Digital Technologies – A Panacea or a Double-Edged Sword? Understanding The Consequences of Artificial Intelligence for Individuals, Firms, and Society

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Abstract

Title:

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Throughout human history, the acceleration of digital technologies is certainly unprecedented. No previous innovation has caused such a profound and widespread alteration of our modern living habits in a comparatively short time frame. Although the advancements of emerging technologies such as artificial intelligence (AI) facilitate economic growth and are oftentimes labeled as a panacea for solving the world's most urgent problems, more than one-third of the world's population remains with no access to the digital world and is thus exposed to a serious risk of falling even further behind. Modern technologies have several shortcomings beyond the challenges related to equal access and utilization opportunities, as we frequently fail to correctly anticipate the unintended consequences of their use, not only for the individual users, but for our planet, humanity, and communities. To understand these implications, this thesis analyzes existing frameworks and concept from the literature at the intersection of digitalization and sustainability. Drawing upon the identified scientific foundation and collected data, diverse use cases of AI and their desired implications are identified to subsequently juxtapose these implications with the unintended consequences on the micro-, meso- and macro-level. Based on each use case, the respective consequences in conjunction with the Sustainable Development Goals (SDGs) are illuminated, thereby closing a previously identified gap in research. The results of this work are based on scientific literature and an extensive case study and thematic analysis on AI grounded on 61 Financial Times articles published between 2017 and 2022.

Keywords:

Digital Technologies, Artificial Intelligence, AI, Sustainability, Sustainable Development Goals, SDGs, Unintended Sonsequences, Individual Effects, Firm Effects, Societal effects.

Título:

Tecnologias Digitais - Uma Panaceia ou uma Espada de Duas Pontas? Compreender as Consequências da Inteligência Artificial para indivíduos, empresas e sociedade

Autor:

Lea Luise Schoppe

Resumo:

Ao longo da história humana, a aceleração das tecnologias digitais é certamente sem precedentes. Nenhuma inovação anterior provocou uma mudança tão profunda das nossas vidas num curto espaço de tempo. Enquanto os avanços nas tecnologias emergentes, tais como a inteligência artificial (IA), facilitam o crescimento económico e são frequentemente rotulados como uma panaceia para a resolução dos problemas do mundo, mais de um terço da população mundial permanece sem acesso ao mundo digital e está exposto a um sério risco de ficar ainda mais para trás. As tecnologias modernas têm várias deficiências para além dos desafios relacionados com a igualdade de acesso e oportunidades, uma vez que muitas vezes não antecipamos correctamente as consequências involuntárias da sua utilização para os indivíduos, para o nosso planeta, para a humanidade e para as comunidades. Para compreender estas implicações, a presente tese analisa os quadros e conceitos existentes na literatura na intersecção da digitalização e da sustentabilidade. Com base nos fundamentos científicos e nos dados recolhidos, são identificados vários casos de utilização de IA e as suas implicações desejadas para justapor estas implicações com as consequências não intencionais a nível micro, meso, e macro. Com base em cada caso de utilização, as respectivas consequências em conjunto com os Objectivos de Desenvolvimento Sustentável (ODS) são iluminadas, preenchendo uma lacuna de investigação anterior. Os resultados deste trabalho baseiam-se na literatura científica, num estudo de caso extensivo e numa análise temática da IA fundamentada em 61 artigos do Financial Times publicados entre 2017 e 2022.

Palavras-chave:

Tecnologias Digitais, Inteligência Artificial, IA, Sustentabilidade, Objetivos de Desenvolvimento Sustentável, ODS, Sonsequências Não Intencionais, Efeitos Individuais, Efeitos Firmes, Efeitos Sociais.

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Abbreviations

AI	Artificial Intelligence
BMJV	Bundesministerium der Justiz und für Verbraucherschutz - Federal Ministry of Justice and Consumer Protection
CDR	Corporate Digital Responsibility
CEO	Chief Executive Officer
CIA	Central Intelligence Agency (intelligence agency of the United States of America)
CSR	Corporate Social Responsibility
CO_2e	Carbon dioxide equivalent
ESG	Environment Social Governance
FAO	Food and Agriculture Organization of the United Nations
GeSI	Global Enabling Sustainability Initiative
GCHQ	Government Communications Headquarters (intelligence agency of the United Kingdom)
ICSU	International Council for Science
ICT	Information and Communication Technologies
IDC	International Data Corporation
IEA	International Energy Agency
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
ISSC	International Social Science Council
ITU	International Telecommunication Union, the United Nations Specialized Agency for Information and Communication Technologies – ICTs
OECD	Organization for Economic Cooperation and Development
RFID	Radio Frequency Identification
SDG	Sustainable Development Goals
SME	Small and Mid-sized Enterprise
TBL	Tripple Bottom Line
UK	United Kingdom
UN	United Nations
UNCTAD	United Nations Conference on Trade And Development

UNDP	United Nations Development Programme
UN DESA	United Nations Department of Economic and Social Affairs
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States of America
WCED	World Commission on Environment and Development

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1. Introduction

1.1. Research Purpose

Throughout human history, the acceleration of digital technologies is certainly unprecedented. No previous innovation has caused such a profound and widespread alteration of our modern living habits in a comparatively short time frame (UN, n.d.-a). Information and communication technology (ICT) is considered one of the largest industries with a forecasted spending of almost 5.5 trillion US dollars in 2022 (IDC, 2020). Notably, the global market is dominated by three regions accounting for almost 60 percent of the total market: the United States (36 percent), the European Union (15.2 percent), and China (11.6 percent). On the one hand, the advancements of emerging technologies such as artificial intelligence (AI) or blockchain lead to an accelerating trajectory of their respective markets and are often regarded as a panacea for solving the world's most urgent problem. On the other hand, 2.9 billion humans, more than one-third of the world's population, remain with no access to the digital world and thus, are exposed to a serious risk of falling even further behind (ITU, 2021). The United Nations Development Programme (UNDP) Administrator highlights that,

> "*To ensure that the benefits of technological innovation are shared by all, we need policy responses and business decisions that are guided by the commitment to end extreme poverty, curb inequalities, and fast-track progress for the people who have been left furthest behind."* - Achim Steiner, UNDP, n.d.

However, modern technologies have several shortcomings beyond the challenges related to equal access and utilization opportunities, as we frequently fail to correctly anticipate the unintended consequences of their use, not only for the individual users, but for our planet, humanity, and communities.

During the last decade, the business world embarked on a digital discourse with the ubiquitous use of the terms digitalization and digital transformation. While these terms have become buzzwords for corporations, governments, and consultancies implying the pursuit of organizational, societal, and technological change, little light has been shed on the broader and unintended implications of their utilization and omnipresence in every aspect of our lives.

With mankind continuously overshooting the earth's capacity, the focus of research has shifted from a predominately presence-oriented to a highly prospective mentality securing a habitable planet for all the generations to come. Accordingly, consultancies have seized this paradigm shift and proclaimed the present time as the *era of sustainability* (Gadiesh & Davis-Peccoud, 2021; Jonason & Mörée, 2021; Young & Gerard, 2021). Due to the advancements

and disruption of businesses and markets triggered by sustainability considerations, organizations are under constant pressure to review their operations and behavior to deduce adequate implications thereof. Notwithstanding, the economic relevance of the digital transformation efforts did not wane and continues to possess an indispensable raison d'être in today's decade of sustainability. Digital technologies have the power to encourage leapfrogging in developing countries, foster innovation to mitigate climate change, and secure the food supply for our growing world population (GeSI, & Accenture, 2015; UNCTAD, 2018; World Bank, 2021).

Simultaneously, digital technologies pose concomitant risks to human rights and labor, digital security, and other negative externalities, threatening the prospect of a greener and more equitable world for all (UNDP, n.d.). Technology has not only enabled the systematic ethnic profiling and detention of the Muslim minority in China (Mozur, 2019) but furthermore led to false allegations and the arresting of black men in the US (Johnson, 2022) in conjunction with facial recognition software, which is known for errors in correctly identifying women and people of color. Moreover, the case of Cambridge Analytica and Facebook has raised universal concerns regarding data protection and the ethical use of data (Confessore, 2018).

1.2. Research Aim Question

This master thesis aims to identify, describe and accumulate the unintended consequences of modern digital technologies. This paper aspires to reveal how nuanced digital technologies ought to be understood, recognizing that they are neither inherently good nor bad. Accordingly, the focus of this research will be to critically examine the consequences of digital technologies through a variety of perspectives and reflect on their implications for businesses and governments. To this end, the technological domain of artificial intelligence (AI) will be analyzed in greater depth. AI has experienced an enormous rise in its utilization and market opportunities, partially due to its anticipated and promising contribution toward achieving the Sustainable Development Goals. However, in the course of this thesis, I will provide answers to the question of which unintended consequences for individuals, firms, and society are triggered by the use and design of artificial intelligence.

Although the correlation between sustainability and technology has been rigorously studied in recent years, the research has primarily focused on the purpose of technologies and their intended outcome. By analyzing and classifying the unintended consequences of AI in

light of sustainable development, this thesis seeks to surpass the direct effects and reveal the side effects of this technology for sustainability in the digital age.

1.3. Outline

This paper is composed of five sections. The literature review (2) describes the underlying principles necessary for a contextual comprehension of this work. The methodology is presented in section three, including the research approach (3.1.), design (3.2.) data collection (3.3), and analysis process (3.4.). Drawing on previously discussed concepts and principles, the fourth section addresses the consequences of AI in the public and the private sector. Linking theoretical and practical implications, I discuss the outlined consequences of AI and indicate possible responses. In section five, I conclude with a critical summary of the main findings, recommendations for follow-up proceedings, and limitations.

2. Literature Review

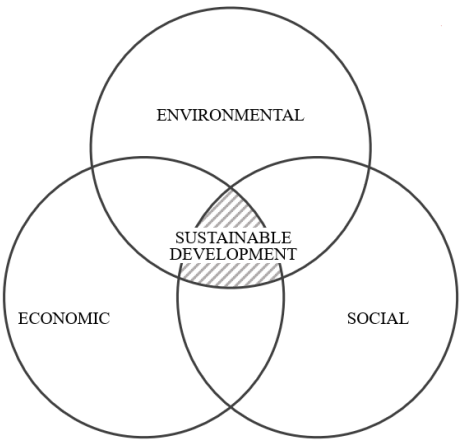
2.1. Sustainability and the Sustainable Development Goals

With sustainability evolving from being a management imperative to becoming the new business as usual (Duncan, 2020), multiple definitions have emerged and co-exist in literature (Purvis et al., 2019). In the Brundtland Report 'Our common future' from 1987, sustainable development is defined as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs "(WCED, 1987, p. 43). The beforementioned terminology has served as the foundation for the development of various other definitions and concepts, inter alia, the Triple Bottom Line (TBL) coined by Elkington (Elkington, 1994, 1997). Since its initial introduction in 1994, the TBL concept claimed that corporate performance should not solely be evaluated based on financial performance but equally on environmental quality, economic prosperity, and social justice. The components of the TBL are commonly illustrated as intersecting circles, emphasizing their connectivity (Elkington, 1994, 1997; Purvis et al., 2019) as depicted in Figure 1.

The concept has been widely adopted by the business world, visible in its prevalence in the reporting scheme of the Global Reporting Initiative (GRI), the ESG metrics which are increasingly gaining relevance among investors, and the Dow Jones Sustainability Index (DJSI), measuring corporate performance against the TBL (Elkington, 2018; López, Garcia & Rodriguez, 2007; Milne & Gray, 2013; Society & Organizations Institute of HEC Paris & HEC Movement for Social*Business Impact, n.d.).

Figure 1

The Three Intersecting Circles of Sustainability



Note. Adapted from Purvis et al. (2019)

In 2018, Elkington publicly announced that his initial concept of the TBL aimed for a system change through the transformation of capitalism rather than the application as an accounting tool. Recalling the current application of the TBL, he urges for a "triple helix for value creation, a genetic code for tomorrow's capitalism, spurring the regeneration of our economies, societies, and biosphere" (Elkington, 2018).

Sage (1999) has adopted a broader definition of the term by likewise addressing natural, social, cultural, and political parameters in addition to the three mentioned previously. The individual analysis of the mentioned aspects poses a dilemma, considering that they are closely intertwined and thus, ought to be assessed within a holistic context. Despite their indispensable premise for sustainable development, the materiality of political, social, and cultural factors has only been acknowledged posteriorly (IPCC, 2007).

Drawing on the previous definitions and approaches, the United Nations adopted the 2030 Agenda for Sustainable Development in 2015 and manifested, inter alia, the 17 Sustainable Development Goals (SDGs). Among the 17 global SDGs are social objectives, such as good health and well-being, and economic objectives, including appropriate economic growth and responsible consumption and production. The ecological goals include climate action and affordable and clean energy (UN DESA, 2020). The SDGs adopt an integrative approach, which recognizes that activities in one area are likely to affect outcomes in others. Furthermore, they also emphasize that the balance between social, economic, and environmental sustainability needs to be maintained.

Conversely, the SDGs have been subject to criticism claiming that the aspirations of the United Nations are imprecisely formulated, lacking both adequate ambition as well as meaningful substance, and fail to recognize the reciprocal dependency of humanity and ecosystems (Butchart et al., 2016; Holden et al., 2017; Hopwood et al., 2005; Stafford-Smith, 2014; Stokstad, 2015; Wood and DeClerck, 2015). Furthermore, Holden et al. (2017) criticize the multitude of objectives and indicators, the omission of target prioritization, and the absence of standardization, given that particular SDGs are framed as means to an end while others are phrased as an end itself. Especially the goals concerning the biosphere fail to recognize planetary boundaries and incorporate a relevant level of aspiration, indicating existing dissension on measurability (see for example ICSU & ISSC, 2015; UNECE et al., 2008, Stiglitz et al., 2010).

Despite the reasonable criticism, the UN Sustainable Development Goals have been widely acknowledged and utilized to shed light on various challenges from a sustainable development perspective. Due to the universal adoption of the terminology and its presence in international cooperation (Bergman et al., 2018), I will adopt the United Nations' definition of sustainable development based on the SDGs. The three dimensions and their implications linked to the SDGs are outlined in more detail in Figure 2. A more comprehensive overview of all SDGs and their respective goals can be found in Appendix A.

Figure 2

The Sustainable Development Goals and Their Dimensions

Note. Adapted from Bergman et al. (2018).

2.2. Theories of Unanticipated and Unintended Consequences

The first systematic analysis of the unanticipated consequences of purposive social actions was developed by Robert K. Merton in 1936. In his theory, Merton (1936) differentiates between the human action to obtain the desired outcome and the undesired or unanticipated effects. Suggesting that the unanticipated effects can be twofold, desirable, or undesirable, Merton describes the outcome of rational and deliberate action as desirable by nature. He identified two methodological pitfalls which are outlined in the following:

1) Causal imputation: The difficulty of determining to what extent an effect or a consequence can be attributed to a given action. Merton suggests that this "ever-present difficulty of causal imputation must be solved for every empirical case which is studied" (Merton, 1936, p.897).
2) Determining the factual purpose of the studied action: Formally organized actions are considerably less affected by this pitfall since this form of action involves a group commonly communicating the purpose and objectives of their actions. To detect this error, Merton suggests evaluating the context of meaning between the knowledge about the actor, the apparent action, and the inferred intended action within the specific situational context.

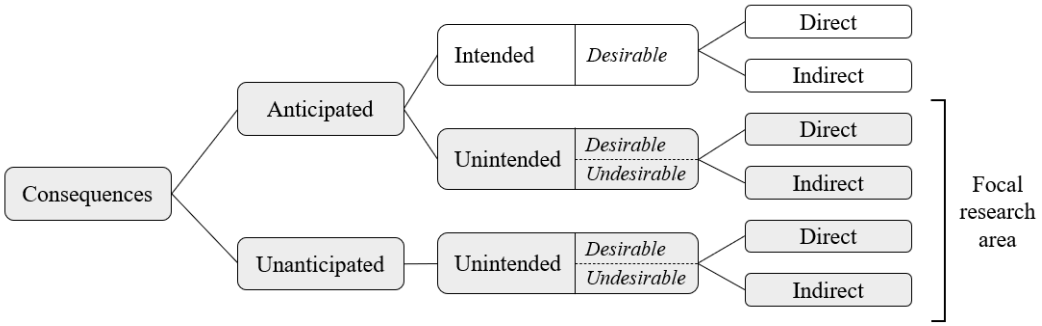
According to Merton, "the most obvious limitation to a correct anticipation of consequences of an action is provided by the existing state of knowledge" (p.898), meaning that limited knowledge is prone to erroneous anticipation. The term bounded rationality attributes the incorrect anticipation of consequences to the incomplete availability of information, restricted time and resources (Baert, 1991; Simon, 1990), and the uncertainty of the future (Baert, 1991).

Despite the interchangeable use of the terms unanticipated and unintended consequences in existing literature (Merton, 1968; Rogers, 2003), other scholars have emphasized the significant differences between these terms (Baert, 1991; De Zwart, 2015; Parvin & Pollock, 2020; Saha, 1998; Sveiby et al., 2009). According to Baert (1991) the "unintended consequences are not necessarily unforeseen, unexpected or unanticipated" (p.208), asserting that the occurred consequences which have not been aimed for, could have indeed been anticipated (De Zwart, 2015). Parvin and Pollock (2020) have emphasized a distorted perception of responsibility that is entailed by the misuse of the term unintended instead of unanticipated. Consequently, it allows proponents to dismiss perfectly predictable consequences under the guise of unanticipated consequences, rather than consequently and truthfully acknowledging them as undesirable and unintended but indeed anticipated.

Within the context of digitalization, this thesis distinguishes between the unintended anticipated and unanticipated consequences of digital technologies. Figure 3 illustrates the determined structure of consequences by Sveiby et al., (2009), and highlights the specified focal research area. For the further investigation of consequences in this paper, it is relevant that firstly the cause-effect relationship between action and consequence is difficult to attribute unambiguously and is therefore limited in itself, and secondly, the genuine intent (purpose) can only be deduced if the situational context, the background about the actor and about the action itself, is given. Therefore, the findings of this work are limited in the sense that consequences do not solely relate to the application and use of single technologies, but rather have other societal developments or actions as their (co-)cause. To apply this theory to the case of AI, it is essential to understand the technological implications and properties of digital technologies which are addressed in the next subsection.

Figure 3

Overview of Consequences and Focal Research Area of This Paper



Note. Adapted from Sveiby et al. (2009).

2.3. Digital Technologies

2.3.1. Properties of Digital Technologies

Digital technology is commonly referred to as part of the hypernym of Information and Communication Technologies (ICTs) (Erdmann & Hilty, 2010). In order to adequately comprehend the underlying functionality of digital technologies and examine their potential repercussions, recognizing their properties becomes a primary necessity. Yoo et al. (2010) have identified three singular properties of digital technologies which lead to a separation between the physical device layer and its applications which will be elucidated in the following chapter 2.3.4. The re-programmability engenders innumerable possibilities for using equipment, enabled by the capability to decouple its functional logic from the physical state of the processing system (see also Langlois, 2002). Contrary to previously known technologies, the same data is easily accessible by multiple devices through its binary representation, indicating the homogeneous characteristics of data. Lastly, Yoo et al. (2010) refer to the positive reciprocal interference of these technologies and associated innovations (see also Benkler, 2006; Hanseth & Lyytinen, 2010), leading to further novel developments in this domain and concluding that "digital technology, therefore, has democratized innovation and almost anyone can now participate" (p.726). In conjunction with the aforementioned characteristics, Yoo et al. (2012) have highlighted two implications: convergence and generativity. Generativity is associated with the reprogrammable nature of devices and is defined as "a technology's overall capacity to produce unprompted change driven by large, varied, and uncoordinated audiences" (Zittrain, 2006, p. 1980).

