

Public Interest Technology for Innovation in Global Development: Recommendations for Launching PIT Projects

I. INTRODUCTION

THIS paper serves as an Introduction to the Public Interest Technology (PIT) for Innovation in Global Development Special Issue, based on a workshop of the same title held in September 2023. The paper's contribution is in proposing recommendations and practical guidance to aid in launching PIT projects. We begin by situating the Special Issue in evolving definitions of PIT in Section II, followed by an overview of the PIT ecosystem in Section III to offer a succinct account of the current state of PIT scholarship. The corresponding links to the innovation in global development context are subsequently described in Section IV, in keeping with the theme of the workshop. These links relate to an overview of adjacent fields and concepts; an illustrative example in the information technology for development (ICT4D) field; the identification of gaps in current PIT scholarship; and the preliminary questions that require attention. Next, Section V presents workshop outcomes, in the form of a general overview of the event; the identification of prevalent themes emerging from and / or are reinforced in the workshop; and a summary of Special Issue papers. The workshop is used as an interdisciplinary catalyst for the explication of more recent PIT developments. These developments are encapsulated in ten recommendations for launching PIT projects in Section VI, intended to direct PIT project managers or lead investigators prior to project launch or during the initial stages of a project.

II. WHAT IS PUBLIC INTEREST TECHNOLOGY?

Public Interest Technology is a nascent field that can be traced to 2016 when several charitable foundations commissioned a study on a new generation of technologist for the public interest [1], [2]. Notions of the public interest stemming from ancient Greek philosophers such as Plato (428–347 BC) and Aristotle (384–322 BC), have “assumed the existence of a public interest that is more than the sum of the interests of the individuals that make up a polity” [3, p. 101]. Albeit controversially, modern interpretations of the public interest stress the “collective” consisting of individual interests summed together, needing to be protected by public servants [3]. Thus, subsequent efforts in political philosophy and law, have

generally described the public interest in terms of justifiable community benefits [4].

While many definitions of PIT have emerged (refer to Table I for representative examples), most encompass ideas of solving public problems for the “public good” or in the public interest within an evolving ecosystem of stakeholders [5], [6]. Other attributes of PIT include: recognition of the undesirable consequences and implications of technology; responsible approaches to emerging technology supported by cross-sectoral collaboration [7]; public (citizen) participation opportunities [8]; interdisciplinarity with respect to the design, implementation, and regulation of technologies; an emphasis on groups that may be “targeted and neglected by technology” [9]; and the role and training of the public interest technologist [10]. While Freedman et al. [1, p. 1] originally referenced “technologists for the public interest”, the term was reversed in academia and practice to public interest technology, following the established area of public interest law (PIL), and the more recent developments in public interest journalism (PIJ).

III. THE PIT ECOSYSTEM

PIT can be described as both a philosophy of technology / innovation / systems design and development, and / or as an end goal [11]. It can also be depicted as an open socio-technical ecosystem [11, Fig. 1, p. 58], [12]. Core to the PIT ecosystem is the notion of purpose-driven socio-technical innovation, which accounts for unintended consequences and requires a redefinition of what is considered “purposeful”: in this context, it is striving for public (citizen and community) benefit [13]. A primary objective of the PIT ecosystem, and its constituent stakeholders, is to advance core values such as justice and equity in technology or innovation related projects and processes [6]. This objective should be pursued in a manner that aligns with and reinforces the values and needs of traditionally disenfranchised or vulnerable groups [9]. Reinforcing qualitative human values, both individually and collectively, necessitates PIT design methodologies that incorporate expectations, accountability, reflexivity and polycentricity [14].

A related key consideration is establishing the link with public policy, law, regulation, and governance mechanisms within a stipulated context, while identifying and exploring the technological landscape and developments relative to a given application area [11]. Regarding regulation, multiple

