



Ethics Versus Technological Advancements: Partners in Crime

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Abstract

In this book chapter, we delve into the pivotal role of ethics in driving technological progress, with a specific focus on the case of Merck, a leading science and technology company. We present a philosophical perspective on the value-ladenness of technology, emphasizing that technological advancements are not value-neutral but are imbued with ethical considerations. Our framework underscores the interplay between ethics and technology as partners in driving responsible innovation.

The thoughts described in the chapters are the view of the authors, not necessarily the respective companies.

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Furthermore, we examine the operationalization of ethics within Merck, highlighting the establishment of the Merck Ethics Advisory Panel for Science and Technology, the Digital Ethics Advisory Panel, the Code of Digital Ethics, and the Principles-at-Risk Analysis. These initiatives demonstrate how ethics is embedded into the organizational structure and operationalized, guiding the development of responsible and value-driven technology.

In addition, we explore specific case studies within Merck, including the ethical considerations in the development and deployment of generative AI, the handling of patient data in data-based business models, and the ethical implications of embryo-like models. We elucidate how Merck has actively addressed ethical concerns in these areas, integrating ethical frameworks and practices to navigate the complexities of technological innovation while upholding ethical principles.

In conclusion, we underscore the significance of prioritizing ethics in driving technological advancements, using Merck as a compelling example of how ethical considerations enrich innovation. By integrating ethics into the organizational structure, companies can navigate the complexities of technological innovation while upholding ethical principles, benefiting individuals and society as a whole.

Keywords

Responsible innovation · Ethical principle frameworks · Operationalization of ethics principles · Digital ethics · Bioethics · Generative AI · AI governance
Data-based business models · Embryo-like models

1 Introduction

Advancements in science and technology have resulted in the continuous transformation of various aspects of society, including our daily lives, healthcare systems, and businesses (Floridi, 2014). While these advancements clearly bring numerous opportunities, they also raise important ethical questions and challenges that are currently discussed in the academic field of digital ethics (Floridi, 2019; Morley et al., 2021; Becker et al., 2022).

At the same time, many of the organizations driving or utilizing technological advancements have realized the need for a systematic approach to addressing the ethical challenges that emerge from novel technologies. Especially in practical and business contexts, the principles and frameworks of digital ethics thus do not only serve the epistemic function of identifying ethical challenges and issues. In addition, they also provide a foundation for individuals, organizations, and policymakers to make informed decisions and enact policies that actively shape our digital future (Floridi et al., 2018; Jobin et al., 2019; Fjeld et al., 2020; Hagendorff, 2020).

However, while the role of ethics as actively shaping the development and deployment of technologies has gained significant attention with the advent of digital technologies and especially artificial intelligence, a similar discourse has been ongoing among bioethicists for decades—predating the rise of AI (Childress &

Beauchamp, 1978; Beauchamp, 1982). In the field of bioethics, ethical considerations have been crucial in guiding advancements in medical research, genetic engineering, and biotechnology. Similar to the way AI and technological advancements prompt debates about privacy, prejudice, and effects on human welfare, bioethics has delved into considerations like patient independence, informed agreement, and the judicious utilization of medical innovations.

Ethics has thus long been an essential partner for shaping scientific and technological advancements. In this chapter, we want to explore the convergence between technology, digital ethics, and bioethics both from a theoretical and a practical perspective. We will start by explaining and defending the idea that technology is *not* morally neutral—an idea that runs contrary to the often-voiced claim and intuitive idea that since technology is *inherently* neither good nor bad, it is the *use* of technology that should be the focus of normative assessment, and not the technology itself (cf. Miller, 2021; Floridi, 2023; Heyndels, 2023). Based on the idea of the inherent value-ladenness of technology, we will then illustrate that just as “technology drives ethics” (Müller, 2022), simultaneously, ethics drives technology.

Subsequently, we will then explore how ethics drives technology in a practical context. The multinational science and technology company Merck KGaA (henceforth: Merck), has long recognized the significance of partnering bioethics and digital ethics with technology for boosting innovation and guiding technological advancements in fruitful ways. To this end, Merck has established robust frameworks and practices that permeate various aspects of its operations, from research and development to product commercialization. We outline Merck’s journey from its initial focus on bioethics to its engagement with the field of digital ethics and highlight how Merck’s recognition of the importance of ethics and subsequent successful operationalization has shaped its approach to technological advancements. Finally, we present current ethical challenges at the intersection of bioethics and digital ethics and explain how Merck’s comprehensive ethical framework boosts innovation while ensuring responsible technology development and use.

