DOCTORAL CONSORTIUM

VALUE-SENSITIVE DESIGN FOR RESPONSIBLE DATA SHARING IN GOVERNMENTAL ECOSYSTEMS

CHRISTEL VAN DE WAL

Open Universiteit, Faculty of Science, Heerlen, the Netherlands
christel.vandewal@ou.nl

Advances in data-sharing technologies offer governments opportunities to improve efficiency and public service delivery. However, ethical risks, legal constraints, and concerns about public trust often limit the adoption of data-sharing practices within governmental organisations. This study examines how Value-Sensitive Design (VSD) and collaboration technologies, including Distributed Ledger Technology (DLT) and Privacy Enhancing Technologies (PETs), can support responsible and trustworthy data sharing in public governance. The research addresses ethical, legal, and organisational tensions while safeguarding public values and fundamental rights. A mixed-method research design combines literature reviews, qualitative case studies, and empirical validation, structured according to design science research principles. Building on analyses of governance frameworks and case studies in Dutch governmental organisations, the study develops and operationalises a methodological and normative framework for responsible data sharing. The research adapts VSD to governmental data ecosystems and provides a structured design approach supporting ethical and privacy-preserving data-sharing practices in public administration.

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1 Introduction

Data sharing holds the potential to enhance both economic and public value; however, concerns regarding privacy risks, data security, and public trust pose significant challenges[1]. In the Netherlands, these concerns pose significant barriers to the implementation of data-sharing initiatives, thereby limiting the ability of government organisations to leverage data for effective public service delivery (Staat van de Uitvoering, 2023). This observation is reinforced by Mark Vermeer, Director of Digital Government at the Ministry of the Interior and Kingdom Relations, who states: "When sharing data, you have to weigh the risks, and government organisations are not very fond of that... they are naturally risk-averse" (Vermeer, 2023, p. 48). A fundamental issue underlying these barriers is the complexity of continuously aligning ethical, legal, technical, societal, and organisational requirements for data sharing (Agahari et al., 2022; Rukanova et al., 2023; The Royal Society, n.d.; Susha et al., 2023). While policies, IT processes, and systems are often designed with stability in mind, evolving societal values and shifting contexts can disrupt their alignment with public needs (Van de Poel, 2021, 2024). In such cases, previously unconsidered norms or design specifications may become necessary to ensure that organisational processes and IT infrastructures remain relevant and effective. The complexity of balancing ethical principles arises from the often-conflicting interests of stakeholders (Agahari et al., 2022; The Royal Society, n.d.; Wirth et al., 2021). Alignment is therefore not a static goal but a dynamic process, continually shaped by evolving societal values (Van de Poel, 2021). Shifts, such as changing value priorities or conceptualizations, are particularly evident in digital contexts, where trustworthiness depends on dynamic user expectations, perceived vulnerabilities, and socio-technical interactions (Schuetz et al., 2025; The Royal Society, n.d.; Van de Poel, 2024). Addressing these challenges requires ongoing alignment of digital innovations with public values to foster trust, safety, and inclusiveness in data-sharing ecosystems (Panagiotopoulos et al., 2019).

Public values, shaped through deliberation and consultation, play a pivotal role in guiding system and policy development (Benington & Moore, 2011; Moore, 1995). Effective governance strategies must reflect citizens' expectations regarding government data use, ensuring that public values are embedded in decision-making

[1] COM/2020/66 final

(Noije & Ridder, 2024). A range of methods exists to address ethical challenges in technological design, often referred to as design for values (Van de Poel, 2024). This concept, originally introduced by Van den Hoven et al. (2015), is used by Van de Poel (2024) as "a term for a number of approaches that aim at integrating values of moral importance in the design of new technological products, services, and systems in a systematic and proactive way" (p. 301). Four noteworthy approaches that explicitly respect values during design, are Value Sensitive Design (VSD), Value-Based Engineering (VBE), Z-Inspection, and the Guidance Ethics Approach (GEA).