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TABLE I
DEFINITIONS OF PUBLIC INTEREST TECHNOLOGY

Source	PIT Definition Summary
New America (n.d.)	“[T]he study and application of technology expertise to advance the public interest in a way that generates public benefits and promotes the public good”, with an emphasis on solving “public problems” through deep engagement with policy-making processes while creating an ecosystem that embodies fundamental human values, such as equity, transparency and accountability, among other values [6].
Arizona State University (2020)	An approach whereby “[a] public interest technologist can help corporations, government agencies and nonprofits achieve their goals responsibly through the consideration of people as both consumers and global citizens” with the purpose of solving “socio technical problems such as privacy encroachment, security data breaches, inaccessibility to information, unsustainable business practices, humanitarian crises, energy inefficiencies, issues of empowerment, transparency and oversight, among others” [10].
Michael and Abbas (2020)	Focused on addressing “social needs and challenges in society. People working in this space ask communities what their needs are first, without presuming they know what is best for them and generally use a participatory approach to innovation with values in mind and cultural awareness. Public interest technologies pertain to technologies that might leverage open source software for collaboration, and open data initiatives to overcome societal challenges, may exercise crowdsourcing and crowdsensing techniques toward collective awareness. The goals of PIT ... may include, human rights, social justice, sustainability and environmental justice in [the] workforce, going beyond corporate social responsibility and compliance” [5].
Committee for Economic Development of Australia (CEDA) (2020)	“[D]evelopment, adoption and management of emerging technologies to deliver the greatest public opportunities and benefits,” seeking suitable risk management and mitigation measures to address the undesirable impacts of technology through technological stewardship and cross-sectoral collaborations between stakeholders such as industry, academia, business, government, and technology-based actors [7].
U.S. General Services Administration (2022)	[C]entered on public engagement through a range of approaches and corresponding initiatives including of crowdsourcing, citizen science, and schemes focused on improved data and information access [8].
Stanford University (2022)	“[I]nterdisciplinary approach that demands technology be designed, deployed, and regulated in a responsible and equitable way,” with an emphasis on the experiences of groups that have been disproportionately affected by technology including “marginalized groups who have been both targeted and neglected by technology” [9].

stakeholder perspectives need to be accounted for, including user-based and individual perspectives on regulatory compliance and the associated perceptions of emotional

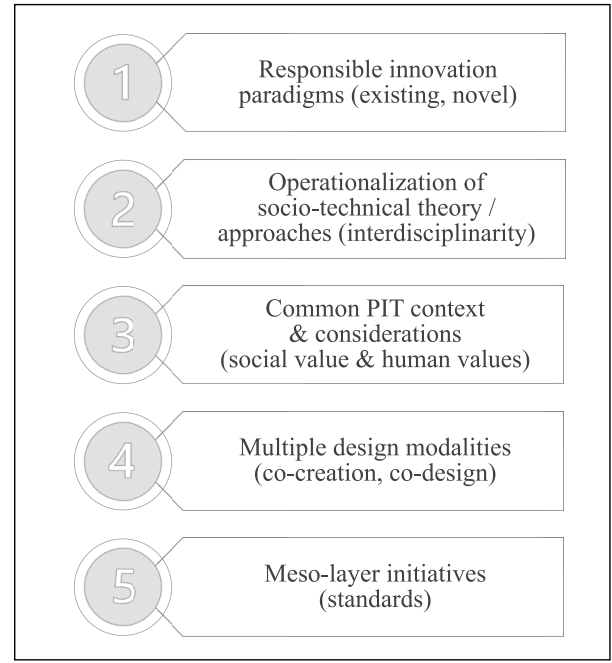


Fig. 1. PIT workshop themes.

empowerment in value-based contexts, for instance, with respect to security- and privacy-preserving technologies [15]. The way in which these individual perspectives contribute to broader public perceptions regarding a range of values in a specific context is also critical. A related consideration here is collective action, relying on coordinated efforts and the orchestration of knowledge “in order to achieve a desired outcome relative to the applicable metrics,” such as performance and quality [16, p. 6].

A PIT ecosystems perspective equally requires an appreciation of other factors and interacting elements incorporating financing considerations, stakeholder-related experience and expertise, theoretical and conceptual frameworks, and design approaches allowing for operationalization, in addition to the identification of a suite of fundamental human values that need to be accounted for. Refer to Abbas et al. [11, Fig. 1, p. 58] for a visual representation of the PIT open socio-technical ecosystem framework, which provides the necessary context for this Introduction.

