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CORPORATE DIGITAL RESPONSIBILITY (CDR) SECURING OUR DIGITAL FUTURES

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TABLE OF CONTENTS

CORPORATE DIGITAL RESPONSIBILITY (CDR) SECURING OUR DIGITAL FUTURES

ABSTRACT

The digital era has witnessed the introduction of technological innovation in machine learning (ML) and artificial intelligence (AI). The advances in the use/reuse of data and digital technologies have produced multiple advantages and disadvantages while permeating all aspects of daily life to the extent that the risk of using ML/AI-enabled applications has become normalized. This has led to little questioning by users of what data is collected, for what purpose, and how this informs technological advances or decisions made about them. Indeed, despite regulations such as GDPR, the Digital Services Act, and the EU AI Act, which require organizations to be more transparent about ML/AI and data use to make users aware of cyber privacy and security issues. Levels of complacency have led to a user trade-off between ease of use and frictionless functionality over security and privacy concerns until users become victims of hacking, cloning, and a range of cybercrimes. Only when personal lives are impacted do users react, seeking culpability and recompense for the impact on their livelihood. Therefore, the topic of responsibility levied on organizations providing digital services and products is increasing. But who is responsible—the organizations, regulators, government, users, or all stakeholders? Corporate digital responsibility (CDR) emerged in the past decade in response to these complex issues as a framework/mechanism by way of a point of reference in the digital era, in which corporate social responsibility (CSR) is no longer fit for purpose. In recognition of the complexities facing organizational leaders in navigating responsibility across the social, economic, and environmental (physical and digital) domains, CDR is a method to assist evidence-based decision-making processes. Furthermore, few organizations possess the skills, knowledge, or resources to implement a coherent process or policy to manage potentially conflicting responsibilities, let alone sectoral regulation(s). A CDR manifesto was co-created via an international group of industry practitioners, consultants, and academics working through the challenges of producing an adaptive framework and manifesto. The framework and manifesto underpin this white paper as a holistic mechanism that enables organizations to understand their responsibilities for the use/reuse of data and digital technologies in providing safe digital environments for stakeholders while taking responsibility for preserving the planet and its finite resources. Furthermore, providing techniques to assist in shaping and changing organizational culture and mindset takes time and draws on the lessons learned from current CDR adopters. The goal is to inform and promote critical thinking and organizational practices that are fit for purpose in today's fluid socio-technological and digital marketplace. To place the previous information in context, a definition of CDR and the need for this framework in our current digital society is required.

1. WHAT IS CORPORATE DIGITAL RESPONSIBILITY (CDR)?

1.1. THE DEFINITION

CDR is not clearly defined or named within regional, national, international, or European legislation. Indeed, people operating in this field have generally relied on academic definitions to map CDR-related norms and legal texts. Therefore, in 2021, an international group of academics, corporate practitioners, and published authors collaborated to aggregate their existing work into a single, international definition that draws together varying definitions in building a set of principles that serve to guide an organization on their Digital Responsibility journey [1].[1] Consequently, Corporate Digital Responsibility (CDR) was defined as "a set of practices and behaviors that help an organization use data and digital technologies in ways that are perceived as socially, economically, and environmentally responsible."[2]

This aggregated definition considered previous research, work, and definitions that existed and were broadly known by the end of 2020. Specifically, the authors and references involved and published in the MIT Sloan Review [1], Atos [3], the Ethos Fund in Switzerland, and work in Germany, including the CDR Building Bloxx [4] and the world's first book on CDR [5]. Many published definitions were closely aligned within 80–90% of each other, though several took into consideration that it is the responsibility of companies to enhance the positive societal impacts of digital and to reduce the negative ones beyond legal obligations.

1.2. CDR PRINCIPLES

1.2.1. GENERAL

The next stage of development, having established an agreed definition, was to think about the core principles of CDR. An outcomes-based approach was agreed (TABLE 1), which considers the societal, economic, environmental, and technical impact on the planet.

[1] The numbers in brackets correspond with the sources listed in Section 7.

TABLE 1 SEVEN PRINCIPLES OF THE CORPORATE DIGITAL RESPONSIBILITY MANIFESTO

NO.	PRINCIPLE
1	**PURPOSE AND TRUST** A clear and unambiguous public statement of intent to positively impact both the planet and society, in conjunction with clarity of defining purpose. A commitment to drive for strong and responsible digital governance evidenced by, for example, the implementation of a Digital Ethics Board and driving for exceeding and advocating for improved legislation, regulation, and ethical guidance in the geographies in which the organization operates.
2	**FAIR AND EQUITABLE ACCESS FOR ALL** A commitment to equity, diversity, and inclusion in the organization and extended supply chain, ensuring that resultant products **and services are accessible and consumable by all. Furthermore, ensure that the employees involved in building, delivering,** and supporting those products and services are treated responsibly and fairly.
3	**PROMOTE SOCIETAL WELLBEING** A stronger focus on protecting personal data, supporting improved privacy balanced with identity, addressing digital poverty in access to skills, and understanding and protecting society from harmful consequences of digital products and services.
4	**CONSIDER ECONOMIC AND SOCIETAL IMPACT** Considering the economic and societal impact of decisions within the organization. Transparency regarding organizational use of algorithms and data with shareholders, employees, and consumers alike. A fairer share of gains inside and outside organizations and minimizing economic impact on communities through sustainable automation.
5	**ACCELERATE PROGRESS WITH IMPACT ECONOMY** Take steps to improve consumer demand for ecologically and societally better products, support and incubate more cleantech, Greentech, organic, and low waste supply chain SMEs, and invest in sustainable and societal impact initiatives.
6	**CREATING A SUSTAINABLE PLANET TO LIVE** Understand and report corporate impact against the UN Sustainable Development Goals or similar. To innovate and go beyond carbon negativity and solve the biggest challenges.
7	**REDUCE TECHNOLOGICAL IMPACT ON THE CLIMATE AND ENVIRONMENT** Implement an Environmental IT Strategy, understand the consequences of technology, shift energy use to renewables, mitigate and minimize impact and use of offset.

Simply put, CDR now has a set of principles and an accompanying manifesto to guide organizations [from C-Suite, managers (all levels), employees, to supply chain suppliers] to consider their individual and collective levels of responsibility.

Similarly, in examining the impact of technologies across the social, economic, and environmental domains, CDR aligns with the UN's ESG (environmental, social, and governance) directives. These guidelines first came to prominence in the 2004 "Who Cares Wins" report developed under the UN initiative [6]; areas of CDR that appear in international legislation and guidelines have, until recently, been largely related to information listed in 1.2.2 through 1.2.4.