As the digital world becomes increasingly amalgamated with the physical sphere, this convergence is causing traditional industry boundaries to progressively blur (Yoo et al., 2012). Bohnsack et al. (2022) concluded that these inherent characteristics contribute to the difficulty of thoroughly and accurately anticipating the consequences of these technologies for the industry, humanity, and every individual. Furthermore, unintended consequences originate from the emergence of multiple, co-existing pathways, enabled by the generative nature of new technologies (see also Hanelt et al., 2020). According to Bocken et al. (2013), differentiating between a value-enhancing or value-destroying net effect becomes a critical and intricate undertaking. Especially with regards to the generative novelty of emerging technologies, possibilities appear to be myriad and therefore, the corresponding effects are increasingly challenging to foresee compared to those of traditional physical innovations (Bohnsack et al., 2022).

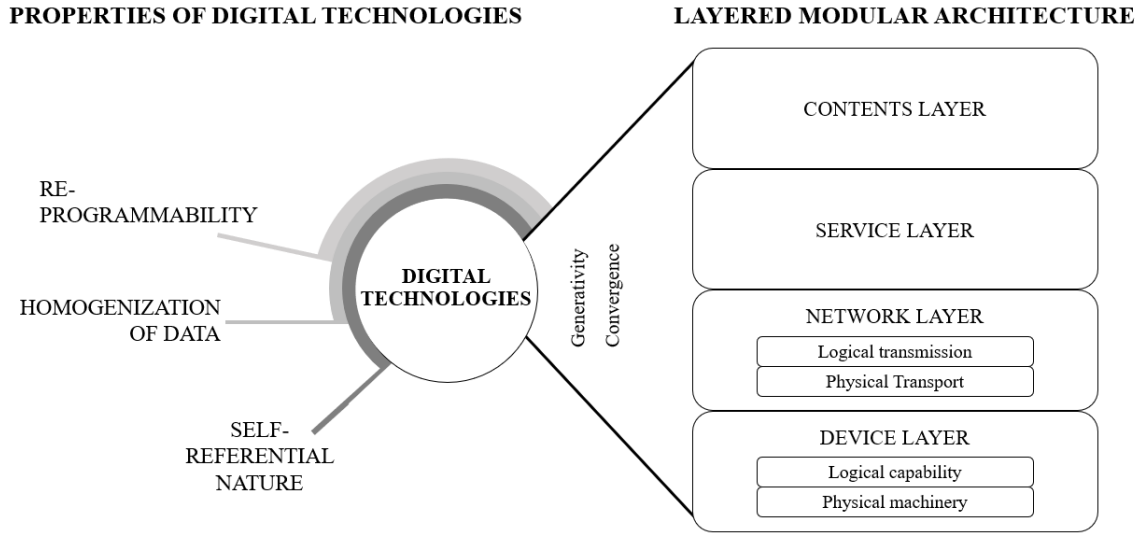
2.3.2. The Layered Modular Architecture of Digital Technology

The layered modular architecture of digital technology is a result of the combination of its properties: the foundation lays both the re-programmability and the homogenization of data (Adomavicius et al. 2008; Gao & Iyer 2006, Yoo et al, 2010). Multiple scholars (Benkler 2006; Farrell & Weiser 2003, Yoo et al., 2010) have illustrated digital technologies as the descending combination of the four layers of 1) contents, 2) services, 3) networks, and 4) devices, with further separation of the two latter layers, as illustrated in Figure 4. The properties of re-programmable nature and the homogenization of data lead to the separation between device and service, and between network and contents, respectively.

Firstly, the content layer can be understood as "the set of humanly meaningful statements that human beings utter to and with one another" (Benkler, 2006, p.392) including but not limited to videos, photos, recordings, and their respective meta-data (Yoo et al., 2010). The service layer thereunder secures appropriate capabilities, allowing content data to be consumed directly by the customer such as mobile applications. For the device layer, Yoo et al. (2010) distinguished between the physical equipment, e.g., hardware, and the operating intermediary of software, enabling interconnectivity and linkage to the other tiers. Likewise, the network layer is subdivided into the logical transmission layer of network protocols, ensuring interconnectivity among the layers, and their physical components such as sensors or cables.

Figure 4

Properties of Digital Technologies and The Layered Modular Architecture



Note. Own illustration based on Yoo et al. (2010, p.724–735).

Despite their relevance in existing theory, it is of vital importance to recognize the limitations of separating the different layers, especially due to fluid technological boundaries and the existence of various hierarchical concepts (Clark, 1985; Yoo et al., 2010). The adoption and combination of different layers in novel ways leads to innovations that diverge by their type. Generativity, therefore, is not only rooted in the properties of digital technology but additionally, in its modular architecture enabled by these particular properties. In the course of industrialization and globalization, digital technologies have become increasingly prevalent and present multiple implications for today's world.

2.3.3. Implications of Digital Technologies

Due to digitalization and digital transformation, the utilization and integration of these technologies into business processes have become a far-reaching priority for the majority of firms (Benjamin & Scott Morton, 1988; Fitzgerald et al., 2013; Hanelt et al, 2020; Hess et al., 2016; Ignat, 2017; Matt et al., 2015). Within this context, as businesses continue to compete, it is seen as a strategic imperative to modify the way of doing business and avoid the jeopardy of being outperformed (Fitzgerald et al., 2013; Sebastian et al., 2017).

A central debate in literature has evolved around the multiple implications of technologies for the various facets of our lives. As the world's technology advances at an unprecedented pace, scholars have noted a wide array of implications, from business efficiency gains and organizational changes to cost-effective control and coordinating mechanisms (Cascio and Montealegre, 2016), resulting in profound changes occurring across almost every aspect and part of everyday life (Bejtkovský et al., 2018; Châlons and Dufft, 2016; Petter et al., 2012). We are living in a world "that is hyperconnected and data-saturated, a world where an Internet of everyone is linked to an Internet of everything" (Wooldridge, 2015, p. 29), implying that multiple processes related to the use of digital resources are henceforth decoupled from the temporal and geographic boundaries which formerly existed (Cascio and Montealegre, 2016). Technologies that amalgamate physical, digital, and biotic spheres have laid the foundation for the fourth industrial revolution (Schwab, 2016).

While it is widely acknowledged that digital technologies have "the power to change lives of individuals, economies, cultures, and societies" (Arts et al., 2015, p.661), the recent COVID-19 pandemic has further amplified the pace of digitalization (Trenerry et al., 2021). As the result of rapid advancements in information and communication technologies (ICT), today's world is characterized by transformational changes in organizational value creation and value capture,

ways of working, and ultimately, our communication and interaction (Cascio and Montealegre, 2016).

2.4. Artificial Intelligence and Its Application in Selected Industries

2.4.1. Artificial Intelligence Definition

Artificial Intelligence (AI) presents a technology bundled under the umbrella term ICT and, as a digital technology, already wields considerable impact on our world. In the future, AI promises to leverage our everyday lives to a more profound extent, for example through self-driving cars, the automation of work in industry, and automated decision-making (Stahl, 2021).

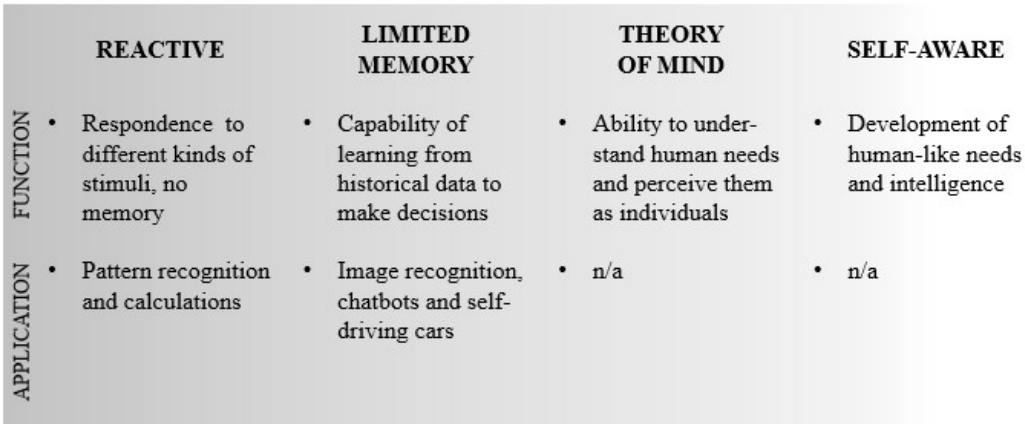
Contrary to intelligence inherited by living things, AI describes the intelligence of soft- and hardware elements, thus, their ability to make substantiated decisions, recognize voices or faces, provide reasoning, and process languages (Crayton, 2019; Russell & Norvig, 2010). Although no widely accepted definition exists, AI is commonly understood as "a system's ability to interpret external data correctly, to learn from such data and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Haenlein & Kaplan, 2019, p. 5).

With a compound annual growth rate of 19.6 percent until 2025 (IDC, 2022), AI represents an enormous economic potential that has been facilitated through the rise of computing power and big data availability which is required to train the algorithms (Sunyaev, 2020).

In this thesis, the understanding of AI is based on the classification according to the similarity with the human mental capacity as illustrated in Figure 5 (Joshi, 2019).

Figure 5

Four Types of Artificial Intelligence



Note. Own illustration based on Joshi (2019).

2.4.2. Impact on the Sustainable Development Goals

A report by GeSI and Deloitte (2019), studying the reciprocal effect of seven digital technologies and the SDGs, predicted that the prospects of digital access, fast internet, cloud, Internet of Things (IoT), cognitive technologies, digital reality, and blockchain technologies significantly impact sustainable development in the midterm. They concluded that the selected seven technologies are closely intertwined concerning their conception and utilization. Combined, they unmediated affect approximately 61 percent of the 169 sub-targets of the 17 SDGs.

Technologies in the digital realm are used in a plethora of contexts and across a wide range of industries. The three below-mentioned industries have been curated based on their relevance for sustainable development to illustrate various ICT use-case scenarios and their related discussions in academia. However, these industries and the use of AI should neither be deemed as representative nor exhaustive in nature, but rather serve as illustrative examples.

2.4.3. Digital Technologies and AI within the Agriculture and Food Industry

According to the World Bank (2021), the agriculture and food industry is considered to be of vital importance for enabling the food supply and security for our growing world population, in particular concerning SDG number two, eliminating world hunger. According to an estimate in a recent report by the Food and Agriculture Organization of the United Nations (FAO et al., 2021), almost 10 percent of the world's population is suffering from starvation and approximately 30 percent are affected by food insecurity. In addition to the global pandemic causing the deterioration to persist (FAO et al., 2021), scientists have anticipated that global warming will further aggravate the situation (IPCC, 2022).

Within the agriculture and food industry, RFID and blockchain technologies have been identified to secure food standards and safety by increasing information accessibility along the food supply chain (IBM, 2020; Samundeswari et al., 2019; Tian, 2016; Wang et al., 2022; Xu et al., 2020). Moreover, several scientific papers have indicated that the use of AI, IoT, smart sensors, cloud computing, and robotics is fostering more precise and resource-efficient agriculture, playing an important role in environmental conservation, climate change, and sustainable development (Ai Koi, 2020; FAO et al., 2021; Fountas et al., 2015; Kittichotsatsawat, 2021; Musa et al., 2022; O'Shaughnessy, 2021; Santiteerakul et al., 2020; Viviano, 2017; Walter et al., 2017).

2.4.4. Digital Technologies and AI within the Transportation and Logistics Industry

In 2018, the transportation and logistics industry, excluding passenger road vehicles, was accountable for approximately 10 percent of the global greenhouse gas emissions (calculated based on Climate Watch, 2021; IEA, 2022), presenting a hurdle for the achievement of SDG 13 (Climate Action). In the wake of a temporary decline in emissions due to COVID-19, emission levels have recovered rapidly, according to the UNEP (2021). In addition to the industry's effect on the environment and society (Khan et al., 2019; Rashidi & Cullinane, 2019), studies have emphasized the profound interdependence of social and performance indicators (Guner & Coskun, 2012) and the contribution of logistics in a country's economic advancement, enabling economic growth in line with SDG eight (Hayaloğlu, 2015; Lean et al, 2014; Martí et al., 2014; Munim & Schramm, 2018).

Traditional logistics challenges, including autonomous trucks, accurate delivery predictions, warehousing operations, and route and load optimization, have been successfully addressed using artificial intelligence in combination with IoT (Ding et al., 2020; Klumpp, 2018). The collaborative deployment of various digital technologies, such as IoT, AI, cloud computing, and big data is commonly referred to as smart logistics (Ding et al., 2020; Woschank et al., 2020).

2.4.5. Digital Technologies within the Financial Services Industry

Deemed as a cross-cutting enabler for virtually all SDGs (Corporate Citizenship, 2019), especially SDG one, two, five, 10, and 13, the financial services industry possesses the capability to channel investments toward currently underrepresented groups and opportunities, e.g., women, SMEs, microfinance, and climate finance, to eventually, provide universal financial access for all (Helms, 2006; Thomason et al., 2018). Mushtaq and Bruneau (2019) observed a positive effect of ICT indicators on economic growth, equality, and poverty alleviation through the mediator of financial inclusiveness.

Especially digital technologies have been identified as transformational within the financial services landscape, and equally for our economic transition towards net-zero (Oertli, 2020). While blockchains enable the fastest and most cost-effective way of trading assets (Rugg, 2021), artificial intelligence has been utilized for managing investment risks at a large scale and determining optimal asset allocation (OECD, 2021). A survey published by the Institute of International Finance (Delle-case et al., 2018) has emphasized the meaningful role of AI for institutions to detect and combat money laundering. Asset management corporations increasingly deploy AI and machine learning to maximize economic and decision-making

efficiency (Blackrock, 2019). Considering the benefits on the consumer side, data can be translated into individual carbon footprints, generating incentives for sustainable purchases and consumption (Oertli, 2020).

2.5. Corporate Social Responsibility, Digital Responsibility, and Digital Sustainability

With the rise of sustainability in the era of digital transformation, several concepts related to their interplay have emerged. This chapter differentiates between their conception and use within the business context.

Loew and Rhode (2013) describe the responsibility of firms to avoid or mitigate negative consequences for individuals, society, and the environment caused by their activities or existence as Corporate Social Responsibility (CSR). Furthermore, CSR management can contribute towards sustainable development by ensuring compliance with applicable regulations and considering relevant stakeholder interests. CSR and the term sustainability utilized in the corporate environment can be used interchangeably and have merged over time, according to literature (Loew & Rhode, 2013; Schneider, 2015, Crane et al. 2013).

However, other authors have argued that CSR is predominately used for reputational purposes or greenwashing (Zappettini & Unerman, 2016) and emphasized that neither awareness nor reporting was able to change the status quo of environmental damages and social inequality (Pucker, 2021). As a consequence of the not-standardized reporting framework, solely self-reported information, and human biases, a study by Berg et al. (2019) found that rating agencies evaluate the sustainability performance or ESG performance of companies differently.

In his frequently cited article, Banerjee (2008) emphasizes the problematic utilization of a narrow and stakeholder-focused definition of corporate sustainability and associated terms, labeling them as “ideological movements that are intended to legitimize and consolidate the power of large corporations” (p.51). A recently published report by the New Climate Institute and Carbon Market Watch (2022), investigating the transparency and integrity of 25 transnational corporations concerning their environmental performance and objectives, found that the majority of corporations make ambiguous and embellished statements in their ESG reports. Furthermore, the authors claim that the currently fragmented regulations within industries and countries facilitate ambiguous reporting, leading to greater intricacies for detecting and correctly identifying greenwashing. Consequently, and in line with Banerjee (2008), one could argue that the truthful sustainability efforts have systematically been

obfuscated to safeguard the legitimacy of corporations and their social license to operate (for definition, see Demuijnck & Fasterling, 2016, for the effect of CSR on legitimacy see also Escamilla Solano et al., 2019).

With the omnipresence of terms such as digitalization and digital transformation, the term Corporate Digital Responsibility (CDR) has evolved. While firms manage the social and environmental impacts of their business activities with their CSR strategy, CDR holds businesses accountable in the digital world. After all, every organization collects data, consumes energy and resources for servers, hardware, and programs, and encounters challenges related to accessibility (Teucher & Molle, 2021). With the convergence of digitalization and sustainability, Dörr (2020) states that corporate responsibility is evolving into CDR which is concerned with ensuring digital sustainability as well as taking into account the global economic, social, and ecological effects of corporate digital actions

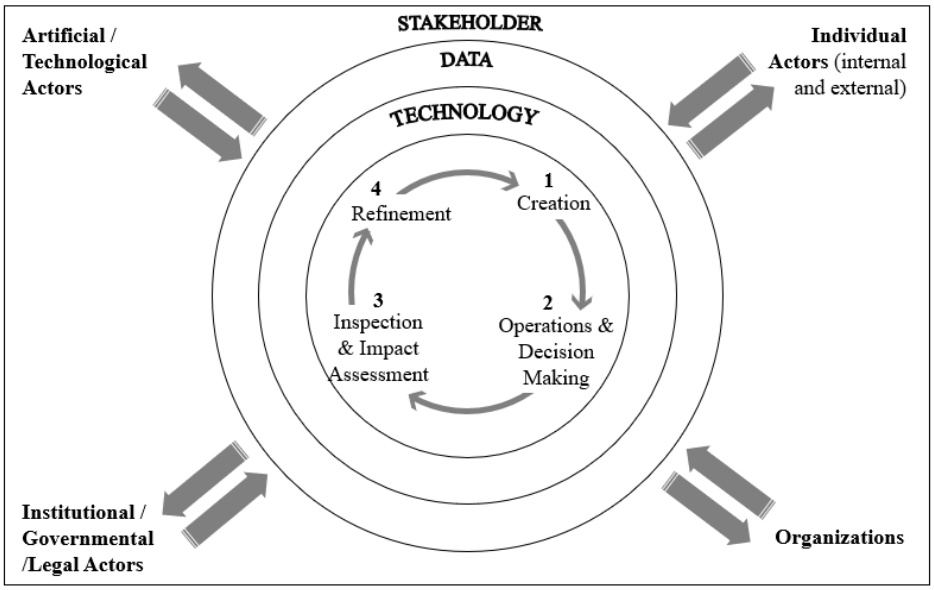
While Lobschat et al. (2021) suggest basing the CDR term on the CSR understanding of Schwartz and Caroll (2003) by considering currently prevailing societal beliefs about the economy, legislation, and ethics, they simultaneously emphasize the differences between both concepts due to the nature of digital technologies. More precisely, the authors argue that both concepts have a raison d'être and overlap in certain areas, however, they consider the novelty, and therefore, perceived urgency of CDR to be higher, due to:

1) the disruptive potential of technologies; similar to the self-referential nature of technologies noted by Yoo et al. (2010);
2) their transformative and adaptive characteristics and new ethical attitudes and imperatives that follow the unanticipated consequences of digital technologies; similar to the re-programmability noted by Yoo et al. (2010);
3) the ubiquity of digital technologies and the scarcity of adequate alternatives.

Accordingly, Lobschat et al. (2021) recommend corporations proactively integrate CDR considerations into their strategy and operations to ensure stakeholders' trust, particularly because technological advancements precede the appropriate legal regulations and frameworks considerably. A corresponding framework for organizations seeking to integrate CDP into their actions is illustrated in Figure 6.

Figure 6

Fundamental Constituents of the Corporate Digital Responsibility Concept



Note. Adapted from Lobschat et al. (2021, p. 878).

The four areas of consideration for CDP are elaborated hereafter:

(1) Creation of technology and data capture: Firstly, corporations are encouraged to incorporate ethical considerations not only during the development stage but also adopt a CDP mindset during their launch phase.

(2) Operation and decision-making: The second area of CDR comprises all ethical considerations during the utilization phase by anticipating a multitude of potential use cases and their broader implications.