IV. PIT FOR INNOVATION IN GLOBAL DEVELOPMENT

With its emphasis on equity, justice, ethics and responsibility, PIT and its ecosystem manifestation is somewhat comparable to other fields that connect technology, innovation, and scientific endeavors to global development. The definition of global development assumed in this Introduction, not to be confused with the often-conflated term international development, is about advancing local, regional, national, and international community interests from social, economic, technological, health, environmental, and other connected perspectives, resulting in a relational and encompassing definition of development that is valid globally [17]. This definition

is aligned with recognized sustainability agendas that promote “global partnership” and apply to both developing and developed nations and broader perspectives of global development, such as the UN Sustainable Development Goals [18]. This definition also relates to other fields and concepts that are adjacent to PIT, and that have emphasized technological interests among others.

A. Adjacent Fields and Concepts

Narrowing in on the technological and innovation aspect of global and sustainable development for the purposes of this Introduction, a discernible starting point at the intersection of PIT and global development are fields such as humanitarian engineering [19], [20], Tech for Good [21], [22], Civic Tech [23], [24] and Information Technology for Development (ICT4D, see the following section for further detail), among others. Other adjacent fields include responsible innovation [25], [26], [27], [28], socio-technical design / co-design / participatory design [29], [30], [31], [32], [33], [34], [35], and citizen science [8], [36], [37], [38].

A cursory view of the identified fields indicates that they tend to be discipline- or sector-specific. Furthermore, they appear to overlap in their emphasis on people and planet, although this is often contested as discussed in the following section. While a comprehensive review of these fields is beyond the scope of this Introduction, ICT4D is used below as an illustrative example of a global development field that is adjacent to PIT with the purpose of highlighting that PIT scholarship and the PIT ecosystem do not exist in isolation. This is significant as there may be the need to explore adjacent fields and concepts in the context of any given PIT project.

B. Illustrative Example: Information Technology for Development (ICT4D)

ICT4D is defined as a multidisciplinary field [39] that focuses on the supply and use of information and communication technologies or digital technologies for community development, initially aimed at progressing developing countries and communities [40], [41], [42], although this definition has been challenged [43]. Development in this context has been described from four vantage points: specifically, from the perspectives of enhanced freedom, inclusion, well-being, and economic productivity [44].

The evolution of ICT4D can be described in three distinct periods: the first (mid-1980s to mid-1990s) championed research on the social implication of information systems (IS) in developing countries; the second (mid-1990s to mid-2000s) coincided with significant technological changes and ensuing critiques, resulting in an expansion in the scope, type of research and disciplinary focus beyond the IS domain; and the third (2000-2017) amplified the interdisciplinary focus and critiques of the field [41]. While interdisciplinarity and critical reflection are enduring themes in current ICT4D discourse [39], and global development scholarship more broadly, a high incidence of ICT4D project failures has been reported [44], attributed to many factors including insufficient attention to the relationship between “the macro context and

the local IS innovation” setting [45, p. 698] and the design-reality gaps [46], [47].

The ICT4D field was initially scrutinized for what was considered a problematic emphasis on developing countries [48], contributing to further issues relating to both ICT4D research and practice [43], [48]. These include issues such as the lack of user centricity while in parallel furthering technocentric ideologies; inadequate treatment of ethics and ethical considerations; and the lack of quality and rigor in research, which naturally impedes practical efforts and projects [43]. Less forgiving assessments question the central premise of the field, that is, the technologically deterministic perspective that suggests technology is in fact a requirement to achieving (global) development objectives [43], which can somewhat undermine the indispensable social orientation of global development research and projects. Recent studies have called for a reorientation of sorts, where it is suggested that justice and equity should and can be operationalized through an impact-driven framework that defines the interrelated elements of motivation, stakeholders, practices, and goals [49]. The intention in this instance is to address issues of the marginalization of populations and select criticisms of ICT4D research [49].

When positioning ICT4D relative to PIT, it is immediately evident that both fields relate to global development in their overarching goals. For example, the ICT4D field is committed to tackling significant issues, including but not limited to, economic wellbeing, global health, and the undesirable consequences of ICTs [41]. The PIT field is similarly inclined. However, points of divergence include the foundations, maturity, evolution, and focus of the respective fields. A case in point is the direct emphasis on “the public” in the case of PIT compared with the techno-optimistic perspective that has traditionally been assumed in the ICT4D field [43].