1.2.2. SUSTAINABILITY AND ENVIRONMENTAL IMPACT

International climate agreements are broader than digital. However, the recently launched CODES Action Plan for a Sustainable Planet in the Digital Age is a significant step forward at the international level. For example, the EU environmental legislation includes a digital focus as follows:

- Regulation (EC) on a community energy-efficiency labeling program for office equipment.
- The Eco-design for Sustainable Products Regulation (ESPR), which is currently under approval and replacing The European Eco-design Directive (Directive 2009/125/EC).
- Waste from Electrical and Electronic Equipment (WEEE) directive 2012/19 EU.

1.2.3. PRIVACY AND SECURITY

The most notable example of multi-jurisdictional legislation (outside of Human Rights law) in this field is the European General Data Protection Regulation [Regulation (EU) 2016/679)] (GDPR), which, with its extra-territorial impact, has increasingly led to GDPR-like laws appearing internationally, truly having a "Brussels effect."

1.2.4. SOCIAL IMPACT AND INCLUSIVITY

This includes guidelines such as the Web Content Accessibility Guidelines (WCAG) 2.1, published by the World Wide Web Consortium (W3C) in 2018. The guidelines include legislation, with key examples coming from the EU Corporate Sustainability directive (EU 2022/2464) and the recent EU AI ACT.

These core tenets link to a previous IEEE standard, namely, IEEE Std 7010-2020 [8], which can be analyzed relative to the CDR context and application.

2. WHAT IS IEEE STD 7010-2020?

2.1. GENERAL

IEEE Std 7010-2020 [8] is a global standard that is part of a suite of projects that were inspired by the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems. The user of this standard is provided with an orientation to autonomous and intelligent systems (AIS) that revolves around human well-being (stakeholder-oriented approach), as opposed to traditional corporate risk or shareholder-oriented approaches. Specifically, it highlights the need for contextual well-being metrics that facilitate the use of a Well-being Impact Assessment

(WIA) to help proactively safeguard human well-being throughout the lifecycle of AIS. The standard addresses the following challenges:

- Defining the problem that is resolved using AIS and discussing how this fosters or undermines human well-being (Spiekermann [7]).
- Measuring the impact of technology on well-being at the individual, community, and societal levels.
- Producing outcomes utilizing AIS that are truly beneficial to humanity.
- Catering for reactive afterthought (reflective practice), repair (a human process to stimulate this process), and litigation (e.g., redress and compensation).

The standard [8] contains 12 domains of human well-being, defined as follows:

a) Satisfaction with life.
b) Affect, including feelings, mood, and emotions, which may be positive or negative, lasting or momentary.
c) Psychological well-being, including a sense of leading a purposeful and meaningful life, and doing things that are worthwhile and fulfilling.
d) Community, including a sense of belonging, community participation, social support, community safety, and discrimination.
e) Culture, including arts, creativity, traditions, customs, and localized practices.
f) Education, both formal and lifelong learning.
g) Economy, including standard of living, economic equity and equality, jobs, natural resources, consumption and production, business, and entrepreneurship.
h) Environment, including general environmental indicators, climate change, air, water, soil, and biodiversity.
i) Government, human rights, institutions, civic engagement, trust in government.
j) Health, physical health, mental health.
k) Human settlements, including housing, food, transportation information, and communications technology infrastructure.
l) Work, including workplace governance and environment at the workplace.

The 12 domains need to be translated into indicators that an organization responsible for AIS would seek to measure and monitor both from subjective (qualitative) and objective (quantitative) perspectives. The use of the

WIA involves organizational activities, including internal analysis, stakeholder engagement, developing well-being indicators, data collection, and analysis, which ultimately seek to iteratively improve AIS. This could represent adjusting development, monitoring (via continuous feedback loops), and further updating metrics to improve AIS for human well-being. Assessing human well-being is pivotal because of addressing and measuring all aspects of potential harm(s) to human well-being in and through the adoption of AIS, for instance:

- Physical harm
- Financial harm (including profit, economic standards, standards of living, Gross Domestic Product, consumption, etc.)
- Psychological harm
- Emotional harm
- Social factors
- Environmental factors

This list of harms is *not* mutually exclusive and are often interdependent of each other within layers of factors and contextual complexity. Hence, IEEE Std 7010-2020 is designed for AI creators, including organizations that wish to design, deploy, procure, or evaluate these systems for their impact on the well-being of humans, providing the following five key benefits:

- Building awareness of well-being.
- Collecting and measuring objective and subjective data to provide evidence of well-being.
- Building internal and external organizational infrastructure for considering, analyzing, and responding to well-being needs identified through the data. This includes having defined organizational roles and responsibilities.
- Strengthening risk management: Does WIA impact analysis, measures, and reporting to employees, customers/consumers, users, and wider public stakeholders assess well-being? This is in addition to meeting regulatory requirements.
- Improving well-being by engaging in proactive protocols and safeguarding against harm(s).

This standard embeds well-being into the “DNA” of the organization and AIS practice. Simply put, IEEE Std 7010-2020 WIAs should complement other approaches, including a range of impact assessments—fundamental rights/human rights, equality, algorithmic, environmental, data protection, privacy, and security, or other assessments necessitated and prescribed via localized regulatory compliance. Top-down and bottom-up approaches can achieve this, and this is where the overlaps with the principles of the CDR framework are clear

and can be used together to guide the incorporation of multi-dimensional well-being considerations throughout the AI system lifecycle. Thus, understanding, measuring, and mitigating negative impacts of AIS systems to reduce risks while enhancing positive impacts to improve the benefits for individuals, communities/groups, and society. The standard/CDR raises the question of the role of humans as global citizens and a collective community where what is done, and the AIS that is created, impacts locally and geopolitically.

This standard also recommends [9] that various stakeholders, including AI designers and developers, researchers, educators, and policymakers, develop supporting resources, conduct further research, increase awareness of human well-being across all protected characteristics, and integrate well-being into AI design and policymaking. TABLE 2 shows an excerpt from IEEE Ethically Aligned Design for Business, Prioritizing People and Planet [10], producing the capability matrix that can build upon the tenets of CDR and the purpose of considering the well-being of *people and the planet* for sustainable development goal (SDG, UN) directives.

TABLE 2 WELL-BEING METRICS READINESS FRAMEWORK[2]

	Lagging	Basic	Advanced	Leading (WBbD[3])
Internal training, support, and people resources *(Who or what exists at an organization to introduce, support, or drive well-being metrics)*	▪ Employees on their own to use any metrics beyond standard financial KPIs ▪ May be encouraged but no official support	▪ Well-being efforts come from outside consultants and focus largely on employee health	▪ ESG and CSR reporting but not prioritized at the outset of the design ▪ Training for financial or other reporting includes recognition of design-oriented ESG or well-being metrics	▪ Well-being metrics are understood and utilized by all employees (roles) and in onboarding
Leadership buy-in	▪ Leadership is unaware of or won't implement well-being metrics	▪ Introductory workshops or training on well-being metrics provided	▪ Leadership explores proof of concept tests around product or service design utilizing well-being ethics methodologies	▪ Leadership prioritizes and requires well-being metrics as the top KPIs for design, value, and company brand
Metrics and KPIs	▪ Organization only utilizes traditional single bottom-line	▪ ESG, CSR reporting created as an afterthought or	▪ Well-being efforts include the trial of methodologies	▪ Comprehensive and holistic well-being metrics

[2] Table sourced from reference [10]. This framework mirrors the AI Ethics Readiness Framework that is featured on page 13 of the first document created by the committee, "A Call to Action for Business using AI." If one works in AI, comparing these frameworks is recommended to incorporate well-being metrics into the work.
[3] Well-being by Design – The new standard for responsible innovation.

