The International Journal of Digital Accounting Research
Vol. 23, 2023, pp. 1-18
ISSN: 2340-5058

Corporate digital responsibility: bibliometric landscape – chronological literature review

Michaela Bednárová. Pablo de Olavide University, Spain, mbed@upo.es

Yuliia Serpeninova. Sumy State University, Ukraine; University of Economics in Bratislava, Slovakia, yuliia.serpeninova@euba.sk

Abstract. Over the last decade, we have witnessed how new technologies, such as AI in the form of automation or machine learning, have proliferated in business processes. Although digitalisation has led to a significant increase in efficiency, it raises certain concerns related to privacy, data protection and other human rights, which might be at stake when huge amounts of data are being collected and processed or when AI is used for decision making. Digitalisation, apart from increasing efficiency, has a strong potential to contribute to sustainable development if responsibility and trust are guaranteed. Therefore, companies should critically reflect upon different ethical criteria to avoid compromising democratic rights and values when engaging in digitalisation. In our study, we wanted to draw attention to and increase awareness of an evolving area of corporate digital responsibility. In addition to the bibliometric analysis of the CDR literature, a summary of the definitions is provided.

Keywords: Corporate digital responsibility, corporate social responsibility, digitalization, sustainable development, bibliometric analysis.

1. INTRODUCTION

Nowadays, we are facing the rapid development of new technologies, which has led to outstanding cost savings, the incasement of goods and services quality, the

DOI: 10.4192/1577-8517-v23_1

Submitted November 2022
Accepted January 2023

transformation of certain management and marketing processes and human resources, etc. This tendency is expected to proceed even in a wider dimension. Based on Gärtner (2019), AI, as a type of robotic process automation, corporation management software and machine learning, is the number one investment worldwide.

Nevertheless, the huge incorporation of AI into the business environment has led to some issues related but not limited to data privacy protection, which might be affected by AI's capacity to aggregate a significant amount of data. Thus, the rapid expansion of new technology brings not only advantages but also new concerns and justifies the need for regulatory support of these processes due to pressure from different stakeholders (Bednárová, 2022). This contributed to the rise of a new concept called Corporate Digital Responsibility (CDR).

Digitalisation, apart from increasing efficiency, has a strong potential to contribute to sustainable development. However, digital transformation is currently failing to create sustainability due to a lack of responsibility and trust. So, what is necessary to guarantee a sustainable development? On the one hand, it is a digital transformation in the form of AI, automation, etc. that has the potential to improve people's lives and the efficiency of economic processes. On the other hand, to contribute to a trustworthy digital space, the basis for sustainable development, a company engaging in the world of new technologies, such as algorithmic automation, artificial intelligence, Internet of Things, blockchain, etc., should critically reflect upon different ethical criteria to avoid compromising democratic rights and values.

Therefore, to move towards sustainable development, the ESG context should be extended by a "digital" attribute (AECA, 2022). Nevertheless, while digitalisation can contribute to the faster and more efficient development of social and economic processes, the ability to identify and mitigate ethical concerns related to digital technologies is a key skill in sustainable development.

CDR awareness differs from country to country. Germany is currently considered a leader in CDR efforts. The Federal Ministry of Justice and Consumer Protection introduced the CDR Initiative in 2018. The Initiative has the support of both the government and a number of companies from different sectors. Within the

Initiative, the CDR Code was introduced, setting objectives in five fields of action: data handling, education, climate and resource protection, employee involvement, and inclusion. Its main aim is to ensure that digital responsibility becomes an integrated part of day-to-day business decisions (BMJV, 2018).

Another country where this concept is gaining importance is Spain (AECA, 2021). Recently, the Spanish Accounting Organization (AECA, 2022) proposed how CDR can be implemented and enforced in corporations.

Sustainable Development Goals (SDGs) have been designed to support sustainable development. SDGs cover a system of goals, targets and indicators that help to achieve progress towards a sustainable future. Considering the importance of digitalisation in terms of sustainable development, Digital Responsibility Goals (DRGs) have been proposed based on a multi-stakeholder approach. A consortium consisting of academics, NGOs and industry experts was created to provide an agenda for digital responsibility. As a result, the consortium identified seven focus areas that should be considered when shaping the digital economy based on democratic rights and values: digital literacy, cybersecurity, privacy, data fairness, trustworthy algorithms, transparency, and human agency and identity (Identity Valley, 2021). DRGs are expected to shape a trustworthy digital space and contribute to truly sustainable development (Meier et al., 2022).

