

A Summary Comparison of CDR with Value-Based Engineering (VBE) for Ethical IT & AI

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Value Based Engineering (VBE) can play a crucial role in supporting and enabling the concrete realization of Corporate Digital Responsibility in organizations because it is a system design philosophy that prioritizes human values in the creation and operation of digital technologies (including AI), aligning tightly with the principles of CDR.

In a fine-grained empirical comparison between VBE and CDR, we used the “lens” method (cf. Walk 1998), viewing VBE’s 10 core principles as a perspective to analyze CDR (cf. Munin 2023). The 10 principles of VBE are (cf. Spiekermann 2023):

1. IT ecosystem responsibility
2. Willingness to renounce IT Investments for ethical reasons
3. Stakeholder inclusiveness
4. Use moral philosophy and/or spiritual traditions for stakeholder value elicitation
5. Sensitivity to the IT System’s context of deployment
6. Respect for regional laws and international agreements
7. Leadership engagement in value strategy formation and value prioritization for IT Systems
8. Transparency of the IT’s value mission and operations
9. Understanding stakeholder values in depth
10. Risk-based IT system design

The analysis has deepened our understanding of CDR’s relationship with VBE, specifically how the principles and practices of VBE can help operationalize CDR. Applying the findings from the VBE and CDR comparison presented in Figure 1, several conclusions stand out.

CDR Sources / VBE Principles	1. Ecosystem Responsibility	2. Willingness to Renounce Investment	3. Stakeholder Inclusiveness	4. Use Moral Philosophies for Value Elicitation	5. Context Sensitivity	6. Respect for Regional Laws and International Agreements	7. Leadership Engagement	8. Transparency of the Value Mission	9. Understanding Values in Depth	10. Using Risk-Analysis for System Requirements Elicitation
Lobschat et al. (2021)	underscores CDR in ecosystems	implies potential sacrifices	advocates	implicitly suggests	highlights	infers	implies	advocates	echoes	indirectly refers
Mueller (2022)	demonstrates	suggests	encourages	utilizes moral philosophies	emphasizes	advocates	stresses	advocates transparency	suggests	highlights
Elliott et al. (2021)	upholds Ethical AI ecosystem	mentions	emphasizes	applies ethical principles	advocates implicitly	asks to comply	stresses need	asks to ensure	implies	implies
Herden et al. (2021)	acknowledges	considers	includes	infers	recognizes	recognizes	emphasizes leadership engagement	advocates	recognizes	implicitly mentions
Trittin-Ulbrich / Boeckel (2022)	partially addresses	implies	mentions multi-stakeholders	implicitly reflects	emphasizes	highlights	implies	not explicitly addresses	not clearly addresses	aren't addressed
van der Merwe / Al Achkar (2022)	advocates	not stated	insists	promotes ethical approach	recognizes	implicitly suggests	not addressed	calls for commitment	explores	highlights various risks
Carl / Zilcher / Hinz (2022)	addresses	discusses trade-offs	considers as key	focuses on ethics	emphasizes	adheres	not mentioned	emphasizes importance	affirms	does not focus
Wirtz / Kunz / Hartley / Tarbit (2023)	discusses service ecosystem	mentions trade-offs	emphasizes	Utilitarian perspective	integrates contexts	not mentioned	demonstrates	stresses	shows	infers via CDR calculus
Merbecks (2023)	considers	not discussed	emphasizes	considers ethical problems	reflects Germany specifics	respects	reflects as key	highlights	implies	indicates
BMUV CDR Code (2021)	emphasizes holistic impact	not discussed	limitedly mentions	indirectly implies	emphasizes	not mentioned	underscores commitment	prioritizes	not mentioned	reflects
CDR Building Bloxx	ensures ecosystem responsibility	echoes VBE	advocates	encourages	respects	emphasizes	requires	promotes	motivates	uses
Digital Trust Label	mandates	supports	promotes	enforces ethical principles	embraces	enforces adherence	relies upon	promotes	necessitates	employs risk analysis
Digital Ethics Compass	promotes	no reference	emphasizes	utilizes moral philosophies	advocates	not mentioned	not addressed	dedicates	encourages	infers necessity
Digital Responsibility Goals	closely ties	aligns	resonates	aligns	supports	aligns	mirrors	echoes	reflects	aims for trust in algorithms
CDR Manifesto	stresses	not mentioned	advocates	promotes	caters	stresses compliance	requires	emphasizes	not stated	not mentioned

FIGURE 1: SUMMARY OF VBE AND CDR COMPARISON
(SOURCE: CF. MUNIN 2023)

Firstly, there is a strong convergence between VBE and CDR in the area of stakeholder inclusiveness. Both advocate for involving all relevant parties in the design and decision-making process, ensuring their values, expectations, and requirements are considered. This inclusion promotes transparency, accountability, and respect for stakeholder interests, aligning with the ethical objectives of CDR. Secondly, VBE and CDR are closely aligned in emphasizing ethical IT system designs. Both advocate for designing systems in a manner that respects stakeholders' rights and caters to values and rights that have been deemed universally valid, such as privacy, freedom, dignity, etc. Additionally, the two approaches focus on ensuring digital solutions that contribute positively to society by maximizing overall happiness and well-being while minimizing harm.

