Guest Editors' Introduction

Co-Designing the Future With Public Interest Technology

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Defining public interest technology

This special issue is dedicated to the theme of public interest technology (PIT) [1]. PIT acknowledges that technological potential can be harnessed to satisfy the needs of civil society. In other words, technology can be seen as a public good that can benefit all, through an open democratic system of governance, with open data initiatives, open technologies, and open systems/ecosystems designed for the collective good, as defined by respective communities that will be utilizing them. Just like in the established field of public interest law (PIL) [2], [3] and public interest journalism (PIJ) [4], we can consider potential fields around the idea of PIT [5], [6], such as public interest co-design (PITco), even public interest engagement (PITengage) or public interest consulting (PIC). For decades, public interest engineers (PIEs) have volunteered their time to collaborate in meaningful participative engagements. These engineers have self-organized some impressive collectives including Engineers Without Borders, ASCE Disaster Assistance Volunteer Program, Appropriate Infrastructure Development Group, Architecture for Humanity, Bridges to Prosperity, Bridging the Gap Africa, Engineers for a Sustainable World, GISCorps, Habitat for Humanity, National Engineering Projects in Community Service, just to name a few. These collectives and initiatives call attention to the primary role of a PIT practitioner. That is, the importance of PIT practitioners serving as transdisciplinary intermediaries between the community and the STEM disciplines and technical teams, emphasizing the importance of justice, equity, and inclusion in the design and deployment of new technologies [7] that allow for positive social transformation and empowerment [8].

For clarity and consistency, the working definition of PIT used throughout this issue is the design and development of technologies in the civic interest for societal benefit [9], using inclusive problem-solving and focusing on well-being, human-centered design, and policy [10].

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Toward co-design: "With" and *not* "for" stakeholders

Modern information and communication technologies, such as mobile phones and broadband communications, are permeating almost every aspect of our lives, yet not everyone benefits from them. Privatization has led to further misappropriation of the original intent of the technologies which has, in turn, brought about mixed outcomes in terms of their real value to society [11]. Even in countries undergoing rapid development, infrastructure undergirding such technology is usually not owned by the local community but by external and international actors with significant private interests [12]. In this tug of war between the private interests of foreign entities (governments, transnational companies,

international organizations such as not for profits), niche companies like Google's Jigsaw have emerged and publicized missions centered around exploring "threats to open societies," "upholding technology as a force for good," tackling major human rights issues such as disinformation, censorship, toxicity, violent extremism, and more [13]. Ironically, these public claims from companies like Jigsaw that they serve in the public interest have drawn the media and the public's attention, raised critical questions about what constitutes public benefit, the link between technology and power, the significance of geopolitical infrastructure, and software/application and data ownership [14]. As a result, the debate on the role of the public and what constitutes public benefit concerning technologies now takes center stage.

Understanding the rightful place of science and technology is imperative through the creation of new tools of engagement that are more participative and inclusive in practice, incorporating persons of diverse representation [15]. This participatory science policy paradigm was championed by Daniel Sarewitz, the highly regarded and recently retired Co-Director of the Consortium of Science, Policy and Outcomes (CSPO), a top-ranked science policy think-tank at ASU [16]. As noted in the philosophy behind CSPO, "today's societies are high-tech, and technology increasingly weaves throughout our lives … [our] research seeks to understand what it means for social relationships, values, identities, and organizations to inhabit advanced technological societies, how societies arrange themselves around large, complex technological systems, and the ways that human lives and livelihoods come to be defined by and in these systems."

The ultimate aim of any co-design engagement is to bring together diverse stakeholders with potentially competing and or divergent needs and interests to encourage the collective and creative design of solutions to contemporary problems and allow for a sense of ownership. It is to synthesize the lived experience and expertise of the individuals in a respective local community with professional (technical, regulatory, other) expertise to advance toward the sustainability and flourishing of that community [17], [18]. We maintain that technology, in its broadest sense, is not just restricted to a tangible artifact, but often embraces the end-to-end socio-technical processes or systems/ecosystems that may offer incremental to radical improvements to existing operations. With respect to the co-design of such socio-technical processes and systems, the co-designer(s) maintain(s) an active role and continue(s) to be engaged until the respective community is empowered to a state of self-sufficiency [19].

Co-design engages end-users and other relevant stakeholders in the creative process of design [20]. As such, according to Michael *et al.* [21], the aim of this design approach "should be human-centered value-sensitive socio-technical systems, offered in response to local community-based challenges that are designed, through participatory and co-design processes, for reliability, safety, and trustworthiness." In other words, designing PIT ought to happen "with" stakeholders and not "for" them. This participatory engagement must also include integration and socialization practices that are often bottom-up. Per Sargent *et al.* [22], such socio-technical systems "can work if they are embraced by locals, and harnessed for good by local companies, NGOs, elders, and other stakeholders."

Building on these notions, the co-design approach we advocate for here is not overbearing, knows its bounds, will provide expertise when required, but will also embrace the lived experience and expertise of community members and representatives, while concurrently attempting to integrate and reconcile other operational and nonoperational stakeholder interests, such as regulatory. The objective here is to co-design the future with PIT and with local communities. The IEEE International Symposium on Technology and Society 2020 (IEEE ISTAS 20) provided a forum for discussing this theme, and select perspectives are offered in this special issue.