	Lagging	Basic	Advanced	Leading (WBbD[3])
	KPIs	solely for reasons of compliance	such as impact assessments and process or governance models around holistic well-being metrics	are utilized as KPIs for design at the outset of ideation ▪ Well-being metrics are weighted alongside financial KPIs
Organizational impact	▪ Well-being metrics are not understood or purposefully ignored ▪ Any existing efforts are siloed	▪ Well-being metrics are formally adopted as reporting beyond standard ESG or CSR reporting	▪ Well-being metrics are formally adopted as reporting beyond standard ESG or CSR reporting	▪ Well-being metrics and their use define the brand messaging ▪ Well-being metrics increase employee retention

2.2. IEEE STD 7010-2020 ALIGNMENT WITH CDR

IEEE Std 7010-2020 centers on assessing the well-being implications of AI on people, providing a series of standards implementing what is termed "ethics by design" at the ideation stage of machine learning aggregating to AI. However, this is now being updated to include people and planet under IEEE Std 7010-2020, a recommended practice for ESG and SDG implementation and advancing CSR. This is not to the limit of alignment with CDR's framework, principles, and manifesto. Indeed, as discussed, CDR progresses beyond CSR to address digital issues that arise in global business contexts across all sectors, applicable to programmers, engineers, technologists, and managers. IEEE Std 7010-2020 and CDR consider how the products and services organizations can support human well-being, shifting responsibility beyond a wider spectrum of traditional success/performance measures than economic growth and the triple bottom line. Rather, seeking a paradigm shift in approach and mindset where the standards/CDR focus on the social and ethical implications of data use/re-use and design of digital technologies. This white paper argues for the use of the CDR framework to support the fulfillment of IEEE Std 7010-2020.

In short, the combination of protocols provides a platform to build trustworthy data and digital practices. Furthermore, facilitating a holistic overview and critical-based approach to operationalizing human, economic, environmental, and societal well-being that aggregates multi-dimensional intelligence and maintaining a "human in the loop" to oversee ML/AI until the effect on people and the planet can be contained while cognizant of

sustainability. The values underpinning the design of IEEE Std 7010-2020 that perfectly align with CDR is that the standard includes raising awareness, educating the public and stakeholders, and providing a framework for regulations and policy. This is not to suggest that ML/AI is entirely "bad"; there are examples of apt critical thinking applied to specific use cases where AI enhances the process [11].

2.2.1. WHY IS THIS IMPORTANT?

The UN SDG directives have been recognized and effectively adopted across global businesses, leading to regular annual progress reporting under the UN Global Compact. The 2030 targets are firmly front and center of organizational "green" objectives, and it is necessary to deliver on the commitments. Since 2017, business experts have called for an 18th SDG regarding the impact of data and digital technologies across the other 17 SDGs, which was not necessarily understood at the outset of setting SDG directives.

The CDR community [12] supported the 2021 announcement of the intent to build and deliver a "Global Digital Compact," which was scheduled for implementation in the fourth quarter of 2024.[4] This follows a lengthy consultation and engagement process with individuals, associations, businesses, and governments worldwide. The CDR community in Europe collaborated in responding to the consultation process, building on the work of several community members, who also contributed to the creation and publication of the UN CODES (Coalition of Digital and Environmental Sustainability) 2022 report, "A Global Action Plan for a Sustainable Planet in the Digital Age" [13]. This action plan refers to CDR in multiple areas.

The CODES report introduces three necessary mindsets and practical shifts for organizations to embed in their operational protocols as **enablers** to effectively manage their ability to forecast and **mitigate consequential negative effects or harms of digital technologies.** Furthermore, **innovate using these same technologies to have a positive impact** on operations and outcomes**.** The breakdown aligns with the CDR principles, as defined in the manifesto, and their correlation is documented.

As CDR has continued to spread through academic research at universities, EU-funded projects such as CDR Europe (co-funded by the Interreg Europe program) and government and business adoption, some repeating patterns provide compelling reasons why the time to act is now.

- **Brand reputation**

  With the introduction of legislation and regulations, privacy and security, environmental or otherwise,

[4] https://www.un.org/global-digital-compact/sites/default/files/2024-09/Global%20Digital%20Compact%20-%20English_0.pdf.

that correlate to CDR principles and the emerging Global Digital Compact, organizations are increasingly aware of operating in a compliance environment. An example of this is the Corporate Sustainability Reporting Directive (CSRD - Directive (EU) 2022/2464 [14]), which requires large and listed companies to publish regular reports on the social and environmental risks they face and how their activities impact people and the environment. Large fines cause financial stress, but reputational damage and loss of trust in the organization is a greater operational cost and risk.

- **Access to talent**

  Gen Z (born 1997–2013) is reported to base career choices on a different range of factors compared to previous generations and will often focus on environmental or responsible business practices (including ML/AI) as influencing where they work [15]. This can extend to highly qualified, experienced talent that tends to change careers or organizations based on the ethical practices and procedures of a company. Therefore, brand reputational damage for Gen Z encompasses assessing positive impacts on society and the planet as indicators used to make career decisions.

- **Access to money**

  Private equity, VC funds, and public funding have increasingly focused on ESG as a long-term measure of business sustainability. In recent years, public authorities have been managing R&D funding or procuring services that incorporate selection criteria linked to responsibility, ethics, and sustainability. This ranges from large research funding programs, such as the EU Horizon Europe that stipulates gender, open science, and sustainability considerations in all funded projects, to national, regional, and local public authorities. Organizations that have voluntarily strengthened compliance with CDR and related principles have found improved access to R&D investment.

The combination of top-down regulation (e.g., GDPR, AI regulations) and bottom-up voluntary adoption of standards such as CDR work together as an effective driver for change toward improved organizational mindset and culture, understanding, behaviors, and reputation. As a set of guiding principles, CDR sits in a niche that enables organizations to take a holistic view across recommended actions, inter-relating regulations, and more. In essence, it helps ensure that an organization is conscious of its impact on the planet and society.