Hence, the concept of corporate digital responsibility has recently drawn the attention of both practitioners and academics. Therefore, the objective of our study was to gain some insight into the trends in the current literature on this topic by conducting a bibliometric analysis and summarising the definitions of this relatively new concept.

2. CORPORATE DIGITAL RESPONSIBILITY

2.1. CDR concept

Rapid development of technology assumes certain responsibilities for its implementation in business, which has led to the concept of CDR. This is a relatively new term that has appeared in the scientific literature very recently but has gained momentum very actively. Despite increasing interest in CDR among

scholars and professionals, there is a need for its further development and conceptualisation.

Some scholars have noted a direct connection between CSR and CDR. Bonsón et al. (2023) stated that CSR and CDR definitely have some common principles. Early CDR adopters also support this idea as they include this information in their sustainability reporting (Deloitte, 2019; PWC, 2019). For example, Nicolai Andersen, a Chief Innovation Officer at Deloitte, mentioned that CDR must be presented within the CSR framework (Deloitte, 2019).

In 2017, Driesens et al. proposed the following definition of CDR: *"CDR is a voluntary commitment. It starts with the need to conform to legal requirements and standards – for handling customer data, confidential, intellectual property and so on – but it also extends to wider ethical considerations and the fundamental values that an organization operates by."*

The following definition proposed by Lobschat et al. (2021) is widely referred to in the current literature: *"CDR is the set of shared values and norms guiding an organization's operations with respect to the creation and operation of digital technology and data."*

The definition of The Institute of Consumer Policy refers to the CDR as data and algorithmic decision making, participation and reduction of inequality, digital education, future of work, and digitalisation in service of an ecologic transformation (Conpolicy, 2021).

According to Mueller (2022), the CDR concept has roots in computer ethics and business ethics. From a computer ethics perspective, CDR is related to information ethics, machine or robot ethics, internet ethics, cyberethics, AI ethics, etc. Another conceptual pillar in which CDR is rooted is business ethics and, thus, general ethical behaviour in the corporate world.

Hera (2021), one of the pioneers in CDR disclosure, defines CDR as *"a set of practices and behaviours that help an organisation to use data and digital technologies in an ethical and responsible way in social, economic, environmental and technological dimensions to address sustainability and digitalisation in a coherent and complementary manner to anticipate and reduce future risks."*

The German initiative - CDR Code defines it as follows: *"Corporate Digital Responsibility (CDR) refers to voluntary entrepreneurial activities that go beyond what is legally required, particularly in the interests of consumers, and actively help to shape the digital world for the benefit of society. CDR can make a significant contribution to making digital transformation fair and to the benefit of all. It thus promotes sustainable development"* (BMJV, 2018).

Innovation and digitalisation are complementary elements necessary for sustainability. Due to the increasing digitalisation of activities and processes, corporate responsibility has expanded from ESG to include a digital aspect. Such an approach lays the foundations for a new perspective of sustainability, in which environmental, social and governance dimensions are affected by digitalisation. Therefore, an increasing number of authors suggest a connection between CDR and CSR, which we can see reflected in previous definitions.

2.2. Regulatory framework

A legal framework proposal was presented by the European Commission in April 2021. This covers regulation of AI, which could have a significant influence on CDR. The preliminary steps towards the regulation proposal included the following papers: Coordinated Plan on AI (2018), Ethical Guidelines for Trusted AI (2019), and White Paper on AI (2020).

This proposal is crucial for EU initiative transformation in the sphere of AI regulation. Suggested regulation is considered a starting point of the legislative process and is still under continuous substantial moderation (European Commission, 2021). It aims to ensure the security and rights of individuals and corporations within the frame of the EU, adjusted for the Digital Age. Thus, it points out approaches for trust in AI based on a risk assessment differentiating levels of AI system risks: unacceptable, high, limited and minimal. Based on the AI system risk category, a corporation is required to provide a determined transparency level.

This regulation raises the issue of the voluntary disclosure of the CDR (apart from some data protection matters that are already regulated by the GDPR). Such EC initiatives demonstrate the growing importance of CDR and move it to a new, practical level.