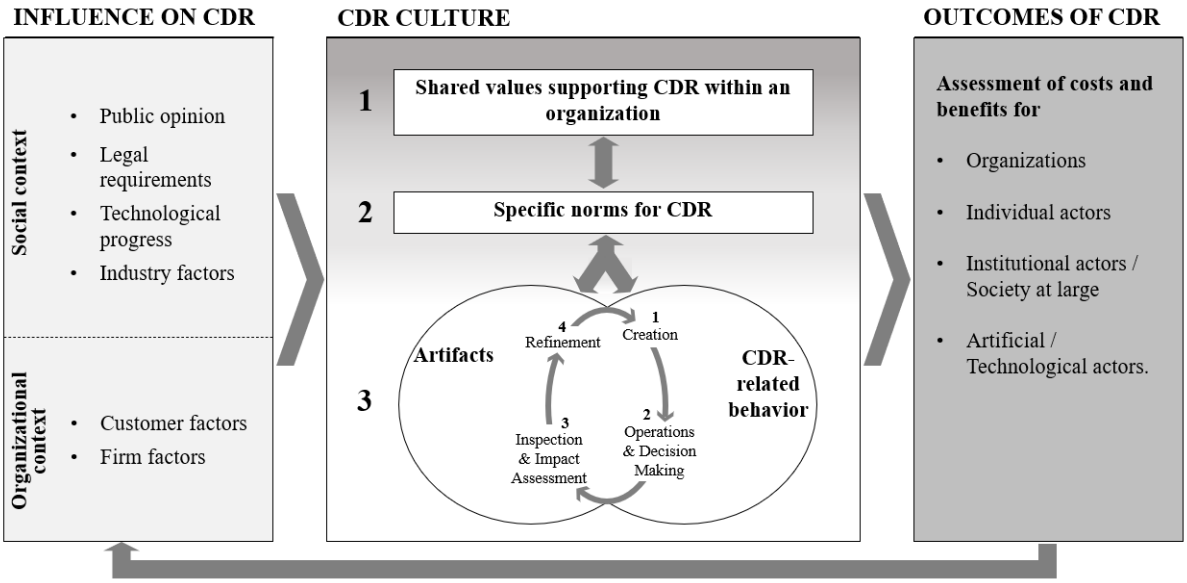
(3) Inspection and impact assessment: During the use phase of the technology, a comprehensive evaluation is necessary to identify not intended consequences for directly and indirectly involved stakeholders, as well as wider implications for our living environment.

(4) Refinement of technology and data: By continuously analyzing the emerging ramifications and assuring stewardship during end-of-use activities, corporations can adapt and modify technologies to eliminate ethical or privacy concerns.

Figure 7 places the four-stage cycle of CDR considerations of firms in the broader economic construct, highlighting the effect of external and internal influencing factors on CDR integration within corporations and how they can be translated and applied to benefit all involved stakeholders (Lobschat et al., 2021). Dörr (2020) refers to CDR as a way for firms to publicly demonstrate their pursuit of responsible digitalization, arguing that the regulatory monopoly of nation-states has been jeopardized by the ever-increasing interdependence of global digital markets (see also Bitkom 2018; Charta der digitalen Vernetzung, n.d.; Schäuble, 2017). However, activities at the political level to support companies on the path of new corporate responsibility are present, for example in Germany (BMJV 2018, 2021; Corporate Digital Responsibility Initiative, n.d.).

Figure 7

Conceptual Framework for Corporate Digital Responsibility



Note. Adapted from Lobschat et al. (2021, p. 882).

Based on the sustainability core values of equality, harmony, and self-determination of Sparviero (2021), Sparviero and Ragnedda (2021) define the term digital sustainable development by augmenting the TBL sustainability concept of economic, environmental, and social values by individuals, indicating the digital literacy. The UNESCO Institute of Statistics (2018) proposed the following definition for digital literacy, highlighting its relevance in today's world:

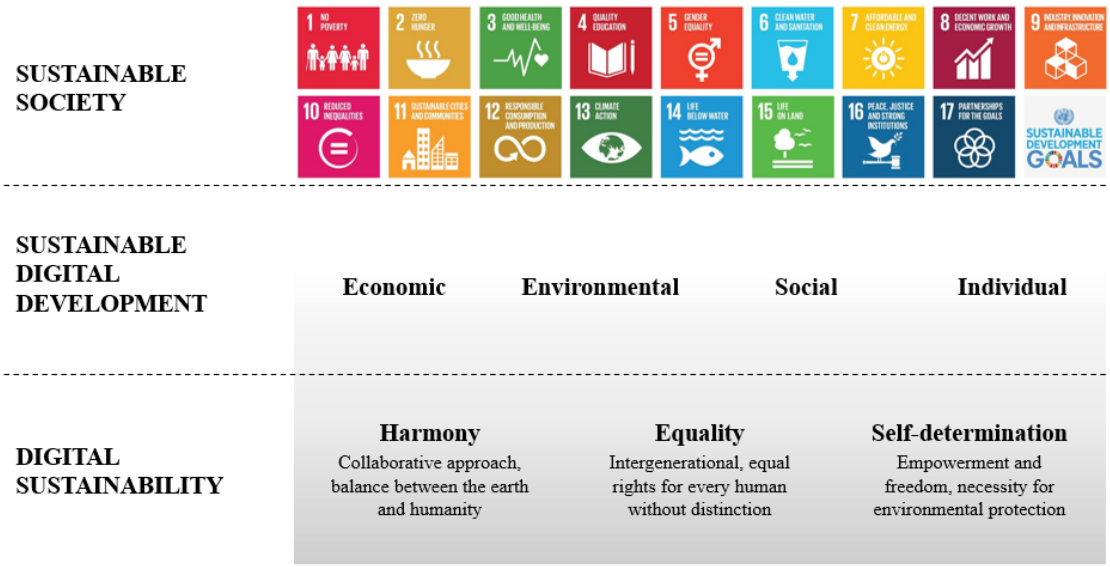
> "*Digital literacy is the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital devices and networked technologies for participation in economic and social life. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy, and media literacy."*

Adopting a more comprehensive and normative understanding of the term digital sustainability in the context of digital transformation, rather than being passively steered by the SDGs, technologies should be actively harnessed to generate sustainable value in pursuit of achieving the SDGs (Sparviero & Ragnedda, 2021). For the understanding of how individuals are impacted by their technological familiarity, uptake, and knowledge, the authors distinguish between the three levels of discrepancy of access and use of ICT (see also Dewan & Riggins, 2005; Ragnedda & Ruiu, 2017). The first level of the digital divide precisely reflects the aforementioned difference, whereas the second and third levels refer to its utilization and thereby, the potential to favorably impact peoples' livelihoods, respectively (e.g., Attewell, 2001; Hargittai,2002; Hargittai & Walejko, 2008; Sparviero & Ragnedda, 2021; Van Dijk, 2006). These already prevailing disparities have been further amplified by COVID-19 (Ragnedda & Ruiu, 2020; Robinson et al., 2020). In Figure 8, the dimensions of sustainability in the digital context highlight that a sustainable society, i.e. attaining the SDGs, will only be viable when values of sustainability are advocated and the development efforts encompass each of the four dimensions.

Sparviero and Ragnedda (2021) criticize that the relevance of digital sustainability has been diminished due to its narrow and thus limited consideration in an economic or corporate context (Mithas & Lucas, 2010) or from a digital conservational perspective (Bradley, 2007).

Figure 8

The Concept of Digital Sustainable Development



Note. Own illustration based on United Nations (n.d).; Sparviero & Ragnedda (2021, p. 216–228).

2.6. Frameworks for Categorizing the Consequences of ICT

Multiple scholars have further analyzed and summarized the ecological consequences of information and communication technology (e.g., Bisoyi et al., 2020; Berkhout and Hertin, 2001; Ciocoiu, 2011; Forge et al., 2009, Hilty, 2008).

Berkhout and Hertin (2001) and Hilty (2008) focus on the effect on environmental sustainability and conclude that ICT affects the environment both positively and negatively in a first, second, and third order. Forge et al. (2009) classify the impact on each level explicitly either as positive or negative and suggest an additional fourth order for effects on decision-making. Table 1 juxtaposes the classifications of Berkhout and Hertin (2001) with the framework developed by Hilty (2008) and Forge et al. (2009).

The comparison reveals that the authors not only propose a different order of effects but moreover they identify divergent outcomes of these effects, thus not evaluating the effect types homogeneously in either a positive or negative manner. Especially the framework by Hilty (2008) has served as a foundation for further adaptions and re-interpretations (Hilty & Lohmann, 2013). Despite its presence in literature, the framework was criticized for not recognizing reciprocal interference between effects and for its non-uniform conception of the order of effects (Hilty & Aebischer, 2014). Consequently, the model illustrated in Figure *9* 1

has been developed to rectify these deficiencies. The authors proposed that the impact of ICT should be examined at three levels: The direct life-cycle impact encompassing all production, use, and disposal-related effects in accordance with Life-Cycle Assessments (LCA; the threefold enabling impact of ICT at the micro level and the structural impact at the macro level, comprising changes related to the economy and society). All of the aforementioned frameworks ought not to be deemed exhaustive due to the complexity of reality but can rather be seen as a critical reflection and conceptual groundwork for the underlying environmental impacts of ICT.

Table 1

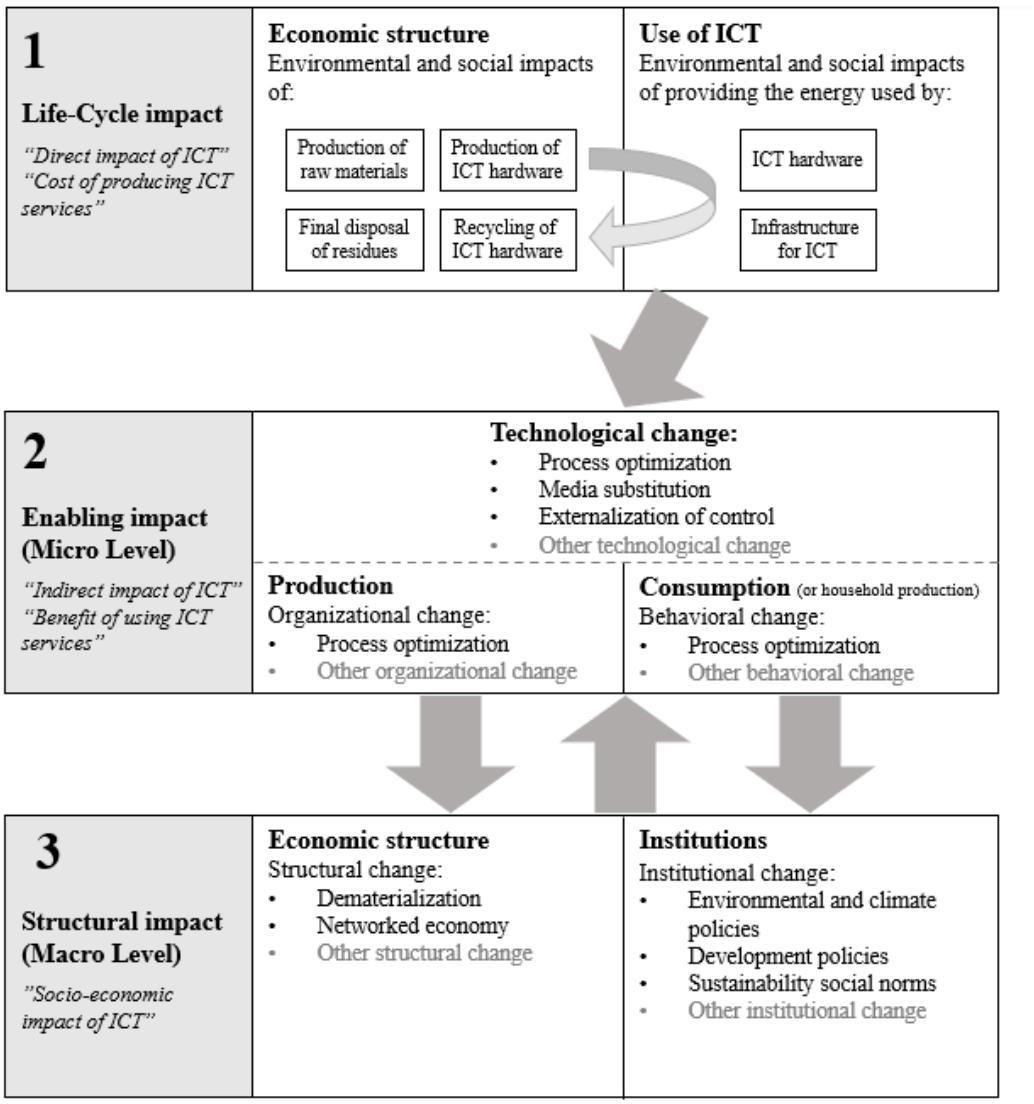
Different Classifications of Ecological Consequences of ICT

	BERKHOUT AND HERTIN (2001)			HILTY (2008)			FORGE ET AL. (2009)		
Order of effect	**Classification**	**Impact type**	**Effect type**	**Classification**	**Impact type**	**Effect type**	**Classification**	**Impact type**	**Effect type**
First order	Direct environmental effect (production and use of ICT)	• Resource use and pollution related to the production • Electricity consumption • Waste disposal	Positive and negative	Environmental effects of the physical existence of ICT	• Production, use, recycling and disposal of ICT hardware	Positive and negative	Production & use	• Manufacturing efforts • Pollution and energy during use phase • Disposal	Negative
Second order	Indirect environmental impacts on structure of the economy, production process, products and distribution systems	• Dematerialization: less input for more output • Virtualization: substitution of tangible goods • Demobilization: substitution of travel through communication at a distance	Positive and negative	Indirect environ-mental effects of ICT due to its power to change processes	• Changes in production, transport or consumption processes	Positive and negative	ICT to cut energy/ pollutants/ water consumed	• Ability of application to optimize unsustainable consuming processes • Optimizing energy use through application of ICT	Usually positive overall
Third order	Indirect environmental effects	• Rebound effect • Impacts on lifestyle and value systems	Positive and negative	Environmental effects of the medium- or long-term adaptation	• Behavioral changes, e.g., consumption pattern • Changes related to economic structures to the availability of ICT and the services it provides	Positive and negative	Substitution for lifestyle practices	• Medium to long-term substitutional effects due to technology diffusion, e.g., for physical travel: savings on travel, road congestion, knock-on affects	Positive
Fourth order							n.a.	• Improvement of decision-making capacity with real-time impact measurement to implement sustainability policy	Positive

Note. Own illustration based on Berkhout & Hertin (2001), Forge et al. (2009) and Hilty, (2008).

Figure 9

The Three-Level LES Model to Categorize the Effects of ICT



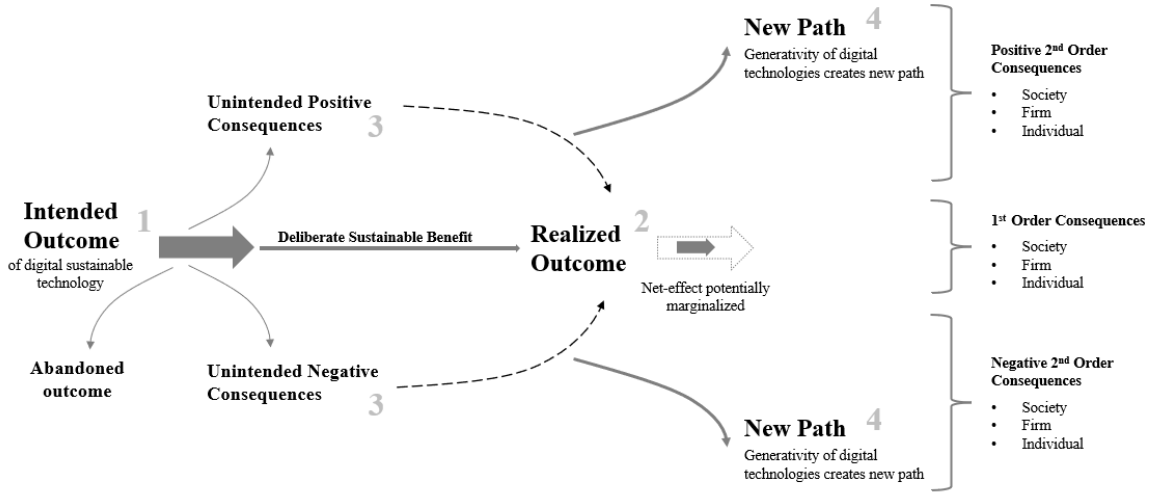
Note. Adapted from Hilty & Aebischer (2015).

While other researchers have focused solely on the environmental aspects, Bohnsack et al. (2022) have developed a framework for the assessment of broader potential consequences of digital technology. The scholars distinguish between direct first-order consequences following the realized outcome, and the indirect second-order consequences that emerge due to the generativity of new development pathways (see also Hanelt et al., 2020). Their developed framework in Figure 10 depicts the emergence of different consequences on a societal, firm, or individual level in the light of innovations for sustainability. Arguing that a firm's purpose partly determines the intended outcome of digital technologies (1), Bohnsack et al. (2022) infer that other particular circumstances likewise cause the realization to derogate from the intent (2)

and accordingly result in first-order effects. In addition to the aspired outcome, the application of technologies may result in inadvertent consequences (3) (see also Cappa et al., 2022; Knight et al., 2022). Emphasizing the significance of second-order effects that evolve through the generation of novel pathways (4), the framework lays the foundation for investigating effects that are caused by a distinctive feature of digital technology: its generativity (see also Hellemans et al., 2022; Yoo et al., 2010, 2012). Moreover, **Table *2***Table 2illustrates their identified effect levels and suggestions for future research within this context.

Figure 10

Framework for the Unintended Consequences of Digital Technologies



Note. Adapted from Bohnsack et al. (2022).

Table 2

Effect Levels of Digital Technologies

Effect level	Potential effect categories	Future research suggestion
Individual	Lifestyles, decision-making, and social interactions, and how they affect the functioning of organizations and societies.	Facilitation of sustainable lifestyles enables less physical and local contacts; changing form and function of communities
Firm	Direct consequences: production and coordination processes Indirect consequences: Implications for other relevant stakeholders, namely users, suppliers, competitors, employees and society	Identification of potential trade-offs; rebound effects in energy consumption or privacy concerns related to artificial intelligence
Society	Governance of digital technologies and their use for solving societal challenges based on implications for individuals and firms	Effect on sustainable development should be assessed across levels; analysis tools should link micro-, meso-, and macro-levels

Note. Own illustration based on Bohnsack et al. (2022, p. 599–602).

3. Methodology

The current understanding and supporting evidence associated with the unintended consequences of digital technologies are still scarce, particularly concerning the second-order consequences which are not directly associated with the use and production of such.

Multiple scholars have concluded that further research is needed to shed light on the broader consequences. Bohnsack et al. (2022) emphasize that the research on sustainable digitalization has only recently emerged and to thoroughly evaluate the multifaceted consequences of digital technologies, further research should differentiate between the consequential individual, firm, and societal dynamics and explore tools that allow for an in-depth analysis of technology across micro-, meso-, and macro-levels. Davies and Oreszczyn (2012) recognize that the complexity of unintended consequences requires an interdisciplinary research approach and although the occurred effects have been observed, our knowledge about them remains limited. Additional consequences may occur in the future and are not anticipated at this point.

In the following chapter, the research approach and its suitability for the topic are explained, followed by the selected design and a concluding discussion of the research quality, validity, and reliability.

3.1. Research Approach and Setting

Van Aken et al. (2012) have emphasized a theory-based approach is most appropriate in case of less researched and recent phenomena. This thesis is explorative in nature to detect patterns, coherences, and contributing factors of the emerging second-order consequences of Artificial intelligence on individuals, firms, and society.