3. OPERATIONALIZATION OF CDR: FROM PRINCIPLES TO PRACTICE

3.1. GENERAL

This section introduces the CDR principles and how to embed them into business practice, while acknowledging that CDR needs to be tailored to align with organizational culture and operational needs. Initially, organizations can assess what elements of CDR already feature in current protocols and benchmark CDR readiness and competence levels, before evaluating the next steps in the CDR journey. Examples of practices that align with CDR, which organizations may already have, include engaging with accessibility, green strategies, data protection officers and protocols, and organizational social values. The added value that CDR offers is as a holistic framework that supports pre-existing efforts in this space, assisting in identifying better cohesion, collaboration, gaps, and opportunities to reduce organizational data and digital impact on society and the planet.

3.2. RECOGNIZING THE NEED TO CHANGE

While the introduction of regulations forces organizations to consider how to adopt new working practices and governance, some organizations have proactively adopted a framework such as CDR to help structure and guide practices across the business. This includes early CDR adopters. Early adoption stemmed from individuals or small teams (i.e., “champions”) recognizing the potential value of CDR to help drive change and promote positive evolution in reducing the impact of technologies in the digital era. In Switzerland, the Ethos fund started to benchmark businesses for CDR in 2022. The driver for change stemmed from an external measurement requested from an influential organization that could be deemed to have a negative impact on the brand. Both cases highlight that embedding CDR initiatives can rest at the individual or senior levels of management, and it is their collective responsible actions that create and drive change. Therefore, illustrating the importance of senior level buy-in to support implementation that cascades across the organizational structure. This is underpinned by the foresight of influential individual(s) to consider and highlight the organization’s global digital impact and, specifically, drive change by asking how the organization currently performs in all facets of Digital Responsibility. This is a key question for all organizations to ask under the remit of SDGs and conducting responsible business practices where purpose, trust, and profit combine.

3.2.1. ASSESS CDR ORGANIZATIONAL READINESS

A range of change readiness assessments or measurement tools have emerged over recent years from various organizations. Note that CDR is a holistic framework, covering multiple aspects such as data, algorithms, sustainability regulations, and more, where some organizations may conduct assessments at a more granular level. Assessments commence via an informal CDR readiness check in the form of in-depth discussions with leaders to ascertain their current work and check for CDR overlaps. This stage can identify who are the organizational leaders and potential candidates for CDR advocates/champions. Next, a more formalized CDR readiness assessment can be conducted through a combination of investigative in administrating a company-wide survey (to evaluate competencies and gaps) and focus group sessions across the organizational structure, accompanied by top-down and bottom-up interviews. The result of this qualitative inquiry is to understand feedback from employees in the context of the CDR principles and help ascertain where the organization sits with a CDR journey (e.g., a benchmark pre-implementation phase or sprint). A CDR journey can include the following levels [5]:

Level 0: Work towards corporate digital responsibility has not yet started.
Level 1: Commitment to economic/legal efforts towards CDR.
Level 2: The societal impact of CDR is incorporated, including non-regulatory and informal measures.
Level 3: CDR is fostering the organization's competitive advantage.
Level 4: CDR implementation and practice establish the organization as proactive policymakers.

In effect, this benchmarking assessment evaluates current levels of CDR and incorporates a solution-focused approach to developing a personalized CDR journey rather than metrics alone. That is, to develop actions that progress the organization to the next level of CDR competence.

3.2.2. RAISING CDR AWARENESS ACROSS AN ORGANIZATION

Organizational CDR readiness levels can be used to inform and tailor raising CDR awareness. Organizing CDR knowledge sessions structured around the CDR principles across the organizational hierarchical structure and targeting all roles is recommended. Interactive exercises include questions tailored to the organization's services (a template for one such activity is the Moral IT cards [16]) and use cases for hypothetical scenarios for ongoing projects can be invaluable for CDR exploration by the relevant project team(s). These exercises introduce the organization to consequence scanning exercises for CDR in a context-specific way that focuses on applied outcomes. CDR use cases cover multiple topics, from evaluating the cost/benefit analysis of CDR implementation in relation to offsetting long-term costs to conducting horizon-scanning of new global (digital and green)

regulations that could impact operations. A further step can include CDR in the onboarding process for employees during induction as part of core organizational materials and processes.

3.2.3. CDR CAPACITY BUILDING AND SKILLS DEVELOPMENT

Introducing and embedding CDR principles to a company, small or large, requires commitment from the C-suite, management and beyond. Furthermore, requiring sufficient recognition in the allocation of human resources who possess the skills to undertake the assessment; engage other members of staff; and design, implement, and monitor actions. Depending on the size and structure of the company, this can be an internal member of staff, or the company can seek external support. CDR should not add an unnecessary operational burden. Therefore, it is appropriate to allocate members of staff who are already working on similar or relevant projects to integrate these with CDR roles and responsibilities. For instance, staff employed in human resources, standard compliance roles, or sustainability measurement to digitalization project leads in the organization. As CDR is a holistic framework, similarly, an individual (e.g., program manager, product owner, or CDO) or dedicated group of people with an overarching view of the organization are critically to embed CDR within the “DNA” of operations. Hence, possessing the ability to see the interdependencies and cross-function implications of digitization rather than a single lens or focus of the technologist, sustainability team, compliance, and so forth.

This is where appointing a CDR champion is vital to the embedding process. This responsibility embodies a top-down and bottom-up approach to CDR compliance and is viewed as a rotation-based role. Therein, the individual advocates, promotes, and gains CDR insights while providing guidance to embed CDR across cross-functional teams, departments, senior leadership, and C-suite. Of key importance is the rotational and iterative role of the CDR champion, following a product/service/software lifecycle to counteract individual burnout, while making CDR part of the organizational culture (e.g., DNA). The CDR champion role permits employees to be given ownership of the CDR process, which helps to curb common fears around CDR implementation and reduce resistance to change, which hinders innovation.

3.2.4. ACTIONS TOWARDS CDR

CDR’s holistic framework for digital responsibility must build on current organizational actions in relation to responsible digitization practices. Therefore, it enhances, strengthens, and completes many metrics that organizations may already have in place. In short, combining the principles of the International CDR Manifesto. TABLE 3 gives examples of how CDR principles and practices are developed across an organization.

TABLE 3 EXAMPLES OF ACTIONS TOWARDS CDR BY PRINCIPLE

NO.	PRINCIPLE	EXAMPLES OF ACTIONS
1	**PURPOSE AND TRUST**	▪ Digital Ethics Board to support organizations to comply with legislation/regulation and provide ethical guidance. ▪ Digital Responsibility Code that aligns organizational goals with CDR, developed in cooperation with the organization's staff and codifying existing standards, behavior, and codes. ▪ Internal and external awareness and communication campaigns for employees and stakeholders that will create/communicate impact, trust, and transparency.
2	**FAIR AND EQUITABLE ACCESS FOR ALL**	▪ Regular consultation with staff on digital needs and challenges in relation to their role and responsibilities ▪ Staff training related to identified needs. ▪ Staff training on cybersecurity, as human error remains one of the central weaknesses of cybersecurity systems. ▪ Design thinking processes integrated into all product and service development, focusing on digital responsibility. ▪ Informal chats/events organized by CDR experts/organizations that will promote good practices and examples. ▪ Create a CDR e-learning repository (materials, studies, webinars, training, etc.) that will enable employees and stakeholders to access information and educate themselves in their own time and pace.
3	**PROMOTE SOCIETAL WELLBEING**	▪ Design thinking processes, including a risk assessment, are integrated into all product and service development. ▪ Ensure compliance with standards that promote accessibility of websites and mobile applications (see, for example, the DIRECTIVE (EU) 2016/2102 [17], with obligations for public organizations but relevant input to public and private organizations). ▪ Encourage accessibility to digital tools by application of World Wide Web Consortium (W3C) Web Content Accessibility Guidelines [18]. ▪ Integrate CDR principles/actions into existing organizational strategies and plans (CSR, gender equality, social inclusion and diversity plans, anti-discrimination strategies, etc.) with a focus on the benefits of work-personal life balance.