3. METHODS

Data within the research topic covers scientific papers indexed in three databases: Scopus, Web of Science and Google Scholar. All papers were sorted without a time lag as of 01.01.2023 by keywords "corporate digital responsibility" in article titles, abstracts and keywords. Thus, by means of Publish or Perish software, 95 papers dedicated to CDR indexed in the Google Scholar database were gathered; by means of inbuilt analytical instruments in Scopus and Web of Science databases, 32 and 18 articles, respectively, were compiled.

Bibliometric analysis covers such methods as clustering (through association strength) and the creation of bibliometric maps using VOSviewer software. The visualisation of research networks that form scientific schools, as well as scholar's output in the study of CDR, was also made via VOSviewer instruments. Formalisation of the subject areas of papers indexed in the Scopus database might be done by means of SciVal. Chronological specifics, trends, dynamics, regional distribution and citation dynamics of publishing activity were analysed through inbuilt analytical instruments in Scopus and Web of Science databases by means of Publish or Perish software for the Google Scholar database. Google Trends was used to identify user's demand for "corporate digital responsibility" searching requests.

Bibliometric analysis is an effective tool to eliminate an existing gap in academic support of progress in the chosen research area related to ESG aspects and sustainable development (Bulavinova et al., 2021; Makarenko et al., 2021). Despite the sound contribution of scholars (Herden et al., 2021; Mueller, 2022) to the analysis of literature related to CDR, there is still space for deep meta-analyses in this field of study.

4. FINDINGS

4.1. Bibliometric analysis

Dynamics of publications on CDR (Table 1, Figure 2), as well as the visualisation of user's demand based on frequency of the user's query "corporate digital responsibility" on the Internet (Figure 1) showed the general trends in this research field.

Figure 1 demonstrates an increase in user's requests on "corporate digital responsibility" since the beginning of 2020 with the maximum frequencies in 2022. This might be explained by the significant influence of COVID-19 on the world economy, which stimulated businesses to move a lot of activities to online and remote formats. As a result, it forced a huge transformation of digital tools for corporations, which justified the need for CDR development. As for the regional distribution of user's requests according to Google trends results, the highest number was from Germany (100), the Philippines (53), and India (18), which shows the high interest in this topic from users in these countries.

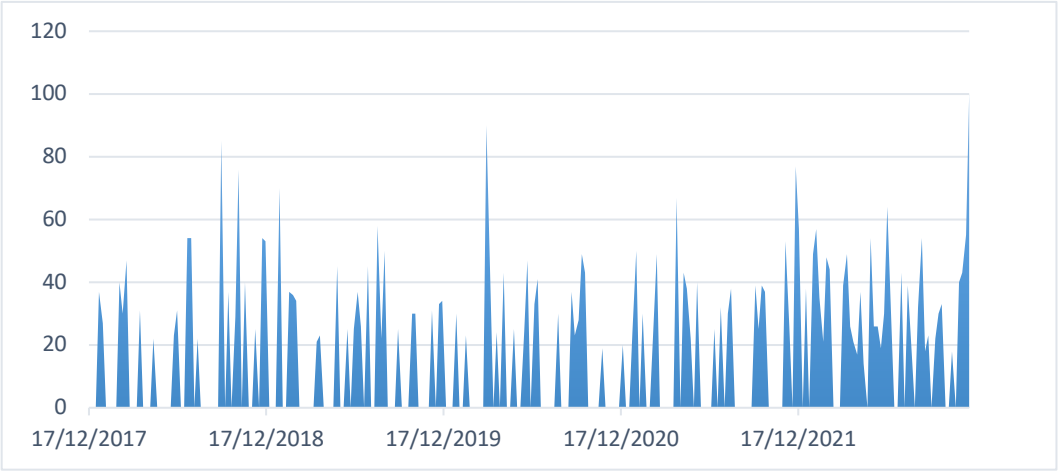

Figure 1. Dynamics of "corporate digital responsibility" user's requests.
Source: Compiled via Google trends: https://cutt.ly/p0l7Bpg

The highest number of publications dedicated to CDR (95 papers) is presented in the Google Scholar database and has a growing tendency over the selected timeframe. Table 1 indicates that, before 2021, there were almost no papers on CDR in the Scopus and Web of Science databases, which states that this topic is newly emerged. Publication dynamics on CDR for the last five years (Figure 2) proves the increase in scholar's interest in this topic due to the growing number of papers.