The VSD- approach systematically incorporates human values in a specific context into policy and system design through a formative framework of conceptual, empirical, and technical phases (Friedman & Hendry, 2019; Hendry et al., 2021). VSD actively involves stakeholders and balances competing public values, supporting the alignment of digital infrastructures with societal expectations (Friedman et al., 2006; Lee-Geiller & Lee, 2019). The application of VSD can be operationalized through various methods, each tailored to a specific purpose and adapted to the context in which it is applied (Friedman & Hendry, 2019; Van de Poel, 2021, 2024). In contrast, Value-Based Engineering (VBE) offers a standardized approach, made possible through the IEEE 7000™ framework (2022), which provides a structured process for integrating values into system design (Bednar & Spiekermann, 2024). Where VSD emphasizes reflection and dialogue, VBE "specifically assesses negative character effects of IT systems" (Bednar & Spiekermann, 2024, p. 184). Z-Inspection functions as an ethical audit tool during or after the development of AI systems, assessing whether ethical considerations have been adequately addressed in practice (Zicari et al., 2021). Its retrospective character makes it less suitable for shaping values during earlier design stages, but it can add value in the assessment to what extent ethical requirements have been met. The Guidance Ethics Approach (GEA), spans the entire lifecycle from design to implementation and use, fostering societal dialogue to ensure that both the technology and its application context remain aligned with public values (Verbeek & Tijink, 2020). This study adopts a Value Sensitive Design (VSD) approach, as the realization of public values and the context-dependent nature of system and process design require a methodology that can flexibly respond through a diverse set of methods. VSD was also chosen to offer a complementary perspective to predominantly risk-averse practices of VBE, creating space for reflection and a focus

on public values within broader societal contexts. Z-Inspection merely concentrates on assessment and less on design and development, while GEA was deemed less suitable given its intensive stakeholder engagement requirements across the full technology lifecycle. Responsible and trustworthy data sharing in governmental ecosystems requires technologies that can minimise, and secure information transferred between parties. Emerging technologies, including Multi-Party Computing (MPC) in general and Privacy-Enhancing Technologies (PETs) in particular, as well as Distributed Ledger Technology (DLT), provide relevant capabilities to enable the secure exchange and analysis of data while supporting public and economic value creation (ICO, 2023; Wirth et al., 2021). This Office identifies MPC as a privacy-enhancing technology that "provides data minimisation and security by allowing different parties to jointly perform processing on their combined information, without any party needing to share all of its information with each of the other parties" (p. 17). On the other hand, DLT refers to a family of technologies that enable decentralised data management by distributing control among multiple participants. Its most prominent example, blockchain, demonstrates how DLT can foster transparency, traceability, and trust in digital governance (Bons et al., 2020). Together, MPC and DLT are examined as key technologies to support secure, privacy-compliant, and trustworthy data sharing in governmental ecosystems.

2 Research objective

This study investigates how Value Sensitive Design (VSD) can guide the implementation of Multi-Party Computation (MPC) and Distributed Ledger Technology (DLT) to support public values in governmental data-sharing ecosystems. The research question of this research proposal is:

How can Value Sensitive Design be applied in the implementation of Distributed Ledger Technology (DLT) and Multi Party Computation (MPC) to strengthen responsible and trustworthy data sharing in governmental ecosystems?

To systematically address this question, the research is structured around four key sub-questions with mentioned studies, each reflecting a complementary perspective on ethical, legal, technical, societal, and organisational requirements:

1. What are the current mechanisms or practices of Value-Sensitive Design (VSD) in use, and in what ways are Distributed Ledger Technology (DLT), and Multi Party Computation (MPC) being explored within governmental data-sharing initiatives? This sub-question is addressed through a narrative literature review and an exploratory case study, focusing on the application of VSD, DLT, and MPC in an existing public-sector data-sharing project.
2. How can VSD, DLT, and MPC be applied ex-ante in the design of trustworthy and responsible data-sharing processes in governmental ecosystems, addressing value tensions? To explore this, a pilot case study is conducted, examining how the continuous consideration of public values can be embedded in the early stages of technological design and governance for data sharing.
3. How can a normative and methodological framework be designed and constructed to integrate public values into the use of emerging technologies and governance strategies for responsible and trustworthy data sharing? This question is approached through a theoretical literature review combined with the development of a governance framework.
4. How can the proposed framework be operationalized and empirically assessed in terms of responsible and trustworthy data sharing? This final sub-question is examined through empirical validation, using either action research or a multi-case study approach. These methods are intended to evaluate the practical applicability and effectiveness of the framework in real-world settings.

3 Elaboration of the core concepts

To operationalise public values, a Value Sensitive Design (VSD) approach systematically integrates and aligns these values within both policy and system design. Concurrently, the technologies MPC and DLT promise to enhance the governmental technological capacity to mitigate risks, promote transparency, and ensure adherence to legal and ethical standards. The interplay between VSD, DLT, and MPC is vital to enabling responsible, secure, and trustworthy data sharing.