NO.	PRINCIPLE	EXAMPLES OF ACTIONS
4	**CONSIDER ECONOMIC AND SOCIETAL IMPACT**	▪ Procedures to ensure transparency with Stakeholders with Verifiable 3rd Party Data. ▪ Application of ethical assessment tools when making decisions on investments and developments. Commercial and open-source tools exist, such as the EU's High-Level Group on AI "Assessment List for Trustworthy AI – ALTAI" [19]. Such tools can be adapted to include indicators relevant to the specific societal impact (sustainability indicators/employment indicators/diversity indicators).
5	**ACCELERATE PROGRESS WITH IMPACT ECONOMY**	▪ Incentives from public and private R&D funding organizations to encourage development and market access to clean and green tech.
6	**CREATING A SUSTAINABLE PLANET TO LIVE**	▪ Adding capability that focuses innovation on solving big issues in the broader context of the organization. ▪ Ensure that R&D, innovation functions, or product owners are thinking about the impact of digital solutions on people and the planet.
7	**REDUCE TECHNOLOGICAL IMPACT ON THE CLIMATE AND ENVIRONMENT**	▪ Design and implement an Environmental IT Strategy. ▪ Apply internal strategies for sustainable website design and use in line with the World Wide Web Consortium (W3C) Web Sustainability Guidelines [20] and the Sustainable Web Manifesto [21]. ▪ Apply LCA analysis to measure the environmental footprint of products (many LCA software tools are available on the market).

3.2.5. RESISTANCE TO CHANGE DURING CDR IMPLEMENTATION

Instigating mindset and cultural changes, as discussed in the paper thus far, can invoke resistance to engagement and embedding the CDR principles and practice for a range of underpinning psychological factors. Kahneman [22] discussed the role of fast (instinctive and reactive) and slow thinking; the latter is aim to invoke critical reflection and consideration during the CDR implementation phase. A body of literature focused on organizational change and the psychological factors creating barriers concluded on the mandatory preconditions impact on the likelihood of successful change implementation:

- Senior leaders (e.g., champions) can make the "right" interventions.
- Initial conditions of the organization (i.e., readiness for CDR – that the organization's culture is assessed, recognized, and accepted by the senior leaders before attempting change).
- All agents feel a sense of ownership of the process.

- Systematic and frequent testing.
- Fast feedback loops.

In the context of CDR, the above points appear logical and straightforward to instigate organizational change toward responsible and ethical business practices in the digital era. However, international activities have highlighted the crucial "readiness" factor of cultural awareness as a significant barrier [23].[5] This refers to the need in some organizations and countries to raise cultural awareness surrounding the impact of digitalization prior to introducing the key concepts of CDR and its significance within the digital era. Moreover, a tendency has emerged in practice to reduce CDR to a single dimension, producing a narrow perspective with more focus on environmental CDR (recycling, re-using materials, buy-back programs for electronics) and less focus on social (diversity and inclusion) or economic CDR (sharing economic benefits with society through taxation). The idea of a holistic approach to responsibility is missing.

Driving organizational change starts and ends with human actors, who are difficult to predict in terms of individual behaviors that can facilitate or block the implementation of principles, manifestos, frameworks, compliance, and assessment unless the cost/benefits to the individual are clear. Similarly, to embed and implement "new" protocols, humans have a default tendency to adopt a "tick-box" compliance mentality over authentic engagement, termed a "quick and dirty" response. To counteract the tick-box mentality encroaching into CDR implementation, focus on "how to" implement CDR adhering to the five mandatory conditions cited previously. This entails understanding the goal of a CDR assessment in terms of *levels* of cultural/organizational readiness for change and promoting CDR as a collaborative, iterative, and shared *journey* of owning implementation, actions, and solutions rather than imposing CDR across the organization and expecting instance compliance.

4. SECURING OUR DIGITAL FUTURES

4.1. RESPONSIBLE INNOVATION

The 20th century marked a profound change in how people traveled and moved around, thus called the "Speed Century." The 21st century is impacting society by revolutionizing information and communication channels, thus named the "Digital Era." Scientists, researchers, public opinion, and policymakers agree that with these new technological advancements comes a degree of responsibility to make sure that the next generations will live in a

[5] Research carried out within the CDR EUROPE project, including an international survey with respondents from eight countries run between December 2023 and March 2024.

safe, trustworthy, and inclusive digital environment. Often, innovation comes with a price, and it is our collective responsibility to focus on future digital technologies in terms of responsible design thinking and development, and how such technologies are sustainable and used to avoid unintended consequences.

Sometimes, during the innovation process, knowledge providers can be largely unaware of the importance of embedding CDR principles in their activity, as this is an aspect related to the core research and design process. Both public knowledge providers (such as universities and research institutes) and private ones (e.g., research and design-oriented companies) are constrained to respond to the criteria established by the public-funded programs and instruments, which may not include CDR-related principles among the concepts of ethics by design, eligibility for inclusion, or monitoring values.

Policymakers must be aware that responsible research, ethical design, and innovation should be a mandatory point on the national research agenda. Thus, policymakers' and researchers' awareness of responsible research and innovation, conducting education and training programs on CDR is an essential activity. Such initiatives should start from the first years of schooling to succeed in making future generations perceive and apply CDR principles as a natural thinking process. Educating the younger generation can lead to the formation of a large pool of experts in various fields, all connected by CDR principles. As a result, governments will have a strong capacity of highly trained experts at their disposal who can develop future instruments and programs in an ethical and sustainable manner.

Essential measures for publicly funded instruments and programs should include in their calls texts specific criteria about the responsible use and dissemination of innovation and research results. These criteria can be integrated or combined with other evaluation values, which will help create a holistic approach to CDR. However, it is crucial to educate policymakers first and make them aware of the importance of digital responsibility.