Accordingly, a qualitative research approach has been selected to explore the unintended consequences of digital technologies. Furthermore, according to Rogers (2003), the wider diffusion of technology is required to deduce its repercussions, thus, limiting the number of potential technologies as the subject of this study. As previously mentioned, the reality of effects may be confounded by a vague use of the term ‘unanticipated’. Those effects are undesirable and anticipated but may have been labeled under the guise of unanticipated consequences to avoid the otherwise associated responsibility (Parvin & Pollock, 2020). The research is based on reliable secondary data that has been validated previously. Reddy and Agrawal (2012) note that companies may limit information flows that could negatively influence their public opinion and therefore recommend the use of news and other media to comprehend recent phenomena or industry trends.

3.2. Research Design

The case study research design has been selected as the methodology of choice as it investigates potential answers to the question of how and why (Yin, 2003). Following Yin (2009), case studies can provide detailed insights about recent phenomena which are not discernable from their contextual settings. While early critics have argued that the generalizability of case studies is bounded (e.g., Abercrombie et al., 1984; Campbell and Stanley 1966; Dogan & Pelassy, 1990) and biases inherit the researcher's work (e.g., Diamond, 1996) and human perception in general (Bacon, 1853), the appliance of the methodology has gained momentum in business research (e.g., Bohnsack et al., 2014, 2021; Graebner & Eisenhardt, 2004) as well as in social and political sciences (e.g., Hamel, 1992; Rhodes & Brook, 2010; Viano et al. 2022).

As specified by Flyvberg (2006) social constructs oftentimes lack underlying and suitable theories and while the value of case studies as a "force of an example" (p.12) is easily disdained, they are a powerful method for contextualizing knowledge. Commensurating with the standpoint that generalizability and validity can be enhanced through a strategic case selection (Ragin 1992; Rosch 1978;) and a multiple embedded case study design (Yin, 2009), multiple exemplary usages of the AI technology in different settings and their respective consequences have been investigated.

3.3. Data Collection

For the case study, the Financial Times was selected as the foundation for the research efforts (cf. Bohnsack et al., 2014; 2021). The Financial Times is a global renown business publication that has its finger on the pulse of the time when it comes to news and information about businesses, politics, and the economy. Accordingly, it was chosen to provide a better understanding of the current deployment of AI, and its multilayered challenges related to the intended and unintended consequences of the technology. To ensure the narrative nature of the research objective, a high-quality newspaper was designated as the resource of choice rather than academic publications. Newspapers have been recognized as an accurate and reliable reflection of our reality and, therefore, present a valid groundwork for a qualitative case study (Yin, 2003).

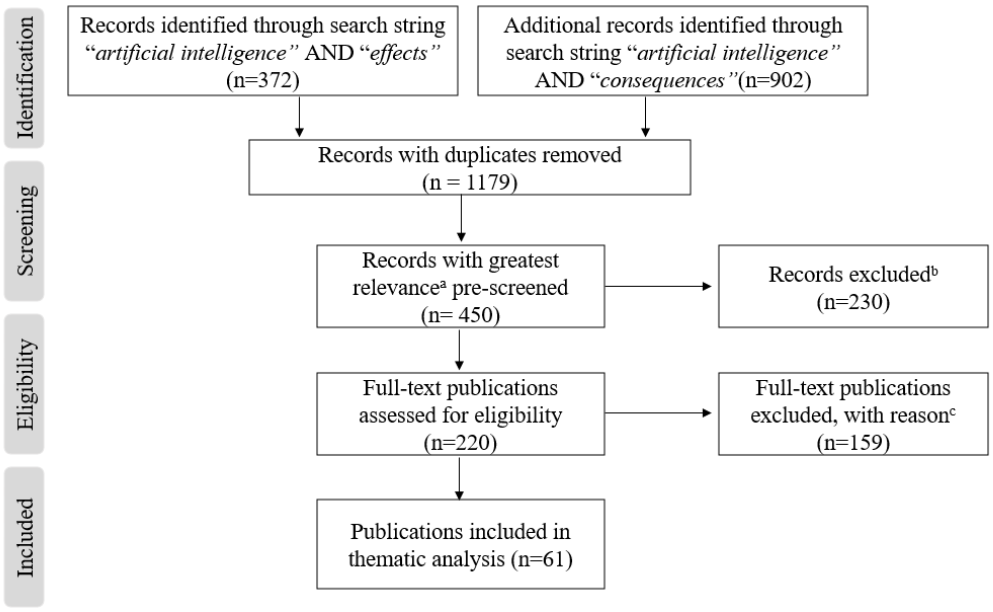
As a first step, the online database of the Financial Times was scanned for articles published between 2012 and 2022 with different search strings to test the number of publications and their relevance. The period was selected to gather a long-term view because the number of AI publications has increased exponentially since 2010 (Zhang et al., 2021). The

use of strings involving synonyms of sustainability, for example, *"artificial intelligence" AND "consequences" AND "sustainable",* did not yield relevant articles for the research endeavor. After testing different possibilities and scanning the corresponding articles, the below-mentioned search strings were selected as those with the highest thematic relevance for the data collection. While 372 publications were associated with the search of *"artificial intelligence"* AND *"consequences",* 902 publications were displayed as a result of the search string *"artificial intelligence"* AND *"effect"*. Despite their semantic resemblance, the intersection of the two outputs and their associated articles proved to be limited with 95 common articles leading to 1179 articles excluding duplicates. In an early preliminary screening, 450 articles of the result list and their matching excerpts were reviewed for their importance and eligibility. Those articles were chosen based on their relevance ranked by the FT according to their conformity between the articles' content and the search string.

Based on the exclusion criteria considering article focus, headline, and matching excerpt relevance, 230 of the records were excluded. In the sequential step, the full texts of the remaining 220 publications were skimmed and reviewed for their relevance in providing insights on the effects of AI. Eventually, 61 of them were chosen for an in-depth analysis based on their focus on Artificial intelligence and the broader context of unanticipated effects. The articles and their related information are included in Appendix B. The detailed data collection process is depicted in Figure 11.

Figure 11

Data Collection Process



Note. [a]Articles were ranked by the Financial Times according to their relevance, displaying articles with the greatest similarity with the search string. [b] Topic did not fit, evaluated based on headline and matching excerpt, mostly superficial overview of technology and innovations of AI. [c] Mostly not related to the unanticipated consequences, no specific AI context after reading the full text, or not meeting the inclusion criteria.

3.4. Data Analysis

For the subsequent analysis, a systematic two-step procedure was adopted. In the first step, the selected 61 Financial Times articles were preliminarily analyzed in Excel to systematically prepare the data for the consequential thematic analysis. This stage involved the extraction of information regarding the article, including author, title, focus industry, and companies as well as the relevant text quotes related to the implications of AI. Not unexpectedly, all selected articles were published between 2017 and 2022. The underlying reasoning can be found in the development and deployment of artificial intelligence as well as through the research published within the field. In economics and related sub-fields, Bickley et al. (2022) have observed a significant growth in the number of AI-related publications since 2016[1] and according to a recent report published by the Stanford Institute for Human-Centered Artificial Intelligence

[1] The final year included in the research was 2020 but since 1986 the number has been rising steadily and therefore, it can be assumed that this upward trend has persisted during the last years.

(Zhang et al., 2021), the number of peer-reviewed AI publications per year has more than doubled between 2016 and 2019 and increased by 34.5 percent from 2019 to 2020. As subsequent effects emerge with a certain time lag, it appears logical that the selected Financial Times articles are published after the recent rise of AI discussions in academia from 2016 onwards.

In a second step, the data analysis software Atlas.ti was utilized to systematically facilitate and support the thematic analysis of this qualitative data set. Braun and Clarke (2006) define the objective of the thematic analysis as uncovering patterns in a given data set. As this frequently not only includes the description but furthermore, the interpretation of data, "the qualitative researcher is often described as the research instrument insofar as his or her ability to understand, describe and interpret experiences and perceptions is key to uncovering meaning in particular circumstances and contexts*"* (Maguire & Delahunt, 2017, p.3351). The implications derived from this understanding are discussed in chapter 5.3.

The thematic analysis was conducted geared to the six-step proposed by Braun and Clarke (2006) whose framework has become the most widely recognized and utilized approach for the implementation of this qualitative research method (Clarke & Braun, 2017). A detailed description of each phase is illustrated in Table 3. The approach has been utilized in business research (cf. Casell et al., 2017), the intersection of business and technology (e.g., Delgosha et al., 2021), and the domain of entrepreneurship (e.g., Jones et al., 2011; Ogundana et al., 2021; Singh Ghura, 2017) and was chosen due to its flexibility given the diverse nature of effects that are studied (Clarke & Braun, 2006).

During the coding phase, the data was revised, and new codes were generated along the process, following an open-coding scheme with codes on the latent level, where meaning was extracted between the lines of written text. Braun and Clarke (2006) specified the latent level as the level "go[ing] beyond the semantic content of the data, and start[ing] to identify or examine the underlying ideas, assumptions, and conceptualizations – and ideologies - that are theorized as shaping or informing the semantic content of the data." (p.84). As opposed to generating codes based on previously selected theory, the codes were inductively derived from the data, following Boyatzis' definition (1998) of a code as "the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon" (p. 63). In the following, the undertaken steps are outlined in more detail whereby certain phases have been compiled for greater clarity and conciseness.

Table 3

The Six-Phase Approach for Thematic Analysis

1	**Familiarizing yourself with your data**	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2	**Generating initial codes**	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3	**Searching for themes**	Collating codes into potential themes, gathering all data relevant to each potential theme.
4	**Reviewing themes**	Checking in the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic „map" of the analysis.
5	**Defining and naming themes**	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells; generating clear definitions and names for each theme.
6	**Producing the report**	Final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Note. Adapted from Braun and Clarke (2006, p.35).

Phase 1: Familiarizing yourself with your data

During this phase, it is critical to gather a good initial understanding of the data through in-depth reading. Therefore, only the relevant text excerpts were transferred to an Excel sheet capturing the article details regarding context as well as peripheral characteristics. This provides insights about the data and lays the foundation for immersion into pattern detection.

Phase 2 and 3: Generating initial codes and searching for themes

After the database has been formatted and prepared for the transfer to the software Atlas.ti, the document was uploaded to a new Atlas.ti project. The articles were labeled according to the APA citation style and sorted into document groups according to their publishing year. In total, more than 36,000 words of content were transferred to the program for coding. Thereof, I created 272 initial codes following an open-coding scheme where I reviewed each article's content was reviewed and coded each paragraph one-by-one. Those initial codes were then

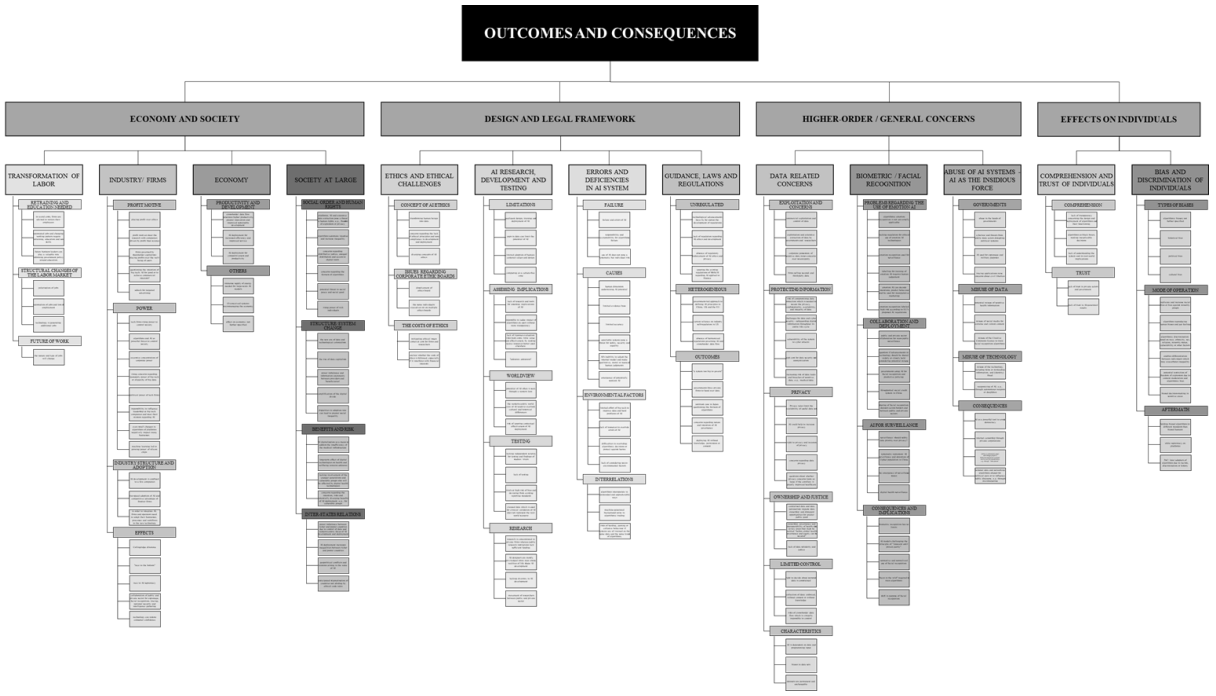
defined and sorted thematically aiming to detect inter-code relations and remove potential duplicates.

Phase 4 and 5: Reviewing, defining, and naming themes

Thereafter, the codes sorted into preliminary themes were classified into sub-themes for the sake of clarity due to the extensive data and a large number of initial codes. This step demonstrated the coherence between the individual codes and enabled the review of the data. Each group of codes was examined for potential mergers, adjustments, and additions of codes, and the content of each code was reviewed accordingly. Based on the thematic orientation and the latent meaning of the content, the codes were amended and defined to avoid overlaps and achieve consistency. Subsequently, coded excerpts were revised one by one following the final coding scheme. In total, 534 relevant text passages were sorted into four categories, 13 themes, 47 sub-themes or groups, and 181 codes. A passage thereby could be associated with several codes concurrently. Figure 12 provides an overview of the thematic map which was compiled manually in PowerPoint. Further details can be found in Appendix C.

Figure 12

Thematic Analysis Map

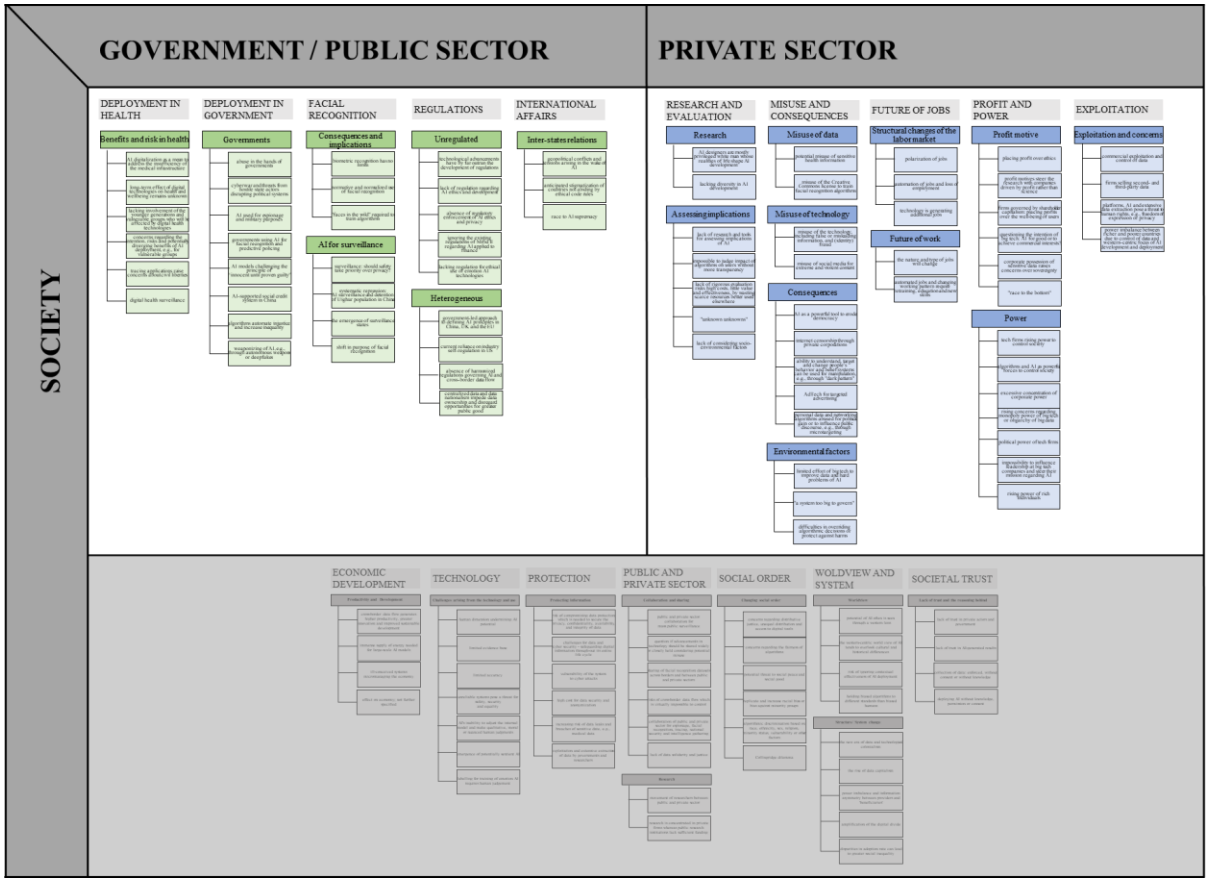


Note. Own illustration based on the thematic analysis of the 61 selected Financial Times articles.

To gain a better understanding of the unintended implications and differences of AI in the private and public sectors, the preliminary thematic map has been rearranged and aggregated into the final version depicted in Figure 13. Public and private sector were chosen to highlight the distinctive implications, on the one hand, comparing their different approaches, and on the other hand to illustrate common challenges and the interplay between those sectors. While the mandate of private corporations is often simplified as profit maximization, the public sector's objective is to maximize public welfare (Madhani, 2014). Consequences that cannot be unambiguously allocated were not be examined further due to their magnitude. As shown in Figure 13, they have been identified and likewise categorized, although a more extensive examination of them would exceed the scope of this paper.

Figure 13

Thematic Map: Public and Private Sector



Note. Implications that cannot be clearly assigned have been categorized but have been greyed out since they will not be addressed further. Own illustration based on a sector-specific thematic analysis of the 61 selected Financial Times articles.

4. Findings and Discussion

The following chapter presents the findings that were derived from the data of the 61 FT articles. For the final classification of unintended consequences, I followed the suggested structure of Bohnsack et al. (2022) to differentiate between the implications for individuals, firms and society. The following systematic examination indicates the respective AI technology according to their classification specified in chapter 2.4.1 and their intended outcome before unintended consequences are discussed on the micro-, meso- and macro levels. In this regard, it is worth noting that the collected data does not necessarily cover each of the three levels, but rather that some technologies exhibit varying characteristics in terms of their effects and manifestations.

AI has been likewise recognized for their potential in the public (Berryhill et al., 2019) and private sector (Dubber et al., 2020) but as an exploration of the technology's unintended effects has not been present in scientific research, this thesis seeks to fill this gap. A tabulated overview of the results and classifications presented in the following is attached as Appendix D.

4.1. The Unintended Consequences of AI

AI-Enabled Diagnoses in Health

In health care, limited memory AI enables medical diagnoses, either remotely via app or through systems applied in hospitals such as Google's deep learning system for specific diabetic eye disease (Waters, 2020). The technology partly substitutes medical practitioners and thereby, addresses the insufficiency of the medical infrastructure (Olcott, 2022).

