Preface: A Study in Science, Technology, and Society (STS)

Aims and Major Themes

I have written this book to help you to systematically explore Ambient Intelligence (AmI) and the Internet of Things (IoT) as notable advances in science and technology (S&T) within the European information society. This book therefore is a study in science, technology, and society (STS), i.e., an investigation of science-based technology in social context. In this respect, it analyzes the complex, dialectical interplay between scientific and technological developments pertaining to AmI and the IoT and other dimensions of social life, treating S&T as cultural and material productions and historical events. AmI and the IoT are the most recent and prevalent sociotechnical visions in the European information society, depicting the future of information and communication technology (ICT) and its far-reaching societal implications. Sociotechnical imaginaries highlight the fact that visions of future (noteworthy) advances in S&T bring with them wide-ranging visions on how society will evolve as well as on the immense opportunities to take advantage of and on the potential risks to face. While a range of visions of a next wave in ICT and how they will shape the everyday future have, over the last two and a half decades, gained prevalence and generated worldwide attention, only those which have won support over others in different parts of the world are evolving from visions to achievable and deployable realities. The S&T-enabled future lifeworlds are a leitmotif in the ongoing political and public debates in technologically advanced societies. As a key function performed by future world-making in the context of the European information society, AmI and the IoT landscapes and applications are being justified as solutions to the kind of the proposed lifeworlds constituted as part of grand narratives of modernity and broad historical narratives of change. In a nutshell, AmI and the IoT are interrelated fields where a wide range of scientific and technological areas and human-directed sciences converge on a common vision of the future and the tremendous opportunities and fascinating possibilities as well as the significant risks and serious concerns such future will bring. Both the benefits and perils of these technologies are generated by the

incorporation of advanced ICT intelligence and technology into people's everyday lives and existing environments.

To facilitate your embarking on exploring the realm of AmI and the IoT in the social and cultural contexts of the European information society, I have designed the book around three related aims: to help you gain essential underpinning knowledge relating to both the STS perspective in this particular context and the topic under investigation, and evaluate and reflect on the nature, practices, risks, and implications pertaining to AmI and the IoT as science-based technologies; to help you develop a deeper understanding of AmI and the IoT, as you make connections between your understandings, relevant theoretical and analytical concepts, and the views and visions of technologists and scientists as creators of AmI and the IoT technologies; and, more importantly, to encourage you to take part in an ongoing debate about AmI and the IoT developments in the twenty-first century, exploring multiple disciplinary perspectives on such science-based technologies as social institutions holding distinctive arrangements, practices, discourses, commitments, and allegiances specific to the European culture at this period of history—and thus change overtime.

Furthermore, this book, with its STS orientation, endeavors to build bridges between disciplines that do not normally converge (e.g., computer science and social science, technology and philosophy, environmental science and political (-economic) theory, etc.), and provides ways of amalgamating knowledge in areas that are extremely difficult, if not impossible to comprehend through any single discipline (e.g., information society, sociotechnical studies, cultural studies, innovation studies, environmental studies, and the human and social sciences). This is to help you to develop more robust understandings of the nature of debates over the risks posed by AmI and the IoT as science-based technological applications, the grounds and drives of related scientific discovery and innovation, the relationship of the European culture and its intellectualism (the doctrine that scientific discourse is the ultimate form of rational thought or that reason is the ultimate criterion of knowledge), and the historico-epistemic limits underlying the so-called rational analytic approaches to describing and explaining multifaceted problems.

In sum, this book offers a novel, compelling, illuminating, and holistic approach to the study of science-based AmI and the IoT technologies in terms of the complex, dialectic interplay between their development and innovation and their historico-epistemic, sociocultural, politico-institutional, and eco-environmental dimensions. In so doing, it combines academic, scientific, and practical relevance with philosophical, historical, social, ethical, and environmental analysis, evaluation, and reflection.