C. Gaps in PIT Scholarship

In this Introduction, we acknowledge progress in the ICT4D field, and the adjacent fields previously identified. We also call for a recognition and exploration of these fields when considering the launch of PIT projects. This particularly applies to projects centered on global development in the broad sense of the term, but equally concerns PIT projects in general. In doing so, we seek to better understand how we can engage in and successfully launch PIT projects within what can be considered a rich, overlapping, and interconnected environment, thereby addressing a significant gap in existing PIT literature. This understanding is a prerequisite for engaging in interdisciplinary PIT dialogue and projects, as the somewhat indistinct connection between PIT and adjacent fields may inhibit the progress, and indeed the launch, scope, and focus, of PIT projects. This is specifically pertinent in instances where there may be perceived discrepancies regarding approaches and concepts, and a potential sense of rivalry regarding disciplinary positions, expectations, and interests.

D. Preliminary Questions

As there is insufficient academic research into these considerable discrepancies, gaps, and challenges, several preliminary

questions surface with respect to PIT for innovation in global development and more broadly. Questions include: What is the role of public interest technology (as a field, philosophy, outcome) when applied to global development? What initiatives are required to strengthen the emergent academic field of public interest technology? Do we need novel theories, methodologies, frameworks, and approaches given the existing body of knowledge in adjacent fields? What is required for interdisciplinary PIT projects to succeed? How can purposeful, interdisciplinary PIT partnerships and projects be initiated and nurtured, moving toward an agreed upon, values-based outcome? And are there any practical recommendations for launching PIT projects?

V. PIT FOR INNOVATION IN GLOBAL DEVELOPMENT WORKSHOP (PIT WORKSHOP)

A. Workshop Overview

The preliminary questions identified in the preceding section, among others, and previous work in the PIT domain (see Appendix A which refers to supplementary material/media files.) for a teaching module study guide containing further readings related to global PIT initiatives, Appendix B (this refers to supplementary material/media files.) for the accompanying slides and [50] for the associated video resource) provided the impetus for developing the concept of the Public Interest Technology for Innovation in Global Development Workshop (from here on the PIT Workshop) and issuing the associated call for papers [51]. The PIT Workshop was held on the 12 September 2023 and was co-located with the *IEEE International Symposium on Technology and Society 2023* (ISTAS23). The workshop overview [52] and five PIT papers emerging from the event were published in the ISTAS23 proceedings [53]. The workshop also provided paper development opportunities with the purpose of progressing manuscripts for consideration in related special collections, including this Special Issue in the *IEEE Transactions on Technology and Society (IEEE TTS)* and a special collection in the *International Journal of Business Science and Applied Management (IJBSAM)*. Refer to [A1], [A2], [A3], and [A4] below for a list of the accepted *IEEE TTS* Special Issue papers. The PIT projects identified in the papers were at varying stages of development and employed assorted perspectives and approaches, contributing to the primary focus of the workshop: to expand our understanding of PIT for innovation in global development with the purpose of addressing local through to broader societal challenges, using interdisciplinary approaches [51].

B. Themes

The PIT Workshop papers, inclusive of related Special Issue papers, covered various themes, sub-themes, concepts, and approaches that enrich existing PIT scholarship (refer to Appendices A-B which include supplementary material/media files for further reading and [50] for an accompanying resource reviewing global PIT initiatives and considerations). Specifically, these articles and resources contributed valuable insights into the interpretation of interdisciplinary dynamics

and subtleties in the context of a range of PIT projects related to innovation for global development. Five dominant workshop themes were identified manually through high-level coding of the published PIT workshop papers. The purpose of this Introduction and Special Issue is to demonstrate how existing projects and studies can be utilized to inform the launch of PIT projects in the first instance and contribute to PIT scholarship and the explication of PIT ecosystem elements in the second.

The dominant themes from the PIT Workshop are identified in Fig. 1, and are broadly centered on developing responsible innovation paradigms, operationalizing socio-technical approaches through genuine interdisciplinarity, enhancing the understanding and representation of common contextual factors and considerations that are consistent across all PIT project instances, highlighting the multiple modalities for engaging in co-creation and problem and solution co-design, in addition to emphasizing the role of meso-level initiatives with the purpose of designing, developing, and implementing artifacts consistent with the core tenets of PIT, as described in Sections II and III. Table II succinctly summarizes the respective themes, presenting the implications for PIT research and practice.

