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The digital transformation of companies: between responsibility and value creation (an approach to Corporate Digital Responsibility in France)

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RESUMEN: Este capítulo tiene como objetivo explorar la evolución de la investigación sobre la transformación digital de las empresas, los retos vinculados a su responsabilidad social y la creación de valor, desde una perspectiva francesa. Para ello, se aborda el concepto de Responsabilidad Digital Corporativa (RDC), junto con las cuestiones conexas de los datos como activo intangible, el impacto medioambiental y la dimensión social de la tecnología digital. Mientras que los dos primeros se han estudiado en gran medida en los últimos años, el último, la dimensión social de la RCD, es especialmente complejo y se ha visto muy influido por el desarrollo de la inteligencia artificial (IA). Destacando la importancia de examinar las oportunidades que ofrece la IA y sus consideraciones éticas, este estudio concluye proponiendo profundizar en los nuevos retos ligados a la identificación y comprensión de las nuevas formas de trabajo, así como a las dinámicas organizativas inducidas por la digitalización.

PALABRAS CLAVE: *Transformación digital; responsabilidad social de las empresas; creación de valor; responsabilidad digital de las empresas; perspectivas de investigación*

ABSTRACT: This chapter aims at exploring the ways in which research is evolving with regard to the digital transformation of companies, the challenges linked to their social responsibility and the creation of value, from a French perspective. To this end, the concept of Corporate Digital Responsibility (CDR) is addressed, along with the related issues of data as an intangible asset, environmental impact and the

social dimension of digital technology. While the first two have been studied to a large extent in recent years, the last one, the social dimension of CDR, is particularly complex and has been greatly influenced by the development of artificial intelligence (AI). Highlighting the importance of examining the opportunities offered by AI and its ethical considerations, this study concludes by proposing to deepen the new challenges linked to the identification and understanding of new forms of work, as well as the organisational dynamics induced by digitalisation.

KEYWORDS: *Digital transformation; Corporate Social Responsibility; value creation; Corporate Digital Responsibility; research prospects*

1. Introduction

Digital uses are tending to develop on a massive scale at all levels, leading to new challenges for businesses (Giebe & Schulz, 2021). Several surveys confirm the scale of the impact of these transformations on consumer habits in France (INSEE, 2023; Statista, 2023). For instance, the INSEE study shows that «in 2022, 85% of people living in France have used the Internet in the last three months, compared with 65% in 2009». As a result, new uses are appearing in all sectors of activity (Appert & Lavergne, 2023), forcing companies to redefine their positioning in the face of new challenges. In France, the perception of digital technology and its benefits by SMEs is positive and growing; however, although it is on the rise, the sector is wary both of the risks posed by the increase in cyber-attacks and of the fact that certain digital uses do not seem relevant to all business activities (France Num Barometer, 2022).

Moreover, the challenges of digital transformation are increasingly coupled with issues of social responsibility. According to France Stratégie, (2020), «[t]he cross-disciplinary nature of digital technology and its ubiquity mean that the value it creates must be understood and shared by all, in the light of its democratic, social and societal implications» (p.7). In 2017, the French Institute of Public Opinion (IFOP) also reported that 70% of French people surveyed said they had changed their consumption habits to adopt more responsible practices¹.

This raises questions about how to capture and assess the changes taking place in production and consumption patterns. More specifically, we can ask what good digital practices can support sustainable consumption and production. To this end,

¹ IFOP (French Institute of Public Opinion) for WWF France - Les Français, la consommation éco-responsable et la transition écologique - October 2017 - <https://www.ifop.com/publication/les-francais-la-consommation-eco-responsable-et-la-transition-ecologique/> (Access date : 26/04/2023)

this chapter first highlight a number of findings and issues to better define the problem, and then explore a number of avenues in this regard.

2. Observations and challenges of digital transformation, corporate responsibility and value creation

A general examination of the concept of digital responsibility in organisations reveals several major observations: on the one hand, digital technology is contributing to structural changes in the economic and social spheres; on the other hand, the lack of a link between digital technology and CSR strategies within organisations has been identified.

Firstly, digital transformations contribute to structural transformations at both economic and social levels. In fact, some authors no longer speak of digitalisation but rather of digital revolution (Bourreau & Pénard, 2016). This refers to the integration of profound changes in production processes and in the way, people trade and consume through the adoption of digital technologies (Arciniega Gil, 2022). Examples include robotics, connected objects and predictive and generative tools. One of the consequences is that value creation is based on the production and analysis of data, rather than on the production of goods and services, which calls into question the entire value chain associated with them (Monnoyer-Smith, 2017). The cards are being folded in different sectors, prompting economic players to question their strategic positioning, to find out how to make choices geared towards the notions of sustainability and the generation of shared values; all in a context of competition and economic growth that is at the root of criticism in terms of ecological sustainability.

Secondly, France Stratégie (2020) points to the lack of connection between digital governance and CSR strategies within organisations: «even though digital transformation is now impacting all companies, it is still poorly integrated into CSR issues - and vice versa. These are two worlds that still ignore each other» (p. 32). For example, while stakeholders expect organisations to be more digitally responsible when it comes to data collection, management and processing, these issues are still poorly integrated into overall CSR strategies (Pretto, 2022). The concept of Corporate Digital Responsibility, which is addressed in the next section, attempts to explore the prospects for mutual enrichment between digital strategy and CSR strategy for organisations.

