

BRIDGES FROM THEORY TO PRACTICE Ethics, Technology and Society



*Melisa Vivanco*

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# Bridges from Theory to Practice

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***Ethics, Technology & Society***

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In Loving Memory of my *Abue*



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# INTRODUCTION

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## Crossing the Bridge

In recent years, technology has developed rapidly. The introduction of certain technologies at particular historical moments has led to paradigm shifts that have revolutionized human practices both at an individual and collective level. Three central examples of these paradigm shifts with respect to technology have been the Industrial Revolution (1760–1840), which was the process of changing from an agricultural and artisanal economy to one dominated by industry and machinery manufacturing the popularization of the internet (1990–1996), which completely changed the dynamics of creation and flow of information and, more recently, the use of artificial neural networks and other powerful machine learning techniques (2016), which is giving rise to the revolution of artificial intelligence. This fast pace of technological advancements has urged universities to include an ethics and society course for technology-related programs. This academic need reflects a social need in which the stakeholders call for increased consciousness and accountability from corporations, governments, and communities regarding creating, utilizing, and disseminating diverse technologies available at any given moment. In this sense, this book aims to provide engineers and computer scientists with the critical thinking, theoretical tools, and practical knowledge necessary to develop their work from a more conscious and socially responsible perspective.

This book serves as a comprehensive guide for students across various disciplines, aiming to bridge the gap between science, technology, engineering, mathematics (STEM), and the liberal arts. It has a dual purpose: first, to provide STEM students with essential philosophical knowledge to navigate ethical and social dilemmas related to technology; and second, to introduce liberal arts students to the formal structures underpinning technological advancement. Divided into three parts, the book offers a structured approach to understanding the intersection of technology, ethics, and society. The first part lays the groundwork by covering fundamental concepts of logic and ethics necessary for a deeper examination of the moral and social implications of technology. Here, students gain insights into the ethical frameworks that guide decision-making in technological contexts. The second part delves into practical principles essential for technology professionals, building upon the abstract concepts introduced earlier. It emphasizes the application of these principles in real-world scenarios, preparing students for ethical decision-making in their future careers. In the concluding third part, the focus shifts to the evolving digital landscape, where technology not only complements but also shapes our reality. We explore contemporary debates such as cyberwarfare, copyright issues, and genetic modification, understanding how these seemingly disparate topics are interconnected within the fabric of society and technology. By connecting these issues, the book provides a holistic understanding of the complex relationship between technology and society, equipping students with the knowledge

and critical thinking skills necessary to navigate the digital age. Ultimately, the goal is to equip the forthcoming professionals with the necessary tools to make informed decisions within their respective roles in technology development and implementation. This objective requires the analysis of certain aspects of language and thought that link general principles of action (which aspire to be universal) with specific cases that arise in particular instances.

## Overview

We do not intend to provide final answers to the crucial questions these new technologies raise. This book is neither political nor controversial. We don't want to push any one agenda. Given the status of our civilization today, we think that technological advancement is unavoidable. However, we also think that we have a say in the exact direction that these advancements go. In the upcoming decades, developing technologies will undoubtedly be able to assist us in a number of ways. But it's also critical that we keep in mind the harm that these technologies are causing to humans. Recognizing that it is our duty, both personally and collectively, to make the kinds of decisions that support the peaceful and constructive application of new technologies is a necessary step in taking these problems seriously. To do this, one must possess the capacity to consider important topics in a deliberative, logical, and centered manner. To put it briefly, it calls for critical thinking skills.

Chapter 1 delves into the foundational role of language in philosophy, science, technology, and social institutions. Language, with its underlying principles, serves as the bedrock of our knowledge systems, forming the basis for the development of technology and societal structures. The chapter begins by examining the formal and informal aspects of language, presenting three distinct approaches within this framework. The first approach focuses on the structure of language, emphasizing the difference between syntax and semantics, and the distinction between form and content. Next, the discussion shifts to the nature of language terms, introducing concepts like vagueness and highlighting the interplay between objectivity and subjectivity. To conclude, the chapter addresses inferential processes, distinguishing between reasoning processes governed by the laws of logic and those influenced by human elements such as emotions, intuitions, and creativity.

In this first chapter, we explore the intersection of technology and human cognition, contrasting the strengths of technology in formal reasoning with the strengths of human minds in informal reasoning. While technology excels in tasks requiring formal logic and deductive reasoning, human cognition shines in informal reasoning, including pattern recognition, intuitive leaps, and creative hypothesis formation. Despite these differences, technology and human intelligence can complement each other, with technology assisting in complex calculations and formal analysis, while humans provide context, domain knowledge, and nuanced understanding. Ultimately, the chapter emphasizes the importance of leveraging the strengths of both human and technological intelligence to maximize their potential and ensure their responsible use in society. Recognizing and harnessing the strengths and limitations of each lead us to strive for the ethical development and application of technology in our increasingly interconnected world.