2 Is Technology Value-Neutral?

What is the role of ethics in technology? Is technology morally neutral or are technological advancements inherently value-laden? In non-academic discourse (see in Heyndels, 2023) and especially in debates around emerging technology legislation (see in Floridi 2023), one regularly encounters the claim that technology itself is value-neutral or morally neutral—a claim the academic literature refers to as the Value Neutrality Thesis (VNT).¹ Simply put, proponents of the VNT argue that

¹A related, albeit not immediately relevant debate concerns the role of values in scientific and technological practice more broadly. While that debate concerns the question in which sense scientific practice can or cannot be seen as a value-neutral endeavor, we are here concerned with the question whether technology and technological advancements *themselves* can be seen as value-neutral or inherently value-laden.

technology *itself* is neither good nor bad, but that it is the way in which the technology is *used* or the context in which it is *deployed* that is of normative significance (cf. Heyndels, 2023; Floridi, 2023). For example, one could claim that technologies such as specific artificial intelligence systems aren't inherently good or bad due to the way they are built or designed, but that these systems can instead be used in both malicious and beneficial ways. For instance, on one end of the spectrum, these systems can be leveraged maliciously—like using AI for the dissemination of misinformation, leading to social discord and mistrust. Conversely, on the positive end of the spectrum, the same systems can be harnessed to effectuate positive change, such as improving healthcare diagnostics. This can lead to early detection of diseases and better patient outcomes, showcasing the potential benefits of these technologies. This dichotomous potential illustrates the argument for technology's moral neutrality focusing on the context of deployment instead of the technology itself.

However, the VNT is not very widely accepted among academics and philosophers of technology (cf. Miller, 2021; Heyndels, 2023), a notable exception being Pitt (2000, 2014). Instead, it is mostly claimed that technology is inherently value-laden. From this perspective, it is not merely the context of deployment that is normatively significant, but technologies themselves—independently of the concrete way in which they can be used—can embed positive or negative values. We will delve deeper into the specifics of this position shortly. Let us first briefly highlight the practical relevance of this debate.

First, under the umbrella of value neutrality, the primary role of ethics in technology is to provide a lens or perspective for identifying ethically appropriate and inappropriate uses of technology. However, from this perspective, ethics does not necessarily play a crucial role in actively shaping technologies themselves. Ethics merely provides a framework for evaluating the moral implications of different technologies in deployment, and thus serves as a tool to examine the potential impacts of technology on individuals, society, and the environment, helping to identify and mitigate potential harms that arise from the way in which technology is used.

Second, and relatedly, as Heyndels (2023) has also argued, the VNT can be used by developers of technologies to reject responsibility for the ethical issues and questions that arise with technological advancements. If technological advancements themselves are value-neutral, it is entirely within the responsibility of those deploying the technology to ensure that it is used in morally sound ways, but ethical considerations do not need to be part of the prior research and development phase. If, on the contrary, we accept the idea that technology is not value-neutral but already encompasses ethical considerations in its very design and development, explicitly addressing this normative dimension becomes a responsibility that cannot be delegated to the downstream deployment phase.

However, as mentioned before, the value neutrality thesis is widely rejected in academic discourse. On the contrary, it is becoming increasingly clear that ethics must play an active and crucial role in influencing not just the ultimate deployment of technology, but the design and development of technology itself (see, for example, approaches to value-sensitive design such as Brey & Dainow, 2023; Umbrello

& Van de Poel, 2021). Ethical considerations can push technology developers to incorporate safeguards and ethical principles directly into the design process, ensuring that technologies are aligned with societal values and do not perpetuate or amplify existing social inequalities or injustices.

But in which sense should we understand the idea that technology is not value-neutral? How can technological artifacts or advancements inherently carry ethical values? Floridi (2023) has recently provided an illuminating framework for understanding the value-ladenness of technology. He argues that even in cases where some technology appears to be value-neutral, we should instead think of it as “value double charged” (ibid.). In other words, he argues that instead of being neutral in the sense that technology is value-free, it is best to consider technology as inherently laden with *both* positive and negative values—thus leading to the impression of value neutrality.

To illustrate this very idea, we can apply Floridi’s framework to social media platforms. On the one hand, in terms of benefits, these platforms enable efficient communication, as well as facilitate community networking and dissemination of varied ideas, supporting global social movements. They are also beneficial for forming supportive groups, sharing educational resources, and aiding in professional networking, marking the presence of positive “value vectors.”

On the other hand, however, these platforms can exhibit a negative side. They can serve as channels for spreading misinformation, intensifying polarization, promoting addictive behaviors, and potentially compromising user privacy. Along with these negative aspects, the potential for cyberbullying, the distribution of hate speech, and cases of exploitation designate the existence of negative “value vectors.”