4.2. RESPONSIBLE GOVERNANCE

While CDR is becoming more and more valued by organizations, investors, and consumers, governments need to be agile and develop public policies that regulate and encourage such measures, thus creating a clear legislative framework. However, not all governments are prepared and responsive enough to keep up with the changes and develop such policies. Although companies' digitalization is encouraged and supported by governments through instruments and financial aid, creating a holistic approach to CDR is a policy objective that is still far from being achieved by most countries.

The benefits of digital technologies are critical elements of business growth, innovation, and operational continuity. Companies invest massively in developing digital skills for their employees and are interested in having a highly trained workforce available for them. Nonetheless, the costs are sometimes too high, and many companies (especially start-ups, small and medium ones) are forced to choose between investing money in such programs or investing in developing their businesses, most of the time the decision being in favor of growing or saving the business. In the long term, such decisions have a negative impact on the scalability and development of such organizations, with a cascading negative effect on the local ecosystem.

Here is the point where governments should act quickly. Technology cannot be regulated (because it is developing very fast) but the use of it needs to be regulated. By taking a proactive approach, forward-looking political decision-makers can propose, endorse, and practice public policies and instruments that are linked to and encourage the responsible use of digital tools and technologies. By promoting CDR programs, which are sustained over time, governments not only help to ensure a nurturing base for sustainable economic growth but also create a trusting and inclusive environment for all stakeholders: citizens, organizations, public institutions, academia, research organizations, etc. Societal expectations for the accountability of digital technologies can no longer be ignored, and leaders are aware of this fact. CDR is much more than cybersecurity and data protection, it is about creating an inclusive and diverse social environment that will accelerate progress and have a positive impact on the economy, thus creating a sustainable planet for all of us to live. Sometimes the most difficult step is to begin.

5. CONCLUSION: WHY DO ANYTHING AT ALL?

5.1. BACKGROUND

CDR means more than preparing for technology readiness; it incorporates a set of values that have a profound impact on future societal development. The current population is responsible and accountable to the next generations to create and maintain a safe, sustainable, and inclusive framework where professional activities can be performed and people can live secure lives. Even though it may be impossible to fully comprehend or forecast the consequences of developing digital technologies in the future, at least the world can do its best to regulate their use.

There is no regulation that says one must implement CDR. There are few governments that will enforce it.

However, there is an ever-increasing number of regulations and laws that govern the way in which digital products and services are provided to the world, and it becomes ever more complex and cost-effective to keep on top of those.

For many years, CDR has grown in the domain of academia, business communities, and global thought leadership. Yet CDR is expanding—more countries, more universities, more focus. In truth, it does not matter if the focus is labeled as CDR, so long as the breadth of focus areas is largely similar. For example, the CDR community has been engaged with the UN not only with CODES, but also with the forthcoming Global Digital Compact. The main interest is the intersection of all aspects of CDR, with a stronger focus on the governance and management of the conscious impact of the work that organizations execute with digital at the heart.

CDR is a framework; it is like glue, connecting data, AI, sustainability, privacy, accessibility, trust, cybersecurity, and many other areas into one. It is there to help people and organizations maximize the way in which they impact people, society, and the planet, to help grow and improve reputation, and to help consciously question and reduce the potential negative effects that could occur. It may help to attract new talent and new investment.

It is not mandated, but it is logical. It should be about sustainable growth and not about unnecessary overhead. It should be a rallying call and not a hindrance.

In today's digital landscape, addressing CDR is no longer a matter of choice; it is a crucial decision placed upon policymakers, academia, companies, knowledge providers, and all other stakeholders that are interconnected inside an ecosystem. A lack of coherent legislative framework and proper education may inadvertently encourage discrimination, social exclusion, and bullying activities that can lead to resource waste and unfriendly climate actions to be performed, or it may even allow fraud and cyber-attacks to happen. CDR is a necessity, but like all innovations, it has its share of challenges and barriers that must be overcome.

One of the most important ones is the human resistance to change, which in most cases, is a natural reaction of people when they are facing a new set of rules imposed on them by authorities. Beyond clear strategies and implementation plans, leaders should be aware of and consider the interaction with the human factor. This is why a good communication and awareness strategy must accompany all legislative acts and decisions. People are willing to respect rules if they understand their importance and role, and if they are included in the process and develop a sense of ownership in embedding CDR. Thus, CDR champions, experts with authority and knowledge, can help explain the reasons why such measures are needed. The resistance to change can be diminished if educational programs are implemented from the early stages of development. Children and the

younger generation who have grown up surrounded by technology and digital devices must be educated and instructed on how to use them safely and navigate the digital world.

Another barrier that CDR faces is the lack of vision and strategy. If one considers CDR only from the cybersecurity perspective, one can miss the effect that digital responsibility can have in other areas: environment, resources, education, social climate, economy, and so forth. CDR must be understood as a full package of principles and actions that impact our lives on many levels. Sometimes, leaders are pressured to take measures or actions in one domain without understanding how it can be aligned with others, thus resulting in incorrect prioritization of resources and capacities. CDR can help leaders outline a clearer vision that will result in the right strategy to help ensure long-term success for projects and actions.

Last but not least, the lack of digital skills and talent is a strong barrier that affects the implementation of any good strategy. It takes time to develop the necessary skills and expertise, which is why educational programs are important, and political leaders should prioritize them in their national strategies. Starting educational programs with a focus on responsible digital skills from the first years of schooling and continuing them with more advanced programs during academic studies will create a mature workforce that can easily adapt to the challenges of the digital journey. Long-life learning materials and courses, or emergent "micro-credential" programs, are also crucial to ensure that experts stay updated on the latest developments of digitalization and help to fill in the skills gaps that the current generation is experiencing. The business sector is already aware and encourages employees to constantly update their skills. A wide range of programs is available to them, such as mentorship programs, knowledge-sharing sessions, shadowing programs, and the possibility to participate in industry conferences, workshops, webinars, and round tables, thus allowing employees to stay ahead in the rapidly evolving digital landscape.

Barriers are there, but through collective effort and strong communication leaders can make informed decisions about CDR that will positively impact the future.

5.2. CREATING A CASE FOR CHANGE

Creating a case for CDR requires C-suite and senior leadership team buy-in to change. While there may be an outlay of initial cost, budget, and resource allocation, CDR implementation will generate further innovation, deriving a competitive advantage, thereby benefiting from return on investment over the longer term. To make the case for CDR, an organization needs to do the following:

a) **Find the organization's principled approach and set out its CDR strategy.** Taking a whole business and product/service end-to-end lifecycle approach (from design to decommissioning, including where third-party elements are procured) will engender corporate-wide purpose and trust.

b) **Assess the impact:** Assess the current *environmental impact and sustainability* of current internal technology and supply chain providers (including cloud, banking, and pensions) and create a timeline to shift to the preferred state over an agreed timeline.