Some discrepancy exists between VBE and CDR, specifically regarding the willingness to renounce investments. VBE Principle Eight (above) advocates for the possibility to refrain from an IT investment if it contradicts ethical values. This principle is seldom mentioned in the CDR sources analyzed, suggesting a possible area of divergence in how both viewpoints approach the financial implications of digital responsibility. According to CDR sources, the assumption seems to be that every IT investment is per se responsible to the degree that an organization should never renounce it. This stands in contrast to VBE, which regards digital innovation generally as a “funnel rather than a tunnel”; that is, only worthwhile IT & AI innovations are pursued, producing a positive value balance, especially from a social perspective.

Interestingly, the academic literature on CDR is found to be less well-aligned with practitioners' CDR vision than VBE, which was not invented with a view to CDR. VBE emerged as an approach in the context of the ISO/IEEE 24748-7000 standard development: a process model for ethical IT System design. Especially when it comes to leadership engagement, risk-based IT design and transparency of the value mission, CDR practitioners are very much in line with VBE; and more so than CDR's own academic community, which does not stress these latter points in the literature analyzed. VBE, it seems, can significantly contribute to the CDR mission because it provides a robust framework to operationalize CDR principles. However, to implement VBE effectively, continuous adaptation and understanding of regional and technological deployment contexts is also crucial. This VBE principle is not as explicitly reflected on and embedded in CDR.

What is beneficial for CDR in using VBE as a technical IT design approach is that VBE provides a concrete way to translate abstract value principles (often legal principles or CDR principles

of an organization) into IT system requirements. Risk-based analysis is used for requirement elicitation, in line with many CDR-related laws and regulations now published (e. g. the AI Act). VBE hence offers concrete steps to put CDR principles into action. VBE also suggests a deep and nuanced understanding of the social and individual values of an IT system. It embraces the multidimensionality of values, acknowledging their cultural, social, and individual dependencies. This perspective can enrich the application of CDR, which has traditionally not discerned between the core values of a system and value qualities to be found in the technologies and policies of an organization.

Lastly, CDR can benefit from VBE's promotion of transparency in the value mission because VBE practitioners create a Value Register, which captures for organizations what value missions they identified with stakeholders and translated into system design. In this way clarity is created and trust is fostered among stakeholders. Ethical decision-making is supported and a more reputable and ethical digital brand building is facilitated.

In sum: While CDR defines the “why” of good corporate digital behavior, VBE provides the “how.” It equips organizations with an ethical compass and a blueprint for implementing material value ethics into real-world digital solutions. As a whole, VBE can play a crucial role in enabling a beneficial and responsible digital transformation, thereby embodying the essence of Corporate Digital Responsibility.

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Appendix

This appendix presents a summary of the comparison between VBE and CDR, as shown in Figure 1. Fifteen CDR sources were chosen to represent the current state of thinking in the CDR domain. While this selection does not encompass the full scope of the CDR concept, it provides insight into various aspects of Corporate Digital Responsibility that are suitable for comparing with Value-Based Engineering.

These sources come both from academic CDR research and practitioners' CDR initiatives. Particularly, the academic field contributes with nine most-often cited CDR articles as per (cf. Yadav/Mishra 2022) and (cf. Bednarova/Serpeninova 2023), while the remaining six practitioners' initiatives are listed in (cf. Mueller 2022).

The comparison of Value-based Engineering to CDR presented in Table 1 uses the lens approach (cf. Walk 1998). To visualize the VBE perspective on the CDR domain, a color scheme is used with three colors representing different levels of alignment between CDR source and VBE principles: dark green indicates close alignment, light green suggests potential contributions of VBE to the development of CDR in terms of ideas, and dark red highlights areas where CDR source implicitly ignores particular VBE principle, which can serve as "red flag" for the development of CDR domain. Additionally, a concise overview of each CDR source from the perspective of Value-Based Engineering is included below to inform the corresponding entries in Figure 1.

Looking through Value-based Engineering Principles lens, the "Corporate Digital Responsibility" article by Lobschat et al. (2021) advocates for the integration of ethical principles, stakeholder inclusiveness, and leadership engagement in corporate strategy to tackle digital challenges effectively. The article mirrors the VBE principle of ecosystem responsibility by highlighting how corporations and their partners need to embrace responsibility for their digital ecosystems. Furthermore, the authors emphasize context sensitivity, the need for transparency, and deeper understanding of values in addressing issues of digital responsibility.

