Designing a Reporting System for Trust in Environmental Social Governance

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Abstract

In an effort to make companies adhere to green practices, they are increasingly required to publicly disclose environmental, social, and governance (ESG) key performance indicators (KPIs). Typically published within annual reports, the current format may not deliver all legally mandated information, and also does not attract investors who have become more focused on sustainable investing. Thus, various industries aim at improving their ESG KPIs reporting practices, including life insurance companies. Life insurance companies need to integrate ESG-focused strategies into their client interactions to obviate greenwashing allegations and appeal to their environmentally-friendly target group. This helps them remain competitive and build long-lasting institution-based trust. To help these companies address the complexities of ESG KPIs reporting, this study proposes the development of a reporting system architecture supported by Distributed Ledger Technology (DLT) for compliant, transparent, reliable, and standardized ESG reporting.

Keywords: Reporting, Architecture, Greenwashing, Green Information Systems, Blockchain

1. Introduction

The call for more sustainable practices across all industries has made the integration and transparent reporting of ESG practices in companies indispensable (Kim et al., 2021). Both consumers and business partners demand transparency that goes beyond the occasional mention of ESG KPI in annual reports (KPIs for ESG, 2010; Nugroho et al., 2024). More specifically, the corporate image, perceived price fairness, and purchasing behavior can be influenced by how accessible and transparent a company's ESG practices are (Park & Han, 2021). AbuRaya (2017) and Zhan (2023) emphasize the importance of governance to improve the frequency and quality of corporate environmental sustainability, while also calculating ESG risk (Awan, 2011; Vasiu & Bratu, 2022; Ziolo et al., 2023), i.e., potential financial repercussions due to the implementation of ESG practices (Bax et al., 2023), and their influence on corporate performance. However, these ESG risks appear small given the potential cost savings, increased operational efficiency, long-term resilience (Sousa et al., 2023), and green productivity afforded by business models that are well aligned with a company's ESG strategies (Gaur et al., 2011).

Moreover, regulators have tightened their legal frameworks regarding reporting and disclosure requirements (Ho, 2023) to improve the transparency and quality of ESG-related data, e.g. in the European Union (EU). Their frameworks focus particularly on the financial industry – based on the FinTech Action Plan (2018) and the Sustainable Finance Strategy (2021) – to help market participants compare the sustainability of different financial products (Duran & Tierney, 2023). Anticipating that such frameworks will soon also be issued for other industries, companies are well-advised to systematically improve their ESG reporting (Jean & Grant, 2022). Additionally, ESG strategies and goals have evolved into an investment strategy, with sustainable investing being projected to surpass the $40 trillion mark by 2030 (Bloomberg, 2024).

Despite the evident need for companies to demonstrate excellence in reaching ESG goals (Hang et al., 2023), ESG implementation and reporting comes with challenges. Specifically, companies lack comprehensive and reliable metrics (Vasiu & Bratu, 2022). Although Cruz and Matos (2023)

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have envisioned a solution in the form of a software framework, it still needs comprehensive real-world testing and validation, as it is still in development and the data on its effectiveness and user satisfaction are limited. Moreover, the software framework by Cruz and Matos (2023) does not anticipate the potential institution-based trust issues related to potential greenwashing allegations. Greenwashing describes marketing tactics (Chueca Vergara & Ferruz Agudo, 2021) aimed at deceiving stakeholders about the environmental impact of an organization or promoting an unsustainable product or service as sustainable by highlighting desirable and masking undesirable features (Delmas & Burbano, 2011; Duran & Tierney, 2023). Building on studies such as Lindgren et al. (2021), Prabawani and Hadi (2022), we thus not only highlight the need for better measurement and certification of green business models and products but also ask how we can build an information system that supports ESG integration and facilitates ESG reporting while avoiding greenwashing and providing trustful and reliable results.