The need to combine digital technology and CSR to create shared value

In a conciliatory approach, a proposal combining digital, social and environmental issues is emerging, mainly under the name of Corporate Digital Responsibility (CDR). With regard to this concept, Herden & al. (2021) take stock of the definitions and the various existing notions (see in particular the definitions compiled by the authors in «Table 2 Existing definitions, conceptualisations, and uses of the term CDR», p. 16). With the aim of analysing technology and digital responsibility across the board, this chapter retains the definition of Lobschat & al. (2021) and extends the range of definitions with those proposed by Elliott & al. (2021), Herden & al. (2021), the CDR Manifesto (2021) and, finally, France Stratégie (2020). This last will be the one on which the analysis of this chapter will mainly rely in order to contribute to the state of the art from a French perspective, which is the context on which the research of this study was conducted.

Therefore, it is possible to highlight three main areas in which CDR is acting: data management, environmental impact and the social dimension of new technologies (see Table 1). The latter will be addressed in the study from the perspective of the management of new technologies, in particular artificial intelligence (AI).

From the definitions presented above, it is clear that digitalisation is a technical transformation and a strategic challenge with opportunities to be explored, while at the same time being a factor that introduces new risks to be apprehended. In order to have a positive impact within a shared value chain, it is therefore necessary to explore the tripartite link between the dimensions of CDR: technology, environmental impact and the social dimension of digitalisation. However, this correlation is complex and not so obvious.

Tensions over how to implement a CDR strategy

The digital transition is often surrounded by positive rhetoric, but not without criticism and questions about the benefits it actually offers. Since the middle of the 19th century, many benefits have been promised by digital technology, including increased collaboration between innovation stakeholders, easier communications, and the opening up and sharing of data. Although obvious in a context of competition and economic growth, these benefits are being called into question by emerging notions such as digital sobriety and responsibility, which contrast with the flourishing discourse of the digital revolution (France Stratégie, 2020). As awareness of the negative impacts of digital technology grows, so too does the questioning of this form of «revolution or e-volution» (Doucy & al., 2022).

Table 1. Corporate Digital Responsibility (CDR) definitions

Author	Definition
Lobschat & al. (2021, p. 876)	«the set of values and specific norms that govern an organization's judgments and choices in matters that relate specifically to digital issues. Such CDR-related values and norms share some principles and goals with CSR, or an organization's commitment (and accountability) toward social and ecological causes in general. [...] Notwithstanding this similarity, [...] CDR should be considered explicitly and separately from CSR, because of the particularities of digital technologies».
Herden & al. (2021, p. 17)	«an extension of a firm's responsibilities which takes into account the ethical opportunities and challenges of digitalization. Similar to the responsibilities proposed in the CSR pyramid developed by Carroll in the 1990's (Carroll, 1991), we propose that corporate digital responsibilities also encompass four different levels (i.e., economic, legal, ethical, and discretionary)».
Elliott & al. (2021, p. 184)	«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 on addressing social, economic, and ecological impacts on digital society. [Limited literature exists, but we advocate CDR as a separate proposition for organisations specifically linked to digital technology and data (Lobschat et al. 2021), not an extension of CSR (Herden et al. 2021). Rather, CDR complements such protocols, as the digital realisation of the same responsibilities but with a two-fold appropriate use of digital and data within and by the organisation to impact society while sustaining our planet to improve organisational environmental and social governance performance (Dörr 2020). Thus, the combination of environmental and social responsibilities is viewed as the transparent measurement of effectiveness in CDR execution, while accessible for stakeholders to evaluate organisational performance operating within digital society».
International CDR Manifesto (2021)	«a set of practices and behaviours that help an organisation use data and digital technologies in ways that are perceived as socially, economically, and environmentally responsible» ² .
France Stratégie (2020, p. 25).	«CDR is a new and essential deployment of CSR, based on the same principles of accountability, ethics and exchange with corporate stakeholders. A digitally responsible company should therefore respond to several major challenges, in line with the [Sustainable Development Goals - SDGs]: regulatory responsibility linked to data protection and compliance with the [General Data Protection Regulation - GDPR] and sectoral regulations; ethical responsibility linked to artificial intelligence software; societal responsibility linked to data management, the transformation of working methods, data sharing and the inclusion of everyone; environmental responsibility linked to the use of data to take into account the environmental impact of companies' activities».

² Corporate Digital Responsibility [website]: <https://corporatedigitalresponsibility.net/> (Access date : 05/05/2023)

To understand the challenges of the digital transition, it is necessary to analyse its effects, which are often forgotten or underestimated. A number of studies have highlighted the significant material impacts of digital technology, particularly in social terms (Elliott & al., 2021; Herden & al., 2021; Lobschat & al., 2021) but also in environmental terms (France stratégie, 2021; The Shift Project, 2020). Both have become a central concern in the face of the imperative of a dual transition: on the one hand, the «digital transition», and on the other, the «ecological transition» (Monnoyer-Smith, 2017). Two parallel discourses can be observed: (i) on the abundance of digital information and resources, which does not necessarily translate into responsible management and use; (ii) on the growing awareness of all commercial parties of the limits of natural resources (Schmitt, 2023; Tutenuit & Galaup, 2023).