C. Special Issue Papers

Further to the PIT Workshop themes above, this section provides a summary of the accepted *IEEE TTS* Special Issue papers, each of which presents insights regarding one or more of the themes, as applied to a specific context and level (e.g., micro, meso or macro). The first paper in this Special Issue is titled “The Human(e) Technology Design Studios: An Action-Oriented, Co-creative Modality for Centering the Human in Critical Technology Discussions,” by Erica O’Neil, Elizabeth Grumbach, Gaymon Bennett and Elizabeth Langland of the Lincoln Center for Applied Ethics at Arizona State University [A1]. This paper outlines a co-creation tool developed to facilitate critical technology dialogue with a specific focus on user groups that are “disproportionately impacted” by a given problem or system, thereby aligning with fundamental definitions and requirements of PIT, as described in this Guest Editorial. The authors present the theoretical underpinnings informing the Human(e) Technology Design Studios and the principles of engagement, covering notions such as experience and expertise, the question-based orientation of the studios and the significance of “systematic thinking,” among other principles. They also reveal details about the rhythm or progression of the design studios encompassing movements and convergent and divergent thinking activities, after which a comprehensive case study elaborating on the creation of the principles is presented. A publicly accessible Design Studio Modality toolkit is forthcoming.

The second paper in this Special Issue is by Emily Zuetell and Paulina Jaramillo from the Department of Engineering and Public Policy at Carnegie Mellon University [A2]. The paper is titled “A Framework for the Interpretable Modeling of Household Wealth in Rural Communities from Satellite Data.”

TABLE II
DESCRIPTION OF PIT WORKSHOP THEMES AND IMPLICATIONS FOR PIT RESEARCH AND PRACTICE

#	Theme Overview	Implications for PIT Research and Practice		
1	Requirement for strengthening existing, and providing novel, paradigms for responsible innovation in the context of PIT.	Ensure a direct link to responsible innovation in the design, scoping and formulation of PIT projects. This entails an understanding of what responsible innovation means in the context of PIT for innovation in global development, PIT in general, and / or PIT in a specific project instance. Refinement of existing responsible innovation paradigms and approaches may be required.		
2	Resurgence of socio-technical scholarship and studies with distinct calls for the operationalization of socio-technical approaches through interdisciplinary engagement toward an outcome in the public interest.	Emphasize the socio-technical framing and dynamics when a PIT project is being conceived. This includes a socio-technical conceptualization of a project prior to its commencement; and identifying and selecting a suitable socio-technical design approach that is aligned with the conceptualization and with the purpose of operationalizing socio-technical systems theory. This will provide fertile grounds for both interdisciplinarity to flourish, and socio-technical approaches to be implemented in practice for the public good and to achieve public benefits and / or generate opportunities.	4	Application of a multitude of modalities for problem and solution co-creation, in addition to the co-design of PIT artifacts.
3	Enhanced understanding of the common contextual factors and considerations prior to the commencement of any PIT project.	Provide clarity regarding underlying assumptions and shed light on both the seemingly invisible and visible values that may impact on design-related beliefs prior to project commencement. This is a requirement for adopting and operationalizing socio-technical theory, as per the previous theme. A common context across PIT projects will necessarily incorporate elements of social value (philosophical) and value-sensitive, ethics-based, responsible, democratic, and collaborative approaches to design. This is important as the context within which PIT-related projects exist and socio-technical approaches are operationalized are bound by both obscure and visible assumptions and contextual considerations that could potentially be overlooked. Agreement regarding these assumptions and values among interdisciplinary project members is critical prior to project launch.	5	Institution of meso-level initiatives and mechanisms, such as standards, that can aid in the creation and delivery of suitable PIT artifacts, solutions or outcomes in a range of settings, including those that seek to explore both the use of prevalent technologies such as AI and those that may support industry and communities in times of crisis and in general.
				Integrate the notion of multiple design modalities facilitating the co-creation of both PIT problems and design solutions through deep collaboration between a range of stakeholders. This includes stakeholders such as end-users, ageing populations, potentially underserved and remote communities, citizens within the context of (smart) cities and other community settings where there are unmet needs, as per the example stakeholder groups referenced by PIT Workshop participants in their projects. In the context of this Introduction, the need for collaborative approaches to problem identification is stressed, given the intention to provide guidance for activities that take place as a PIT project is being conceived and prior to project launch. Another important element is the involvement of groups that have traditionally been marginalized with respect to public engagement initiatives relating to technology and innovation.
				Clearly denote meso-level initiatives relative to micro and macro level considerations, which may aid in attributing responsibility for various facets of a PIT project prior to its launch. This includes assigning responsibility for governance and regulatory efforts to suitable stakeholders, while also embedding a sense of awareness regarding the constraints and relationships that exist at and between certain levels. For example, the limitations and challenges associated with public engagement and co-design (micro), development and implementation of industry standards (meso) and agreement regarding socially and ethically acceptable approaches in the context of a given PIT project and the governance of technologies / the technological landscape more broadly (macro). Awareness of the requirements, constraints and challenges is vital prior to project launch, as it will allowing necessary preparations to be made relevant to micro-, meso- and macro- level initiatives.