Drawing upon these considerations, it may appear to some observers that because the perceived positive and negative “value vectors” of social media platforms seem to counterbalance each other, these technologies should be considered as neutral. However, when understood through Floridi’s concept of technology being value double charged, it highlights the inherent complexities associated with such technologies.

Now, it is crucial to clarify that this example is not centered merely on the *use* of social media platforms. Rather, it focuses on the underlying architectural design of the platforms as well as the embedded algorithms that drive these systems. The *design* of these platforms and their algorithms inherently carry values that are built into them and therefore influence user behavior. For instance, these algorithms often prioritize sensational or polarizing content to keep users engaged, leading to an increase in misinformation or extreme views. On the positive side, algorithmic design can also connect individuals with shared interests, leading to support networks and fostering community building. Therefore, the “value vectors” embedded within these technologies are integral components of their design and operational algorithms, rather than simply being by-products of their use.

With the above elucidation, we have shed light on Floridi’s framework for understanding the value ladenness of technology. However, it does not directly make a case for why we should endorse this understanding. However, an argument recently provided by Heyndels (2023) presents a compelling reason for adopting this

viewpoint. Essentially, Heyndels argues that technological artifacts or systems extend beyond being a mere collection of physical entities: They are specially crafted entities, designed with distinct functionalities. Therefore, to have a comprehensive understanding of these constructs, we need to focus not merely on physical attributes, but also consider their *purpose* and the *intent* behind their creation. These elements of function and intention encompass far more than just the physical constituents of the technology. This argument supports Floridi's framework by underscoring that technology inherently holds both positive and negative implications, a feature intrinsic to their design and function, extending beyond a traditionally understood physicalistic perspective. Thus, this provides a rational argument that supports the adoption of the concept of technology being inherently value double charged.

To explain Heyndels' argument in a bit more detail, it is useful to briefly introduce the position of Pitt (2000, 2014), who is one of the few explicit defenders of the VNT. Pitt's argument primarily states that for technology to embody significant values, these values must be *empirically identifiable* within the artifacts. However, values aren't empirically identifiable from technological artifacts. Therefore, he concludes that technological artifacts do not embody any values. According to Pitt's argument, values are not empirically identifiable from technological artifacts due to their inherently abstract nature. That is, values are a type of concept or principle that we ascribe meaning to base on social, cultural, and individual perspectives. However, they do not have a physical manifestation that can be measured or quantified in the same way a technological artifact or technological system can be.

Against this foil, we can understand Heyndels (2023) perspective as a challenge to the notion that values are not empirically identifiable within technology. Instead, he argues that technological systems are more than mere assemblages of physical entities: They represent specially engineered entities, designed with distinct functionalities and for specific purposes. In other words, Heyndels proposes a shift of perspective: instead of thinking about technology from a pure physicalist or materialist perspective, we should also consider the underlying values that inform its design and purpose. This suggests that values can be embedded within technology, shaping its capabilities and effects on individuals and society. By recognizing this, Heyndels provides a compelling reason for accepting that technology is not value-neutral and instead calls for a more nuanced understanding of how values can be intertwined with technological development.

3 The Role of Ethics in Technology

Given the perspective developed above, how should we then think about the role of ethics in technology? Clearly, when viewed through the lens of technology's value-ladenness, the ethical considerations attached to the evolution of technology span far beyond the confines of merely identifying suitable or unsuitable use case contexts. Instead, it becomes clear that the role of ethics is integral and consistent throughout every phase of the technological lifecycle, with ethical considerations

being a significant determinant from inception to deployment. They are not merely auxiliary “afterthoughts” appended to the technological discourse upon the technology’s deployment.

A key insight we would like to draw from these considerations is that while technology can indeed be constructed without *active* ethical deliberation, it is an impossibility to create technologically advanced tools that are morally neutral. Every technological breakthrough inherently embodies the values and objectives that the scientists, researchers, and developers embedded into them—whether consciously or unconsciously.

This highlights the indispensable role that digital ethics and bioethics play in the realm of technological development. Bioethics offers a structured approach to assessing the moral implications of progress in life sciences and biotechnology. It can direct ethical decision-making processes in diverse areas, including genetic engineering, stem cell research, and lately, the formulation of embryo-like models. The integration of bioethics into the developmental process can assure that ethical considerations receive due thought, thus facilitating the prevention or mitigation of potential ethical stumbling blocks.