The above is a major challenge because the social and environmental impacts of digital technology are present throughout the value chain. This includes, in particular, its use by the end consumer and the resulting waste. Consequently, if digital technology is a tool subject to network effects and systemic reactions, it needs to be integrated into companies' strategies and business models in order to identify the strengths, weaknesses, opportunities and risks it entails.

Standards and voluntary processes undertaken directly by companies, as well as flexible and binding legal instruments proposed by governments and public authorities, are tools that can help reconcile the conflicting interests that arise in the deployment and use of new technologies. That said, they are not the only ones, and companies and their business models must be able to evolve towards models of sobriety, sustainability and cooperation by rethinking productivity in terms of use, pooling of resources and energy consumption, beyond the sphere of economic competitiveness alone (France stratégie, 2021). In other words, it is a question of knowing how a position of responsibility can constitute a winning strategy for companies in the era of digital and ecological transitions.

3. Defining the problem

Focusing on data management, the environmental impact of digitisation, as well as management challenges and opportunities for companies in the face of AI

Given the scale of digitisation and the emergence of new technologies, in particular big data and AI, the concept of CDR can be seen as promising. On the one hand, it suggests responsible management of data as a new intangible asset for companies; on the other, it proposes taking account of the social and environmental dimensions

as major commitments of the transition for companies. The first suggestion includes respect for privacy and the protection of personal data; the second covers the well-being of employees, consumers and stakeholders, as well as reducing the ecological impact and carbon footprint of digital activities. This study proposes to approach the social dimension from a new angle and focuses its analysis on the management of AI within companies.

The aim is to explore ways of making the most of digitisation while respecting fundamental rights and freedoms both inside and outside the company, as well as developing shared strategies and methods for reducing the negative impacts of digital technology and using technologies in a socially conscious way (France Stratégie, 2021). In other words, it is about understanding how to integrate these issues as central elements of a responsible business approach.

Objectives. In the light of the above, this study aims to identify the main challenges in three major areas: (i) data management, (ii) the environmental impact of new technologies and (iii) their social dimension with a focus on management and AI. These elements will allow to explore initial avenues of research based on the identification of good practices whose impact can be extended more broadly across the value chain of organisations.

Research questions. In order to achieve the objectives set, the content of this chapter is guided by the thread of three main questions: What changes are taking place in digital modes of production and consumption? How can companies grasp and monitor this digital transformation? What can good practices in the use of digital technologies by organisations suggest for future research on digital sustainability?

4. Methodological approach

Theoretical research with relevance analysis

The study is based on a theoretical research approach with a relevance analysis as categorised by Raïche and Noël-Gaudreault (2008); built on Gohier (1998) and Martineau, Simard and Gauthier (2001), they propose categorising theoretical studies according to their subject matter.

On the one hand, relevance analysis research aims to highlight relevant research questions in a particular field. The aim is to identify the problems that have been observed and to open up avenues for future research. This approach seems relevant given the emerging nature of the CDR concept and the major challenges surrounding it.

On the other hand, the documentary research supporting this study is based on the collection, description, analysis and discussion of information and secondary data in France. It crosses its analysis by focusing on the challenges of the digital transition of companies in general, with a view to understanding its significance in the particular context of CDR, as an emerging field of study. Emphasis is placed on the three main areas of analysis identified, namely data management, environmental impact and the social dimension of digital technologies.

5. Analysis and discussion

The figures on digitisation, the issues involved in defining and implementing a CDR strategy

In France, the «France Num 2022 Barometer»³ on digital technology in SMEs and micro-businesses (0 to 249 employees) highlights that the perception of digital technology and its benefits by SMEs is positive and growing: 81% in 2022, compared with 78% in 2021 and 68% in 2020 (CREDOC, 2022). However, although the trend is upwards, businesses remain wary both of the risks posed by the increase in cyberattacks, and of the fact that some of the digital uses proposed do not seem relevant to all commercial activities.

In particular, it is emphasised that SMEs use digital technology in three main areas: (i) attracting new customers (15% think that their customers come from the internet); (ii) improving communication (59% with employees or collaborators and 78% with customers, a figure that remains stable compared to 2021); (iii) business management (85% in total, with accounting management software coming out on top with 73%, up 15 points; invoicing software with 70%, up 13 points; online payment solutions with 37%, up 3 points; and production, purchasing and logistics management tools with 32%, up 7 points).

Although largely widespread, these uses face three major challenges: (i) cybercrime (44% of SMEs fear data loss or hacking); (ii) the relevance of digital uses to all business (14% are not visible online because they consider it irrelevant to their business, mainly the agricultural and financial sectors; and 56% do not sell online for the same reasons, mainly the manufacturing and construction sectors); (iii) the effectiveness of digital tools in an inappropriate context (23%, up 6 points, think that digital technology harms their relations with their customers and employees;

³ Baromètre France Num (France Num Barometer) : <https://www.entreprises.gouv.fr/fr/actualites/france-num-decouvrez-donnees-du-barometre-2022> (Access date : 20/04/2023)

19%, up 7 points, think that it wastes their time; and 37%, down 4 points, think that digital technology allows them to make money).