3.1 Public Value Theory

According to Horner and Hutton in Benington and Moore (2011), public value is "an interrelated process of authorization, creation and measurement that determines what the public values through a process of consultation and deliberation" (p. 122). These elements underpin Moore's (1995) *Strategic Triangle*, which balances value creation, legitimacy, and operational capacity. Public services are shaped by democratic processes and must align with societal expectations, especially in areas like data sharing. Public value strategies depend on the level of abstraction, risk and legal certainty (e.g. GDPR[2]), and the actors involved. Effective strategies require alignment between ethical values, legal authorization, and operational feasibility.

3.2 Value Sensitive Design

Value Sensitive Design (VSD) integrates conceptual, empirical, and technical analyses to embed public values into system design (Friedman et al., 2006). VSD balances services, delivery methods, and public expectations. Conceptual analysis identifies values and stakeholders, empirical analysis aligns with real-world contexts, and technical analysis ensures implementation. VSD follows iterative steps such as identifying values, stakeholders, risks, and resolving conflicts. Collaborative governance is central, involving stakeholders in co-creation. This approach supports the development of ethical, trustworthy public systems.

3.3 Emerging technologies

This study focuses on Privacy-Enhancing Technologies (PETs), such as Multi-Party Computation (MPC) and Private Set Intersection (PSI), which enable privacy-preserving data sharing (Gao et al., 2024). MPC allows joint computation without revealing inputs, while PSI identifies overlaps between datasets without exposing other data (Bay et al., 2022). Despite their potential, challenges remain in scalability, accessibility, and governance (Agarwal et al., 2022). Distributed Ledger Technology (DLT), including blockchain, enhances transparency and trust through decentralisation and immutability. Smart contracts can automate agreements but also introduce legal and operational complexities (Zou, 2020).

[2] http://data.europa.eu/eli/reg/2016/679/2016-05-04

3.4 Aligning Ethical, Legal, and Socio-Technical Requirements

Effective data sharing depends on governance, data quality, organisational culture, and expertise. Technologies like MPC and blockchain reduce the need for full trust while maintaining data control. However, trustworthy use requires standards, monitoring, and secure access mechanisms. Technologies are value-laden, meaning ethical considerations must be embedded in both design and implementation. Achieving public value requires dynamic capabilities within organisations to adapt to change. Alignment between values, legal frameworks, and operational capacity is essential and must be continuously maintained.

4 Conceptual model, propositions and expectations

The conceptual model is based on three theoretical perspectives. Firstly, Public Value Theory, introduced by Moore (1995), describes how public values emerge through deliberative processes and influence governance structures, policy decisions, and institutional trust. Secondly, Value Sensitive Design (VSD) provides a structured approach for incorporating ethical, legal, and societal values into technological and policy development. This approach consists of conceptual, empirical, and technical phases that integrate stakeholder values and interests into system and governance design (Friedman et al., 2006). Thirdly, blockchain and Multi-Party Computation (MPC) or Private Set Intersection (PSI) enable secure data processing in multi-actor infrastructures while supporting trust and compliance with legal and ethical frameworks (Bay et al., 2022; ICO, 2023). The conceptual model integrates these perspectives to provide a structured approach to digital governance. Public Value Theory informs the normative foundations of governance, VSD provides a methodology for embedding stakeholder values into policies and systems, and PETs and blockchain function.

4.1 Structure and components of the conceptual model

Public value identification, derived from deliberative and consultative processes, serves as the foundation for governance strategies regulating data sharing within the data ecosystem. VSD translates these values by guiding policy and infrastructure design choices, while emerging technologies in a multi-actor infrastructure, including blockchain and privacy-enhancing techniques, enable responsible and trustworthy data-sharing mechanisms that align with regulatory requirements. The interaction

between the VSD and de emerging technologies influences trust and compliance, shaping responsible and ethical data-sharing practices within a governmental ecosystem. To ensure continuous alignment with public values, the model incorporates a feedback loop where governance mechanisms are evaluated against predefined criteria, stakeholder expectations, and regulatory frameworks.

4.2 Structure and components of the conceptual model

Based on the theoretical framework, the following research propositions are formulated:

P1: The integration of Value Sensitive Design (VSD) and the deployment of blockchain and privacy-enhancing technologies (PETs) in multi-actor infrastructures positively affects responsible and trustworthy data sharing in governmental ecosystems.

P2: The alignment of ethical, legal, technical, societal, and organizational requirements moderates the relationship between VSD with blockchain and PETs and responsible and trustworthy data sharing in governmental ecosystems.