Similarly, digital ethics has emerged as a crucial discipline in the age of rapid digital transformation. It examines the moral dimensions of technology use and development, focusing on issues such as data privacy, algorithmic bias, and social implications of emerging technologies. Digital ethics originated as a field based on computer and information ethics during the late Twentieth Century (Moor, 1985; Bynum, 2019; Floridi, 2013) as well as the more specific fields of data ethics (Floridi & Taddeo, 2016) and the ethics of artificial intelligence and automated decision-making systems (Hagendorff, 2020; Mökander et al., 2021). It encompasses issues like privacy and surveillance (Mittelstadt & Floridi, 2016), ethical challenges brought about by the proliferation of data and advancements in algorithms, but also challenges regarding bias, transparency, and accountability surrounding the development and operation of algorithms (Rochel & Évéquoz, 2021; Mittelstadt et al., 2016).

Integrating bioethics and digital ethics into the fabric of technology development and decision-making processes thus allows to foster of responsible innovation. It can encourage a comprehensive examination of the values embedded in technology, allows for ethical considerations to be factored into the design and implementation of technology, and promote accountability for the potential impacts on individuals and society. Thus, just as bioethics has shaped the ethical landscape of medical and life sciences research, digital ethics has the power to influence the responsible development and deployment of emerging technologies. The actions and decisions made by companies today have far-reaching consequences for society, and maintaining an ethical approach is essential to ensure that technology continues to serve as a force for good. Incorporating digital ethics allows for greater alignment with societal values, increases stakeholder trust, and mitigates the potential harms associated with technology misuse or abuse. By fostering a culture that values ethics as a partner in crime of technological advancements, companies can proactively address complex ethical issues and establish themselves as leaders in responsible innovation.

4 Operationalizing Bioethics and Digital Ethics at Merck

However, to provide active guidance for technological advancement, ethical considerations must first be translated from theory to practice. In a company context, this usually requires operationalizing high-level, principles-based ethics guidelines to match a specific organization's structure, workflows, and unique digital challenges (Floridi, 2019; Mittelstadt, 2019; Hickok, 2020; Mökander et al., 2022). In the following, we will briefly outline how Merck has successfully integrated both bioethics and digital ethics across the whole organization and how Merck's responsible development of technology enables better innovation.²

Originating as a pharmacy in the seventeenth century in Darmstadt, Germany, Merck has grown into a multinational organization operating in 66 countries. With three business lines in healthcare, life sciences, and electronics, the company employs over 60,000 individuals (Merck, 2024). Merck maintains a strong commitment to responsible entrepreneurship (Oschmann, 2018) and actively seeks ethical guidance for its operations. Specifically in rapidly evolving areas such as the biomedical field and the digital landscape—where regulatory frameworks often significantly lag behind the current technological state-of-the-art—active ethical guidance is required.

To that end, Merck first established the Merck Ethics Advisory Panel for Science and Technology (MEAP, formerly known as Merck Bioethics Advisory Panel, MBAP). Since 2011, this panel of external academic experts in biology, medicine, bioethics, philosophy, and law has been instrumental in providing ethical direction to Merck's ventures, particularly in areas such as genome editing and stem cell research (Herget et al., 2020). Following internal deliberations regarding embryonic stem cell research in 2011, Merck recognized the imperative of establishing an independent multidisciplinary expert body to make critical decisions on bioethical matters. Consequently, the MEAP was founded in the same year. Initially representing Germany and the United States, the panel expanded its scope in 2017 to include representatives from Asia and Africa, with the aim of incorporating diverse global bioethical perspectives. Currently, the MEAP includes eight permanent members from six different nationalities.³

The primary role of the MEAP is to offer guidance on bioethical matters and formulate worldwide recommendations applicable to all sectors within Merck. These recommendations are founded upon ethical principles, current scientific advancements, and corporate criteria. Upon thorough discussion and deliberation within the MEAP, the resulting recommendations are subsequently implemented by Merck as binding operational guidelines. Various examples exist, including the incorporation of significant principles like the "Stem Cell & Human Cloning Principles" (2011), the "Fertility Research Policy" (2011), guidelines pertaining to the ethical treatment of laboratory animals ("Use, Care and Welfare of Laboratory

²For further case studies, see, for example, Van Campen et al. (2015) or Mökander and Floridi (2023).

³<https://www.merckgroup.com/de/sustainability/business-ethics/bioethics.html>

Animals”, 2011), and the handling of biological samples (“Biosamples/Biobanking Policy & Guidelines”, 2015). In 2017, revised policies regarding reproductive medicine, stem cell research and therapy, and, for the first time, genome editing were adopted.