The data shows that, while most companies have integrated the processes associated with the digitisation into their day-to-day business (86%, up 5 points, with at least one online visibility solution), this comes with new risks which, in turn, open the door to new market opportunities (81%, up 5 points, stress the need to equip themselves with cybersecurity solutions). This last point is consolidated by an overall increase in the digital budget (compared with 2020), with 41% of SMEs spending more than €1,000 in 2021 (15% more than €5,000) and 67% having digital projects for the next two years (32% planning to invest more than €2,000, including 16% more than €5,000). The two priorities are the acquisition or improvement of IT equipment (28%, up 7 points) and communication on social networks (18%, down 5 points).

That said, as the CSR Platform of France Stratégie (2020) points out, if the cross-disciplinary nature of digital technology means that the value created must be understood and shared in the light of democratic, social and environmental issues, it is important to look at the way in which corporate responsibility is taking on a new dimension in the era of digital and ecological transitions. The focus is therefore on the three main areas of application identified, namely data management, the ecological impact and the social dimension of digital technology (the latter under the prism of AI management in companies in view of the original contribution of this study).

Data as a company's intangible asset: tackling risks through the benefits of a data minimisation strategy

In our society, new technologies have become ubiquitous and the various digital tools put in place produce and consume large quantities of data (Chaix, 2018). The massification of data is due to the fact that digital services are based on systems that are connected 24/7 and that, even during periods of inactivity, a large flow of data is still generated which leads to the complex and not always transparent collection of user data.

Millions of pieces of data are in constant circulation, coming from a variety of sources. The data flow indicator of global traffic, known as the Internet Protocol (IP), shows that the exponential growth of the data economy has taken the IP from around 100 gigabytes (GB) per day in 1992, to more than 45,000 GB per second in 2017, and to more than 150,700 GB per second in 2022, particularly through the increase in the number of people connecting to the internet and the growth of connected objects (UNCTAD, 2019). Consequently, companies must be able

to promote the principle of transparency in the management of digital data and inform users about their practices in this area.

However, the taxonomy of data sources is complex. In order to develop new services, in particular digital services, access to and exploitation of large amounts of user data is necessary. «This may be data provided voluntarily by consumers (by registering on the platform or writing requests or messages), data that is easily observable (IP address, device operating system), or data collected by following consumers' journeys on or off the platform (tracking cookies, *etc.*)» (Bourreau & Perrot, 2020, p. 5). This data is then used by companies to understand consumer behaviour and improve their services. This is a major point, because it is on the basis of these practices that companies build up databases as intangible assets. On the one hand, informational data is used to improve algorithms and digital services; on the other, users, often without their knowledge, provide data as the main resource.

Nevertheless, «the collection, processing and storage of data must today comply with a certain number of rules set out in particular in France by the Data Protection Act (Loi Informatique et libertés - LIL) and then by the General Data Protection Regulation (GDPR) which came into force in 2018» (Coron, 2020, p. 95). Indeed, companies today collect far more data than they use, and most of the data collected and stored is not processed (Corallo & al., 2023; Trajanov & al., 2018).

This fact is the source of a number of risks, including: security risks (cyber-attacks); privacy risks (misuse or illegal sale of consumer data, including sensitive information); compliance risks (unnecessary data collection may breach laws and regulations, such as the LIL in France or the GDPR in Europe); cost risks (excessive data collection requires more storage space, more data warehouses, more processing power and more management resources).

These risks can be linked to problems of various kinds. For example: in decision-making (excessive data collection undermines the quality of the data and, consequently, its strategic value); financial (the more data there is, the higher the costs of collection and processing); in the relationship of trust with consumers (particularly due to users' growing awareness of the lack of transparency in the exchange of personal data); and finally, ecological (digital pollution).

To deal with this situation, one good business practice that has been identified is «data minimisation». In fact, by focusing its data collection strategy on what is just necessary, data minimisation is an approach that can respond to this problem and that also has many strategic, financial and ecological benefits (Biega & Finck, 2021).

In principle, data minimisation is a key concept enshrined at European level in the GDPR. It stipulates that: «[p]ersonal data shall be [...] adequate, relevant and

limited to what is necessary in relation to the purposes for which they are processed ('data minimisation')» (Article 5.1 GDPR). This means implementing appropriate technical and organisational measures to protect personal data effectively, both when determining the means and at each stage of processing. In general, it is considered that the risks associated with the re-identification of users could be limited by «data minimisation», in addition to applying anonymisation techniques known as «*privacy by design*», which also includes treatments such as «pseudonymisation» (article 25 of the GDPR).

To be clear, an online form for downloading a file should not require more than an e-mail field for the purpose of retrieving the document, and not a telephone number, postal address, the user's age, *etc.*, as these data are not strictly linked to the purpose of the processing (Biega & Finck, 2021). The principle of data minimisation, which consists of collecting less but better, would therefore make it possible to tackle the problems encountered by excessive data collection and storage, while making financial savings, reducing the ecological footprint, increasing data quality, improving KPI analysis and complying with the provisions of the GDPR (the latter making it possible to respect the privacy and personal data of consumers).