Take a whole lifecycle approach to *algorithmic (and risk) impact assessment, not just data protection impact assessment or privacy impact assessment* (who, how, what, when, why, mitigations, and remediation). Build it into existing agile design, develop and deploy processes, and build it into the organization's risk management and registers.

c) **Get your house in order**

1) **Create a CDR business case that factors in both increased costs and rewards:** In short, medium, and long term for accelerating progress in the impact economy. What is this impact investing doing for you, your employees, and your clients?

2) **Take ownership of the outcomes:** Recognize responsibility through internal facing responsible, accountable, consulted, and informed (RACI), external client-facing understanding of roles and responsibilities, and who is accountable in the good times and the bad times. Lay out risk and reward clearly.

3) **Avoid siloed working:** This could potentially be born out of rapid growth and pre-existent/getting by operating models. Promote inter-team/inter-disciplinary working.

4) End-to-end **approach:** Walk through the current energy consumption and sustainability, data journey, AI/ML journey, and physical and cybersecurity practices. Internally audit it and identify the gaps

5) **4Ps:** Make paperwork stack up in aligning (i) Principles with existing (ii) Practices, (iii) Policies, and (iv) Procedures need to align with CDR strategy and end goals.

6) **CDR champions:** Top-down and bottom-up approach to CDR compliance that pervades the organizational culture. This includes a C-suite level champion as part of a collective organizational group of "CDR champions," role models or "go-to" persons who actively seek

CDR innovative approaches and company-wide feedback.

7) **Recruitment review and skills audit:** Recruitment and talent acquisition, retention, and management that actively seeks CDR skill sets, growth, and inclusion in roles with the budget and resources to match. Does the organization have the current competence, capability, and capacity within its workforce to prepare for future potential? If not, recognize it and recruit it in.

8) **Training:** Embed CDR competence, capability, and capacity organically across all roles with the own organization's own blend/brand, thereby "Grow Your Own" workforce.

d) Be aware of the unknown unknowns

1) **Consequence scanning and worst-case scenario planning:** (First-order, second-order, and third-order effects, scenario scope, impacted/influenced, likelihood, and severity). Understand and assess the unknown unknowns. Do not be afraid to do stakeholder identification and analysis with clients in the room.
2) **Engage stakeholders:** Understand and assess the impacts to your clients, and the ultimate end users of your products and services, whether labeled/white labeled. Get diverse and inclusive perspectives of all who could be impacted or influenced economically and socially (economic and societal impact).

e) Be digitally and socially inclusive:

1) Understand that it is not what is done but the way it is done that matters. Find out what the real-world impacts are of the products and services. There will always be an end user. How does what is being done impact end users/society?
2) Is there a viable alternative for this product/service for someone who is not digitally engaged?
3) What happens if someone does not have access to devices, data/broadband, bandwidth, or network availability (4G/5G), or infrastructure?
4) What does this product/service do for and to the future workforce and/or future education? Could it create skills wastage? How will that skills wastage be redeployed?

f) Talk about it—Be prepared to communicate:

1) Share your vision for CDR with your workforce (Align your culture with your comms; every role counts. The message should reach every person in their role, no matter their location.)

2) Be transparent about your CDR efforts publicly, whether on your website, with your clients, supply chain, or local community (purpose and trust, creating an impact)
3) Have a Crisis Comms Plan that demonstrates transparency to your core (what happened, why it happened, remediation actions taken, how you intend to stop it from happening again, what is going to happen going forward (purpose and trust—repair after breakdown of trust due to an incident)

g) **Thrive on feedback—Measure, review, reflect, repeat:** Measure successes and see areas for improvement as a potential for innovation.

h) **Embed human oversight for the longer term:**
1) Build CDR into your AI/data governance framework
2) Establish strong digital governance through an internal and external facing Digital Ethics/Advisory Board: multilayered, multi-faceted, multi-disciplinary, and multicultural. Diversity of thought, expertise, experience, and protected characteristics is key.

The previous suggestions serve as a road map of methods and critical questions to assist in embedding CDR and starting the journey in organizations. Section 6 showcases CDR case studies demonstrating the incorporation of CDR in practice, including the challenges and benefits of implementing CDR to change culture and mindset over time.

6. CDR CASE STUDIES

6.1. CDR PILOT STUDY: SOFTWARE DEVELOPMENT CONSULTANCY

6.1.1. BACKGROUND

A CDR pilot study was conducted with a Software Development Consultancy (SDC) based in the UK. The SDC had been operating for approximately 10 years, and parallel to the growth experienced by the software engineering industry with the onset of COVID-19, it also experienced rapid growth due to the status of essential workers from 80–100 to 200–300 employees at the time of the study. The SDC showed tenets of early-stage CDR principles, such as developing their organization's social values, meeting information security management standards, and longer-term aspirations towards B Corp certification. Thus, SDC should be aligned with piloting CDR.

6.1.2. CDR PILOT STUDY

The pilot study, planned for 6 months, actually spanned 11 months, exemplifying one challenge for implementing CDR—that securing engagement with key staff and working around workload extends the process, even when there is ardent interest. To mitigate this, a formal top-down allocation of time and space for the employees supporting the implementation of CDR should occur with support from line management. The SDC possessed similar practices for sub-community spaces; however, changing to CDR incurred the delay.

The CDR pilot study included the following activities: 1) CDR knowledge-sharing and discovery, 2) CDR sessions, 3) CDR leadership interviews, 4) CDR readiness survey, 5) CDR workshop, and 6) CDR readiness report.

1. ***CDR knowledge-sharing and discovery sessions:*** The first step was to gain top-down buy-in for CDR by engaging the SDC's C-suite/senior leadership. In these sessions, C-suite/senior leadership was introduced to the CDR principles and framework, followed by discovery sessions resulting in routes for implementing CDR in the organization. The sessions resulted in outlining teams in the SDC that would be the best fit to champion CDR.
2. ***CDR sessions:*** The teams selected were situated within employee recruitment and client relations. CDR sessions were conducted that commenced with CDR knowledge-sharing and closed with interactive virtual post-it sessions. The topics included the top risks/safeguards for their role and daily tasks involving applications that collect, prepare, analyze, store, and share data. Context-specific areas were also raised, such as incorporating questions assessing ethical values in the recruitment interview process, and updating ways in which to handle client data concerns long-term. Thus, context-specific opportunities to embed CDR emerged from these sessions.
3. ***CDR leadership interviews*****:** 10–15 in-depth 1-hour long CDR interviews were conducted with individuals that the participants identified in the CDR sessions as being well equipped to spearhead CDR for the organization. These were the leads of specific practices such as software engineering, user-centered design and research, and technical leads for cross-functional teams. A key outcome of the CDR sessions and interviews was an in-depth insight into the experiences and perspectives of leadership, and as such, the next step was to gain a bottom-up overview of the perceptions of the employee community of the SDC, which was done through a CDR readiness survey.
4. ***CDR readiness survey:*** The research team created an online qualitative survey using Qualtrics; the questions were themed around the CDR principles and adapted from EthicsGrade key questions for a CDR study with Ethos [24] and Digital Catapult's Ethics Questions Framework [25]. The link to participate was

distributed by the SDC's senior leadership team on their online community channels. A qualitative survey was utilized as the goal was to gain descriptive bottom-up insight as to the trends in employee perceptions and attitudes towards CDR practices. However, a quantitative or hybrid survey can also be used to achieve these means with different insights.

