data aggregation. For buyer regions considering deployment, the validation evidence addresses the core risk areas: citizen adoption, regulatory compliance, and cross-organisational interoperability.

## 5.5 Future Plans

The dHDSI team identifies the convergence of EHDS and eIDAS 2.0 as the critical dependency for cross-border scaling. The solution is architecturally aligned with both frameworks, and the consortium states that what is still required is implementation alignment at the national identity level, which depends on policy decisions outside the scope of any single solution. The three pilot regions encountered this constraint directly: while each region was able to run a valid pilot within its national context, cross-

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border data exchange between regions was not achievable within the Phase 3 timeframe for this reason.

The consortium considers the Marketplace model ready for regional deployment under a PPI instrument. Nordic Health Innovation has indicated its availability to support buyer regions seeking to establish a governed data space aligned with the EHDS. The dHDSI stack is built on open standards, which the consortium states avoid proprietary lock-in and allows any health data system to participate as a Data Source or Data Using Service.

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# 6. What Comes Next

The conclusion of Phase 3 marks the end of the CRANE PCP. Both solutions emerged from this process as validated platforms, tested with real citizens, clinicians, and health systems across three European countries. They provide a validated basis for future deployment at scale.

## 6.1 Shared Lessons from the CRANE PCP

Both consortia gave candid assessments at the Demonstration Day, each from a different angle. Data for Care approached the question as one of governance and society. dHDSI focused on the structural mechanics of the PCP instrument itself.

### Data for Care: a new social contract for data

Data for Care reflected that the challenge addressed by CRANE requires alignment across technical, regulatory, governance, and social dimensions. The consortium argued that neither technology nor regulation alone is sufficient, and that coordinated action across public and private actors is needed.

Three principles emerged from their pilot experience: citizen data is everyone's interest but no one's responsibility, which creates a governance vacuum that neutral intermediaries like DfG can fill; people and perspectives matter as much as technical architecture, since regional differences in culture, language, and trust, fundamentally shape adoption; and the problem calls for new collaboration and governance models that go beyond existing institutional boundaries. At the Demonstration Day, the consortium framed CRANE as an opportunity to reorient health data governance around the citizen rather than around institutions or service providers.

### dHDSI: structural lessons on the PCP instrument

The dHDSI consortium focused its reflections on the mechanics of the PCP model, identifying one clear opportunity and two areas requiring action.

| | |
|---|---|
| OPPORTUNITY | **The PCP model levels the playing field**<br>Evaluation based on demonstrated capability rather than company size means that any well-prepared SME can compete and win. Both winning consortia are SME-led. This is a structural advantage of the PCP model worth preserving and amplifying in future rounds. |
| CHALLENGE | **Specific regional requirements can put cross-border scale at risk**<br>Three buyer regions, three validation contexts, three regulatory environments. Cross-border interoperability remains out of reach until EHDS and eIDAS 2.0 implementation converge. Both consortia flag this as a critical dependency for European-scale deployment. |
| ACTION NEEDED | **PCP payment terms create a structural barrier for SMEs**<br>Receiving 50% at phase midpoint and 50% at PCP close forces SME consortia to seek bridge debt financing. This is an access barrier that contradicts the inclusive intent of the PCP instrument. Upfront bridge financing or milestone success payments should be considered in future PCP designs. |

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## 6.2 From PCP to PPI

Both consortia presented clear routes to market at the Demonstration Day. The natural next step for both solutions is Public Procurement of Innovation (PPI): moving from publicly funded R&D into full regional or national deployment. Both platforms have been validated in real-world conditions across two EU Member States and Norway, completing the Phase 3 validation requirements of the CRANE PCP.

The replicability of both solutions across European health systems is a relevant consideration for the CRANE consortium and for the European Commission. Both solutions were designed from the outset to avoid dependence on specific national infrastructure.

DfC operates on a consent and governance model that can be adapted to different national legal frameworks, while dHDSI is built entirely on open, EU-mandated standards (eIDAS 2.0, FHIR, ISO 27560) that are jurisdiction-agnostic. This suggests that future PPI deployment could build directly on the validated Phase 3 outputs, whether at regional, national, or cross-border level.

For buyer regions or national health authorities interested in deploying either solution, the CRANE consortium can provide full documentation from the PCP process, including technical specifications, validation reports, DPIA documentation, and lessons learned.