We aim to tackle this need using a design science research (DSR) approach to design an architecture for an ESG KPI reporting system. Our paper is structured according to the framework suggested by Gregor and Hevner (2013): it begins with a *Literature Review* in the theoretical background which sheds light on the convergence of ESG reporting and the burgeoning discussion of blockchain in IS within the EU legal framework and institution-based trust theory. This is followed by the *Method* section that details our approach. We then describe and evaluate our artifact in the *Artifact Description* and *Evaluation* sections. The paper continues with the *Discussion* of our findings and implications, culminating in the *Conclusions* section that summarizes key insights and potential areas for future research in FinTech.

2. Theoretical background

2.1. Fundamentals of ESG (reporting)

Good ESG reporting follows two purposes (Ho, 2023): (1) to showcase the positive impact of investments in sustainability, which ideally, encourages more such investments (Chopra et al., 2024) and (2) to mitigate investment risks resulting from reputational damage due to non-compliance with promoted sustainability strategies (EBA Report, 2024). Encouraged to leverage the benefits of good ESG reporting, many businesses proactively focus on establishing or refining standards and accountability frameworks. While current and imminent regulations provide guidance, they often need to be translated into the organizational context with the help of ESG KPIs.

ESG KPIs serve as quality indicators for products and aim to improve the presentation, guidelines, structure, and content of ESG reporting. As part of company performance reports they ensure that relevant data is complete and provided in an accessible format (KPIs for ESG, 2010). This way, the overall report provides different stakeholders and potential investors with a transparent and comprehensive overview of a company's ESG strategies and practices, allowing for the comparison of products (KPIs for ESG, 2010). Dependent on a company's focus and goals, ESG KPIs can be versatile. They can, for instance, encompass energy consumption, carbon footprint, and the circular economy, as well as social topics, such as issues of inequality, labor relations, and human rights (European Commission, 2024). Regarding the actual ESG reporting, KPIs such as transparency on management structures or accountability frameworks are crucial.

2.2. EU ESG-related Legal Frameworks

These accountability frameworks can, for instance, be inspired by EU legislation. The EU has already declared its intention for the financial industry to accelerate its transition to a net-zero economy by 2050 (EU Taxonomy, 2020). To support this transition, the EU has established a comprehensive package of measures, including policy papers, the delegation and implementation of acts, directives, and regulations. The package should also make corporate sustainability reporting more common and standardized, reducing greenwashing and preventing market and regulatory fragmentation among the member states. Moreover, it can provide transparency to investors so that they can adequately assess and value investments risk related to, for instance, EU climate. The most significant EU legislative documents on ESG sustainability reporting are the EU Taxonomy Regulation (EU Taxonomy) 852/2020 (2020), Sustainable Finance Disclosure Regulation (SFDR) 2088/2019 (2019), and Corporate Sustainability Reporting Directive (CSRD) 2022/2464 (2022).

The EU Taxonomy is a classification system that sets six main environmental objectives (article 9 EU Taxonomy) and respective criteria to ensure economic activities are sustainable, functioning as a basis for standards and labels for sustainable financial products. The SFDR regulation supplements the EU Taxonomy by enhancing investors' protection and is directly related to the ESG KPI reporting(s). It specifies sustainability disclosure requirements for financial market participants, such as the inclusion of product-related and entity-related disclosure in pre-contractual documents (articles 8-9) or the publication of concrete sustainability strategies on websites (article 10) and periodic reports (article 11) (Macchiavello & Siri, 2020). The CSRD introduces the concept of double materiality according to which companies report their impact from two mutually constitutive views. That is, it assesses the effects of environmental changes and sustainability issues due to, for instance, ESG, on a company's (economic) performance and probes into different social sustainability issues, such as human rights.