Three of the main problems identified are presented below, each accompanied by the advantages that a data minimisation strategy can offer. The fourth problem, digital pollution, will be analysed later in the next section.

Decision-making. While collecting large amounts of data can lead to less effective decision-making, a data collection strategy based on minimisation can help to counter the negative effects of this problem.

On the one hand, data allows companies to adapt their product or service offerings to users' needs, explore new market opportunities and consumer trends, as well as reduce the costs of exploiting the data itself (Benyayer & Chignard, 2015). On the other hand, the strategic collection and use of data, using techniques such as data minimisation, can support decision-making through cleaner statistical analysis, more effective machine learning, clearer visualisation of services, as well as more accurate performance analysis, among others. Data collection based on the «less but better» principle would therefore allow businesses to focus on quality data collection, which would also allow new KPIs to be developed using only essential data to make decision-making more agile and customer service more accurate (Biega & Finck, 2021). However, it is worth noting that the capacity and power to act of many companies, particularly SMEs, remain an obstacle to the equitable exploitation of these intangible resources. This is because the implementation of

an effective data management strategy and the professionalisation of the work that ensures it, through the figure of the DPO, are challenges that represent a substantial human, economic and material investment cost for companies (Arciniega Gil, 2022).

Financial risk. With the increase in cyber-attacks and theft of digital data, financial risk is an inherent problem in data collection and storage. Yet, data minimisation by streamlining and optimising the production process would reduce financial risk.

In addition to the threat that cybercrime poses to the lives of businesses, particularly in the light of some examples of organisations that have already gone bankrupt⁴, there are the penalties laid down by the GDPR with fines of up to 2% and 4% of the total worldwide annual turnover of companies in the previous financial year (Article 83(5) of the GDPR). Consequently, the processing of data by organisations involves procedural strategies. Before proceeding with data minimisation, it is necessary to make an inventory to identify useful data, and then to qualify and classify these informational elements. In other words, reducing data storage means rationalising and optimising the data production process. It is thus important to train staff and develop tools or practices to automate the elimination of data that is not or is no longer useful (for example, the detection of duplicates), as well as adding functions or extensions to minimise data collection and improve data quality (Biega & Finck, 2021).

Strengthening trust with consumers. As well as being considered a responsible business practice, data minimisation can be a tool to strengthen trusting relationships with consumers.

In concrete, a data minimisation strategy would increase customer confidence in the supply of this information, while reducing data management and processing costs. The aim is to establish a culture of transparency, for instance by including indicators on «responsible digital practices» in the company's annual report. The same applies to facilitating and guaranteeing the right to access, modify and delete the data collected. This last point would also make it possible to comply with the provisions of the GDPR. Therefore, while respecting the rights and privacy of consumers, data minimisation would be a winning strategy for the company,

⁴ (RTS Info, 2021). La cybercriminalité génère des milliards et pousse des sociétés vers la faillite [Information]. rts.ch. <https://www.rts.ch/info/sciences-tech/12173038-la-cybercriminalite-genere-des-milliards-et-pousse-des-societes-vers-la-faillite.html> (Access date: 12/05/2023)

because users would have confidence in the transparency of data management, since the collection would be limited to the information necessary for the smooth running of the company's activities.

Understanding the benefits of a data minimisation strategy means understanding the overall benefits it brings in terms of security. Indeed, reducing the amount of data stored, to which a limited number of backups can be applied as a preventive measure, reduces the amount of information that could be hacked or leaked. Building trust between all stakeholders is one of the key challenges of digitisation, as this dimension of corporate responsibility gains ground as a competitive strategy with both consumers and other stakeholders.

Yet, while changing practices within the company, such as data minimisation, can identify opportunities and benefits within the value chain, in the age of globalisation and the borderless internet, it is not exempt from grasping all the related considerations. It is then important to examine how companies can take other factors into account, in particular the ecological dimension of new technologies, by reducing their impact and carbon footprint on the environment.

The environmental impact of digital activities

Digital technologies now account for 4% of greenhouse gas (GHG) emissions, and their energy consumption is increasing every year (The Shift Project, 2020). Every action taken on the Internet consumes electricity: for example, downloading an online newspaper uses as much energy as using a washing machine⁵. The use of digital applications is also a source of high data consumption, with the applications that consume the most being music and video applications, as well as applications using geolocation for GPS data (Fleury, 2021). Finally, digital technology gives rise to certain paradoxes: while connected objects enable more economical management of resources, e.g. *smart grids*, they also require greater electricity consumption because of the constant connectivity needed to transfer data, leading to a rebound effect (France stratégie, 2021).

Beyond its use, digital pollution is also characterised by the fact that it is present throughout the life cycle of products and services. On the one hand, digital pollution is caused by the manufacture of electronic devices. Every year 53.6 million metric tonnes of electronic waste are produced worldwide and the frequent renewal of electronic devices, such as smartphones, generates a significant amount of waste

⁵ (Infography) Pollution numérique : Du clic au déclic - Qu'est-ce qu'on fait ? Qu'est-ce qu'on fait ? <https://www.qqf.fr/infographie/69/pollution-numerique-du-clic-au-declic> (Access date: 12/05/2023)

and requires the extraction of large quantities of raw materials essential to their production (Forti & al., 2020). On the other hand, online data storage and the cooling of data centres is the most polluting consequence of Internet use. “[I]n 2010 [big data centres] were estimated to consume 1-1.5% of the global electricity usage, with predictions of increment from 3 to 13% consumption by 2030, depending on the measures taken to reduce electricity expenditure. [...] Electrical usage by data centres globally in 2020 might also be larger than electricity generated in the United Kingdom in 2017” (Puebla & al., 2020, pp. 1-2).