In recent years, however, Merck has also experienced a substantial *digital transformation* that encompasses both internal operations and business expansion. Merck’s digital initiatives encompass various areas, including drug discovery, safeguarding supply chain integrity, and human resources (Merck, 2020). Additionally, Merck engages in collaborative ventures such as Syntropy, a joint endeavor with Palantir that focuses on the integration of healthcare data from diverse sources into a unified technological platform for clinical research (Merck, 2020).

In pursuit of a robust ethics strategy that also covers the area of digital activities, Merck has consequently established a Digital Ethics Advisory Panel (DEAP) comprising external experts proficient in digital ethics, law, big data, digital health, data governance, and patient advocacy (Merck, 2021). The DEAP’s key responsibilities encompass (1) providing guidance on specific ethical queries related to data and algorithmic systems raised within Merck; (2) assessing proposals for mitigating ethical risks put forth by business units, incorporating panel guidance and offering feedback for implementation; (3) serving as a platform for discussing and evaluating new company policies with ethical ramifications, in addition to assessing Merck’s existing ethical principles and policy documents; and (4) proactively advising Merck on pertinent advancements and emerging areas of discourse within the realm of digital ethics (Nemat et al., 2023).

In its initial undertakings, the DEAP supported Merck in the development of a comprehensive Code of Digital Ethics (CoDE) founded upon a framework of 20 digital ethics principles (Becker et al., 2022). This endeavor involved the examination of scholarly discussions on digital ethics, as well as an extensive review of existing ethics guidelines with the objective of effectively implementing the CoDE across Merck’s entire spectrum of digital activities. Despite this focus on operationalization, implementing and integrating the CoDE effectively into Merck’s diverse workflows necessitated comprehensive efforts. To ensure company-wide adoption of the CoDE, multiple tools are being developed. These include foundational training for all employees, more advanced courses for teams engaged in working with data and algorithms and exploring options for semi-automated ethical risk assessments that can integrate seamlessly into existing software workflows.

Jointly, both the MEAP and the DEAP thus provide ethical guidance to Merck, ensuring that the organization actively considers ethical principles and issues in technological advancement and digital activities. By integrating bioethics and digital ethics into its operations, Merck demonstrates a commitment to responsible innovation and ethical decision-making. The organization recognizes that technological advancements must be guided by ethical considerations. This commitment to ethics not only safeguards the interests of stakeholders but also enables Merck to build trust with customers, partners, and the broader society as it continues to innovate responsibly. In the following chapter, we will outline how ethics subsequently shapes technology at Merck based on three exemplary case studies.

5 How Ethics Shapes Technology at Merck?

5.1 Generative Artificial Intelligence

Generative AI (GenAI) refers to a subset of artificial intelligence that involves creating or generating new content, such as text or images, based on patterns learned from existing data. It involves the use of machine learning algorithms to generate new and unique outputs and can have various applications across an organization like Merck.

For example, in HR management, GenAI can be used to automate and enhance various tasks, such as candidate screening and assessment, employee recommender systems, and generating employee training materials. It can analyze past successful hires and generate profiles of potential candidates who share similar characteristics. But GenAI could also be applied across a multitude of other functions. For instance, in drug development, GenAI could be used to discover and design new molecules with desired properties. It can analyze large datasets of chemical structures, identify patterns, and generate new molecules that have the potential as drug candidates. In addition, GenAI could also be used in drug repurposing, where existing drugs are explored for new therapeutic uses. By analyzing data on drug structures, biological targets, and clinical outcomes, generative AI can suggest new applications for existing drugs, potentially opening up new avenues for drug development.

Simultaneously, the broad applicability of GenAI encompasses distinctive ethical challenges and interlinked risks, originating from its intrinsic ability to autonomously generate content and its adaptability across diverse contexts. Among the concerns associated with GenAI, inaccuracy emerges as a prominent issue wherein GenAI systems may produce outputs that diverge from reality or contain erroneous information. Even more significantly, the application of generative AI can result in content known as hallucinations, which convincingly resemble factual information but are actually untrue. This has the potential to disseminate false or misleading information that appears exceptionally compelling and plausible.

Additionally, the application of generative AI in specific use cases can lead to ethical concerns, including the potential for unethical use and data breaches. Since the generation of content by GenAI systems heavily relies on extensive datasets, their use can raise concerns about data privacy and security. Improper handling or unauthorized access to sensitive data used in generative AI models can lead to breaches of privacy and confidentiality. If, for example, improperly deployed in the context of HR services, applications could also include the use of sensitive human characteristics such as gender, emotions, or political beliefs, thus leading to biased decisions. And, related to the phenomenon of hallucinations, GenAI use cases without proper human oversight or user expertise can lead to wrong decisions and potentially harmful outcomes.