2.3. Trust Reduction in ESG Reporting due to Greenwashing

While ESG-related legal frameworks already try to tackle greenwashing in ESG reporting, more needs to be done to avoid the impression of fraudulent practices. Greenwashing typically aims to mislead consumers regarding the environmental practices of a company (firm-level) or the environmental benefits and impact of a product or service (product/service level), both of which appear sustainable but are not (Delmas & Burbano, 2011; Duran & Tierney, 2023). In ESG reporting, greenwashing particularly manifests in the form of vague descriptions of concrete sustainable practices, omitting or concealing undesirable information, or overstating the effects of the few ESG strategies companies actually implement (Chueca Vergara & Ferruz Agudo, 2021).

This practice may not only violate compliance with established legal frameworks but can also negatively influence institution-based trust. Trust is a fundamental factor in any kind of (business) relationship when risk or uncertainty are involved (McKnight et al., 2009). Institution-based trust, in particular, describes an individual's feelings of relative security towards an impersonal structure despite potential risks (Goo & Nam, 2007; McKnight et al., 1998). Structural assurance and situational normality are the two subconstructs of institution-based trust (Goo & Huang, 2008). They can be directly impacted by, for instance, greenwashing practices since the legislative normative efforts currently only constitute an intention to implement sustainability strategies but are not binding, thus, threatening Structural Assurance (Foley et al., 2024). Greenwashing also unsettles the belief in sustainability promises and the associated Situational Normality, which causes trust to crumble (Foley et al., 2024; McKnight & Chervany, 2001) and violates the qualities of a trustworthy trustee (McKnight & Chervany, 2001). That is, greenwashing not only undermines trust in the entire ESG mechanism but also the trustee's integrity, as it provides a false willingness to help, thereby breaching the principle of good faith (McKnight & Chervany, 2001). To prevent not only the practice but also potential allegations of greenwashing that could negatively impact a company's reputation, technical solutions can be used to ensure ESG data reliability and integrity, improve data accuracy, and facilitate regulatory compliance.

2.4. Trust-Building through Blockchain Technology

Blockchain technology could prove to be a valuable building block in creating such a solution. Since its inception in 2008 (Satoshi, 2008), blockchain has been hailed as a technology that would replace interpersonal trust with trust in technology (Casey & Vigna, 2018; De Filippi et al., 2020; Utz et al., 2023; Ziolkowski et al., 2020). Technically speaking, blockchains are distributed databases that record transactional data in a chronological order on several blockchain nodes in a blockchain network (Jones, 2019; Swan, 2015). Each basic ordering element, called 'block', is cryptographically linked via hash functions with the previous block, creating a chain (Scholl et al., 2020). The proposition of the next block is typically tied to a scarce resource such as the amount of energy required to solve computational puzzles or a certain cryptocurrency balance put at stake (Rieger et al., 2022). This not only makes blockchains difficult to manipulate but each attempt would also be transparently recorded (Pincheira et al., 2020). Additionally, the increase in energy consumption of a specific blockchain should always be balanced with the savings and benefits it provides (Sedlmeir et al., 2020).

Most blockchains also support the deployment of deterministic programming logic, so-called Smart Contracts (Szabo, 1994). They are characterized by self-enforceability (Rozas et al., 2021). From the moment they are created, no human interference is required since the pre-specified programming logic underlying smart contracts ensures that all requirements are met and transactions executed as well as recorded on the blockchain (Raskin, 2016). In an environment characterized by uncertainty and risks, the assurance that contractually agreed parameters will be met, given that involved parties cannot meddle with the functionality of the smart contracts after deployment, contribute another valuable trust-building component of blockchain technology (Mendling et al., 2018; Savelyev, 2017) and decrease ex-ante smart contract specification costs changing the predominance of transaction governance mode (Halaburda et al., 2024).

3. Research Method

3.1. DSR approach

We used DSR to explore how blockchain technology can be used to improve institution-based trust in ESG reporting through the development of a blockchain-based ESG KPI reporting system. This system is designed to improve compliance, reliability, transparency, and standardization in ESG reporting. DSR is a well-established research method widely used in the design and creation of various Information Technology (IT)-based artifacts, including constructs, frameworks, architectures, models, methods, and algorithms (Peffers et al., 2007). Additionally, DSR addresses more abstract artifacts such as social innovations and design propositions, as well as technical and social properties, design principles (DPs), and theories (Utz et al., 2023). This makes DSR a suitable method to develop a technical tool that improves ESG reporting.