In this context, organisations need to acquire a better understanding of how to respond to environmental concerns about pollution resulting from the development and deployment of technologies and data. In other words, companies, developers and any actor who uses digital technologies or processes data need to be aware that the code they write or deploy, as well as the data they collect and process, impose a responsibility on them with regard to digital uses and tools (Lobschat & al., 2021). Companies must therefore choose how to operate responsibly while complying with legal obligations and considering the economic implications.

In 2022, the Green IT Benchmark estimates the impact of digital activities at 2 kilos of carbon dioxide per person per day, equivalent to a ten-kilometre car journey and 18 showers per person per day. Despite these figures, the Capgemini Research Centre (2021) points out that 79% of consumers change their purchasing preferences based on sustainability principles and 46% of workers would choose to work for an organisation that supports sustainable development.

In other words, these indicators could be a way of changing attitudes inside and outside the company to encourage a better understanding of digital pollution. Similarly, responsible digital practices could substantially reduce carbon emissions. Indeed, according to the International Telecommunication Union (ITU, 2019), digital technologies could lead to a 17% reduction in carbon emissions worldwide. Business models based on sobriety, sustainability and cooperation, by rethinking productivity in terms of use, pooling of resources and energy consumption (France stratégie, 2021) could help to prevent the rebound effect.

To reduce the impact of digital technology on the environment, practices inspired by the circular economy can be adopted:

Buying eco-responsible products. While the use of devices is one of the main factors in digital pollution, it is advisable to buy sustainable products to limit it.

In France, the reparability index is a compulsory statement that must appear on electronic products at the time of purchase. It was introduced on 1 January

2021 as part of the anti-waste law enacted on 10 February 2020. In principle, the manufacturer assigns a score based on criteria defined by the Ministry for Ecological Transition. The reparability index is represented by a score out of 10 visible on the product by the consumer. If the product is not repairable, consumers are advised to recycle its components or buy second-hand or reconditioned products.

Adopt new behaviours when it comes to digital communication. A standard email generates around 4g of CO₂ and, with a large attachment, it emits up to 50g of CO₂ (Preis, 2021). Limiting the number of email recipients and avoiding sending large documents with attachments can help to reduce the carbon footprint. Conversely, unsubscribing from newsletters that are not or no longer relevant to the company's activities can significantly reduce the number of messages received. These practices help to limit the amount of data transported over networks, which can help to reduce energy consumption in data centres and greenhouse gas emissions.

Applying the principles of energy sobriety. In simple terms, this means adopting practices that reduce energy consumption.

In particular, companies can ensure that electronic devices are switched off and unplugged when not in use. For example, a computer in standby mode consumes between 20% and 40% of the energy equivalent of a computer that is switched on; if it is switched off but remains plugged in, it also continues to consume energy (around 70 watt-hours [Wh] per day). On average, a central processing unit consumes between 20 and 100 Wh and a flat screen between 10 and 30 Wh; the cost of a single computer switched on 24 hours a day can therefore amount to 100 euros a year in electricity⁶. Reducing energy consumption would, conversely, mean financial gains for the company. More generally, companies can also give preference to sourcing their electricity from renewable energy suppliers wherever possible.

Use “ethical” search engines. Two search engines are mentioned here, by no means exhaustively. Firstly, Duck Duck Go (<https://duckduckgo.com/>) respects users' privacy by not collecting personal information. In other words, it does not target advertising. Secondly, «Lilo» (<https://www.lilo.org/>) is a search engine that

⁶ ADEME – Agence de la Transition écologique - Les équipements électriques, 05 novembre 2021 : <https://expertises.ademe.fr/professionnels/entreprises/performance-energetique-energies-renouvelables/lenergie-bureaux/dossier/equipements-electriques/saviez> (Access date : 20/04/2023)

generates «drops» that can be allocated to different projects according to the user's engagements (environmental, social, sporting, educational, etc.). By using this type of search engine, not only are the principles of protection of personal data and privacy strengthened, but the funding of causes that are described as solidarity-based and ecological is also encouraged.

Making all stakeholders aware of the negative externalities of digital technology. The digital transformation of businesses is increasingly leading to the adoption of online solutions, which in turn is externalising the costs of high energy consumption and its consequences. While there is little room for manoeuvre on this point, awareness can be raised to limit their use to what is strictly necessary. Indeed, despite efforts to improve the energy efficiency of data centres through measures such as the use of more efficient cooling technologies and the optimisation of energy management (Mahbod & al., 2022), it remains difficult to obtain the energy required for cooling without resorting to a chiller, which itself consumes energy. This is despite innovation in systems such as *free-cooling* (a system that cools an area using water-based outside air) and its variant, the *free-cooling* air system, which recovers the cooled energy (Kwon & Jeong, 2023).