On an individual level, technologies require the adaption and prolongation of workflows, and this technological integration constitutes a potential burden for practitioners and their responsibilities (Waters, 2020). Simultaneously, the consideration of socio-environmental factors is essential to prevent cases like the one of Google Health's system that has been proven impracticable due to diverging real-life conditions (Waters, 2020). Presuming that the pharma industry is heavily regulated in comparison with the technology sector (Andrew, 2020) while both operate in the same field, unreliable and unsafe AI systems pose a significant threat to human lives. Aggarwal (2021) argues that for research in health care "without rigorous evaluation, we risk deploying costly technology that offers little value and may even prove detrimental. It may fail to work; not improve the effectiveness of care; be unaffordable or impossible to scale; and ultimately waste scarce resources better used elsewhere

to improve patient outcomes" (para. 7). Even with thorough evaluation and assessment of potential implications, the unknown unknowns (Thornhill, 2021b) will continue to exist, but they will have far fewer societal consequences than those caused by negligent research and evaluation.

The long-term effects of digital technologies on society's well-being and health, SDG three, remain unknown, and AI deployment further challenges the concept of intergenerational equity. Although the younger generation will be predominately affected by technological changes and can be regarded as the main stakeholders with the longest exposure, these groups are currently not included in the debate about the prospects of health technologies and their deployment. This question of intergenerational equity reflects the common understanding that "many health policies [are] determined by and targeting the diseases of older people, who typically wield greater power and resources" (Jack, 2022a, para. 9). However, not only younger but also vulnerable groups are at risk that their obtained benefits of such technology diverge, challenging SDG 10. The prevention of the predicted inequalities in health outcomes "will prove a litmus test of the capacity of our governments" (Kichbusch & Agrawal, 2021, para. 16), outweighing the risks and benefits of intentional and realized AI deployment in health care.

On a global scale, the benefits of AI deployment in developing countries are often evaluated from a Western perspective, neglecting cultural differences and instead representing some sort of neocolonial sentiments where affected countries remain uninvolved in the debate whilst solutions are imposed upon them (Aggarwal, 2021).

Another significant consequence is the widening power gap between wealthier and poorer countries, caused by two major drivers. Firstly, AI is predominantly developed and deployed in China, the USA, and Europe and thus adapted to the prevailing circumstances there. Secondly, they control most of the data with data flowing toward the more powerful countries, giving a hint of neocolonialism (Neville, 2022). For the public good of societies around the globe and to circumvent an ever-widening digital divide, firms need to foster societal trust by "ensuring that products developed in the north are affordable and applicable in the south" (Trister, 2022, para. 3).

Health Data Sharing and Trading

During the pandemic, the UK, India, Singapore, Russia, and China have deployed limited memory AI technology that enabled them to trace their citizen and control the dissemination of COVID-19 through public health data sharing. However, information has been passed to judicial prosecution agencies (Jack, 2022A, 2022B), representing unintended consequences for

their respective populations. Along with restrictions imposed on civil liberties (Jack, 2020), this data sharing risks even greater exposure of discrimination for minorities and vulnerable groups (Kichbusch & Agrawal, 2021), and negatively impacts SDGs 10 and 16.

Simultaneously, concerns about COVID-19 testing results used to gain economic benefits have aroused (Jack, 2022b) and questioned the handling of sensitive data by companies. Firms sell data to second and third parties to generate profit, thereby unintentionally encroaching on individuals' privacy.

Besides Facebook and Google which sell data profiles for marketing purposes, health data apps have been likewise trading sensitive data in three European countries (Jack, 2022b; Pop, 2021). As health data remains a valuable and sought-after asset that will not be effectively protected solely through data encryption, it has become a primary target for cyber-attacks (Olcott, 2022). Ross Anderson, professor of security engineering at the University of Cambridge has articulated his concerns that public officials likewise can "sell on the records without […] knowledge or consent on an industrial scale to drug companies and others who will abuse them" (Murgia, 2017, para. 63). Therefore, it can be regarded a societal implication rather than an individual one due to its systematic nature and challenges SDG 17 (partnership for the goals).

With data and especially health data becoming empowered to control our society if used neglectfully, Couldry and Mejias (2020) noted that "in response, society must, via its regulators, examine the unintended side-effects of allowing a free market for data" (para. 9).

AI Deployment for National Intelligence

In governments, AI is deliberately used for national intelligence purposes such as espionage and military, aiming to ensure a country's national security. However, the FT Editorial Board (2021) states that likewise, "AI gives unscrupulous governments new capabilities to snoop on, control, and potentially coerce their citizens" (para. 7), reflecting a potentially detrimental power asymmetry which hampers achieving SDG 16. Within a more comprehensive, global context, communities might get trapped amid the battlefields and suffer the consequences of geopolitical tension, cyber-war, and inter-state conflicts when hostile state actors deploy AI to undermine the attacked state's security and functioning (Warell, 2020). Moreover, the race to AI supremacy through innovation, development, and investment can trigger new and exacerbate existing geopolitical conflicts (Murgia, 2022b; Venkataramakrishnan, 2019). These implications on the societal level directly affect SDGs 10, 16, and 17.

AI-Enabled Social Credit System

In China, AI's deployment in the public sector enables a social credit system where members of the society are ranked according to their moral and state-loyal behavior (FT Editorial Board, 2021). The objective of this system can be regarded as the process of ensuring the functioning of society by eliminating undesirable behavior. However, with systems that tend to be unreliable and prone to biases (Murgia, 2021), errors of AI can have enormous consequences for individuals, especially their social status and reputation within society. With implications for SDG three, 10 and 16, their consequences are even more far-reaching at the human right level where the technology limits personal freedom and rights, inter alia, freedom of expression and the right to self-determination.

AI Facial Recognition

In the Chinese province of Xinjiang, limited memory AI supports the identification of Uighurs, predictive policing and, potentially, their detention through the deployment by national authorities (e.g., Colback, 2020; Murgia, 2021; Riding, 2019; Tett, 2020). For individuals belonging to the Muslim minority, the mass surveillance and oppression of their ethnic group represent a burden on their physical and psychological health, provoking anxiety and fear (SDG three) (David &Derthick, 2018). Moreover, the Uighurs are limited in their freedom of movement and the far-reaching surveillance represents an intrusion into their privacy.

This profiling of an ethnic minority can constitute a sample for other countries to follow, it enables societal segregation, increases racial bias, and creates an inequality where the surveilled minority is put under general suspicion. Therefore, the deployment of AI in this case highlights issues related to SDGs 10 and 16. Although the practice of facial recognition has become increasingly established and normalized, it has been receiving widespread but concealed reluctance among the population in China, according to an anonymous survey conducted in 2020 (Tett, 2020).

In the US, AI altered "the nature of policing, making it less about reacting to crime and more about mass surveillance and predicting where crime might happen" (Foroohar, 2018, para. 5). The limited memory state-of-art technology supports the police through forecasting crimes and identifying criminals. However, multi-data models challenge the presumption of innocence since the systems would monitor individuals with no previous criminal record and thereby jeopardizing basic human rights. Ultimately, false allegations can lead to turmoil in lives and the loss of reputation and social stability. AI-powered decisions are commonly understood as

particularly hard to reverse (Tett, 2020), and likewise are the potential consequences on the individual level.

With increasingly close AI collaborations between the public and private sector, private firms holding relevant data or engaging in data exchanges with China, receive requests from governments to hand over their data, thereby unintendedly being transposed into a form of law enforcement agency (Foroohar, 2018), which then in turn leads to a deterioration of social trust.

More far-reaching consequences related to the societal concepts of justice and fairness arise under the presumption that AI reflects human biases and, among others, replicated the association of delinquency with darker skin color (Foroohar, 2018).

Facial Recognition Data Sets

Currently, facial recognition software is trained with large face data sets whereby the effectiveness of the algorithms depends heavily on the number and context of the faces that are used (Murgia, 2019). To attain an even larger resemblance with faces in the real-world surveillance scenario and improve the accuracy of AI, there is a growing tendency towards relying on and sharing so-called faces in the wild where footage is often collected for datasets without consent.

In the state of Colorado, researchers have legally captured the faces of 1,700 students on 20 different days without their knowledge or permission (Murgia, 2019). Despite presenting an invasion of privacy for those students, according to the law, this undertaken is legal if the pictures are taken in a public place and the persons' identities remain unknown. Subsequently, those data sets have been shared between public and private sector organizations across the globe. Following Imeson (2019), this “cross-border data flow presents problems on privacy, data protection, intellectual property rights and security” (para. 4).

For society, the practice of data sharing has diverse implications related to SDGs 10 and 16. Information asymmetry exacerbates inequalities within states and across states because data and also data sets “confer[…] power on those who control it at the potential expense of those who are the subject of it” (Montagnon, 2019, para. 13) and can be, while not intended by researchers, utilized for mass public surveillance or in other harmful ways. Therefore, the deployment of AI in this case has adverse effects on SDG 10 and 16.

AI Deployment for Public Welfare Services

The public sector in the US increasingly utilizes limited memory AI for faster and more efficient decision-making. Algorithmic failure has become a major challenge and has led to a family being erroneously accused of child abuse and homeless citizens being deprived of their shelter access (Tett, 2018). Those individuals as part of particularly vulnerable groups will neither be empowered to recognize nor contest these inequitable decisions (Tett, 2018). Respectively, biases and errors in AI decisions amplify injustice and, at their worst, menace people's livelihoods. What ultimately should follow when algorithms make biased decisions is the possibility to reverse or override the decisions, but the absence of such mechanisms has cast a negative and unfair light on AI with the weakest of society facing the most severe consequences according to the political science professor Eubanks: "Not everyone fares so well when targeted by digital decision-making systems. We all inhabit this new regime of digital data, but we don't all inhabit it in the same way." (Tett, 2018, para. 4). The widening disparities reflect the problematic use of AI in governments, contradictory to the realization of SDGs 10 and 16.

AI Deployment on Social Platforms

On social media platforms, reactive algorithms are used to maximize the time spent on the respective platform by suggesting relevant topics and advertisements which continue to engage the users. Private firms intentionally leverage marketing techniques, which are aimed at manipulating their users, in order to maximize their own profits (Waters, 2021).

Empowered by the amplitude and volume of available data, firms have the ability to understand, target, and change people's behavior and belief systems. Accordingly, individuals targeted through dark patterns or other algorithms are directly influenced by the content displayed on the platforms and are manipulated without their knowledge. Exemplary to mention here would be the indication of the remaining time when booking trips, algorithms suggesting children's profiles to pedophiles, or preferential propagation of extreme content (Murphy, 2019; Susskind, 2022; Waters, 2021). Moreover, social media has been associated with a negative influence on the health and well-being of individuals, however, the underlying correlations remain to be conclusively assessed (cf. Keles et al., 2010).

Stuart Russell, professor of AI at the University of California, holds AI responsible for political and emotional polarization in society: "Social media content selection algorithms, particularly those based on reinforcement learning, are guaranteed to manipulate people," (Waters, 2021, para. 11). Microtargeting is another way of using data and algorithms to influence societal perceptions, a tool commonly used within a political context like elections,

as in the instance of Cambridge Analytic (Murphy, 2019; Pop, 2021; Thornhill, 2017). Susskind (2022) further argues that the historical context "shows that, left to market forces, platforms will tend to adopt practices that are good for business, even if they are harmful to democracy or social cohesion" (para. 6).

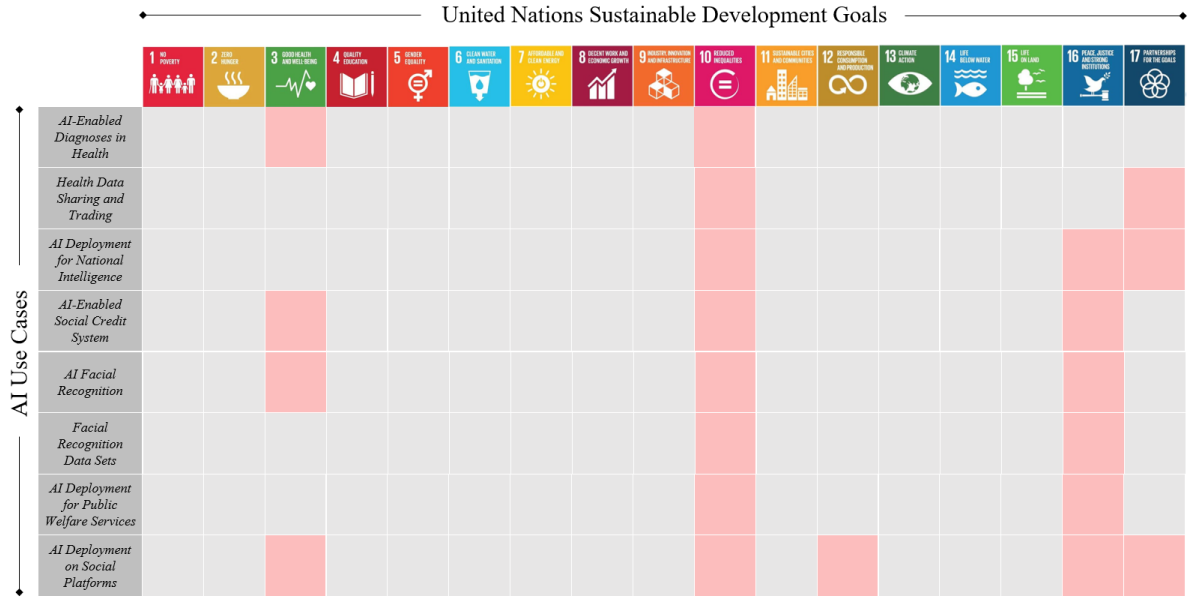
From a company perspective, political polarization and the dissemination of misinformation through AI might be an unintended or deliberate consequences too, highlighting the inevitable ethical consequences originating in the pursuit of their profit-maximization strategy. In the long term, however, these developments might entail greater regulation of the industry as opposed to the self-regulation practiced in the U.S. (Murgia & Shrikanth, 2019a)., thereby eroding the industry's revenue and market power compounded by the reputational losses already sustained.

Censorship on platforms is another widely debated phenomenon with examples ranging from Google's *Project Dragonfly* in China, intending to develop a censored Google search or Twitter's unfair algorithm which excluded more than 600,00 accounts from search results (Murgia & Shrikanth, 2019a; Susskind, 2022). The issue of how to protect free expression persists given that it may be readily silenced by platforms that "rank, sort and order the speech of others. […]. They decide who is seen and who remains hidden. With a click, any user — even the mightiest political leader — can be banned from a platform forever" (Susskind, 2022, para. 2). From a company perspective, the censorship might be intended but it simultaneously affects and even limits the right to free speech for every human being interacting on such platforms. Alongside the threats that AI deployment imposes on human rights, its use and consequences on social platforms jeopardize the attainment of SDG three, 10, 12, 16, and 17.

4.2. Research Results and Impact on SDGs

Figure 14

Heatmap of Unintended Consequences of AI for SDGs



Note. Own illustration based on the findings and discussion of the 61 FT articles.

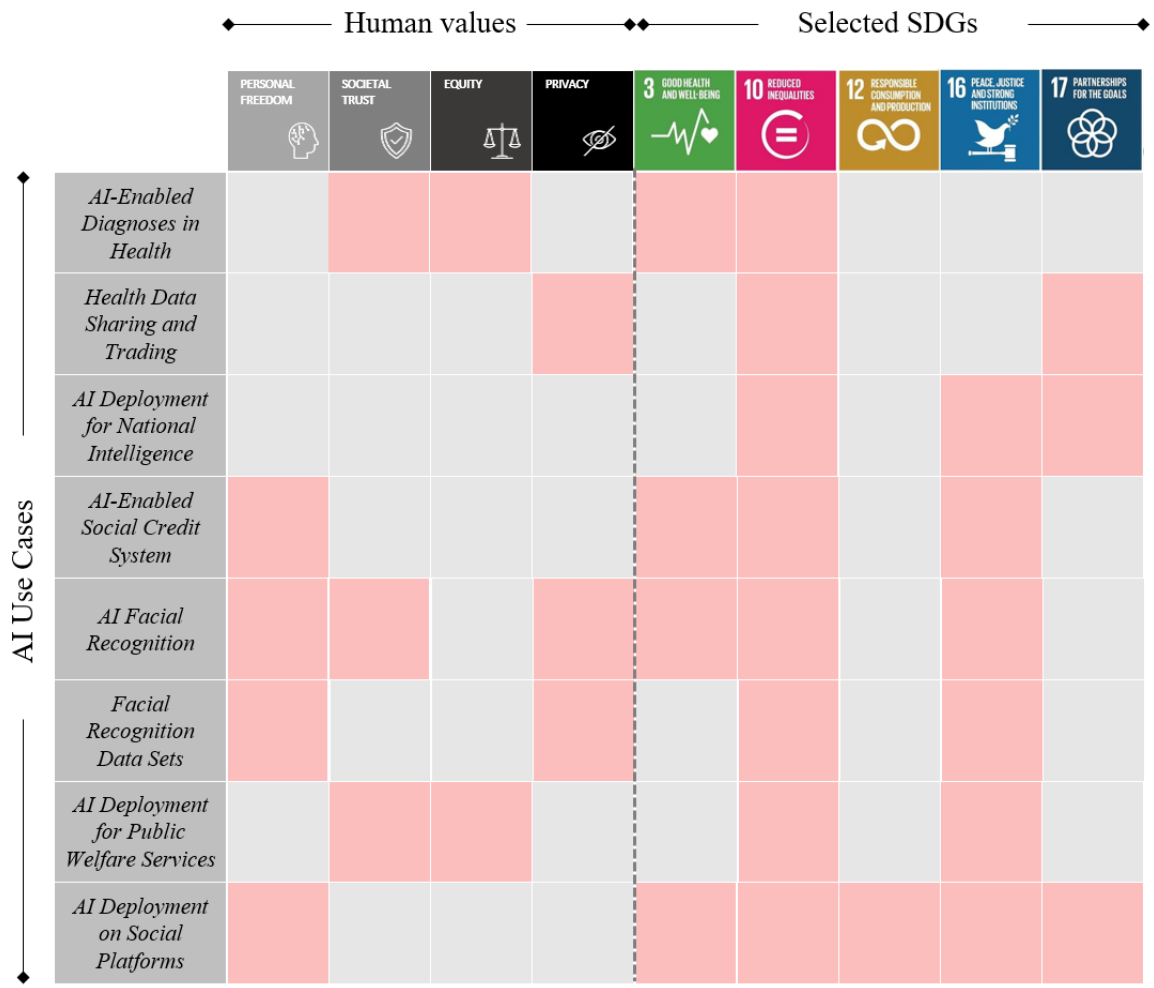
The diverse use cases of AI have highlighted the wide range of AI applications which, in addition to their intended outcomes, entail unintended consequences, some of which contradict the underlying objective of the AI deployment. Figure 14 depicts the affected SDGs and highlights the particularly wide-ranging impacts on SDG three (Good health and well-being), SDG 10 (Reduce inequality within and among countries), SDG 16 (Peace, justice and strong institutions) and SDG 17 (Partnership for the goals) (UN, n.d.-b) of several AI use cases.

All of the eight analyzed implementation examples imply adverse effect for SDG 10 and the equality within and beyond national borders. Furthermore, 75 percent of the AI deployments encompass challenges related to peace, justice and strong institution as described in SDG 16. Consequently, adverse effects related to those SDGs should be closely monitored to curb these effects and obviate their occurrence in the future.

On an individual level, the research results suggests that personal freedom, social trust, equity, and privacy concerns are indeed associated with technological implementations of artificial intelligence. The correspondence between the application of the technology and its consequences on human values and the affected SDGs identified previously are shown in Figure 15.

Figure 15

Heatmap of Unintended Consequences on Human Values and Affected SDGs



Note. Own illustration based on the findings and discussion of the 61 FT articles.