Through the lens of Value-based Engineering principles, the concept of Corporate Digital Responsibility in Benjamin Mueller's article (cf. Mueller 2022) dictates corporations to consider ecosystem responsibility by developing ethical standards associated with their digital technologies that safeguard stakeholders. The notion of stakeholder inclusiveness and transparency of the value mission are evidenced in Carroll's CSR pyramid (cf. Carroll 1991), a fundamental part of CDR,

which recognizes the importance of different stakeholders by acknowledging broader societal responsibilities beyond just economic ones. The principle of using risk-analysis for system requirements elicitation aligns with the emphasis on CSR, suggesting companies need to manage potential risks and trade-offs associated with digital technology usage to balance the interests of different stakeholders, which finally leads to sustainable growth.

From the Value-based Engineering perspective, the theme of Corporate Digital Responsibility in Elliott et al.'s paper (2021) is approached through a diligent balance of stakeholder values, ethical considerations, and ecosystem responsibility. The paper exemplifies principles such as Leadership Engagement and Transparency of the Value Mission by advocating for leaders who publicly endorse core values they wish to universalize and maintain transparent corporate strategies. Furthermore, the principles of Stakeholder Inclusiveness, Context Sensitivity, and Understanding Values in Depth are highlighted as the paper discusses open stakeholder dialogue, the respect of regional laws and cultural contexts, and the implementation of ethical frameworks to guide value elicitation in AI systems.

The article on Corporate Digital Responsibility by Herden et al. (2021) can be viewed from a Value-based Engineering perspective as it emphasizes the importance of ethically responsible behaviors in the digital transformation of corporations. Applying the VBE principles, the article suggests that organizations have to reconsider their traditional CSR activities with the lens of digital responsibility, which includes acknowledging the ecosystem's responsibility and the willingness to renounce certain investments for sustainable and responsible digital transformation. In terms of stakeholder inclusiveness, emphasis on transparency and understanding values in depth, the article discusses the need for organizations to ensure data transparency, adhere to digital security laws, practice ethical digital behavior, and include societal well-being in their decision-making processes for a comprehensive and responsible approach to digitalization.

From VBE perspective, the article on Corporate Digital Responsibility by Hannah Trittin-Ulbrich and Alexa Boeckel (2022) underscores the importance of Ecosystem Responsibility and Willingness to Renounce Investment, as it discusses the need for organizations to deliberate on the societal and ethical implications of their digital technologies even at the risk of incurring additional costs. The principle of Stakeholder Inclusiveness is also demonstrated as cultural perspectives and diverse expectations towards technology need to be incorporated. Finally, the article emphasizes Respect for Regional Laws and International Agreements, with the assertion that tech

companies need to comply with regional and international regulations, embodying Leadership Engagement in the pursuit of ethically aligned business models.

In the context of Value-based Engineering, the Corporate Digital Responsibility articulated in Joanna van der Merwe and Ziad Al Achkar's article (2022) emphasizes Ecosystem Responsibility by supporting responsible data handling and ethical use of digital technologies that consider societal impacts, data privacy, and environmental effects. The need for Stakeholder Inclusiveness is highlighted, calling for strong Leadership Engagement, transparency and comprehensive understanding of key values associated with digital technology use. Lastly, the authors emphasize Context Sensitivity and the value of risk analysis, suggesting a need for corporations to adapt to specific societal nor regional contexts, respect international laws and regulations, and proactively assess potential risks.

As far as Value-based Engineering is concerned, Corporate Digital Responsibility, according to the paper by Valerie Carl et al. (2022), can be perceived as embodying Ecosystem Responsibility by encouraging ethical handling of digital technologies. The paper's emphasis on understanding and adjusting to the unique challenges posed by digitization speaks to Context Sensitivity and risk analysis for system requirements elicitation. Furthermore, CDR's focus on maintaining transparency and engaging multiple stakeholders resonates with principles of Transparency of the Value Mission and Stakeholder Inclusiveness. The paper does not explicitly mention other VBE principles, but these synthesized connections provide a significant degree of overlap between CDR and VBE.

Seen through the lens of Value-based Engineering principles, the paper on Corporate Digital Responsibility by Jochen Wirtz et al. (2023) explores how service firms can responsibly manage their digital ecosystems, acknowledging the need to sometimes renounce potential investments that pose serious CDR risks. The paper emphasizes the inclusion of all stakeholders – organizations, customers, and business partners – in managing CDR issues, stressing leadership engagement, and fostering transparency about the firm's CDR mission. Furthermore, the paper demonstrates depth in understanding the values at stake, respects regional laws and international agreements, and uses a form of risk analysis with the introduction of the CDR calculus.