Once data management and environmental impact have been analysed, the only thing left to do is to look at the social dimension of digitisation of business. This is approached from the angle of the challenges and opportunities that digital activities can bring in terms of management. The scope of digitisation and the emergence of new technologies, in particular Big Data and artificial intelligence (AI), raise a number of questions, particularly in terms of the uses organisations make of these technologies and the management issues that go with them.

A new digital era: challenges and opportunities for business management

AI has revolutionised business operations in a variety of sectors, including finance, healthcare and manufacturing. It has enabled businesses to automate routine tasks such as data entry, process transactions more efficiently (Ismail & al., 2022; Jiménez-Carvelo & al., 2023) and make better decisions in certain situations.

AI is often referred to as a technology capable of performing tasks that normally require human intelligence (learning, decision-making, etc.). AI systems can be designed to perform a wide range of tasks, from recognising speech and images to playing games and driving cars. One of the best-known stories of AI systems is that of AlphaGo: in 2017, AlphaGo beat the best player in the world at the time. Developed by British company DeepMind and acquired by Google in 2014, the

same algorithm has been used to make remarkable advances in healthcare and to predict 3D models of protein structures⁷.

AI use cases for organisations. AI methods use large amounts of data and complex computer algorithms for analysis and prediction, providing a wide range of solutions (Chaix, 2018; Hermann, 2022; Ibrahim & Pronovost, 2021; Lee & Yoon, 2021; Marr, 2021; Martinez & al., 2021). However, the implementation of AI systems within organisations faces several challenges (Kirtil & Aşkun, 2021; Shinde & al., 2021; Vărzaru, 2022).

Personalise offers: AI algorithms can analyse vast amounts of customer data to create personalised product recommendations (Ibrahim & Pronovost, 2021; Martinez & al., 2021). For example, a range of existing solutions can collect data on consumer footfalls: by cross-referencing this type of information with consumer trends, it is possible to personalise offers, which is a powerful tool for boosting sales, whether for an SME or a large shopping centre.

Governance and decision-making: To move towards a more agile organisation, Walmart has implemented technological solutions to give employees easier access to information and knowledge so that they can make decisions more easily (Marr, 2016, 2021). The idea is to facilitate decision-making at the different hierarchical levels of the company.

One of the company's challenges has been to take the human dimension into account in this process. Interaction with technology and its use in day-to-day business activities has highlighted the fundamental need to train employees and create community to continue the transfer of skills. This example shows the importance of socialisation as a key element in the transmission of knowledge and skills; it also confirms the management challenges that companies face every time they adopt a new technology. Paradoxically, one of the greatest challenges highlighted by the chain of digital transformations is the urgent need for organisations to become more human-centred.

Prediction and simulation: Predictive models are one of the most significant contributions to AI today. In the business world, simulation tools are capable of

⁷ See: Google Deepmind (website): <https://www.deepmind.com/research/highlighted-research/alphago> (Access date: 5th June)

producing valuable data for the strategic or operational management of organisations. In his book “Sortez vos données du frigo”, Lévy (2021), describes the example of a predictive sales model for a network of profit centres with 94% month-on-month reliability over the following 12 months. Changing one or several key performance indicators to identify sales potential can be a powerful management tool.

Data accuracy: a question of ethics and performance. Another of the main challenges facing businesses in the age of digitalisation is the quality of the value created from data. The method of data collection and analysis has an impact on the relevance of the data obtained and the accuracy of the algorithms.

As a result, this may have an impact on the factors for developing responsible AI, including necessary ethical considerations such as privacy and responsible decision-making (Bak & al., 2022; Hermann, 2022; Lee & Yoon, 2021; McLennan & al., 2022; Taimoor & Rehman, 2022). For instance, recently the AI technology built into the cameras of the latest smartphones caused a buzz by automatically replacing the moon in photos to enhance them. One parent also discovered that the AI added teeth to a photo of his baby automatically. Technically, the AI has responded to the need to improve photo quality. However, one can legitimately question the concepts of what is true or real in this new era that we have already entered.

Managerial issues. Digital transformations are becoming more and more widespread in various industries, leading to significant changes in managerial practices as they are traditionally known. As interest in and arguments for adopting modern technologies continue to grow, the managerial challenges of using advanced data and algorithms in management processes appear to be increasing. Organisations as we traditionally know them are changing radically. We have entered an era where AI systems are ubiquitous, which is having a significant impact not only on the way people work but also on the way they can be managed.

An appropriate organisational culture and structure: One of the challenges that emerges when implementing digital transformation schemes is the emergence of new collaborative working dynamics (Chevallier & Coallier, 2021; Gamassou & Mias, 2021). The integration of AI systems generates the need for changes in culture and organisational structure in order to guarantee the conditions necessary to effectively benefit from the advantages of these technologies. We therefore need to examine the new forms of work and organisational dynamics brought about by these transformations.

Talent management: In 2021 and 2022, a consultancy called Axys conducted two similar studies into how managers perceive their role in companies and what skills characterise a good manager. The survey involved more than 220 managers from different sectors⁸. In 2021, 41% of respondents said that agility was one of the most important skills to have as a manager. In 2022, the number of responses dropped to 9% for this skill, in favour of being able to be assisted by AI, having collaborative skills and being able to cope with infobesity.