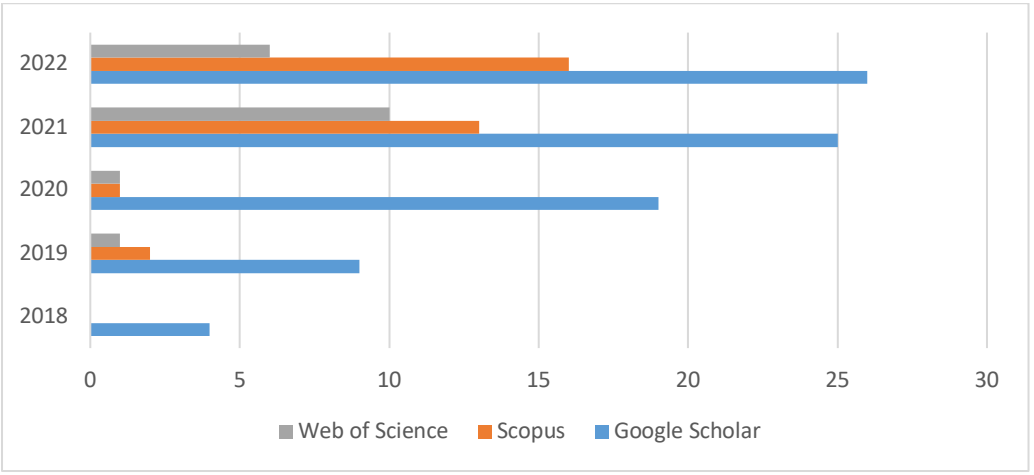

Figure 2. Publication dynamics on CDR for 2018–2022.
Source: Based on Scopus, Web of Science and Google Scholar databases

Database	2018		2019		2020		2021		2022*	
	Papers	Cite	Papers	Cite	Papers	Cite	Papers	Cite	Papers	Cite
Google Scholar	4	37	9	43	19	90	25	260	26	16
Scopus	0	0	2	11	1	10	13	96	16	10
Web of Science	0	0	1	0	1	9	10	14	6	30

Table 1. Publishing activity on CDR for 2018–2022.
** Due to the time gap between article submission, citation and indexation in databases, publishing indicators in 2022 will be updated and increased.*

Table 2 and Figure 3 summarise the information about the authors' contribution to research on CDR.

The analysis of all three databases (Table 2) indicated that the greatest contributions to the development of CDR research were made by Wirtz J., Weber-Lewerenz B., Carl K. V. and Esselmann F. Based on the collected data from all three databases, a bibliometric map of the most cited scholars in this field of study was constructed (Figure 3). Visualisation was made according to citation activity and the strength of the research networks, which form two scientific schools. The first one ("red" cluster) connected such scholars as Lobschat I., Eggers F., Brandimarte I. and Muller B. The second ("green") cluster was presented by such authors as Wirtz J., Kunz W., Hartley N. and Tarbit J. Among the above-mentioned scholars, Wirtz J.

made the soundest scientific contribution to research on CDR, having the largest cell in the bibliometric map, which corresponds to the citation quantity of the authors' papers.

№	Google Scholar		Scopus		Web of Science	
	Scholar	Scholars' output	Scholar	Scholars' output	Scholar	Scholars' output
1	Brink A.	8	Carl K. V.	3	Elliott K.	2
2	Esselmann F.	8	Elliott K.	2	Ng M.	2
3	Dorr S.	6	Hinz O.	2	Van Moorsel A.	2
4	Wirtz J.	5	Mueller B.	2	Mueller B.	2
5	Golle D.	4	Ng M.	2	Wirtz J.	2
6	Hartley N.	4	Van Moorsel A.	2	Weber-Lewerenz B.	2
7	Carl K. V.	4	Weber-Lewerenz B.	2		
8	Hinz O.	4	Wirtz J.	2		
9	Jones P.	4				
10	Weber-Lewerenz B.	4				

Table 2. Scholar's output on CDR research (as of 01.01.2023).
Source: Compiled via VOSviewer
** scholars' output cannot be summarised because the same article can be indexed in all three databases.*