Moreover, on a broader socio-technological level, the adoption of GenAI can have a profound impact on the workforce and the value of individual skills, and thus lead to a large-scale societal transformation. GenAI could seamlessly integrate into various aspects of our professional lives, such as decision-making

processes, creative content production, and automated tasks. The increased reliance on GenAI may result in job displacement in certain industries, as well as a shift in the priorities and demands of skillsets in the workforce. Thus, it is crucial to consider the potential societal consequences of GenAI as well and to ensure that the adoption of GenAI is carried out responsibly, taking into account the equitable distribution of benefits and retraining opportunities for those affected by these changes.

Merck has initiated various projects harnessing GenAI, spanning from insights and content creation to interactive applications serving customers or patients across all business sectors. The diverse nature of these applications introduces a spectrum of ethical considerations that demand careful examination. While some projects align well with general ethical guidelines, fostering bottom-up innovation, others necessitate dedicated oversight procedures or, in certain instances, outright avoidance.

Now, in order to effectively address these ethical risks, Merck believes that it is crucial to implement a robust GenAI ethics framework that allows for the early detection of potential ethical pitfalls not just during the phase of GenAI deployment but already at the level of GenAI experimentation and use case development. To foster responsible bottom-up innovation and experimentation, Merck was actively engaged in developing its own GenAI ethics framework during 2023, matching its business fields and requirements. This framework serves as a practical tool for project managers, offering both self-assessment capabilities and oversight mechanisms specifically tailored to ethically intricate use cases. For example, the use case classification system enables the systematic detection of various ethical risks. The system helps guide decision-making, ensuring that ethical principles are upheld and minimizing the potential negative impact of generative AI on individuals and society. This tool then offers guidelines for developing GenAI systems that are accountable, transparent, and unbiased. It embodies an active endeavor to incorporate ethical considerations at every phase of deployment, encompassing the stages of design, implementation, and usage. While currently a guidebook supporting the innovators, it will be a part of the upcoming AI governance that is developed in reaction to the EU AI Act. This comprehensive approach ensures that Merck can navigate the ethical landscape effectively, identifying areas where specialized oversight is crucial.

The example of GenAI underscores the acknowledgment that technology is influenced by values, emphasizing the role of ethics as a driving force behind technological progress. Including a strong ethical foundation helps ensure that GenAI development and usage align with a value-driven approach, promoting responsible technological innovation and integration. The GenAI ethics framework aims to assist innovators in the decision-making process concerning the development of technology. This resource will enable them to navigate the complexities of GenAI systems and make informed choices that align with ethical principles. By incorporating ethical considerations at every phase, from design to implementation and usage, this framework will offer support to innovators in creating GenAI systems that are responsible, value-driven, and mitigate potential harm.

5.2 Handling Patient Data in Data-Based Business Models

In 2022, a central focus of the DEAP was posed by questions emerging from Syntropy, a digital joint venture between Merck and Palantir Technologies. This collaboration aims at utilizing patient data to expedite the discovery and development of treatments for cancer and other ailments (Merck, 2018). Syntropy's infrastructure facilitates the collection and processing of these data in a secure setting, aiming to derive novel insights. Furthermore, it emphasizes that data ownership stays with the originating institution, encouraging a new scope of collaboration and shared objectives within the scientific community.

Despite Syntropy primarily residing within the biomedical domain, the business model, which enables the integration and exchange of vast quantities of highly sensitive patient data, evokes ethical considerations that extend beyond established bio-ethical principles and the core expertise of the MEAP. To specifically address matters of digital ethics, Merck had established the DEAP as a separate but interconnected advisory entity. Concurrently, Palantir has maintained a long-standing tradition of consulting its Palantir Council of Advisors on Privacy and Civil Liberties (PCAP),⁴ an independent group of privacy law, policy, and ethics experts, to comprehend and tackle the intricate issues arising during the course of its work.

One of the ethical concerns brought to the DEAP from Syntropy centered around the issue of informed consent in the context of data-based business models (for a detailed description see Nemat et al., 2023). Informed consent is a foundational ethical principle in research involving human participants (Eyal, 2019). It is a process through which individuals are provided with relevant information including the purpose of sharing their data, potential risks and benefits, alternative options, and their right to refuse. The aim of informed consent is to respect individuals' autonomy, protect their rights, and ensure that they have sufficient understanding to make decisions about their participation in research.