The aim of this paper is “to demonstrate that simple, human-understandable models can be developed with performance and outcomes similar to deep learning models while adhering

to responsible, equitable, and inclusive design principles.” As such, Zuetell and Jaramillo propose an interpretable model for predicting household wealth utilizing satellite data, specifically

village-level annual household wealth in Uganda. The paper additionally articulates the challenges and trade-offs that exist in this context, highlighting the significant link between interpretable methods of this nature and human-centered design.

The third paper in this Special Issue is focused on “Social and Ethical Norms in Annotation Task Design” and is authored by Razvan Amironesei, an independent researcher, and Mark Díaz from Google Research [A3]. This article explores the reliance on humans for annotation of machine learning datasets, and the ensuing social and ethical considerations in annotation task design. Specifically, the authors draw attention to the process of human-generated annotation that is used as a basis for training machine learning models. Amironesei and Díaz maintain that such approaches may disregard factors such as social and cultural judgements in the context of subjective tasks that require presumed knowledge of socio-cultural contexts. The failure to acknowledge how subjective experiences and individual values influence “data judgements” may lead to a range of biases and “representational harms” potentially impacting minoritized communities. The authors call for responsible AI approaches, posing critical questions that require immediate attention “for proactively addressing representational harms that emerge in data.”

The fourth and final paper in this Special Issue is by Michael Eldred, titled “An Invisible Global Social Value” [A4]. Eldred’s paper provides a deep, philosophical treatment of the setting within which public interest technology initiatives are entrenched and of the concept of value, both the visible and seemingly invisible global social values. Commencing with the question “Who are we?”, the author progresses to the concept of interplay, providing an overview of global human rights and visible values, following the Western tradition. Eldred particularly notes the value of democracy as enabling “a squaring of the circle of political power.” This is followed by an exploration of “thingified value” as an invisible global social value relating to what the author terms the competitive “gainful game.” It is within this setting that Eldred reflects on the impact of assigning worth to thingified value on both people and place, in addition to other notions that provoke thought regarding perceptions of value and values in a public interest technology framework.

VI. RECOMMENDATIONS FOR LAUNCHING PIT PROJECTS

Based on the PIT Workshop outcomes, the emerging themes and their corresponding implications for PIT research and practice, the Special Issue papers and experience drawn from previous PIT scholarship and projects (see Appendices A-B for supplementary material/media files, and [50] for an overview), the following ten recommendations are offered to guide PIT project managers and or lead investigators. These practical recommendations are intended to be used prior to the commencement of a project. The primary purpose is to determine the immediate feasibility of pursuing a PIT project, and to ease the process of launching and/or directing the project. Furthermore, the recommendations are presented only for guidance and are not designed to be prescriptive nor are they validated.