Scope, Purpose, Perspectives, Arguments, and Assumptions

Modern ICT has drastically transformed the way people live, work, interact, communicate, and relax. And the rapid pace of innovation in computing continues to demonstrate that there is a tremendous untapped potential for harnessing and adding intelligence to ICT, with the aim to further improve the quality of people's lives, while the unintended consequences of this innovation increasingly require careful and well-thought-out governance on multiple scales. Recent advances in ICT have given rise to new socially disruptive technologies: AmI and the IoT, marking a major technological change which is expected to lead to a drastic transformation of the technological ecosystem in all its complexity and variety, as well as to a major alteration in the use of new technologies and daily living. Yet no work has systematically explored AmI and the IoT as advances in S&T and sociotechnical visions in light of their nature, underpinning, and practices along with their risks and implications for individual and social well-being and for environmental health. AmI and the IoT raise new sets of questions: In what way can we conceptualize such technologies? How can we evaluate their impacts on individual and social well-being as well as on environmental health—their benefits and risks? How should science-based technology and society's politics relate or interweave? Are science-based technology and society converging in new ways? It is with such questions that this book is concerned. Positioned within the research field—and considering the critical perspective—of STS and thus bringing together scholars from a cross section of disciplines, this book amalgamates an investigation of AmI and the IoT technologies from a variety of interrelated perspectives; their ethical, environmental, social, and political effects; and a philosophical analysis and evaluation of the implications pertaining to such effects. As such, it takes the range of approaches that can and ought to be applied to thinking through the risks and other implications of AmI and the IoT. The STS approach here is both descriptive, aimed at understanding how AmI and the IoT as science-based technologies are done, as well as normative, indicating or exposing where actual practices of such technologies and professed values and norms are in conflict. Moreover, AmI and the IoT technologies are developing very rapidly, and consequently, both pose a challenge to the more reflective approach commonly taken by STS, while at the same time necessitating the perspective provided by STS scholars.

An interdisciplinary approach is necessary to understand the complex issue of scientific and technological innovations that S&T is not the only driving forces of the modern, high-tech society, as well as to respond holistically, knowledgeably, reflectively, and critically to the most pressing issues and significant challenges of the modern world. Accordingly, science-based technologies in today's knowledge-based society need to be approached from a variety of disciplinary perspectives, including history (of scientific knowledge), sociology (of scientific knowledge), philosophy, cultural studies, political science, economics, innovation studies, technology foresight studies, sociotechnical studies, and environmental and energy studies. On the basis of a unique approach to cross-disciplinary integration

along with an emphasis on the risks and implications of a significant set of emerging technologies in the European information society, this book explores in rich and compelling ways the interrelated worlds of scientists, technologists, politicians, policymakers, visionaries, research leaders, and citizens with reference to AmI and the IoT technologies as topical science-based innovations by examining the historical, social, cultural, and political conditions of their creation, emergence, evolution, uptake, and dissemination—i.e., the history, episteme, language, politics, ethics, values, and sustainability of the European culture of ICT innovations. In view of that, it deals with—as pertinent issues at the interface of STS—the tensions, divergences, and interconnections between scientific and technological development, the social and environmental benefits and risks of innovative ICT, and the changing economic realities brought about by a globalized world system's cultural political economy and the ever-faster pace of technological change as they pertain to the emerging fields of AmI and the IoT technologies. The book situates AmI and the IoT developments and innovations as modernist science-based technology enterprises in a volatile and tense relationship with an inherently contingent, heterogeneous, fractured, conflictual, plural, and reflexive postmodern social world. A set of basic arguments and assumptions are developed and validated, respectively, throughout this book. Accordingly, AmI and the IoT technologies are associated with empirically under-researched, theoretically underdeveloped, and imaginary and invisible social life that originates from their social construction and shaping within the wider sociotechnical landscape where they are embedded and propels them across the European information society and its institutional apparatuses and their techniques, constellations, and arrangements, through diverse research institutes, universities, industries, technical research laboratories, government agencies, and policy networks, and into the public sphere—the systems of thought, the norms and rules, the institutions, the strategic and state actors and their actions, and the things. These comprise the dominant discursive formation, episteme, and regime of truth of the European culture—as historically and socioculturally constraining forces. In particular, AmI and the IoT as sociotechnical imaginaries are associated with active exercises of politics influence (or state power) and the management of political dissension and hence are not principally, or only, determined by (scientific) discourse. Put differently, science-based technology is not only socioculturally coded and historically situated but durably constructed materially—i.e., sustained by material practices and networks. In addition, the AmI and the IoT as sociotechnical visions are less sociopolitically accountable, less explicit—as to societal and environmental implications, and less goal-oriented. Furthermore, AmI and the IoT as promissory and innovation narratives are not of a master nature, despite their arresting feature of continuous modulation of promises and imagined futures, but they, as sociotechnical imaginaries, are less grounded in realism and historical memory and more innovative and futuristic. Therefore, they are not what they claim and tout with regard to future lifeworld or social worlds, an issue which needs to be illuminated as a way to come to grips with their analytic power. In all, this book endeavors to overcome the dissections between the cultures

of social and human sciences and natural and formal sciences—i.e., the interpretive and explanatory inquiry and rational and objective analysis.