However, in the context of complex big data-based business models, extended data sharing and the use of complex algorithms, it has been challenged whether traditional notions and procedures of informed consent are still applicable. This is due to the fact that it is usually not possible to predict the precise ways in which one's data will be used at the moment of data gathering and granting consent. Additionally, the combination of various data sources and the use of advanced algorithms could lead to de-anonymization and re-identification of individuals, potentially leading to unforeseen vulnerabilities of patients.

To deal with the intricate issue of informed consent in the digital age, Merck has relied on the expertise of the DEAP, the ethical foundation laid by the CoDE, and devised operationalization measures for systematically addressing concerns. More specifically, a standardized risk assessment tool, the Principles-at-Risk Analysis (PaRA) has been developed to assist the work of the DEAP in addressing digital ethics challenges based on the principles defined in the CoDE (Nemat et al., 2023).

⁴<https://www.palantir.com/pcl/advisors/>

Essentially, the PaRA allows a structured approach to addressing ethical challenges by enabling the identification of ethical principles affected by a technology (for details, see Nemat et al., 2023). Viewed from the perspective of the value-ladenness of technology developed in Sect. 2, the PaRA thus serves the function of making explicit the value vectors and implicit ethical choices made by designing certain technological applications. By making these explicit, the PaRA then allows to alter design choices when values do not align between the organization and the technology. In other cases, it might serve as a tool to refine one's understanding of the actual values embedded in a technology, thus dissolving apparent ethical conflicts or issues. In any case, a tool such as the PaRA is an important cornerstone for ensuring the ethical development and deployment of technology and a clear instance of how a structured and operationalized approach to ethics can aid responsible innovation.

5.3 Embryo-Like Models

Embryo-like models are laboratory-created structures that closely resemble early-stage embryos in terms of their developmental features and organization. These models are typically generated using stem cells or other cellular components to mimic the early stages of ex utero development, ranging from neurulation to early organogenesis, with the aim to replicate the cell behaviors and morphological characteristics observed during natural embryogenesis.

Embryo-like models provide researchers with a valuable tool for studying embryonic development, as they offer a controlled experimental system that can be manipulated and analyzed in ways that are not possible with natural embryos. Thus, embryo-like models have the potential to advance our understanding of early human development, developmental disorders, and reproductive biology. As such, they promise potential application in reproductive biology and In Vitro Fertilization (IVF) and may have implications for improving assisted reproductive technologies and enhancing the success rates of fertility treatments. Moreover, embryo-like models can be utilized in drug discovery, drug screening as well as developmental and reproductive toxicology by providing an alternative to traditional animal testing methods.⁵

The ways of potential use of embryo-like models in research and development at Merck could thus clearly provide ethical advantages—both in terms of the potential applications of embryo-like models for ethical objectives but also in terms of providing an alternative to the use of animals and actual human embryos. At the same time, however, both the development and the use of embryo-like models give rise to a host of ethical questions that necessitate thorough examination. Key areas of ethical concern surrounding embryo-like models include determining their moral

⁵Currently, these application potentials are still in the realm of the hypothetical. Therefore, the immediate emphasis for Merck lies in identifying key areas of research that align with its ethical commitments and guiding the provisioning of R&D tools accordingly.

status, addressing issues of consent and donor sources for acquiring biological materials, and their broader societal implications. We will briefly discuss these issues.

Determining the moral status of embryo-like models involves grappling with questions of their intrinsic value and rights. As these models begin to resemble early-stage embryos, debates arise about whether they should be granted the same ethical protections as actual human embryos (Pereira Daoud et al., 2020, Wilger, 2020, Rivron et al., 2023, Hyun et al., 2020, Blasimme & Sugarman, 2023). Some argue that the increasing resemblance warrants recognition of moral status, as these models possess the potential for further development and possess characteristics comparable to embryos. Others, however, argue that embryo-like models do not have the same moral status as actual human embryos since they lack essential components such as a functioning central nervous system and the ability to develop into a fully formed human being.

Addressing issues of consent and donor sources is also a significant ethical concern. It raises questions about how the biological materials used to create and sustain embryo-like models are obtained and whether the donors have given informed consent. Ethical guidelines and regulations need to be in place to ensure that the acquisition of these materials is done ethically and with respect for the autonomy and dignity of the donors.

Furthermore, the potential use of embryo-like models in research and development may have societal implications as well. As these models become more sophisticated and capable of modeling complex human systems and diseases, questions may arise about who will have access to these technologies and for what purposes. It is important to consider issues such as equity, justice, and the potential for exploitation in the development and distribution of these models. Equity concerns revolve around the fair distribution and availability of these technologies, so as not to worsen existing healthcare disparities. Justice relates to the fair allocation of these potentially transformative technologies to all who need them, not just the privileged few. Ensuring the process around this distribution is fair and equitable is also integral to justice. The potential for exploitation constitutes another pivotal consideration, urging for careful measures to prevent undue advantage of specific groups or individuals through unfair practices or prioritization of profit over patient welfare.