5. Conclusion

5.1. Summary and Synthesis of Findings

The societal debates concerning misuse, ethics, and the deterioration of privacy have cast a shadow over artificial intelligence that has become darker over time.

The public sector has been criticized for AI surveillance and other misuses causing privacy intrusions, unjust outcomes, and prevailing discrimination. Geopolitical tensions reignite or new dynamics evolve, not only through AI-powered weapons but also through the race to AI supremacy. The question remains whether the potential harm caused by hostile states when governments would stop competing and misusing AI for social harmony would trump the current societal implications of AI. With the race to the bottom in the private sector and the race to supremacy in the public sector, it becomes evident that AI holds such great power and transformative capability that they are willingly tolerating the negative impacts.

The reason malpractices occur in public and private sectors alike can be attributed to either non-existent regulation or completely inadequate legislation given the ever-changing state of technology and the absence of a harmonized global framework. Insofar, as reciprocal interference leads to data sharing and negligent research and design, it ought to be common sense that technology, especially concerning health, is designed with human values at its center and independently validated and tested before its deployment.

In order to prevent further erosion of social trust, private firms need to become more transparent regarding their utilization of AI and their balancing act between ethics and profits. To ultimately build AI systems for everyone, diversity in research and the incorporation of socio-economic is essential for the development process. The power that corporations hold influences our thinking and the way our society is structured. Managers ought to take these into account because with great power comes great responsibility alike.

While the world's nations are striving to accomplish the SDG and provide a more sustainable future for everyone, digital technologies have the ability to further aggravate the digital divide and leave already marginalized groups even further behind.

On the contrary, AI may also have positive impacts by creating jobs and supporting economic growth, and while "humans do not come equipped with an 'equity dial' designed to balance different conceptions of fairness across class, income, gender, ethnicity, disability or any other category. Algorithms do, if we choose to use it" (Harford, 2021, para. 8), they represent enormous potential for a more equitable future.

5.2. Implications for Research and Business Practice

This research clearly highlights the manifold and far-reaching consequences that technology has and is a call for action for governments, public and private sector managers alike. Society must, rather than being excluded and left to watch, be integrated into a common approach to shaping AI in a way that is well-thought and not harmful, neither for our planet nor for us. More reflection is needed to see the status quo of the technology: AI practices are bounded by discriminatory and negligent outcomes that can be traced back to the characteristics of our society. Artificial intelligence is neither a panacea nor a lethal poison, it is solely a mirror reflecting the prevailing circumstances of our world. The key implications for the business sector are threefold. To begin with, they should integrate human-centered values from the beginning, ensuring that both data and researchers reflect social diversity and repeatedly re-evaluate their inherent biases and the biases of the systems. Secondly, more transparency is key to stall the crumbling of societal trust and demonstrate that they practice what they preach in terms of company and research ethics. Lastly, firms need to decide with which government bodies they would cooperate with and if it is morally acceptable to sell technology or share data that are, inter alia, used for surveillance and detention.

From a research perspective, the scope of this thesis was limited to the technology of AI but investigated the consequences on all three levels, namely those of individuals, firms, and society. While this thesis constitutes an in-depth exploration of the respective consequences of AI, there are certainly more use cases which were left unexamined herein and require further exploration to holistically understand the magnitude of outcomes within the overall analytical context. Furthermore, an analysis across several industries and across different technologies may be of interest to gather detailed contextual insights and information about industry-specific or cross-industry effects and facilitate between the impacts of discrete technologies, respectively.

5.3. Limitations and Future Research Opportunities

Due to the selected methodology, limitations, in particular researcher bias and the subjectivity of newspaper articles, are also inherent to my work. Maguire and Delahunt (2017) refer to the biases of the researcher which serve as an instrument in conducting a thematic analysis. The related biases have been limited through data triangulation, namely articles by different authors with different backgrounds, and method triangulation through the different approaches in coding and coding schemes that were shaping the final thematic map. According to Yin (2003), newspaper articles are subject to reporting bias as the views of the authors are closely intertwined with the reporting topic and consequently influence the way of reporting, recognizing that articles are intentionally written for a particular reason.

This research reflects since it is based on FT articles and western scientific journals, a worldview that is highly influenced by perceptions from wealthier states. Exemplary here is the perception of the social credit system in China, which is widely accepted in China while seen as evil in the western hemisphere (Kostka, 2019). Therefore, it is important to acknowledge the potential limitations this information asymmetry imposes on the results, e.g., not including Chinese paper on AI (Chu, 2021). However, it remains impossible to include Chinese research papers due to the language barrier, even if this would be necessary and adequate as their number of papers and global share of AI paper citations is now larger than of any other country (Oikawa, A., & Shimono, 2021).

Furthermore, the effects gathered through the analysis of FT articles portray a relatively negative perception of the unanticipated consequences on all levels, mainly because firms and governments alike would not name positive ones as unanticipated, rather they would argue that they have worked hard for achieving these outcomes, thus disguise their insufficiency in predicting such effects.

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Appendices

Appendix A – Overview of the 17 SDGs

Goal		Title	Description
1		No poverty	End poverty in all its forms everywhere
2		Zero hunger	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3		Good health and well-being	Ensure healthy lives and promote well-being for all at all ages
4		Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5		Gender equality	Achieve gender equality and empower all women and girls
6		Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
7		Affordable and clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
8		Decent work and economic growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9		Industry, innovation and infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10		Reduce inequality within and among countries	Reduce inequality within and among countries
11		Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient and sustainable
12		Responsible consumption and production	Ensure sustainable consumption and production patterns
13		Climate action	Take urgent action to combat climate change and its impacts
14		Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15		Life on land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16		Peace, justice and strong institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17		Partnership for the goals	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Note. Own illustration based on UN, n.d.-b.

Appendix B – List of the Selected 61 Financial Times Articles

	Author	Author Background	Title	Year	Link
1	Aggarwal, Ajay	Consultant Clinical Oncologist at Guy's & St Thomas' NHS Trust, and Associate Professor at the London School of Hygiene and Tropical Medicine and King's College London	Beware hype over AI-based healthcare in lower-income countries: Research is needed to better evaluate costly technology that may offer little value	2021	https://www.ft.com/content/f4dd834c-4835-4ee0-8737-ff98626fa010
2	Almirall, Esteve	Associate professor in the Department of Operations, Innovation and Data Sciences at Esade Business & Law School in Barcelona	Why AI is everywhere except your company: Uptake of artificial intelligence is slow, despite the hype. A professor explains	2022	https://www.ft.com/content/5b11f961-fe77-41b0-843c-fdb3b126dbc8
3	Balch, Oliver	Independent journalist and writer	Big data helps put numbers on sustainability: Investor demand for information is driving new accounting models	2021	https://www.ft.com/content/2a405cf6-9592-4de2-960b-4c3e5d0df030
4	Caldecott, Ben	Director of the Oxford Sustainable Finance Programme at the University of Oxford	Banks need to get ahead of climate change, or else: Real economy cannot meet sustainability goals without help from financial sector	2019	https://www.ft.com/content/189e4ba4-98cb-11e9-98b9-e38c177b152f
5	Colback, Lucs	FT Lex writer	The impact of AI on business and society: New technology can bring huge benefits to society but first we have to take away the fear	2020	https://www.ft.com/content/e082b01d-fbd6-4ea5-a0d2-05bc5ad7176c
6	Couldry, Nick; Mejias, Ulises Ali	Co-authors of 'The Costs of Connection: How Data Is Colonizing Human Life and Appropriating It for Capitalism' (Stanford University Press)	Big Tech's latest moves raise health privacy fears: Data about the most intimate details of our lives should not be exploited by corporations	2020	https://www.ft.com/content/01d4452c-03e2-4b44-bf78-b017e66775f1
7	Elder, Bryce	FT's UK equities reporter	Rule books alone cannot govern the rise of the robots: Attempts to regulate algorithmic trading strategies should be a salutary lesson for the autonomous car lobby	2022	https://www.ft.com/content/973efb17-6b8b-420e-a89d-dbddee06adf4
8	Fleming, Jeremy	Director of GCHQ, the UK's Intelligence, Cyber and Security Agency	We have a chance to build a consensus on AI rules and norms	2021	https://www.ft.com/content/c05e1d70-63c2-4868-946c-f8b613a0dd77
9	Foroohar, Rana	FT Global Business Columnist and an Associate Editor	Companies are the cops in our modern-day dystopia: The private sector is being pulled more deeply into the business of crime fighting	2018	https://www.ft.com/content/279f4d80-5f77-11e8-ad91-e01af256df68

10	Foster, Peter; Barker, Alex; Parker, George	FT Public Policy Editor; Global Media editor; Political Editor	Tech platforms could face duty of impartiality in new UK online law: Some conservatives fear 'algorithmic bias' is censoring non liberal views on social media	2020	https://www.ft.com/content/8b93c8d4-7b6c-4158-bfad-0d4a2e2fdfd2
11	Green, Miranda	FT UK and world news editor	Opinion today - A data dystopia: Private sector companies are being pulled into the process of crime fighting and intelligence gathering	2018	https://www.ft.com/content/62d6d206-6233-11e8-a39d-4df188287fff
12	Harford, Tim	Undercover Economist column, and previous economics leader writer for the FT	Algorithms could guide life-changing decisions. But they need work: Many algorithms have been trained on data from a racist, sexist world, and it shows	2021	https://www.ft.com/content/1d999de2-7497-42c3-b8dc-a8306efc1047
13	Imeson, Michael	Senior Content Editor at Financial Times Live	G20 meets as the digital economy stirs debate on ethics	2019	https://www.ft.com/content/85015cfa-730a-11e9-bf5c-6eeb837566c5
14	Jack, Andrew	FT's global education editor	Pandemic-led healthcare advances raise ethical and political hurdles: Health tech has leapt ahead during the Covid era, but communities around the world are not benefiting equally	2022	https://www.ft.com/content/99f5e5e0-b169-48b0-b13f-0635897051f6
15	Jack, Andrew	FT global education editor	Covid crisis offers lessons in digital health and data responsibility: The pandemic has proved the potential of digital health but also shown we have much to learn about how to govern it	2022	https://www.ft.com/content/c2092e65-b639-4396-9e59-4d93e2e1e1d1
16	Jack, Andrew	FT global education editor	AI set to transform healthcare in world's poorer regions: Concerns remain over lack of regulation, governance and equity	2020	https://www.ft.com/content/cdc166d4-6845-11ea-a6ac-9122541af204
17	Kickbusch, Ilona; Agrawal, Anurag	Co-chairs of the Lancet & Financial Times Commission on Governing Health Futures 2030	Ungoverned digital advances undermine global healthcare gains: Too much is at stake for the future of health and wellbeing to leave digital transformations unregulated	2021	https://www.ft.com/content/a3095835-2416-4235-967b-7986d1678601
18	Lee, David	FT correspondent	Big Tech jockeys for position in scramble for health data primacy: As medics strive to harness health information, Silicon Valley is stepping in with tools, though regulation is a concern	2022	https://www.ft.com/content/aaf800be-53ec-4360-8f06-1a60ce6cf3a3
19	McGee, Patrick	FT correspondent	Google places engineer on leave after he claims group's chatbot is 'sentient': Blake Lemoine ignites social media debate over advances in artificial intelligence	2022	https://www.ft.com/content/bedd75a8-3068-49f0-b5bc-e691b28a1d1b
20	Montagnon, Peter	Associate at the Institute of Business Ethics	A tech challenge? Fear not, many AI issues boil down to ethics	2019	https://www.ft.com/content/a7073e7c-7a95-3022-a235-035d5e8fa614

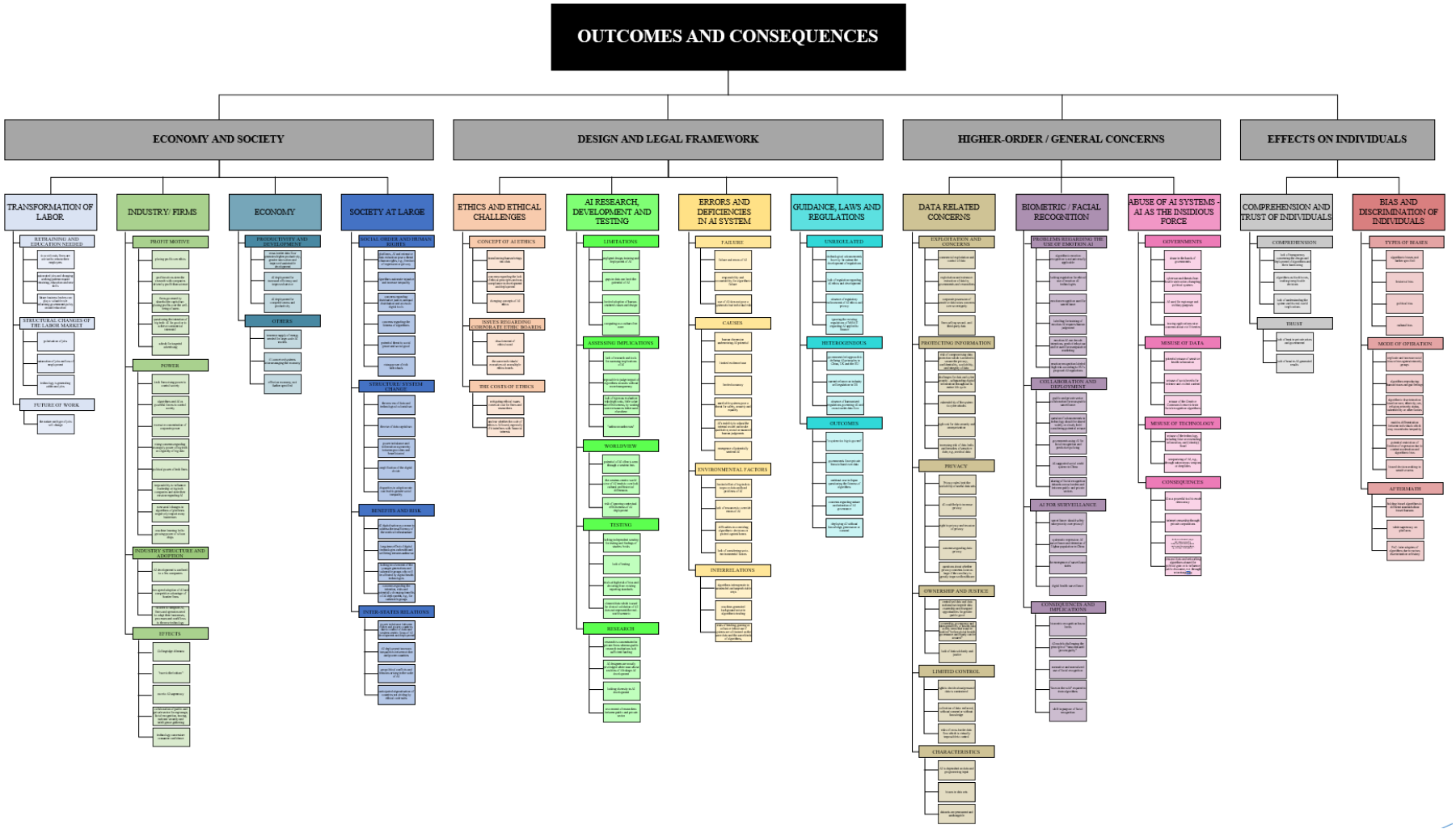
21	Murgia, Madhumita	FT correspondent	Inside DeepMind as the lines with Google blur: Relationship between British AI firm and US giant shifts	2018	https://www.ft.com/content/c26893d0-e9b0-11e8-a34c-663b3f553b35
22	Murgia, Madhumita	FT correspondent	DeepMind invents AI tool to write novel computer code: AlphaCode system created by UK-based Google unit rivals human contestants in coding competitions	2022	https://www.ft.com/content/65477c33-cb72-418d-b03d-b60cfc5a8b5d
23	Murgia, Madhumita	FT correspondent	Who's using your face? The ugly truth about facial recognition	2019	https://www.ft.com/content/cf19b956-60a2-11e9-b285-3acd5d43599e
24	Murgia, Madhumita	FT correspondent	How smartphones are transforming healthcare: Powerful new apps are turning our phones into mobile medical clinics. Could this help solve the issue of rising healthcare costs?	2017	https://www.ft.com/content/1efb95ba-d852-11e6-944b-e7eb37a6aa8e
25	Murgia, Madhumita	FT correspondent	The Franciscan monk helping the Vatican take on and tame AI: Father Paolo Benanti has become one of the Pope's chief advisers on the potential harms of new tech	2022	https://www.ft.com/content/1fa17d8b-5902-4aff-a69d-419b96722c83
26	Murgia, Madhumita	FT correspondent	Eric Schmidt creates $125mn fund for 'hard problems' in AI research: Former Google chief wants latest philanthropic project to solve difficult tech issues such as bias, harm and geopolitical conflict	2022	https://www.ft.com/content/68a4ba34-9785-411c-b7f6-3a9ae2f37cd6
27	Murgia, Madhumita	FT correspondent	Emotion recognition: Can AI detect human feelings from a face? The market for the technology is growing rapidly despite questions from scientists about whether it works	2021	https://www.ft.com/content/c0b03d1d-f72f-48a8-b342-b4a926109452
28	Murgia, Madhumita; Lee, Dave	FT correspondents	Airbnb pricing algorithm led to increased racial disparities, study finds	2021	https://www.ft.com/content/5b1471e0-ed4a-47f5-8f3f-0a1ee7f7999c?shareType=nongift
29	Murgia, Madhumita; Shrikanth, Siddarth	FT technology correspondent; Braking News Reporter	How Big Tech is struggling with the ethics of AI: Companies criticised for overruling and even dissolving ethics boards	2019	https://www.ft.com/content/a3328ce4-60ef-11e9-b285-3acd5d43599e
30	Murgia, Madhumita; Shrikanth, Siddarth	FT technology correspondent; Braking News Reporter	How governments are beginning to regulate AI: The first international accord on AI development comes as countries grapple with the future of governance of the technology	2019	https://www.ft.com/content/025315e8-7e4d-11e9-81d2-f785092ab560

31	Murphy, Hannah	FT correspondent	Facebook joins Silicon Valley's rush to appear responsible: The social media group took steps in 2019 to address concern over its impact but critics called its reforms cosmetic	2019	https://www.ft.com/content/eaa54780-1c7c-11ea-9186-7348c2f183af
32	Murray, Sarah	FT Contributor	Measuring what matters: the scramble to set standards for sustainable business	2021	https://www.ft.com/content/92915630-c110-4364-86ee-0f6f018cba90
33	FT Editorial Board	The editorial board	Why the world needs a Bill of Rights on AI: For the first time, decisions on humans are being made by machines	2021	https://www.ft.com/content/17ca620c-4d76-4a2f-829a-27d8552ce719
34	Nehville, Sarah	FT Global Health Editor	Value from health data creates dilemma for society: Questions over AI's potential in poorer countries also relevant to western healthcare systems	2019	https://www.ft.com/content/4b13402a-f65a-11e9-9ef3-eca8fc8f2d65
35	Nehville, Sarah	FT Global Health Editor	Are data trusts a suitable stewardship model for the developing world? How, and by whom, decisions are made over data sharing has come under heightened scrutiny	2022	https://www.ft.com/content/4283c38f-480e-4ec7-9a8c-453b09a2b5d5
36	Olcott, Eleanor	FT correspondent	China sets the pace in adoption of AI in healthcare technology: Concerns remain over privacy and security of mountain of healthcare data	2022	https://www.ft.com/content/c1fe6fbf-8a87-4328-9e75-816009a07a59
37	Palmer, Maija	FT Acting Deputy Editor, Special Reports	Cyber security: Darktrace's AI system acts fast against attacks on networks	2018	https://www.ft.com/content/f80a931e-39d7-11e8-8eee-e06bde01c544
38	Pop, Valentina	FT Europe Express editor	Facebook whistleblower to ramp up pressure over EU tech regulation: Big Tech's targeted advertising practice is back in the spotlight	2021	https://www.ft.com/content/24ba916c-9ce7-425b-8560-9d90b8d5b38e
39	Riding, Siobhan	FT Asset Management Reporter	Digital human rights are next frontier for fund groups	2019	https://www.ft.com/content/0866d79f-cd48-42d4-b21c-453f964d2fb0
40	Smith, Jess; Murgia, Madhumita; Speed, Madeleine; Smyth, Jamie	FT editor and correspondents	A new legal battleground in US abortion wars - UK advised to ban use of live facial recognition in public spaces	2022	https://www.ft.com/content/e2f112fb-83a6-417f-a570-01a86aa5016c
41	Susskind, Jamie	Author and Former Fellow at the Berkman Klein Center for Internet and Society at Harvard University	It's governments that need to protect free speech — not Elon Musk: Platforms know their systems better than anyone but that doesn't mean their moral and political choices should be outside the law	2022	https://www.ft.com/content/71ddcc40-1f7e-408f-9a22-d0e3614f9e67