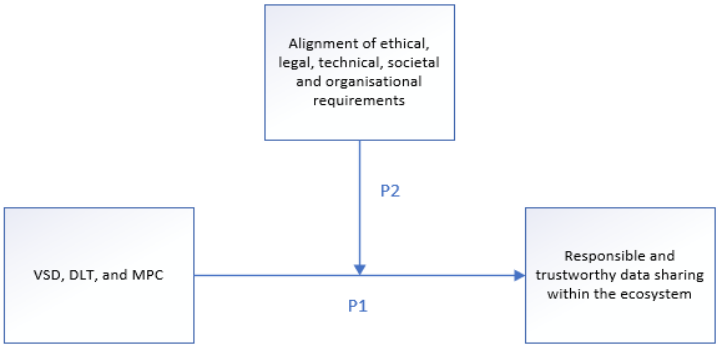

Figure 1: Conceptual model for the research

5 Technical research design and methods

This study adopts a primarily bottom-up approach, complemented by a top-down perspective, to identify relevant norms and values from academic and grey literature, including Dutch governmental sources. These norms inform the identification of

underlying values that guide semi-structured interviews. The research follows a multidisciplinary, iterative methodology involving stakeholders from policy, technology, IT architecture, project management, and legal domains, enabling a comprehensive analysis of safeguarding public values and fundamental rights in governmental data-sharing. Grounded in the GDPR, related legislation, and principles of data protection and good governance, each research question is addressed through tailored methods (Section 5.1), including literature reviews, interviews, surveys, focus groups, and Design Science Research, providing conceptual, normative, and empirical insights.

5.1 Structure and components of the conceptual model

To address Research Questions 1 and 2, this study adopts a qualitative case study approach combining bottom-up and top-down methods. For RQ1, a literature review identifies public values, norms, and stakeholders in governmental data sharing, followed by semi-structured interviews on Value Sensitive Design (VSD) and the use of Distributed Ledger Technology (DLT) and Multi-Party Computation (MPC). For RQ2, qualitative interviews examine how ethical, legal, technical, societal, and organisational factors shape trust and reliability, complemented where possible by quantitative insights. For RQ3, a Design Science Research (DSR) approach guides the development of a normative and methodological framework. A theoretical review and conceptual analysis, combined with earlier findings, synthesise VSD, DLT, MPC, and governance into design principles for embedding public values. Normative grounding draws on Public Value Theory, Value Sensitive Design, and Values Hierarchies, enriched by deontological, consequentialist, and virtue-ethical perspectives. For RQ4, the framework is operationalised and evaluated in two phases: refinement through focus groups and expert panels, followed by a pilot within a governmental organisation (if feasible), assessing effects on privacy, trust, security, and inclusiveness through interviews or surveys.

5.2 Data-analysis

This study employs qualitative and quantitative analysis methods aligned with the nature of the collected data. Thematic analysis (is used to identify patterns ("themes") in qualitative data from interviews, focus groups, expert panels, and open-ended survey responses (Braun et al., 2019). Depending on the research

question and data characteristics, the analysis follows either a deductive approach using predefined codes or an inductive approach in which codes emerge from the data. Quantitative survey data, including Likert-scale and ranking items, are analysed using descriptive statistics to examine trends in the alignment of ethical, legal, technical, societal, and organisational requirements and their perceived influence on trust and reliability in governmental data-sharing processes. This mixed-methods approach supports analytical depth, rigour, and triangulation across data sources.

6 Scientific impact, outputs, and dissemination

This PhD research generates theoretical, empirical, and methodological insights to advance value-driven governance, trust, and ethical ICT design. It delivers a conceptual framework for integrating public values into digital governance, empirical evidence from Dutch governmental case studies, and a methodological approach to value-sensitive data-sharing design.

The research proceeds in phases: two retrospective case studies (2024–2026) examine value identification, design practices, and the role of emerging technologies; a design study (2026–2027) develops a normative and methodological framework; and two empirical studies (2026–2028) operationalise and evaluate this framework in terms of trust, privacy, and institutional legitimacy. The final phase (2028–2029) synthesises the findings into the dissertation. Results will be disseminated through journal publications, conferences, and policy engagement.

7 Relevance for business and educational or training practice

This research advances value-driven governance, emerging technologies, and ethical ICT design, contributing to professional and educational practice. It supports policymakers and organisations in integrating public values into digital governance and promoting responsible, privacy-preserving data sharing. Through policy briefings, workshops, and stakeholder engagement, the study provides actionable insights to enhance trust, compliance, and ethical decision-making. In education, it offers empirical findings, case studies, and methodological insights for curricula and training in public administration, data governance, and ICT ethics. Findings will be disseminated via open-access publications, expert panels, and public engagement, strengthening the link between academic research, policy, and practice.

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