In light of the complex and wide-ranging ethical issues associated with the development and use of embryo-like models, Merck has actively sought ethical guidance from the MEAP. The MEAP advised that it is essential for Merck to establish an internal position on potential future activities in this field, particularly as the similarity between embryo-like models and natural embryos increases. This internal stance should include safeguards for research involving embryo models and the establishment of appropriate oversight mechanisms.

In designing these oversight mechanisms, Merck should consider factors such as the complexity and level of maturity of the models, as well as their potential for further development into live organisms. By taking a proactive approach and implementing robust safeguards and oversight mechanisms, Merck can ensure responsible and ethically sound practices as research progresses. Moreover, it is recommended for Merck to incorporate the inclusion of embryo models into its internal policies,

particularly the Merck Stem Cell Principle. This step will facilitate effective oversight of related research and promote consistency, transparency, and ethical practices throughout all of Merck's research and associated activities.

Together, these steps contribute to the responsible and ethical use of technology by Merck. By actively addressing ethical concerns, implementing safeguards and oversight mechanisms, and integrating the use of embryo-like models into internal policies, Merck demonstrates its commitment to ethical research practices and responsible technological advancements.

6 Conclusion

The aim of this chapter was to explore how ethics drives technological advancement, and to conceptualize the relation between ethics and technology as partners in crime. We started with a philosophical perspective and introduced a framework and an argument in favor of the value-ladenness of technology. From this perspective, technological advancements are not value-neutral. Instead, values permeate technology. Ethics must thus play a central role in developing new technologies not only by assessing appropriate contexts for the deployment of technology but already at the level of development.

We then discussed several case studies in the context of the science and technology company Merck that highlight how ethics can successfully drive technological advancements. To do so, ethics has to be embedded into the organization. At Merck, this is achieved at various levels such as the Merck Ethics Advisory Panel for Science and Technology, the Digital Ethics Advisory Panel, the Code of Digital Ethics, or the Principles-at-Risk Analysis. Through this operationalization, ethics can develop its full potential in aiding the development of responsible and value-driven technology.

Lastly, the paper discussed the specific role of ethics in the realms of generative AI, the handling of patient data in data-based business models, and embryo-like models. In the domain of generative AI, ethical considerations are crucial due to the potential for biases and the risks associated with unauthorized access to sensitive personal information. When it comes to the handling of patient data in data-based business models, there are ethical concerns about privacy, consent, and data ownership. The development and use of embryo-like models necessitate careful consideration of the moral status of these entities, as well as the ethical limits and potential consequences of their creation and manipulation.

In all these areas, the ethical dimension is crucial in guiding the development, deployment, and responsible use of technologies. In sum, Merck thus serves as a compelling example of how prioritizing ethics enriches technological advancements. By integrating ethics into the organizational structure, Merck demonstrates the importance of ethics in driving responsible and value-driven technology. Through ethical frameworks and practices, companies can navigate the complexities of technological innovation while upholding ethical principles, benefiting individuals and society as a whole.

Highlights

- Technology is inherently value-laden, reflecting the values and objectives of its creators. Hence, ethics plays an integral role throughout every phase of the technological lifecycle, from inception to deployment. Viewed through this lens, ethical considerations emerge not merely as afterthoughts or compliance checks but as pivotal determinants shaping the development and utilization of technology.
- This is particularly true in research and commercial organizations where bioethics and digital ethics are critical for ethical decision-making in scientific inquiry and technology development. Here, bioethics assesses the moral implications of progress in the life sciences and biotechnologies, while digital ethics examines the moral dimensions of handling data and algorithms, including AI.
- Integrating bioethics and digital ethics into innovation development and decision-making processes fosters responsible innovation. It allows for a comprehensive examination of the values embedded in a solution or technology, ensures ethical considerations are factored into design and implementation, and promotes accountability for potential impacts on individuals and society.
- Operationalizing high-level, principles-based ethics guidelines has been proven effective in translating ethical considerations from theory to practice in a company context. This involves matching ethics guidelines to an organization's structure, culture, workflows, and unique challenges.
- Companies like Merck that value ethics as a collaborative force in scientific and technological progress are well-positioned to proactively address complex ethical challenges and establish themselves as responsible innovators. This approach fosters trust and acceptance by customers, partners, and society in general and ensures that scientific pursuits align with principles of justice and human well-being.

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