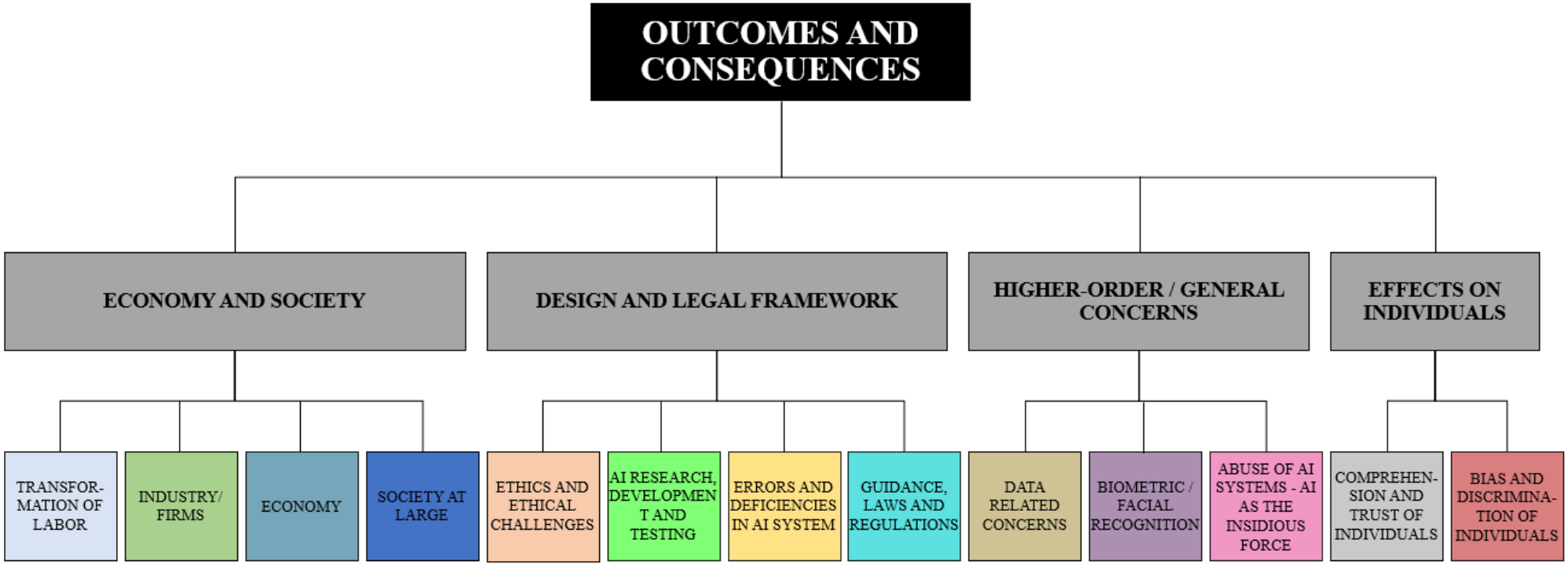
42	Tani, Shotaro; Sugiura, Eri	FT reporter	Japanese court ruling poised to make Big Tech open up on algorithms: Legal experts suggest case related to recommendations site Kakaku.com could have broader implications	2022	https://www.ft.com/content/f360f766-7865-4821-b740-ca0276efec19
43	Terazono, Emiko	FT correspondent	Big Meat facing up to the demands for sustainability: Consumers and investors are looking at the environmental damage the industry has done and calling for change	2021	https://www.ft.com/content/24a94fb9-3f20-453e-a014-50b250991eec
44	Terazono, Emiko	FT correspondent	Winemakers tackle climate change and labour shortages with tech: Digital apps, robots and GPS-fitted sniffer dogs are part of the new smart vineyard	2020	https://www.ft.com/content/52fcff0e-53db-11ea-8841-482eed0038b1
45	Tett, Giliaj	FT chair of the editorial board and editor-at-large, US	When algorithms reinforce inequality: Some people in LA lost access to shelter because a computer assumed that when they had been in prison, they had a home	2018	https://www.ft.com/content/fb583548-0b93-11e8-839d-41ca06376bf2
46	Tett, Gillian	FT chair of the editorial board and editor-at-large	Facial recognition: authoritarian intrusion or crime-fighting tool?	2020	https://www.ft.com/content/7e6131be-4298-11ea-abea-0c7a29cd66fe
47	Tett, Gillian; Nauman, Billy; Edgecliffe-Johnson, Andrew; Temple-West, Patrick	Chair of the editorial board and editor-at-large, US of the Financial Times; Reporter and producer for Moral Money; FT's US business editor; FT Governance Reporter	Moral Money: 20 things to watch in 2020	2020	https://www.ft.com/content/d52684e0-2c09-11ea-bc77-65e4aa615551
48	Thornhill, John	FT's Innovation Editor	Artificial intelligence runs wild while humans dither: Some algorithmic interactions hit a level of complexity beyond our comprehension	2017	https://www.ft.com/content/f2e62ee6-0014-11e7-8d8e-a5e3738f9ae4
49	Thornhill, John	FT's Innovation Editor	Beware the known unknowns when finance meets AI: Regulators face a dilemma in anticipating this new technology's obscure risks for financial systems	2021	https://www.ft.com/content/01c366db-e1b8-49ff-9952-ef40403991ee
50	Thornhill, John	FT's Innovation Editor	As AI develops, so does the debate over profits and ethics: The benefits of taking advantage of new technology still arguably outweigh the costs	2021	https://www.ft.com/content/d1990d60-082e-422c-9753-23ed395a58e4
51	Trister, Andrew	Deputy director of digital health and artificial intelligence at the Bill & Melinda Gates Foundation	How to bridge the digital divide in healthcare: With the right tools and governance, we can empower the communities that will benefit most from digital innovation	2022	https://www.ft.com/content/f2039cbf-c7fb-453a-8827-fb77a6ad8fdb

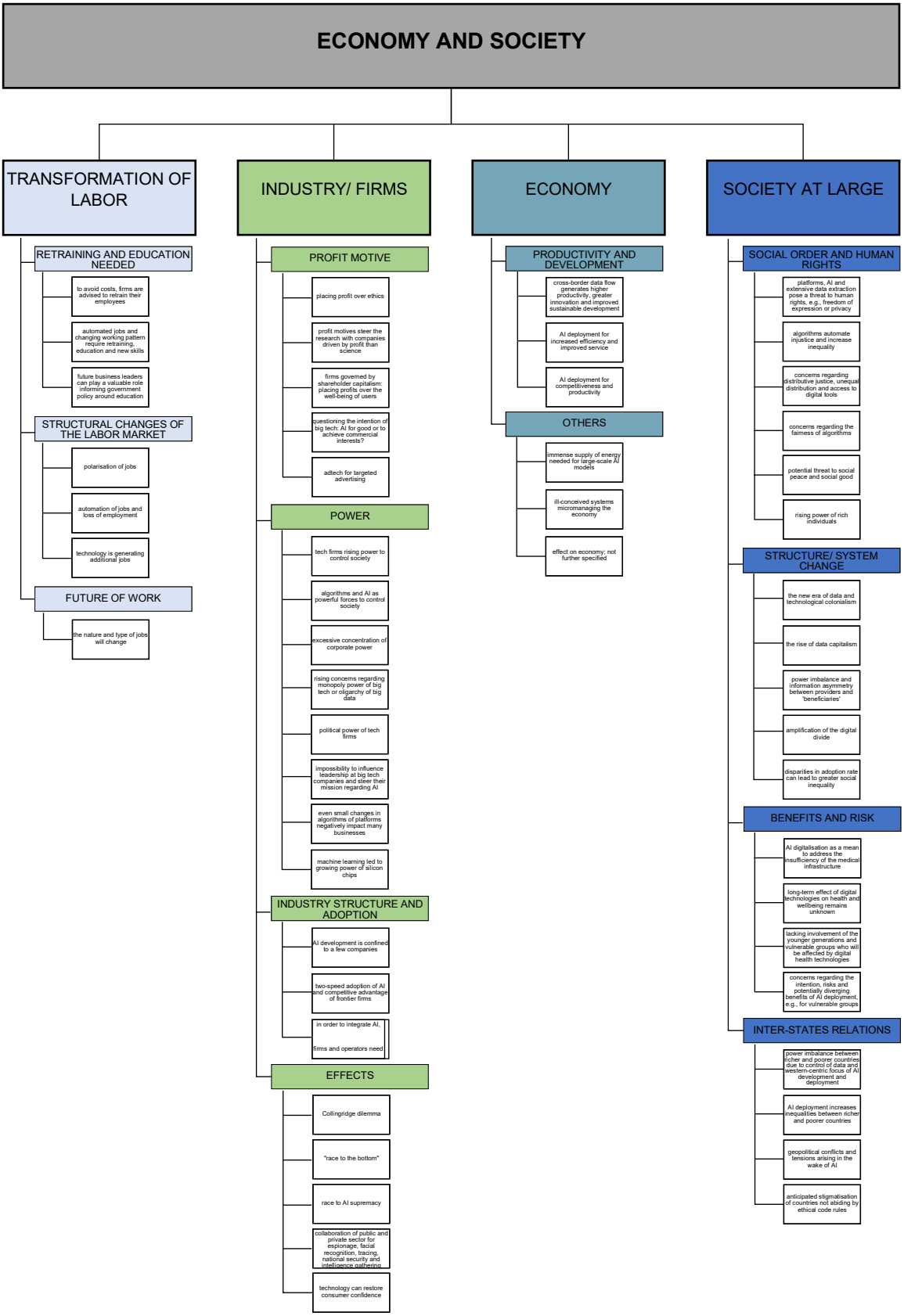
52	Venkatara-makrishnan, Siddharth	FT's banking and fintech correspondent	The flipside of the Al jobs revolution	2021	https://www.ft.com/content/874c418f-62f8-44ac-acb9-8c744a89dda5
53	Venkataramakrishnan, Siddharth	FT's banking and fintech correspondent	EU backs AI regulation while China and US favour technology: Race for innovation blunts efforts to safeguard basic rights	2019	https://www.ft.com/content/4fd088a4-021b-11e9-bf0f-53b8511afd73
54	Warell, Helen	FT Assistant Opinion Editor	UK intelligence urged to step up AI use to counter cyber threats	2020	https://www.ft.com/content/1bbeaf4e-db11-4a67-af9e-5b90dc988859
55	Warrell, Helen	FT Assistant opinion Editor	UK spy agency to use AI against cyber attacks and state actors	2021	https://www.ft.com/content/2b32d454-1cbe-48e7-a12c-fdc2069b6d5c
56	Warrell, Helen; Fildes, Nic	FT Assistant opinion Editor, FT correspondents	Amazon strikes deal with UK spy agencies to host top-secret material	2021	https://www.ft.com/content/74782def-1046-4ea5-b796-0802cfb90260
57	Waters, Richard	FT's west coast editor	Google and TikTok give Meta an AI lesson: Mark Zuckerberg's dreams come up against current reality	2022	https://www.ft.com/content/acfcf78f-fdfc-4c50-9ea1-14a8cf2e636e
58	Waters, Richard	FT's west coast editor	Human dimension presents new hurdles for AI in medicine (Accuracy is not enough — technologies with great promise fail to factor in real-world issues)	2020	https://www.ft.com/content/151dbf12-970d-49af-9d10-d417921f7066
59	Waters, Richard	FT's west coast editor	Critics raise alarm over Big Tech's most powerful tools (Artificial intelligence has been honed by new techniques of machine learning to maximum effect)	2021	https://www.ft.com/content/d9d505fe-d1f6-4a0d-9eae-c6b208f72cee
60	Yang, Yuan	FT's Europe-China correspondent	China's Tencent pitches vision of artificial intelligence ethics (Tech group says it is committed to privacy despite demands from Beijing for data access)	2019	https://www.ft.com/content/f92abc38-6bb8-11e9-80c7-60ee53e6681d
61	Yoshida, Tadanori	Nikkei Asia writer	Asia digs deep to upgrade its agriculture (Perfect storm of population growth and climate change spurs farming innovation)	2018	https://www.ft.com/content/3761b3d4-bfd2-11e6-9bca-2b93a6856354