We started our DSR project with an extensive literature review to establish our initial design requirements and features. These were further refined during a 48-hour long and intensive hackathon, which involved collaboration with a life insurance company and technical representatives from a blockchain lab. The project was then presented and defended before an interdisciplinary jury of seven expert jurors. Additionally, we developed a proof-of-concept and conducted on-site testing during the hackathon. The resulting artifact convinced the jurors to select our project for the final, international competition.

During the design iterations, we could gain generalizable knowledge in the form of DPs that can offer guidance for the incorporation of trust-building components in ESG KPI reporting systems and contribute to theories on trust-building in institutions through technology. Moreover, we incorporated and evaluated our artifact against current legal frameworks for ESG KPI reporting. This makes our artifact relevant from both a theoretical and practical perspective (Gregor & Hevner, 2013; Hevner & Chatterjee, 2012). Our DPs make a knowledge contribution of the exaptation type. Exaptation requires the extension of a known solution to new problems (Gregor & Hevner, 2013).

3.2. Problem and objectives

We started with a comprehensive literature review across various databases, including Google Scholar, Scopus, and Web of Science. Additionally, we employed AI-powered tools such as Elicit. Our keywords were “reporting” AND “ESG” OR “greenwashing”, “ESG” AND “responsible investment”, “greenwashing” AND “trust” OR “institutional trust”, as well as “ESG” AND “reporting” AND “trust” OR “institutional trust”, “ESG” AND “blockchain”, and “blockchain” AND “trust” OR “institutional trust”. Our initial search yielded a plethora of different articles and book chapters. In line with (Webster & Watson, 2002), we excluded articles that were not written in English, book chapters, and articles published in journals with a percentile below 85 % on Scopus. We then reviewed titles, and abstracts of a high-quality subset relevant to our study. While reading some of the selected articles, we included additional papers that proved relevant to our topic. From the combined set, we developed a preliminary problem statement and identified a first set of design requirements. We further refined these initial requirements during the hackathon.

3.3. Demonstration and evaluation

We created and refined our high-level architecture (HLA) for a blockchain-based ESG KPI reporting system in three design and development iterations during the hackathon. This included multiple iterations involving senior management and the technical experts from various sectors (Tab. 1). These interactions helped us contextualize and refine our project concept. It also helped us substantiate our design requirements (DRs), translate them into design features (DFs), and continuously improve our conceptual architecture through iterative build-and-evaluate cycles.

Discussions with stakeholders from the life insurance company helped us better understand the challenges associated with assessing ESG KPIs in practice. This reinforced our decision to use blockchain technology as an essential building block. Consultations with technical representatives from the blockchain lab supported the technical feasibility of our resulting proof-of-concept. We then presented a preliminary version of our conceptual architecture for a blockchain-based ESG KPI reporting system to an interdisciplinary panel of jury members – the domain experts from various business sectors – to collect feedback for further improvement. Additionally, we conducted an evaluation of the proof-of-concept against established ESG frameworks, such as EU Taxonomy, SFDR, through conceptual analysis to ensure its feasibility and relevance.

Problem Identification & Objectives Definition	Design & Development	Demonstration & Evaluation	Communication
Conducted literature review using specific keywords on multiple databases to develop a preliminary problem statement Defined DRs for improving trust in ESG reporting via blockchain, refined during a hackathon	Developed blockchain-based ESG KPI reporting system during a 48-hour hackathon Collaborated with life insurance company and blockchain lab for iterative refinement and technical feasibility checks	Presented system to an interdisciplinary jury, tested on-site during hackathon Evaluated against legal frameworks and feedback from stakeholders	Disseminated the design process, findings, and artifact through presentations and articles

Figure 1. Adapted DSR Model based on Peffers et al., 2007

4. A blockchain-based ESG KPI reporting system

4.1. Design requirement

After our discussion with stakeholders from the life insurance company, we first refined our DRs and translated them into concrete DFs relevant for the development of our artifact.