Viewing from a Value-based Engineering perspective, Ute Merbecks' article (2023) underscores the concept of Corporate Digital Responsibility, which aligns with key VBE principles.

CDR emphasizes Ecosystem Responsibility and Stakeholder Inclusiveness by encouraging companies to consider all stakeholders and the impacts of their actions in the digital economy. The principles of Transparency of the Value Mission and Using Risk-Analysis for System Requirements Elicitation are echoed in the call for increased reporting on CDR activities and addressing and disclosing CDR-related risks.

The CDR Initiative Code¹ (cf. BMUV Federal Ministry for the Environment & Consumer Protection 2021), from a Value-based Engineering perspective, demonstrates Ecosystem Responsibility and Stakeholder Inclusiveness by emphasizing on environmental protection, resource conservation, employee engagement, inclusion, and the reduction of digital access barriers. It showcases Transparency of the Value Mission, Leadership Engagement and Context Sensitivity through its commitment to transparent communication of digital developments and fostering of an interactive dialogue between management and employees sensitive to their needs. It further exhibits the principle of Using Risk-Analysis for System Requirements Elicitation by recognizing the potential risks associated with digital transformation and strategizing to counter those to ensure safe and secure digital offerings.

From VBE perspective, the CDR Building Bloxx² represents an ethical, stakeholdercentric approach to digital transformation. The ten principles of VBE, such as Ecosystem Responsibility, Stakeholder Inclusiveness, and Transparency of the Value Mission, can guide the implementation of the Building Bloxx, grounding every action in a principled, value-oriented framework. This enhances the scope of CDR, allowing it to go beyond legal compliance to consider potential societal impacts, strengthen stakeholder relations, and embody values that align organizational goals with more profound ethical considerations.

From a Value-based Engineering perspective, the Digital Trust Label³ manifests as a commitment to Ecosystem Responsibility by requiring digital services to ensure their partners uphold the principles of trust and transparency. The participation of stakeholders in assessing trust levels aligns with the VBE principle of Stakeholder Inclusiveness, and the requirement for services to abide by regional laws and international agreements resonates with the principle of Respect for

¹ More information under: https://cdr-initiative.de/uploads/files/2022-02_Code_CDR-Initiative_EN.pdf.

² More information under: <https://www.cdr-building-bloxx.com/>.

³ More information under: <https://swiss-digital-initiative.org/>.

Regional Laws and International Agreements. The push for transparency in all processes corresponds with the VBE principle of Transparency of the Value Mission, and the focus on user rights and data protection reflects the principles of Understanding Values in Depth.

The Digital Ethics Compass⁴ applies the principles of Value-based Engineering by emphasizing Ecosystem Responsibility and Stakeholder Inclusiveness, recognizing the influence and responsibility of automated system creators toward stakeholders. The Compass employs Context Sensitivity, Use of Moral Philosophies for Value Elicitation, and Understanding Values in Depth, by encouraging systems to learn and adapt to human behavior changes over time, ensuring the systems reflect ethical values. The principles of Leadership Engagement, Transparency of the Value Mission, and Using Risk-Analysis for System Requirements Elicitation are inferred from the ongoing emphasis on communicative transparency, accountability, and assessment of potential risks with automation.

The Digital Responsibility Goals⁵ can be effectively pursued using Value-based Engineering, which roots decision-making in ethical value theories. The VBE's principles, such as Ecosystem Responsibility, Stakeholder Inclusiveness, and Transparency of the Value Mission, serve as avenues for attaining these goals by ensuring ethical considerations and stakeholder values are embedded in system design and implementation.

The Corporate Digital Responsibility Manifesto⁶ can be viewed from a Value-based Engineering perspective in several ways. First, it adheres to the principles of Ecosystem Responsibility and Stakeholder Inclusiveness by arguing that corporations should make a positive societal and ecological impact, exceeding their organizational limits. Second, it values Transparency of the Value Mission and Leadership Engagement by pressing boards of directors to publicize a Digital Responsibility Code and comply with regional laws and international norms. Lastly, while not overtly mentioned, the CDR Manifesto could potentially encompass the principle of Understanding Values in Depth and Using Risk-Analysis for System Requirements Elicitation via its focus on digital ethics and protection against the misuse and risks of digital technologies.

⁴ More information under: <https://ddc.dk/tools/toolkit-the-digital-ethics-compass/#>.

⁵ More information under: <https://identityvalley.eu/drg>.

⁶ More information under: <https://corporatedigitalresponsibility.net/cdr-manifesto>.