5. ***CDR workshop*:** A 4-hour CDR workshop (with intermittent 10–15-minute breaks) was conducted in person at the SDC's head office with their senior leadership team representing the different areas of the organization. The workshop was sectioned into CDR knowledge-sharing, preliminary study findings, group exercises—"wall work" around CDR tenets, and a CDR use case created by the research team based on the survey findings.
6. ***CDR readiness report*:** The CDR pilot study concluded with a CDR readiness report to the SDC and a follow-up meeting with those charged with the CDR initiative to discuss the report. The report covered the methods of the pilot study, the findings, key takeaways for the organization, guides to available CDR tools and frameworks, and future next steps.

6.1.3. CDR READINESS RESULTS

The employee community was found to be eager to embrace CDR and actively considered incorporating ethical practices within their roles, and there was emergent awareness around ways in which their services could impact groups of users, wider society, and the environment. The majority of community responses were at the level of transformative concern along the CDR journey, with no responses denying the importance of CDR or not having started work towards CDR. This perception towards CDR was reflected by the employee community's recommendation of CDR champions. This recommendation was to have a designated individual, i.e., the CDR champion on technical teams, departments, and at the C-suite level, as an iterative consolidation of a top-down/bottom-up approach to CDR compliance to permeate the organizational culture. Additional findings regarding the SDC's CDR readiness were that they were performing at a high level of readiness for CDR Principle 2: Fair and Equitable Access for All. There was a strong opportunity to develop the remaining CDR principles as the activities in those areas were nascent to developing levels of readiness but showed great potential for growth as leadership demonstrated awareness around all seven CDR principles. A circumstance of the business model of consultancy is detachment after delivering the service, which proves to be a challenge requiring mitigation as CDR advocates the reduction of harmful and unintended consequences beyond contractual obligations, as such the recommendation of long-term aftercare check-ups with clients to be incorporated as a CDR initiative was made.

6.2. CDR SUPPORT TO MICRO-ENTERPRISES

6.2.1. BACKGROUND

It is essential to ensure that principles such as CDR are integrated into the daily operations of organizations of different sizes and characteristics. A challenge is to ensure that small and medium enterprises (SMEs) have the knowledge and capacity to integrate CDR into their digital transformation. This challenge becomes even greater in micro-enterprises. In 2020, work with ten micro-enterprises from different economic sectors in Tuscany, Italy sought to introduce the concept of CDR and consider what might be necessary to roll it out in company operations.[6]

6.2.2. OVERVIEW OF THE SUPPORT SERVICE

In 2020, the Regional Government of Tuscany published the call "Digital Micro-Innovation for Enterprises," providing funding in the form of vouchers for Tuscan Micro and Small Enterprises to contract services to support digital innovation processes. Using this funding scheme, ten companies received funding to support organizational change in connection to digitalization initiatives in the field of:

- Horizontal/vertical integration (company sectors: mechanical machine maintenance, electronic invoicing, and e-payments).
- Cybersecurity platforms (company sectors: engineering and technical/system assistance).
- Artificial Intelligence (company sectors: airport security; social network).
- Cloud computing (company sectors: airport security, agro-food, compliance/regulatory certification, software development—blockchain/human resource management).

In parallel to the technological development of digitalization tools, funding covered a consultancy service to introduce the concept of CDR, understand CDR maturity levels, and develop a set of recommendations as to how each company could integrate elements of responsibility into their digitalization processes.

With each company, the service took the form of workshops with the company owner/manager and other relevant staff members. An initial session was designed to understand each company, including its economic sector, customers, internal technical-organizational structure, relationships with stakeholders, and digital tools in place. Having introduced the concept of CDR, the discussion also covered existing CSR/CDR policies and specific procedures in place at the company level. It also looked at a detailed analysis of the company's expectations with

[6] Source: https://corporatedigitalresponsibility.net/blog-1/f/cdr-in-tuscan-micro-and-small-enterprises.

regard to its digitization process. This second phase consisted of two questionnaires completed by selected staff members. The first questionnaire was designed to assess the degree of company awareness of CDR and any policies and practices in use. The second focused on cybersecurity and the secure management of sensitive data. The questionnaire included the use of an online tool to determine the risk factors for several categories of cyber breaches [26]. In the final stages of the service, a cybersecurity and data-management maturity test was conducted through an interactive training and awareness-raising platform. Finally, an economic and financial analysis was conducted to identify the potential of the digitization investment and estimate its impact and effectiveness.

Results from each of these stages were discussed and used to prepare a set of recommendations. Recommendations covered general organizational/management issues and focused on four CDR dimensions (social, economic, environmental, and technological), with an evaluation of the level of interest/priority and potential in relation to the digitalization project. Recommendations also included a specific section on cybersecurity concerns.

6.2.3. RESULTS FROM THE SUPPORT SERVICE

Overall, the micro-companies involved in this initiative showed openness to the concept of CDR. The majority (87.5%) had not heard of CDR before starting the project, and all (100%) stated that their knowledge of CDR had increased thanks to the service. Overall, the highest level of priority was given to the technological component. Indeed, the issue of cybersecurity sparked particular interest, demonstrating a direct link between critical data management and the socio-economic impact of digital technologies.

Meanwhile, companies felt that the environmental element would be the most difficult to implement (37.5% of replies citing it as the most difficult), followed by social and economic (25% each) and, finally, technological (12.5%).

Companies recognized the potential of CDR in terms of responsiveness to stakeholder needs, cost reduction, and increased market competitiveness. When asked to identify expected benefits from CDR, 75% cited risk management, 62.5% image and commercial benefits, 37.5% economic benefits (savings and new markets), 25% social impact, and only 12.5% environmental impact.

Finally, 75% of companies believed putting a CDR strategy into place would be worthwhile. Of the 25% that answered no, half stated that it would not be relevant for them, and the other half stated that it would require excessive investments (resources and time). To put into place a CDR strategy, the majority suggested they would

require training (66.7%), followed by guidelines and technologies (50%), good practices from other companies (33.3%), and finally, strategy consultancy services (16.7%).

In general, companies expressed difficulties or resistance largely dictated by company size. For small companies, the costs of planning and implementing digitalization procedures are often difficult to sustain. Faced with fewer human, financial, and organizational resources, small companies often perceive the competitive advantage of internalizing CDR as marginal compared to the costs of initiating and maintaining organizational change. In this situation, progress in terms of CDR strategies comes down largely to resources and funding. When asked if they would take forward CDR investments without public funding, 50% of the companies involved replied negatively, citing that the economic impact was too significant.

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