DR1 – Compliance. The implementation of the ESG KPI reporting system should adhere to the aforementioned regulatory framework and *allow companies to submit ESG KPIs (DF1)* to the blockchain. Dependent on a company's business domain, *the system should allow companies to select a set of ESG KPIs that best fit their context (DF2)*.

DR2 - Reliability. Submitted ESG KPIs should be *immutable (DF3)* after the moment of submission and must not be changed or deleted.

DR3 - Transparency. Submitted ESG KPIs should be *publicly accessible (DF4)* for anyone online at any point in time from the public ledger.

DR4 - Standardization. All ESG KPIs and sets thereof are customized for different business domains and predefined. So are *types and lengths of each ESG KPI's value (DF5)* that allows for operating the values of submitted ESG KPIs in a standardised way.

4.2. Description of the artifact

Our artifact intends to provide a blockchain-based tool for compliant, reliable, and transparent ESG KPI reporting. The aim is to enable companies to submit their ESG KPIs (DF1) in a standardized manner (DF5), which also supports investors in assessing the sustainability of companies. Based on blockchain technology, companies will submit ESG KPIs on the public ledger, instead of publishing them in their annual reports, where they are transparently and immutably stored (DF3). The artifact also helps companies become ESG-compliant by default, since it is tailored to their specific business domain needs. Eccles et al. (2012) sustain the need for reporting standards that reflect the need of different industries so that only the most essential ESG dimensions are identified and

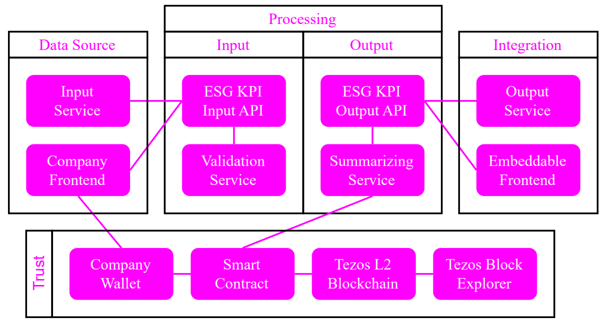

Figure 2. High-level architecture

reported. We envision that companies select their business domain and industry-specific ESG KPIs as a part of an on-boarding process (DF2). This not only increases the relevance of ESG KPIs for companies but also fosters transparency for investors, who can better assess where to allocate their sustainable investments based on available and recorded information (DF4).

The proposed artifact has four layers: the Data Source Layer, the Input/Output Processing Layers, the Trust Layer, and the Integration Layer (Fig. 2).

The **Data Source Layer** allows companies to submit ESG KPI data to the blockchain in a standardised manner (DF5) and in line with EU Taxonomy (2020) framework. The Company Frontend enables the manual submission of ESG KPI data. The Input Service supports non-manual submission of the ESG KPI data via application programming interface (API) of the Input Processing Layer. The submitted ESG KPI data is pipelined into the Input Processing Layer.

The **Input Processing Layer** operates via the ESG KPI Input API and validates ESG KPI input data within its Validation Service. The Validation Service cross-checks the submitted ESG KPI data according to the company's business domain under the EU Taxonomy (2020) itself (and its alignment), CSRD and SFDR. Different business domains also have different sets of ESG KPIs that need to be differentiated and submitted (DF2). The Input Processing Layer does not write a company's ESG KPI data to the blockchain but prepares raw transactions (TXs), which are returned to the Company Frontend (or in a response to the API call within the ESG KPI Input API) for employees of the company to include data. All returned raw TXs are signed by the employees in the Company Wallet and submitted on the Tezos Layer 2 (L2) on their own. The choice of Tezos L2 was dictated by its Ethereum virtual machine (EVM)-compatibility. The TX is essentially a call of the smart contract's function to write a company's ESG KPI data that has been pre-validated within the Input Processing Layer. All functionalities of the Input Processing Layer can be transferred to the Company Frontend in the next version of the proof-of-concept.