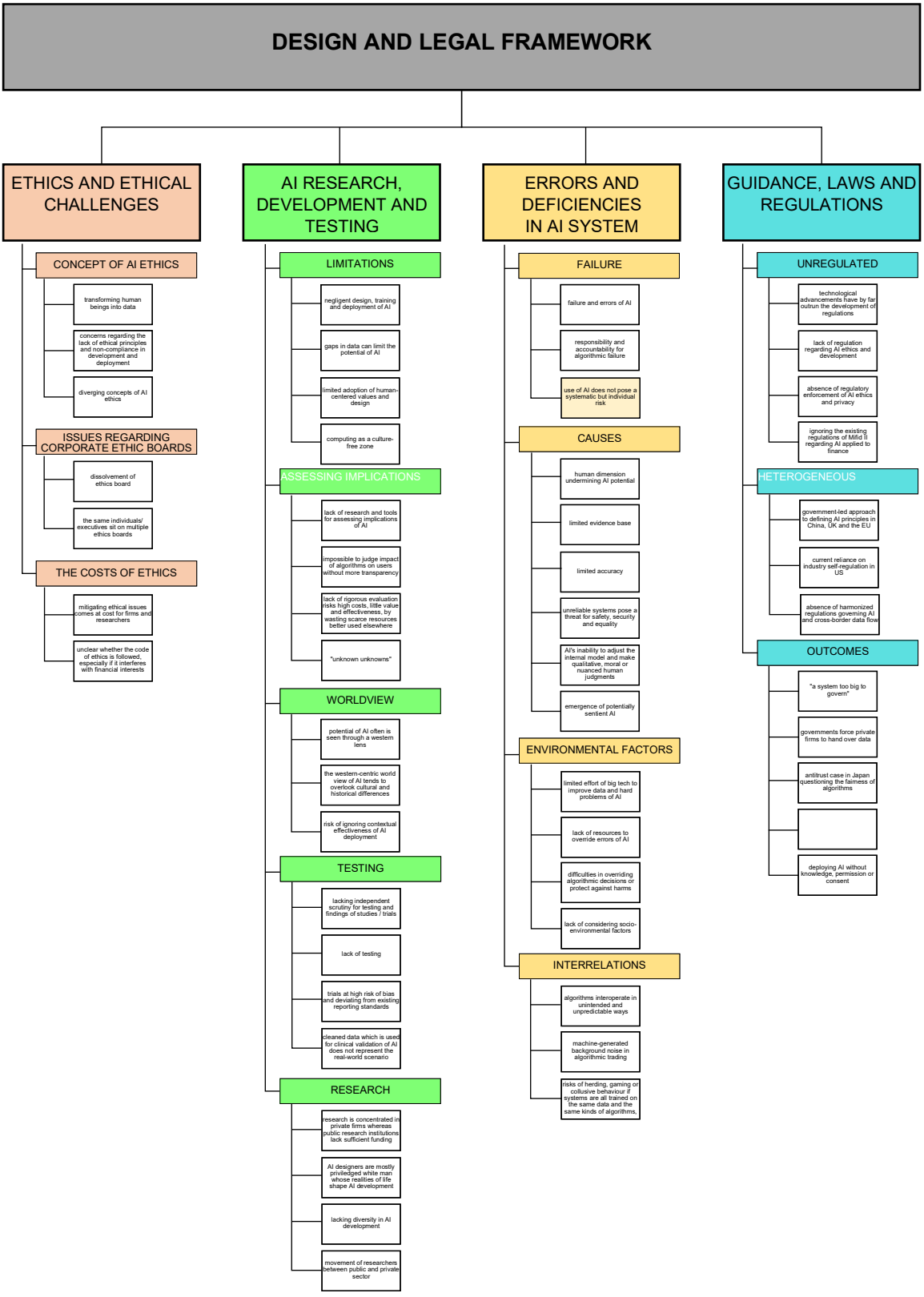
Appendix C – Thematic Map

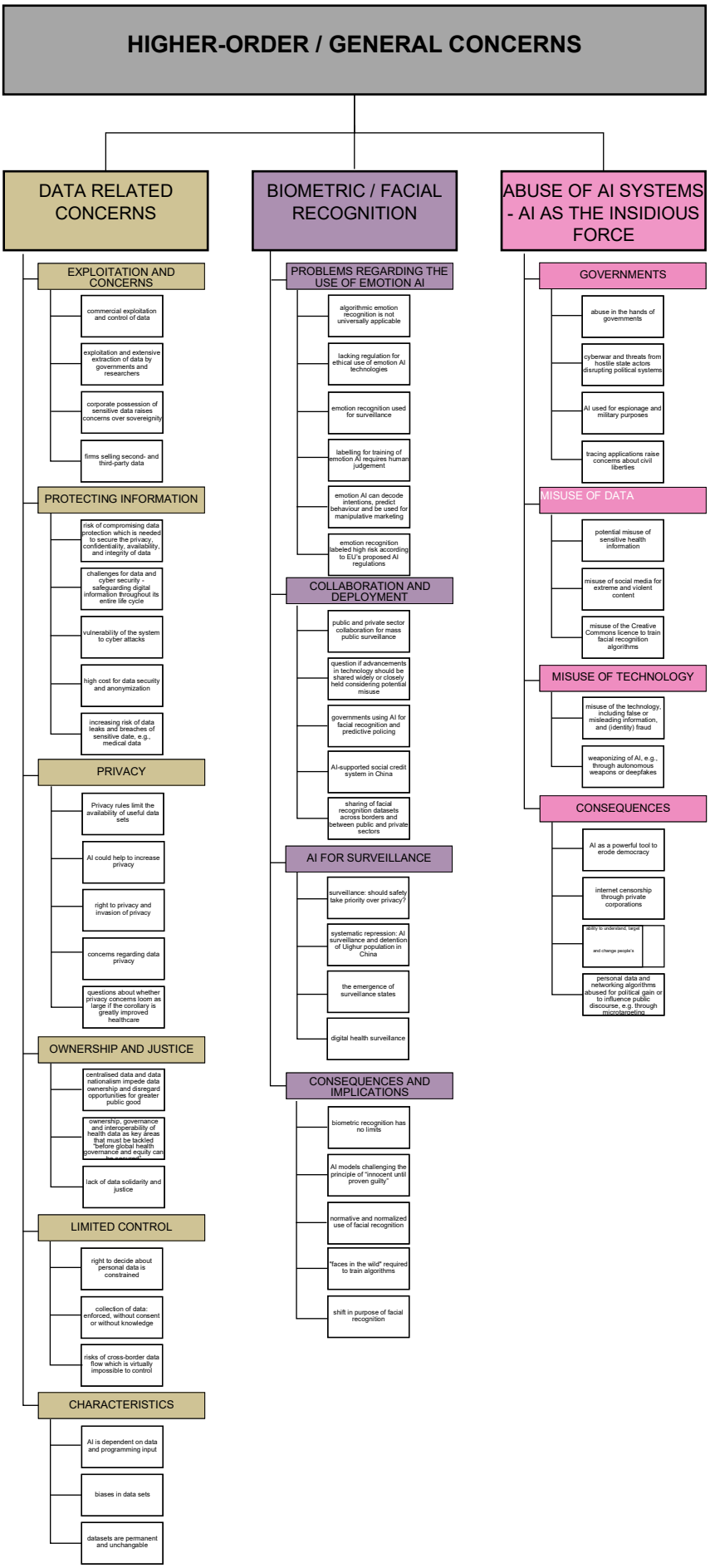

OUTCOMES AND CONSEQUENCES
ECONOMY AND SOCIETY
TRANSFORMATION OF LABOR
RETRAINING AND EDUCATION NEEDED
STRUCTURAL CHANGES OF THE LABOR MARKET
FUTURE OF WORK
INDUSTRY/ FIRMS
PROFIT MOTIVE
POWER
INDUSTRY STRUCTURE AND ADOPTION
EFFECTS
ECONOMY
PRODUCTIVITY AND DEVELOPMENT OF
OTHERS
SOCIETY AT LARGE
SOCIAL ORDER AND HUMAN RELATIONS
STRUCTURE/ SYSTEM CHANGES
BENEFITS AND RISK
INTER-STATE RELATIONS
DESIGN AND LEGAL FRAMEWORK
ETHICS AND ETHICAL CHALLENGES
CONCEPT OF AI ETHICS
ISSUES REGARDING CORPORATE ETHIC BOARDS
THE COSTS OF ETHICS
AI RESEARCH, DEVELOPMENT AND TESTING
LIMITATIONS
ASSESSING IMPLICATIONS
WORLDVIEW
TESTING
RESEARCH
ERRORS AND DEFICIENCIES IN AI SYSTEM
FAILURE
CAUSES
ENVIRONMENTAL FACTORS
INTERRELATIONS
GUIDANCE, LAWS AND REGULATIONS
UNREGULATED
HETEROGENEOUS
OUTCOMES
HIGHER-ORDER / GENERAL CONCERNS
DATA RELATED CONCERNS
EXPLOITATION AND CONCERNS
PROTECTING INFORMATION
PRIVACY
OWNERSHIP AND JUSTICE
LIMITED CONTROL
CHARACTERISTICS
BIOMETRIC / FACIAL RECOGNITION
PROBLEMS REGARDING THE USE OF EMOTION AI
COLLABORATION AND DEPLOYMENT
AI FOR SURVEILLANCE
CONTRADICTIONS AND IMPLICATIONS
ABUSE OF AI SYSTEMS - AI AS THE INSIDIOUS FORCE
GOVERNMENTS
MISUSE OF DATA
MISUSE OF TECHNOLOGY
CONSEQUENCES
EFFECTS ON INDIVIDUALS
COMPREHENSION AND TRUST OF INDIVIDUALS
COMPREHENSION
TRUST
BIAS AND DISCRIMINATION OF INDIVIDUALS
TYPES OF BIASES
MODE OF OPERATION
AFTERMATH

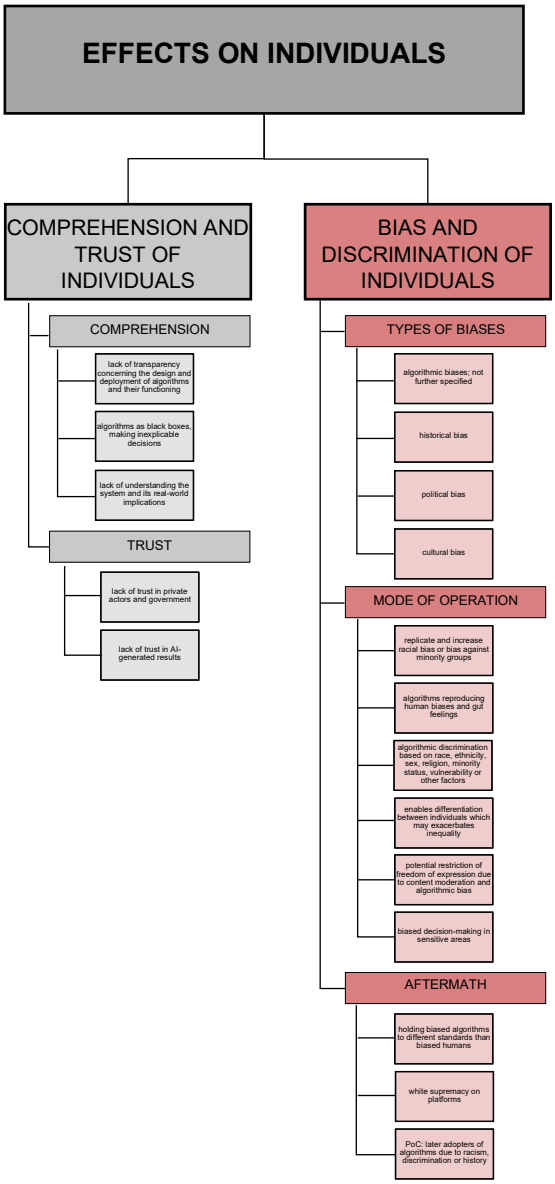
XXX


OUTCOMES AND CONSEQUENCES
ECONOMY AND SOCIETY
DESIGN AND LEGAL FRAMEWORK
HIGHER-ORDER / GENERAL CONCERNS
EFFECTS ON INDIVIDUALS
TRANSFOR-MATION OF LABOR
INDUSTRY/ FIRMS
ECONOMY
SOCIETY AT LARGE
ETHICS AND ETHICAL CHALLENGES
AI RESEARCH, DEVELOPMEN T AND TESTING
ERRORS AND DEFICIENCIES IN AI SYSTEM
GUIDANCE, LAWS AND REGULATIONS
DATA RELATED CONCERNS
BIOMETRIC / FACIAL RECOGNITION
ABUSE OF AI SYSTEMS - AI AS THE INSIDIOUS FORCE
COMPREHEN-SION AND TRUST OF INDIVIDUALS
BIAS AND DISCRIMINA-TION OF INDIVIDUALS


ECONOMY AND SOCIETY
TRANSFORMATION OF LABOR
INDUSTRY/ FIRMS
ECONOMY
SOCIETY AT LARGE
RETRAINING AND EDUCATION NEEDED
to avoid costs, firms are advised to retrain their employees
automated jobs and changing working pattern require retraining, education and new skills
future business leaders can play a valuable role informing government policy around education
STRUCTURAL CHANGES OF THE LABOR MARKET
polarisation of jobs
automation of jobs and loss of employment
technology is generating additional jobs
FUTURE OF WORK
the nature and type of jobs will change
PROFIT MOTIVE
placing profit over ethics
profit motives steer the research with companies driven by profit than science
firms governed by shareholder capitalism: placing profits over the well-being of users
questioning the intention of big tech: AI for good or to achieve commercial interests?
adtech for targeted advertising
POWER
tech firms rising power to control society
algorithms and AI as powerful forces to control society
excessive concentration of corporate power
rising concerns regarding monopoly power of big tech or oligarchy of big data
political power of tech firms
impossibility to influence leadership at big tech companies and steer their mission regarding AI
even small changes in algorithms of platforms negatively impact many businesses
machine learning led to growing power of silicon chips
INDUSTRY STRUCTURE AND ADOPTION
AI development is confined to a few companies
two-speed adoption of AI and competitive advantage of frontier firms
in order to integrate AI, firms and operators need
EFFECTS
Collingridge dilemma
"race to the bottom"
race to AI supremacy
collaboration of public and private sector for espionage, facial recognition, tracing, national security and intelligence gathering
technology can restore consumer confidence
PRODUCTIVITY AND DEVELOPMENT
cross-border data flow generates higher productivity, greater innovation and improved sustainable development
AI deployment for increased efficiency and improved service
AI deployment for competitiveness and productivity
OTHERS
immense supply of energy needed for large-scale AI models
ill-conceived systems micromanaging the economy
effect on economy; not further specified
SOCIAL ORDER AND HUMAN RIGHTS
platforms, AI and extensive data extraction pose a threat to human rights, e.g., freedom of expression or privacy
algorithms automate injustice and increase inequality
concerns regarding distributive justice, unequal distribution and access to digital tools
concerns regarding the fairness of algorithms
potential threat to social peace and social good
rising power of rich individuals
STRUCTURE/ SYSTEM CHANGE
the new era of data and technological colonialism
the rise of data capitalism
power imbalance and information asymmetry between providers and 'beneficiaries'
amplification of the digital divide
disparities in adoption rate can lead to greater social inequality
BENEFITS AND RISK
AI digitalisation as a mean to address the insufficiency of the medical infrastructure
long-term effect of digital technologies on health and wellbeing remains unknown
lacking involvement of the younger generations and vulnerable groups who will be affected by digital health technologies
concerns regarding the intention, risks and potentially diverging benefits of AI deployment, e.g., for vulnerable groups
INTER-STATES RELATIONS
power imbalance between richer and poorer countries due to control of data and western-centric focus of AI development and deployment
AI deployment increases inequalities between richer and poorer countries
geopolitical conflicts and tensions arising in the wake of AI
anticipated stigmatisation of countries not abiding by ethical code rules


DESIGN AND LEGAL FRAMEWORK
ETHICS AND ETHICAL CHALLENGES
CONCEPT OF AI ETHICS
transforming human beings into data
concerns regarding the lack of ethical principles and non-compliance in development and deployment
diverging concepts of AI ethics
ISSUES REGARDING CORPORATE ETHIC BOARDS
dissolvement of ethics board
the same individuals/ executives sit on multiple ethics boards
THE COSTS OF ETHICS
mitigating ethical issues comes at cost for firms and researchers
unclear whether the code of ethics is followed, especially if it interferes with financial interests
AI RESEARCH, DEVELOPMENT AND TESTING
LIMITATIONS
negligent design, training and deployment of AI
gaps in data can limit the potential of AI
limited adoption of human-centered values and design
computing as a culture-free zone
ASSESSING IMPLICATIONS
lack of research and tools for assessing implications of AI
impossible to judge impact of algorithms on users without more transparency
lack of rigorous evaluation risks high costs, little value and effectiveness, by wasting scarce resources better used elsewhere
"unknown unknowns"
WORLDVIEW
potential of AI often is seen through a western lens
the western-centric world view of AI tends to overlook cultural and historical differences
risk of ignoring contextual effectiveness of AI deployment
TESTING
lacking independent scrutiny for testing and findings of studies / trials
lack of testing
trials at high risk of bias and deviating from existing reporting standards
cleaned data which is used for clinical validation of AI does not represent the real-world scenario
RESEARCH
research is concentrated in private firms whereas public research institutions lack sufficient funding
AI designers are mostly privileged white man whose realities of life shape AI development
lacking diversity in AI development
movement of researchers between public and private sector
ERRORS AND DEFICIENCIES IN AI SYSTEM
FAILURE
failure and errors of AI
responsibility and accountability for algorithmic failure
use of AI does not pose a systematic but individual risk
CAUSES
human dimension undermining AI potential
limited evidence base
limited accuracy
unreliable systems pose a threat for safety, security and equality
AI's inability to adjust the internal model and make qualitative, moral or nuanced human judgments
emergence of potentially sentient AI
ENVIRONMENTAL FACTORS
limited effort of big tech to improve data and hard problems of AI
lack of resources to override errors of AI
difficulties in overriding algorithmic decisions or protect against harms
lack of considering socio-environmental factors
INTERRELATIONS
algorithms interoperate in unintended and unpredictable ways
machine-generated background noise in algorithmic trading
risks of herding, gaming or collusive behaviour if systems are all trained on the same data and the same kinds of algorithms.
GUIDANCE, LAWS AND REGULATIONS
UNREGULATED
technological advancements have by far outrun the development of regulations
lack of regulation regarding AI ethics and development
absence of regulatory enforcement of AI ethics and privacy
ignoring the existing regulations of MiFid II regarding AI applied to finance
HETEROGENEOUS
government-led approach to defining AI principles in China, UK and the EU
current reliance on industry self-regulation in US
absence of harmonized regulations governing AI and cross-border data flow
OUTCOMES
"a system too big to govern"
governments force private firms to hand over data
antitrust case in Japan questioning the fairness of algorithms
deploying AI without knowledge, permission or consent


HIGHER-ORDER / GENERAL CONCERNS
DATA RELATED CONCERNS
EXPLOITATION AND CONCERNS
commercial exploitation and control of data
exploitation and extensive extraction of data by governments and researchers
corporate possession of sensitive data raises concerns over sovereignity
firms selling second- and third-party data
PROTECTING INFORMATION
risk of compromising data protection which is needed to secure the privacy, confidentiality, availability, and integrity of data
challenges for data and cyber security - safeguarding digital information throughout its entire life cycle
vulnerability of the system to cyber attacks
high cost for data security and anonymization
increasing risk of data leaks and breaches of sensitive date, e.g., medical data
PRIVACY
Privacy rules limit the availability of useful data sets
AI could help to increase privacy
right to privacy and invasion of privacy
concerns regarding data privacy
questions about whether privacy concerns loom as large if the corollary is greatly improved healthcare
OWNERSHIP AND JUSTICE
centralised data and data nationalism impede data ownership and disregard opportunities for greater public good
ownership, governance and interoperability of health data as key areas that must be tackled "before global health governance and equity can be realized"
lack of data solidarity and justice
LIMITED CONTROL
right to decide about personal data is constrained
collection of data: enforced, without consent or without knowledge
risks of cross-border data flow which is virtually impossible to control
CHARACTERISTICS
AI is dependent on data and programming input
biases in data sets
datasets are permanent and unchangable
BIOMETRIC / FACIAL RECOGNITION
PROBLEMS REGARDING THE USE OF EMOTION AI
algorithmic emotion recognition is not universally applicable
lacking regulation for ethical use of emotion AI technologies
emotion recognition used for surveillance
labelling for training of emotion AI requires human judgement
emotion AI can decode intentions, predict behaviour and be used for manipulative marketing
emotion recognition labeled high risk according to EU's proposed AI regulations
COLLABORATION AND DEPLOYMENT
public and private sector collaboration for mass public surveillance
question if advancements in technology should be shared widely or closely held considering potential misuse
governments using AI for facial recognition and predictive policing
AI-supported social credit system in China
sharing of facial recognition datasets across borders and between public and private sectors
AI FOR SURVEILLANCE
surveillance: should safety take priority over privacy?
systematic repression: AI surveillance and detention of Uighur population in China
the emergence of surveillance states
digital health surveillance
CONSEQUENCES AND IMPLICATIONS
biometric recognition has no limits
AI models challenging the principle of "innocent until proven guilty"
normative and normalized use of facial recognition
"faces in the wild" required to train algorithms
shift in purpose of facial recognition
ABUSE OF AI SYSTEMS - AI AS THE INSIDIOUS FORCE
GOVERNMENTS
abuse in the hands of governments
cyberwar and threats from hostile state actors disrupting political systems
AI used for espionage and military purposes
tracing applications raise concerns about civil liberties
MISUSE OF DATA
potential misuse of sensitive health information
misuse of social media for extreme and violent content
misuse of the Creative Commons licence to train facial recognition algorithms
MISUSE OF TECHNOLOGY
misuse of the technology, including false or misleading information, and (identity) fraud
weaponizing of AI, e.g., through autonomous weapons or deepfakes
CONSEQUENCES
AI as a powerful tool to erode democracy
internet censorship through private corporations
ability to understand, target and change people's
personal data and networking algorithms abused for political gain or to influence public discourse, e.g. through microtargeting



Note. Own illustration and thematic analysis based on the selected 61 FT articles.

Appendix D – AI Use Cases

AI Classi-fication	Sector	Example	Intended Outcome	Unintended Consequences	SDG(s) affected
Limited memory	Health	AI enabled diagnoses remote via app or systems in hospitals	Address the insufficiency of the medical infrastructure (Olcott, 2022)	▪ Workflows need to be adapted or prolonged, technological integration constitutes a potential burden for practitioners and their responsibilities (Waters, 2020) ▪ Long-term effects of digital technologies on society's well-being and health remain unknown ▪ Challenging intergenerational equity – younger generation not involved ▪ Reliability and safety; Big Tech is less regulated than pharma industry ▪ Lack of considering socio-environmental factors can lead to errors in system, in worst case ends with death ▪ Unknown unknowns ▪ A new form of technological colonialism (Aggarwal, 2021) ▪ Decreasing social trust (Trister, 2022).	
Limited memory	Health	UK, India, Singapore, Russia, and China have deployed technology that enabled them to trace their citizen and pass information to judicial prosecution agencies (Jack, 2022A, 2022B)	Public health data sharing during the pandemic to control dissemination	▪ Risking that minorities and vulnerable groups are exposed to even more discrimination (Kichbusch & Agrawal, 2021) ▪ Restriction of civil liberties ▪ Data as a sensitive, valuable and sought-after asset which can be sold, e.g., for abuse (Jack, 2022b; Pop, 2021)	

Limited memory	Public Sector / Defense	AI Deployment for National Intelligence	Ensure a country's national security	▪ "AI gives unscrupulous governments new capabilities to snoop on, control, and potentially coerce their citizens" (FT Editorial Board, 2021, para. 7) ▪ communities suffer the consequences of geopolitical tension, cyber-war, and inter-state conflicts ((Murgia, 2022b; Venkataramakrishnan, 2019; Warell, 2020)	
Limited memory	Public Sector	AI-Enabled Social Credit System	Ensuring the functioning of society by eliminating undesirable behavior	▪ Systems that tend to be unreliable and prone to biases (Murgia, 2021), errors of AI can have enormous consequences for individuals, especially their social status and reputation within society ▪ Technology limits personal freedom and rights, inter alia, freedom of expression and the right to self-determination	
Limited memory	Tech-nology	AI Facial Recognition	China: identification of Uighurs, predictive policing and, detention (e.g., Tett, 2020). US: mass surveillance and predicting where crime might happen (Foroohar, 2018)	▪ Mass surveillance and oppression represent a burden on physical and psychological health ▪ Limitation of freedom of movement ▪ Intrusion into their privacy ▪ Social segregation, racial bias, and increased inequality ▪ Challenge the presumption of innocence since the systems would monitor individuals with no previous criminal record ▪ Decisions are commonly understood as particularly hard to reverse (Tett, 2020) ▪ Private firms becoming police (Foroohar, 2018)	

Limited memory	Nopt speci-fied	In Colorado, researchers have legally captured the faces of 1,700 students on different days without their knowledge or even permission (Murgia, 2019); data set was shared cross-border	Generating facial data sets that are required to train AI and sharing them across sectors	▪ Invasion of privacy – but legally allowed ▪ Dataset can also be misused in a way to train harmful surveillance technology ▪ Information asymmetry exacerbates existing inequalities (Montagnon, 2019) ▪ "Cross-border data flow presents problems on privacy, data protection, intellectual property rights and security" (Imeson, 2019, para. 4)	
Limited memory	Public Sector	AI Decision-Making in Public Welfare Services	Faster and more efficient decision-making	▪ Biases and errors in AI decisions amplify injustice ▪ Inability of lower-income individuals to recognize biased decision or contest them ▪ Absence of mechanisms to reverse or override false decisions (Tett, 2018)	
Reactive	Social media	AI Deployment on Social Platforms	Maximize the users' time on social media platform	▪ Potentially negative influence on the health and well-being of individuals ▪ AI responsible for political and emotional polarization in society (Waters, 2021) ▪ For firms, the developments might entail greater regulation of the industry as opposed to the self-regulation practiced in the U.S. (Murgia & Shrikanth, 2019a) ▪ Censorship of content limits free speach