While the robustness of the sample may be questioned, given the lack of information about it, the results correlate with developments in this area. Recruiters are paying more attention to candidates' interpersonal skills and their ability to cope with digitalisation. Yet, challenges continue highlighting the urgent need for organisations to become more people-centred.

Managing with data: The links between holding knowledge derived from data analysis and measuring performance are ambiguous. Objectification through data raises the risk of technological determinism. The central question, then, is to what extent technological advances in the use of information in decision-making processes are a source of managerial innovation in practice, or whether «this could represent a form of re-manifestation the scientific management theories» (Gueye & Ratnane, 2020, p. 61). Indeed, while it is becoming less and less conceivable today to do without the use of data collection and processing, it is important to question the mechanisms for taking human dimensions into account so as not to fall under the diktat of data alone (*ibid*).

6. Conclusion and research perspectives

Generally speaking, advances in digital technologies pose both challenges and opportunities for organisations. This is forcing companies to redefine their strategic positioning, particularly in the face of the dual imperatives of the «digital transition» and the «ecological transition». In this respect, the concept of CDR is seen as promising because it adopts a conciliatory approach combining digital, social and environmental issues. However, a general examination of the concept reveals that, while digitalisation is contributing to structural transformations at

⁸ Axys Consultants, Study : Du manager au manager augmenté – digitalisation et Data : quels impacts ? [online]: <https://www.axys-consultants.com/actualites/etude-du-manager-au-manager-augmente-digitalisation-et-data-quels-impacts> (Access date: 5th June)

both economic and social levels, there is also a lack of connection between digital uses and a CSR strategy.

This chapter aims to contribute to the state of the art on CDR through an analytical approach and relevance, from the French context. In particular, it highlights that the French SME sector's perception of digitalisation and its benefits, while positive and growing, faces challenges such as cyber-attacks and digital uses that are irrelevant to certain business activities, but opening up new market opportunities. In addition, a third element invites to consider the negative effects of digitalisation, especially in social and environmental terms. In fact, the value created by responsible digitisation can only be understood if it is shared by all stakeholders.

The focus is then on the three main areas of analysis of CDR: data management, environmental impact and the social dimension of digital technologies, the latter from the angle of AI management as an original contribution from this study.

First, data management suggests that companies should be able to promote the principle of transparency in the management of digital data and inform users of their practices in this area. As far as SMEs are concerned, this could be better controlled by a data minimisation strategy, i.e. by concentrating data collection on what is strictly necessary. In other words, collect less but better. This would help to considerably reduce security, compliance and cost risks, among others.

Second, the environmental aspect suggests that businesses need to better understand how to respond to the challenges of digital pollution resulting from the deployment of new technologies and data. In particular, this imposes a non-binding responsibility for the uses and tools that companies use in the course of their business. To reduce their environmental impact, companies can therefore adopt practices inspired by the circular economy, such as purchasing eco-responsible electronic devices, adopting new behaviours in terms of digital communication, applying the principles of energy sobriety, using ethical search engines, and raising awareness among all stakeholders of the negative externalities of digitisation, in particular digital pollution from data centres.

Third, the social dimension traditionally encompasses the well-being of employees, consumers and all business partners involved in the value chain. The aim is to reconcile companies' digital activities with respect for the fundamental rights and freedoms of all stakeholders. However, the extent of digitalisation and the emergence of new technologies, particularly AI, make analysis of this aspect complex. Without calling into question the relevance of the traditional approach to this dimension, this study therefore focuses on the challenges and opportunities

that AI-related activities may have for companies. It highlights a number of issues linked to the use of this technology and the associated challenges in terms of organisational management.

That said, while AI enables businesses to automate routine tasks, process information more efficiently and make better decisions, there are also a number of challenges to implementing this type of technology. One of the greatest challenges is to take account of the human dimension in automated business processes. Interacting with and using AI technology highlights the fundamental need for employee training, as well as the creation of a community for the ongoing transfer of skills. Predictive modelling is also one of the most significant contributions and challenges in the development and use of AI. Simulation tools, for example, are capable of producing valuable data for the strategic or operational management of organisations with a high percentage of reliability, making them a powerful management tool. However, this does not necessarily take into account ethical considerations such as respect for privacy or responsibility in decision-making. As a result, the development of responsible AI is increasingly present in the public debate, but is now subject to the same criticisms.

In summary, this chapter has identified the main challenges in the CDR's three main areas of study: data, environmental impact and the social aspects of digitisation. It has also explored initial avenues of research based on the identification of good practices whose impact extends across the entire value chain. It emerged that CDR is a new field of study which, whether or not it is integrated into CSR, is based on the same principles of responsibility, ethics and exchange between stakeholders. This is particularly true in the context of the dual digital and ecological transition. Future research could then focus on a broader examination of the regulatory responsibility associated with the governance, management and sharing of data. The same applies to the responsibility and ethics associated with artificial intelligence and automated decision-making. Finally, a broader study could be mobilised concerning the environmental responsibility of digital activities, particularly with regard to those that are outsourced, for example, to data centres and other digital service providers.

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