The **Trust Layer** is built around the existing Tezos ecosystem on which testnet we deployed the smart contract. Companies use the Company Wallet to submit pre-validated ESG KPI data to the single smart contract. The smart contract, written in Solidity, manages both public ESG KPIs. It provides functions to write and read public KPI values directly using a unique key generated from a company's wallet address and KPI identifier. This smart contract allows access to KPI data where they are openly accessible. It is possible to read the ESG KPI data directly from the Trust Ledger, using, for instance, Tezos Block Explorer (DF4). Once written to the smart contract, ESG KPIs are stored there permanently in an append-only manner and cannot be changed retrospectively (DF3).

The **Output Processing Layer** enables investors, for instance, to request a summary of a company's KPIs by reading ESG KPI data from the Trust Layer and summarizing however many ESG KPIs into a sustainability metric (0–100 %) – including explanations on how this one-dimensional metric has been calculated – that reflects the company's environmental impact. The Summarizing Service processes the ESG KPI data and outputs in a convenient format for the end users.

The **Integration Layer** uses the ESG KPIs Output API that provides access to the Output Processing Layer and retrieves the summary of company-specific ESG KPI data for each asset in a company's portfolio. Our life-insurance company, for instance, provides clients with an investment app showcasing their portfolio and explaining how they invest the client's premiums.

4.3. Evaluation of the artifact

To evaluate and refine our ESG KPI reporting tool, we used the hackathon and its various feedback rounds as a workshop-like evaluation method (Thoring et al., 2020). Hackathons provide opportunities for gathering concrete and constructive feedback in a multi-stage workshop setting with a final expert jury evaluation. Although we did not expect such a setting to produce a final, refined architecture for our envisioned ESG KPI reporting tool, the multi-stage workshop setting demonstrates its practical viability and potential (Thoring et al., 2020). Moreover, hackathons typically select jury members according to their specific domain knowledge so that they can evaluate the design according to defined parameters. Thus, different representatives of both the business and the technical side provide feedback to develop and refine the artifact. In our case, business representatives from the life insurance sector and technical experts were present. These stakeholders provided vital input on business needs and technical feasibility, ensuring the artifact met both business and technical requirements within existing infrastructures (Thoring et al., 2020).

Throughout the various group discussions – our primary source for feedback (Thoring et al., 2020) – we extensively documented observations and insights, ensuring that we captured the nuances and specific feedback from the stakeholders involved. These notes provided a rich source of qualitative data that helped us iteratively improve the design and functionality of our ESG KPI reporting system. Also, the qualitative data supported our reflection on the overall artifact, which helped us better understand its practical implications and supported our development of generalizable DPs.

For the **first design iteration** we drafted the initial HLA design. During this initial iteration we evaluated the functionality of each component with representatives of the life-insurance company. They pointed out that ESG KPI were currently difficult to process and should instead be summarized per company so that clients can "build emotional repertoire" (Expert 7) with a company's ESG goals. To address this feedback, we proposed the Summarising Service. Our proposal was well received, however, the representatives suggested to "mitigate input flaws by validation" (Expert 6), and requested the inclusion of only the most relevant ESG KPIs for different business domains (EU Taxonomy, 2020). Thus, we added the Input Validation Service.

In the **second design iteration** we refined the HLA based on the prior feedback. During this iteration, we evaluated the HLA with technical experts. They gave us feedback on our design's feasibility, specifically its smart contract functionality, based on a digital schematic HLA on Draw.io. The technical team recommended using the test network of Tezos for our proof-of-concept. They also suggested utilizing its L2 should we be familiar with EVM tools and Solidity so that our solution could be interoperable with all the EVM-compatible ecosystems. Based on their feedback, we included the suggested tools (Solidity, Hardhat, Wallet Connect) and parts of the proposed ecosystem (testnet of Tezos L2) in our proof-of-concept and HLA.