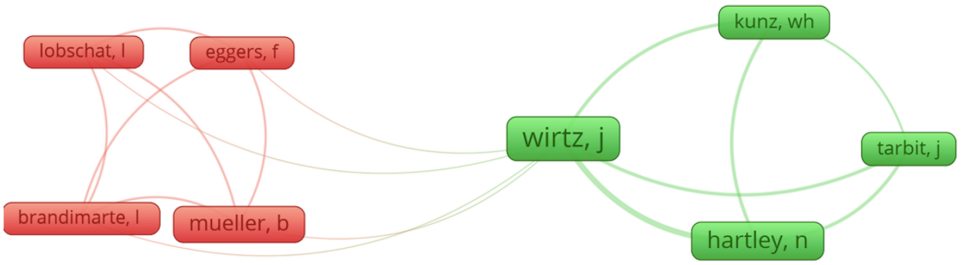

Figure 3. Bibliometric map of scholars in the field of CDR based on Scopus, Web of Science and Google Scholar databases as of 01.01.2023.
Source: Compiled via VOSviewer

Figure 4 presents the bibliometric map of papers dedicated to CDR based on the Scopus and Web of Science databases by keywords, which formalises the most relevant directions of research in this field of study.

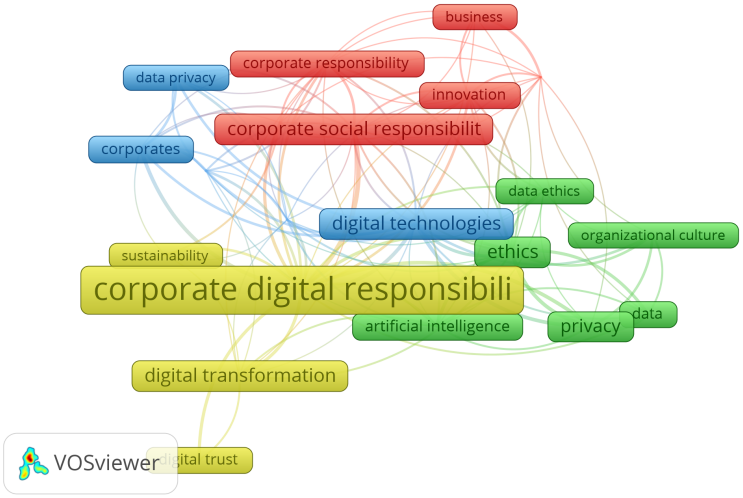

Figure 4. Bibliometric map by keywords of papers on CDR based on Scopus and Web of Science databases (as of 01.01.2023)
Source: Compiled via VOSviewer

Clustering of scientific papers by keywords (Figure 4) revealed three clusters, which allowed us to characterise the thematic focus of papers on CDR. The aggregation of keywords within the "yellow" cluster indicated the importance of CDR in terms of digital transformation, digital trust, and sustainability. The "green" cluster showed the connection between CDR and digital ethics, artificial intelligence, and organisational culture. The "blue" cluster presented papers devoted to the study of digital technologies and data privacy.

The regional aspects of papers on CDR distribution are systematised in Table 3.

Scopus				Web of Science			
№	Country	Output	%	№	Country	Output	%
1	Germany	10	31	1	Germany	7	39
2	Russian Federation	3	9	2	United Kingdom	3	17
3	United Kingdom	2	6	3	United States	3	17
4	Australia	2	6	4	Australia	2	11
5	Singapore	2	6	5	France	2	11

Table 3. Regional distribution of publishing activity on CDR in Scopus and Web of Science database as of 01.01.2022.
Source: Compiled by the author using the inbuilt tools of bibliographic analysis of the Scopus and Web of Science databases.

The data demonstrated (Table 3) that the strongest contribution to the development of CDR was made by German scholars, with scholar's output shares of 31% and 39% in the Scopus and Web of Science databases, respectively. The United Kingdom and the Russian Federation, among other countries, contributed greatly to this field of study, which shows the sufficient evolution of theoretical basics of scientific thought on CDR on the national level.

Figure 5 shows the analysis of papers on CDR within subject areas. Thus, the highest score of papers on CDR in the Scopus database was presented by two subject areas, "Computer Science" (29%) and "Business, Management and Accounting" (25%), which proves the main thematic preferences of scholars in the suggested research topic. The structure of other subject areas provides the ground to state the growing attention to CDR in social sciences, engineering, econometrics, decision science, environmental science, medicine and psychology.