Chapter 2 addresses the crucial role of legislation, norms, and standards in shaping ethical behavior within society. It begins by challenging the common misconception that ethics is solely concerned with dictating what is right or wrong. Instead, the chapter emphasizes the value of asking the fundamental question, *Is this the right thing to do?* before making decisions regarding technology. This approach highlights the importance of ethical considerations in guiding technological development and implementation. Throughout the chapter, the most influential ethical theories are explored, including deontology, utilitarianism, contractarianism, and the concepts of positive and negative rights. Each theory offers unique perspectives on moral decision-making, yet none provides a definitive answer to the question of what is morally right. Despite this, engaging with these theories fosters critical reflection and dialogue, encouraging individuals to contemplate the moral dimensions of their choices. The chapter underscores that while navigating ethical dilemmas related to technology is complex, it is essential for fostering a more just and equitable society. It emphasizes that the pursuit of ethical understanding, in itself, holds profound value for human progress, particularly concerning technology. The incorporation of ethical considerations into technological decision-making processes guides individuals and societies toward a more ethically conscious and responsible technological landscape.

Chapter 3 begins with a discussion about the distinctive characteristics of technologies categorized as AI, focusing on their ability to make decisions akin to those made by non-AI. It raises pertinent questions about the principles guiding these decision-making processes and underscores the importance of ensuring that ethical considerations are incorporated into the development and execution of AI technologies.

A central theme of the chapter revolves around establishing clear ethical guidelines to govern the conduct of engineers and computer scientists, emphasizing values such as honesty, integrity, and responsibility. These principles serve as a framework to guide professionals in their work and ensure that ethical considerations are prioritized throughout the technological development process. Throughout the discussion, the chapter highlights the critical role of ethical considerations in the development, deployment, and use of technological innovations. Concepts such as professional ethics in engineering, the role of professional associations, and the importance of ethics codes and safety culture are explored in depth. The chapter underscores the importance of adopting a proactive and ethical approach to decision-making processes in technology. It emphasizes the need for stakeholders to play an active role, advocates for the incorporation of moral values into technological artifacts, and emphasizes the significance of fostering a safety culture and promoting responsible engineering and computing practices. As explained, technology professionals can make significant contributions to the development of technologies that align with ethical principles and serve the greater good of society by giving priority to ethical considerations.

Chapter 4 takes a closer look at the intricate relationship between technology and society, tracing the historical evolution of technological advancements across different fields. It explores both the positive and negative implications of these advancements while also addressing pertinent ethical issues that arise. To enrich the analysis, the chapter encourages readers to imagine potential future scenarios, emphasizing the importance of promoting an ethical and socially responsible approach to technology. As technology continues to shape society, the fusion of

humanity and technology becomes increasingly pronounced, giving rise to what is referred to as a *cybersociety*. This interconnected relationship permeates interpersonal interactions and societal structures, persisting throughout history and remaining relevant today. Understanding this relationship is essential for designing and developing new technologies effectively, requiring a combination of critical thinking, imagination, practical skills, and knowledge.

The chapter shows the ubiquity of technology in contemporary society, highlighting its integral role in scientific, social, economic, and cultural practices. The concept of cybersociety emphasizes the inseparable connection between technology and humanity, urging for an ethical and social approach to ensure inclusive integration for all. The discussion further explores how the integration of technology and humanity drives societal development across various domains, including science, art, politics, commerce, and social networks. While the topics discussed in the chapter do not exhaustively cover the breadth of the digital world, they represent diverse contexts where technology has made a significant impact. Recognizing phenomena such as the widespread availability of information, the influence of virtual reality, debates surrounding non-fungible tokens (NFTs) and plagiarism, and the risks of over-dependence on technology, fosters a more comprehensive understanding of the desired societal trajectory. Throughout each context, the imperative for ethical considerations and responsible technology use remains evident, guiding efforts toward creating a society that prioritizes the well-being of individuals and future generations.

The topics addressed in this book show the relevance of evaluating the benefits and cons of implementing new technologies in today’s ever-changing technological world. This endeavor involves addressing concerns related to privacy, copyright, accessibility, and environmental impact, as well as using technology for innovation. Ethical and philosophical rules, such as those related to openness, justice, and respect for individual rights, can guide us through technological advances toward the overall goals of a just and equitable cybersociety.