During the **third design iteration**, the proposed solution was comprehensively evaluated by the expert jury (Tab. 1) based on a detailed criteria framework. The jury was chosen according to their experience in, for instance, software development, IT services, insurance, aviation, and education. They had been in their respective professions from four to over twenty years and occupied professional roles such as Adoption Manager (AM), Business Advisor (BA), Chief Executive Officer (CEO), Chief Information Officer (CIO), Chief Communications Officer (CCO), Marketing Director (MD), and Head of corporate social responsibility (CSR). Combined, they could provide a well-rounded perspective on the industry-specific challenges and practices. Their evaluation focused particularly on the project (team), its feasibility, and the viability of the design. Additionally, the quality of the pitch, the clarity and conciseness of the project summary, the business model, the presentation deck, and responses to the jury's inquiries were part of the rating. Blockchain experts were responsible for the technical evaluation and focused particularly on the integration of the Tezos blockchain, the innovativeness of the design's features, the user experience, and interface design.

Initially, all participating teams competed at the hackathon stage. From there, the semi-final included all teams, divided into two groups, with each group evaluated by a dedicated jury board. The top six teams from the semi-finals advanced to the final round, where a single jury board evaluated their projects to determine the winners. Our project won a price and was selected for the finale in Paris, scheduled for autumn 2024.

After reflection on the evaluation during the hackathon, we decided to add a criterion-based analysis with legal frameworks such as SFDR, EU Taxonomy, and CSRD to test our **final design**. We compiled materials from the hackathon and performed the analysis to ensure that our ESG KPI reporting tool complies with regulation. The analysis revealed that we currently do not yet deliver on the double materiality of CSRD since our ESG KPI have primarily focused on environmental sustainability. However, the domain-specific selection of KPI could contain social sustainability goals if they are a particular priority for one company or industry. Regarding SFDR and EU Taxonomy, our artifact delivered on the relevant transparency and standardization of ESG KPI for each domain while accounting for domain-specific differences.

5. Discussion

The evaluation of our conceptual architecture produced valuable insights for the design of blockchain-based ESG KPI reporting systems. Following in the footsteps of Gregor and Hevner (2013), we have identified three design principles that can be useful to practitioners who wish to design and successfully implement such a system. Using blockchain technology as a key building block in our artifact, we also contribute to theory on trust-building in institutions through technology, since blockchain appears to prevent greenwashing allegations by enhancing reliability, transparency, standardisation, and compliance for companies dealing with ESG reporting (Pöll, 2024; Smits & Hulstijn, 2020; Utz et al., 2023).

№	Industry	Size, EE	Position	Exp., y.
1	Blockchain	51-200	AM	6
2	IT Services	2-10	BA	7
3	Insurance	51-200	CEO	20+
4	Airlines	1001-5000	CIO	20+
5	Education	11-50	CCO	4
6	Insurance	51-200	MD	20+
7	Insurance	51-200	CSR	15

Table 1. Experts

5.1. Practical implications

We began the design of this artifact with an observation that current ESG KPI reporting often lacks rigor and standardization, which can confuse customers, stakeholders, and potential investors (KPIs for ESG, 2010). This confusion can also result in the impression of greenwashing practices, since ESG goals are often ambitious and their implementation strategies and accountability frameworks vague (EBA Report, 2024). To address this problem, we provided not only an innovative tool for ESG KPI reporting but also illustrated in the development of our design how practitioners could improve their current ESG reporting.