Note about IEEE ISTAS20 and this special issue

The articles in this special issue have been invited as a result of their presentation, in part or in full, at IEEE ISTAS20 that was held on November 12–15, 2020, hosted virtually by the School for the Future of Innovation in Society (SFIS) at Arizona State University. The General Chair of the Symposium was Katina Michael, the Technical Program Chair was Roba Abbas, the Local Organizing Co-Chairs were Netra Chhetri and Nalini Chhetri, and our Publications Chair was Salah Hamdoun. We are also fortunate to have written this editorial with Jumana Abu-Ghazaleh, President of Pivot for Humanity and our only female pioneer presenter at the Conference. The program ran across four time zones and spanned some 16 hours a day for four consecutive days.

There were 210 abstracts, short papers, and longer peer-reviewed papers accepted into the ISTAS Conference Proceedings, representing over 400 authors from 27 countries [23].

It was indeed the largest ever ISTAS held, with the greatest number of registrations. We are grateful for the support of student registrations by IEEE's Humanitarian Activities Committee (HAC) 2020 Grant, in addition to the scores of volunteers, keynotes, invited speakers, reviewers, and committees over the four parallel tracks. We would particularly like to thank the students from the Innovation in Global Development (IGD) Ph.D. program at the SFIS at ASU, in addition to the student volunteers in the Society Policy Engineering Collective (SPEC) who gave up their time to contribute to the success of the event. There were two outstanding personnel who supported us during the symposium and over a weekend and we thank them especially for the event's logistics and preparation, Cindy Dick and Melissa Waite of SFIS. We are indebted to all who showed such grace by their presence.

For us, highlights included special panels on a variety of themes including co-located panels—Designing Without the – *Isms*: How Tech Inclusion Benefits Society (with IEEE TechEthics), and panels on Embedding Humanistic Values in STEM, Social and Environmental Justice, Graduate Student-Led PIT, Best Practices in PIT, and Age Appropriate Published Terms for Children, among many other memorable sessions on global development, humanitarian challenges, future technologies such as AI and brain implants, professional practice in industry, a hands-on workshop on building a SolarSPELL, several live radio shows and interviews, undergraduate case studies, autoethnographic life stories, socio-legal scholarship, and more.

We have included a diverse mix of articles in this Special Issue in the form of opinion pieces, leading edge pieces, commentaries, and peer-reviewed papers. We are very proud of this volume that incorporates both early career researcher voices and more established researchers and international research teams, with a purposeful diversity of representation. A number of themes emerged from the published authors, including technological responses to COVID-19 and their corresponding benefits and shortcomings, the promises and perils of digital transformation, themes related to care, liberation, and stewardship, and key contributions to values by design, sustainability, and rural communities.

ISTAS20 outcomes

This is the second of three special issues published stemming from collaborations at ISTAS20, the first was published in the IEEE TRANSACTIONS ON TECHNOLOGY AND SOCIETY (IEEE TTS) on the theme of "Socio-Technical Design for Public Interest Technology" (June 2021) by Abbas et al., this special on "Co-designing the Future with Public Interest Technology", and the third in IEEE TTS on "Anticipating Techno-Economic Fallout: Purpose-Driven Socio-technical Innovation" (September 2021). The three specials serve to: 1) identify the need to go beyond technologies and consider evolving socio-technical systems and ecosystems in view of appropriate and enhanced design methodologies; 2) convey an approach known as socio-technical co-design whereby diverse stakeholders are considered in the design process toward a common framing for public community-based causes; and 3) provide a means of understanding and anticipating techno–economic fallout and overcoming those pitfalls of unintended consequences by focusing on purpose-driven socio–technical innovation.

Are you interested in PIT?

PIT programs are designed to train tomorrow's leaders to imagine, design, create, and apply technology for the advancement of the social good. A list of relevant PIT degrees at the undergraduate, postgraduate, and higher degree research levels is maintained by PIT advocate, Schneier [24], and shortly a PIT degree database will be made available on New America's website. These programs "seek to equip individuals to assess new and emerging technologies, engage with community stakeholders, identify issues that are of public interest to communities, find a public consensus and deploy technologies that will benefit humanity" [25]. The Public Interest Technology – University Network (PIT-UN) has been instrumental in bringing together 36 American-based universities to join their network in a bid to raise awareness about the importance of PIT [26]. The network is set to go global in the coming year. Many of the authors participating in ISTAS20 were from member institutions. Together with the Director of PIT-UN, Andreen Soley, Katina Michael, and Roba Abbas co-organized the Day Two event where IEEE

ISTAS20 and PIT-UN Conferences were co-located virtually [27]. In addition to the vibrant PIT-UN panels that were enjoyed by all registrants, there were seven weeks of PIT Colloquia that ran preceding the 15-week lead up to the ISTAS conference. We encourage people to view these recordings if they are considering a PIT career [28]. We also encourage the formation of organic affinity groups to unite toward positive social change in society. ■

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