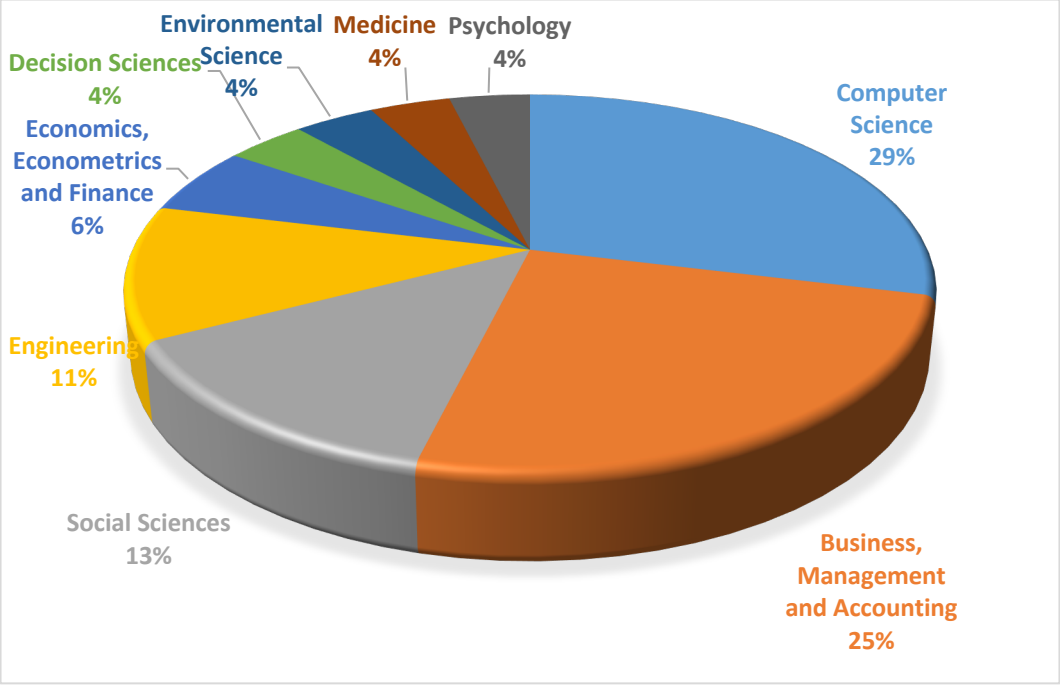

Figure 5. Subject areas of papers on CDR in the Scopus database as of 01.01.2023.
Source: Compiled via SciVal

4.2. CDR definitions overview

Two academic papers (Herden et al., 2021; Mueller, 2022) in our sample provided a summary of the CDR definitions (Table 4). Five other studies providing their own CDR definition were identified (Carl et al., 2022; Elliott et al., 2021; Trittin-Ulbrich and Böckel, 2022; Van der Merwe and Al Achkar, 2022; Wirtz et al., 2022).

Authors	Definition
Ampofo (2016)	"Expanding the remit of CSR to address the impact of the digital tools and environments that businesses operate in."
Andersen (2018)	"A Corporate Digital Responsibility (CDR) complements corporate responsibility and partially re-thinks it as companies need to think about the societal impact of digital products and services as they evolve and ensure that they are compatible with our value standards."
BMJV (2021)	"CDR is a voluntary corporate activity, particularly considering the consumers' perspective, which strives to go beyond what is required by law to shape the digital world for the advancement of society."
Carl et al. (2022)	"CDR puts privacy and data security attempts in a broader context to provide a more holistic approach to corporate responsibilities and to strengthen consumer trust in corporate activities in a digitized world."
CSR News (2018)	"Corporate Digital Responsibility (CDR) refers to corporate responsibility in the digital society."
Driesens et al. (2017)	"CDR is a voluntary commitment. It starts with the need to conform to legal requirements and standards – for handling customer data, confidential, intellectual property and so on – but it also extends to wider ethical considerations and the fundamental values that an organization operates by."
Elliott et al. (2021)	"CDR is a voluntary commitment by organisations fulfilling the corporate rationalisers' role in representing community interests to inform "good" digital corporate actions and digital sustainability (i.e. data and algorithms) via collaborative guidance and addressing social, economic, and ecological impacts on digital society."
Herden et al. (2021)	"CDR is an extension of a firm's responsibilities which takes into account the ethical opportunities and challenges of digitalization."
Joynson (2018)	"CDR is about recognizing that the organizations driving forward the advancement of technology, and those that leverage technology to engage and provide services to the citizen, have a responsibility to do so in a manner that is fundamentally leading us toward a positive future."
Lobschat et al. (2021)	"CDR is the set of shared values and norms guiding an organization's operations with respect to the creation and operation of digital technology and data."
politik digital e. V. (2018)	"Corporate Digital Responsibility is an understanding of corporate responsibility in and for a digital society. It involves a regulated and a voluntary level: on the one hand, the observance of relevant laws or directives, on the other hand, the exercise of a voluntary responsibility in shaping the digital society."