Specifically, we demonstrate how regulation could be used as a guide in the innovation of reliable and trustworthy ESG KPI reporting tools. Many companies have settled for infeasible ESG goals (EBA Report, 2024) and unfocused strategies, which made it difficult to discern relevant raw data to assess the outcomes of a strategy. Inspired by EU legislation for the financial industry EU Taxonomy (2020), SFDR and CSRD, we used their comprehensive package of measures to revise ESG KPI for other industries. Our artifact makes companies compliant by default by entering domain- and company-specific ESG KPI. That is, the **Data Source Layer** enforces the submission of ESG KPI data in a standardised manner – either automatically or manually – via the Input Service. Once submitted, the **Input Processing Layer** validates ESG KPI input data, returns the raw TX, and **Data Source Layer** writes it to

Trust Layer through the Company Wallet. This results in a first design principle **DP1 – Compliant submission of raw data**.

Moreover, our project highlights the use of the Tezos blockchain as an essential building block for delivering transparency. In the form of a **Trust Layer**, the submitted pre-validated ESG KPI data entries for companies, managed by the smart contract, are publicly accessible. We also made sure that people around the world can access the public ESG KPI data via the Tezos Block Explorer to prevent greenwashing allegations due to information accessibility issues (Utz et al., 2023). Thus, our second DP is **DP2 – Public access to immutable raw data**.

Finally, we ensured that ESG KPI reporting encourages real change and prevents accidental greenwashing by distinguishing ESG KPI not only at a company but also an industry level. This way, companies have to comply with industry standards and are less likely to formulate vague ESG goals that sound more like mission statements instead of binding commitments. Implementing the **Output Processing Layer** with a Summarizing Service that gives companies a clear indication of what is required and how their ESG will be assessed. The resulting report, which derives its data directly from the **Trust Layer**, also contains a sustainability metric that provides explanations on how it has been calculated. This results in our third design principle, namely **DP3 – Industry-specific reporting goals and transparent assessment metrices**.

5.2. Theoretical implications on trust in technology

The design of our artifact contributes to literature on trust-building in institutions through technology. Fostering such trust requires an individual's willingness and belief in the positive attributes of functionality, helpfulness, and reliability of a technology even in situations where negative consequences are possible (McKnight et al., 2009). However, once individuals perceive a technology to be a driver of trust, it can be used across different domains to mend or establish trust where trust-levels have been low (Ying et al., 2018).

This is particularly relevant in the (re-)establishment of institution-based trust (Ying et al., 2018). Our choice of blockchain technology for the development of our artifact also lies in its reputation as a motor of trust in an otherwise trust-less environment (McKnight et al., 2020). As our first (DP1) and second design principle (DP2) demonstrate, we find that the use of blockchain enhances structural assurance because it mandates devotion to the duality of legal and algorithmic rule frameworks (Ziolkowski et al., 2020). By complying with the EU's regulatory framework for sustainable finance and governance of financial and corporate actors, our artifact provides a high level of transparency regarding ESG KPI and reduces risks related to ESG by employing standards and easy-to-understand metrics. Moreover, using blockchain in our artifact also satisfies situational normality because it has the reputation of being tamper-proof and reduces human interference through smart contracts (De Filippi et al., 2020; McKnight et al., 2009). Giving users access to ESG KPI data and transparent as well as reliable reports further delivers on trust dimensions that knowledge and the ability to verify data in order to build trust in an institution (McKnight et al., 2017).

5.3. Limitations of this study and potential for further research

The current study contains the first design of an ESG KPI reporting tool and has not yet been implemented in a real-world setting. Thus, our current DPs may either be extended or slightly adapted once we reach the implementation stage. In particular, we need to further investigate the use of privacy enhancing technologies for submission and verification of private data entries. Research in this area is already underway but requires a more in-depth exploration (Sedlmeir et al., 2022). Moreover, the incorporation of regulation in the design of artifacts and simultaneous evaluation may warrant a separate investigation.

6. Conclusion

Our artifact for general-purpose ESG KPI reporting can make a valuable contribution for companies interested in improving their ESG KPI reporting. The use of blockchain technology as an essential building block may prevent greenwashing allegations by enhancing reliability, transparency, standardisation, and compliance with EU regulation. Moreover, it shows potential to enhance institution-based trust by providing an immutable and transparent ledger of a company's ESG KPI.

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