## 6.3 Alignment with the European Health Data Space

Both solutions were built with EHDS alignment as a core design principle from Phase 1. They incorporate the consent infrastructure, data intermediation layer, citizen identity wallet, and governance frameworks relevant to the EHDS Regulation. Both solutions have been tested with real citizens across two EU Member States and Norway under live GDPR conditions, completing the Phase 3 validation scope.

The interoperability dimension of EHDS implementation presents both an opportunity and a constraint for both solutions. Both DfC and dHDSI achieve semantic interoperability at the data layer through FHIR and through consent receipt standards.

However, cross-border interoperability at the identity layer, which requires recognition of national eIDAS wallets across Member States, was not achievable within the Phase 3 timeframe. This is a system-level dependency, not a solution-level limitation, and its resolution depends on the pace of eIDAS 2.0 implementation across Member States. Procuring authorities should factor this constraint into their deployment planning, particularly for use cases that require citizens to share data across national health systems.

The long-term sustainability of both solutions depends on factors that go beyond the CRANE PCP. Both consortia have indicated clear commercial routes, but the public-interest use case, particularly for rural and underserved populations, may require ongoing public support mechanisms.

## 6.4 Relevance for Rural Healthcare and Implications for Future Procurement

CRANE was designed specifically around the needs of rural and semi-rural regions, where the structural barriers to effective health data use are most acute. Dispersed populations, limited specialist capacity, and fragmented data systems create conditions in which integrated data sharing can have a

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disproportionate impact on care quality and efficiency. Both validated solutions address these conditions directly: DfC through a citizen-held consent and data governance layer that works independently of institutional infrastructure, and dHDSI through a federated marketplace that does not require centralisation of data to enable its secondary use.

From the perspective of the three buyer regions, the completion of Phase 3 provides a validated evidence base for procurement decisions. Both solutions have been tested under live conditions with real citizens, healthcare professionals, and health data systems in Västerbotten, Agder, and Extremadura. The validation results documented in this deliverable, including the consent management, privacy-by-design, and federated data access evidence, constitute the technical and regulatory due diligence that would normally be required at the start of a PPI process.

For public procurers considering how to operationalise the EHDS, the CRANE experience offers several practical lessons:

- First, the PCP model is effective at surfacing technically mature solutions from SME-led consortia that would not otherwise reach regional procurement pipelines.
- Second, the validation process demonstrated that robust citizen engagement is not a secondary concern but a prerequisite for adoption.

The CRANE consortium recommends that procuring authorities considering PPI for either solution engage with the respective supplier consortia at an early stage to discuss deployment scope, regional customisation requirements, and the regulatory readiness timeline for EHDS and eIDAS 2.0 implementation in their jurisdiction.

# 7. Conclusion

The CRANE project set out to address one of the most structurally complex challenges in European public health system aiming at implementing integrated care and citizen centred care: how to make citizen health data usable across fragmented systems while keeping citizens in genuine control of how it is shared.

Over five years and three competitive phases, the Pre-Commercial Procurement process produced two technically distinct, complementary solutions, each validated in real-world conditions with real citizens across three buyer regions in Sweden, Norway, and Spain.

The Phase 3 validation documented in this deliverable shows that both solutions demonstrated their core claims within the scope of the CRANE pilots.

Data for Care validated a citizen-held consent and data governance model capable of operating across multiple health services, devices, and informal care contexts, with strong citizen engagement and a privacy framework grounded in an independently reviewed ethical governance model. dHDSI validated a federated data infrastructure layer based on open EU standards, demonstrating that consented, cross-organisational health data exchange is technically feasible without centralising personal data, and that a public-authority-governed Data Marketplace can function as the access control and transparency mechanism envisaged by the Data Governance Act.

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Taken together, the two solutions represent complementary building blocks for the European Health Data Space. DfC provides the citizen-facing consent and data management interface; dHDSI provides the organisational infrastructure for governed data exchange between institutions.

For regional health authorities, national health ministries, and European Commission services considering how to operationalise the EHDS, CRANE offers a validated and documented implementation model that may inform future EHDS deployment initiatives.

The citizen-controlled data ecosystem model at the heart of both solutions is designed to reflect the intent of the EHDS Regulation: that citizens should be active participants in the health data economy, with transparent rights over primary and secondary use, and that public institutions should govern that ecosystem in the public interest. The CRANE consortium makes all Phase 3 validation documentation available to support future procurement, policy development, or replication initiatives.

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