Subject Treatment and What Makes the Book Unique in Its Field

No book of this kind has, to the best of one's knowledge, been produced elsewhere—systematically investigating, delving into, AmI and the IoT as both recent advances in S&T as well as sociotechnical visions in light of their nature, underpinning, and practices along with their risks and other implications for individual and social well-being and for environmental health. This is, in other words, the first systematic endeavor to probe how AmI and the IoT as technological applications of the amalgamation of recent discoveries in human-directed sciences and breakthroughs in computing link up with other developments in the prominent spheres of the European society, such as culture, politics, policy, and ethics, as well as ecological philosophy, a progressive shift from an environmentalism in terms of resources and climate change to a more integrated ecologicalism in terms of the intrinsic interdependence of existing life systems. The book is moreover unique in its approach to cross-disciplinary integration, incorporating history, sociology, philosophy, innovation studies, sociotechnical studies, cultural studies, environmental and energy studies, technology foresight studies, political science, and science and innovation policy. It does this by examining the historical a priori, epistemic, social, cultural, institutional, and political conditions of the creation, emergence, production, evolution, and uptake of AmI and the IoT as advances in ICT—and hence in S&T.

In response to the growing need for an inclusive and holistic analysis of AmI and the IoT as science-based technologies in cultural and social contexts or for a multi-perspectival approach to the study of such technologies, this book addresses interdisciplinary aspects, or explores interdisciplinary approaches to the study, of the rapidly evolving fields of AmI and the IoT as advances in S&T in the context of the European culture and society. And the key aim of this is to achieve more robust and broader understandings of AmI and the IoT as sociotechnological phenomena. This is accomplished through pursuing the STS approach, which encourages analyses whose approaches are drawn from a variety of disciplinary and theoretical perspectives. Recent books and topical studies on the subject of AmI and the IoT technologies focus their analysis on the potential pertaining to their advancements and innovations from a predominantly technological perspective and the broader institutional preconditions that favor or support such advancements. However, technological innovations, in general, cannot be captured only by science and technology, and a purely techno-scientific approach remains unequivocally inadequate as to understanding today's information society. Here, STS comes into play as an approach to analyzing the topic of technological innovations pertaining to AmI and the IoT rather with an emphasis on such technologies which are

embedded in social and cultural contexts, thereby highlighting the nature, practices, and impacts of AmI and the IoT as forms of, and advances in, S&T.

In light of the above, the contribution to the systematic endeavor to probe, based mainly on the ramifications of Michel Foucault and Thomas Kuhn's work, how scientific discoveries and breakthroughs and their technological applications germane to AmI and the IoT as instances of the currently prevailing knowledge configurations link up with other developments in the leading spheres of the European information society is what distinguishes this book from existing books on the subject of AmI and the IoT from a technological perspective, and makes it the first book to be written and thus study to be carried out in the field of STS.

The primary intention of this endeavor is to offer the citizens of the European information society, which is progressively evolving toward a fully technologized one, the resources with which to conceptualize and evaluate—analytically, ethically, socially, and environmentally—the benefits and the risks, the safeties and the perils, of AmI and the IoT as notable advances in S&T. In such technologically advanced society, people, collectively, are creators, users, and adopters of S&T. In this respect, this book intends to act as a lightning rod to focus conflicting societal interests and related stakeholders in the evolving process of technologizing society by sharpening the debate about the nature of social transformation and ecological modernization envisioned with AmI and the IoT—inspiring sociotechnical visions but also of limited modern applicability.

Intended Audience of the Book

The intended readership of the book is aimed at students, academics, social scientists, historians, sociologists of science, philosophers of science, policymakers, decision makers (in private, public, and civil society organizations), research leaders, visionaries, environmentalists, and (social) engineers, whether they are new or already working or involved in the area of AmI and the IoT. Specifically, I have written this book with two kinds of readers in mind. First, I am writing to students taking advanced undergraduate and postgraduate courses or pursuing master's and PhD programs in STS, sociology of science, philosophy of science, sociotechnical studies, innovation studies, environmental sustainability studies, cultural studies, technology foresight studies, political decision making and policy analysis, government and public administration, and (social) engineering. Those familiar with STS and social studies of new technologies will certainly get more out of it and find much that appeals to them in it than those without that grounding. However, those with more limited knowledge are supported with detailed explanations of relevant theoretical and analytic concepts, elaboration on methodological approaches, and their applicability and integration with reference to STS. This is meant to appease the uninitiated reader. Second, I hope that this book will be useful resource for anyone who is looking for an accessible and essential reference of AmI and the IoT as to the interplay between their techno-scientific developments and other

dimensions of social life. In all, people in many disciplines will find the varied coverage of the various strands that comprise, and the multiple perspectives that pertain to, the emerging fields of AmI and the IoT as sociotechnological phenomena to be of interest and value. My hope is that this book will be well suited to people of other modern, high-tech societies than the European information society.

Lastly, I believe that I have achieved an important objective with this book—that is, creating a valuable resource for the STS community in relation to sociotechnical visions associated with ICT as an established form of S&T in technologically advanced societies. I moreover believe that there is an urgent need for STS research in this area and thus for a book of this kind. Therefore, I hope that it will be enlightening, thought-provoking, and, more importantly, making good reading for the target audience. And ultimately, the first edition will be well received.

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