Price (2018)	"Corporate Digital Responsibility is about protecting people's rights around data (in line with regulation), about ensuring that trust is maintained because they see that products and services save them personal time, help them with their health and ageing, and protect them from less acceptable or threatening uses of those same technologies."
Trittin-Ulbrich and Böckel (2022)	"CDR emphasizes the voluntary, self-regulatory character of corporate commitment to responsible digital innovation."
Van der Merwe and Al Achkar (2022)	"CDR as the set practices, policies, and governance structures of corporations as they relate to the digital transformation. CDR must be centered around accountable digital practices, enforcement mechanisms, sustainable growth and development, and the promotion of trust across the digital ecosystem. CDR practices must engage how digitalization shapes society and the environment and the impacts that it has on individuals, communities, and states."
Wade (2020)	"CDR is a set of practices and behaviors that help an organization use data and digital technologies in a way that is socially, economically, technologically, and environmentally responsible."
Weissenberger and Marrocco (2022)	"CDR is a voluntary corporate orientation to ensure a responsible use of digital technologies."
Wirtz et al. (2022)	"We define CDR in the context of service as the principles underpinning a service firm's ethical, fair, and protective use of data and technology when engaging with customers within their digital service ecosystem."

Table 4. CDR definitions overview.
Source: Authors' elaboration

As we can observe, definitions of CDR mainly revolved around the aspects listed in Table 5.

CDR aspect	• a legal aspect, compliance with legal requirements related to, e.g., data protection and security;
	• a voluntary aspect of disclosure related to ethical considerations and challenges of digitalisation;
	• a consideration of CDR complementing the scope of corporate sustainability, including social, economic or environmental impact of digital products and services;
	• a consideration of technology contributions to the society, including but not limited to innovation, strengthening consumer trust, etc.

Table 5. CDR aspects according to definition.
Source: Authors' elaboration

5. DISCUSSION AND CONCLUSIONS

The digital revolution brought new challenges to the transformation of CSR, shifting ESG aspects to the digital dimension. As AI applications might lead to consequential risks in terms of human rights and data privacy, it is crucial to mitigate such risks via obligatory requirements for corporate transparency and information disclosure in this field.

Regardless of the current EC's initiatives to improve the credibility of AI, such as the Coordinated Plan on AI (2018), Ethical Guidelines for Trusted AI (2019), White Paper on AI (2020) and Artificial Intelligence Act (2021), there is still a gap in the legal framework in terms of AI responsibility and obligations concerning its transparency. However, some corporations have already reacted to stakeholders' expectations and disclosed this information voluntarily.

This led to the development of a new concept of CDR and an initiative to formulate digital responsibility goals. As CDR has direct implications for ESG dimensions, it is considered an essential part of sustainability. This has also been shown in our literature analysis, in which a clear connection between CDR and CSR can be observed.

Our bibliometric analysis shows that the concept of CDR is gaining momentum in the academic literature. From 2017 to 2022, the literature on CDR has increased drastically. Thus, more than half of all publications on CDR indexed in Google Scholar, and about 90% of papers in Scopus and Web of Science databases were published in the last two years. Analysis of the regional distribution of publishing activity on CDR shows that the strongest contribution to the development of CDR was made by German scholars (with more than 30% scholar's output share). This statement is also supported by the fact that, according to Google trends results, the highest number of user's requests on CDR was also made in Germany.

Clustering of scientific papers on CDR by keywords and authors' contributions through the construction of bibliometric maps allowed us to formalise the thematic focus of papers on CDR and newly emerged scientific schools in this research area. The obtained results demonstrated that the greatest contribution to the development of CDR research was made by Wirtz J., Weber-Lewerenz B., Carl K. V., Esselmann

F. and others. As for the subject areas of papers on CDR, it could be concluded that more than half of papers on CDR were presented in two subject areas: "Computer Science" and "Business, Management and Accounting."

To the best of our knowledge, this is the first study related to bibliometric analysis of CDR. Therefore, our findings might contribute to the academic literature, as well as serve to increase the awareness of this emerging concept, which seems to be fundamental in sustainable development and necessary to guarantee human rights in a digitalised society.

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