The recommendations, which can be utilized in tandem with the PIT ecosystem framework developed in [11, Fig. 1, p. 58] are as follows:

1. Identify stakeholders within the relevant PIT project. This encompasses both direct and indirect stakeholders to ensure cross-sector representation. It is important to ascertain which stakeholders can realistically contribute to the PIT project, factoring in project constraints, resources, priorities, and other factors. Refer to the stakeholders identified in each of the Special Issue papers [A1], [A2], [A3], and [A4] and the PIT Workshop papers published in the ISTAS23 Proceedings [53], which represent diverse stakeholders in the PIT ecosystem. Example stakeholders include users, ageing populations, underserved and remote communities, and citizens within a particular application context.
2. Ensure that appropriate modalities or approaches for participation are selected to facilitate stakeholder engagement across disciplinary and sectoral boundaries to allow for the joint identification of the PIT socio-technical problem/s that the project is seeking to address. Refer to the Special Issue paper by O’Neil et al. for an example of a co-creative modality in the form of design studios [A1].
3. Ensure clarity and agreement regarding the context of innovation and the definition of “public interest” and “public interest technology” within the identified setting. For instance, from a PIT for innovation in global development perspective, refer to PIT Workshop papers published in the ISTAS23 Proceedings [53] and Special Issue papers listed below ([A1], [A2], [A3], and [A4]) for example studies / projects across distinct contexts.
4. Initiate interdisciplinary, and potentially transdisciplinary, dialogue among project team members and the identified stakeholders in line with Recommendation 1. The PIT ecosystem framework, this Introduction and accompanying Special Issue papers can be used as a guide to prompt discussion around the foundational socio-technical perspective that should be assumed in the early stages of the project. Discussions should additionally cover the conceptions of social value and human values that the project is seeking to privilege supplementary to core PIT values, such as equity. Refer to [12] for further information pertaining to socio-technical systems theory, the Special Issue paper by Eldred for a philosophical treatment of the concept of social value [A4], the PIT ecosystem framework in [11, Fig. 1, p. 58] for an illustrative list of values, and the principles and features of PIT identified in Section II.
5. Collaboratively identify elements within the PIT ecosystem framework that resonate with different stakeholder groups and are applicable in the defined context. See Recommendation 1 for a note on stakeholders, and use the PIT ecosystem framework in [11, Fig. 1, p. 58] as a supplement to this exercise.
6. Collaboratively identify elements that are absent from the PIT ecosystem framework and ensure their inclusion,

once again, mapping elements against the PIT ecosystem framework in [11, Fig. 1, p. 58].

7. Adapt the PIT ecosystem framework [11, Fig. 1, p. 58] to suit the specific project instance, ensuring the elements identified in steps 5 and 6 are adequately represented in the tailored, project-specific framework.
8. Using the adapted PIT framework, identify comparable concepts, frameworks, and terms currently in use by project team members and other relevant stakeholders. Ensure interdisciplinary mapping and knowledge sharing with the purpose of brainstorming existing competencies and mechanisms to foster an environment conducive to knowledge co-creation. This step is crucial for creating respectful and truly interdisciplinary project environments, since it is important not to reinvent the wheel, and acknowledge and link to potentially adjacent fields and concepts, such as those identified in Sections IV-A and IV-B as well as example projects for lessons regarding co-creation, stakeholder engagement and values-based decisions across varied contexts. Refer to the Special Issue papers [A1], [A2], [A3], and [A4] and the PIT Workshop papers published in the ISTAS23 Proceedings [53] for representative examples.
9. Decide on the nature and intended outcomes of the PIT project and ensure agreement regarding specific calls to action among interdisciplinary stakeholders. Pose questions such as: What is the desired PIT design artifact? What constitutes an acceptable outcome for stakeholders? What values supplementary to equity and justice will be advanced?
10. Operationalize selected elements of the PIT ecosystem framework tailored to a specific project instance once there is agreement regarding the above aspects.

The Guest Editorial team offers these recommendations, the papers featured in this Special Issue and the broader PIT Workshop project outcomes with the intention of informing and guiding future PIT projects, ideas, and interdisciplinary dialogue. In doing so, the aspiration is that technology and innovation can be harnessed for development locally through to globally.

APPENDIX: RELATED ARTICLES

- [A1] E. O'Neil, E. Grumbach, G. Bennett, and E. Langland, "The human(e) technology design studios: An action-oriented, co-creative modality for centering the human in critical technology discussions," *IEEE Trans. Technol. Soc.*, early access, Mar. 18, 2024, doi: [10.1109/TTS.2024.3377547](https://doi.org/10.1109/TTS.2024.3377547).
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IN MEMORIAM

The authors wish to remember the late Gaymon Bennett, Associate Director at Arizona State University's Lincoln Center for Applied Ethics and co-author to [A1] who passed away on 31 January 2024.

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