

## RAISE AWARENESS ON THE ISSUES OF GLOBAL POVERTY: A TRANSDISCIPLINARY RESEARCH IN HUMAN-COMPUTER INTERACTION

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**Abstract.** Global poverty is one of today's most pressing issues of sustainability. Raising global poverty awareness is critical, but incorporating Human-Computer Interaction (HCI) as a core to understanding how to design a technology that brings together both academia and stakeholders to see poverty eradicated is underutilized. Furthermore, several factors must be considered and more research is required, particularly when channeling awareness. This comprehension includes incorporating public interest, societal actors, human-centered ICT, and communication into a transdisciplinary investigation that can aid in the success of awareness-raising events. We then proposed to breaking down these major challenges into three study steps: co-design, co-production, and co-dissemination. The proposed transdisciplinary investigation combines philosophy of mind, human-oriented technology, and communication discipline. We proposed investigating and representing a collaboration framework to help generate more evidence of how incorporating Human-oriented ICT and communication discipline as well as understanding collaboration based on transdisciplinarity and integrated context of research concepts using a mix-methodology approach that combines an analysis of systematic literature review and meta-analysis approachment. More importantly, the study aims to stimulate systematic thinking and innovation in order to propose a paradigm for knowledge toward global sustainability, which will be designed and carried out in collaboration between academia and stakeholders, with this investigation focusing on the five paths out of poverty: access, opportunity, empowerment, security, and sustainability. This study challenges in transdisciplinary HCI should be paid attention to keeping design at the heart of HCI regardless of discipline boundaries being crossed, going even further in transdisciplinary HCI research and practice, and also studying the effects of transdisciplinarity in design from communication and collaboration perspectives, particularly with regard to global poverty eradication.

**Keywords:** raise awareness; global poverty; transdisciplinary research; human-computer interaction; communication crisis

### I. INTRODUCTION

The 2030 Agenda for Sustainable Development includes eradicating severe poverty for all people worldwide by the year 2030 as one of its key objectives. The rate of poverty decreased from 10.1% in 2015 to 8.6% in 2018, marking a historical low for the period between 2015 and 2018. What we do today is one of the miles stone to achieve the goal in 2030. Poverty continues to be a critical developmental challenge worldwide (United Nations [UN] 2015). Poverty is defined as persons living below a certain income/consumption level or the poverty line (Moikowa, 2004) and those experiencing non-material hardship (Romeshun and Mayadunne, 2011). Using a poverty line of US\$1.9 per day in 2015, 10% of the world's population was extremely poor, which fell to 8.4% in 2019 but rose to 9.4% in 2020 due to the Coronavirus [COVID-19] pandemic (World Bank 2020). Poverty reduction in South Asia and Sub-Saharan Africa using the US\$3.20 (lower middle-income economies) and US\$5.50 (upper-middle-income economies) poverty lines in 2018 was slower than against the extreme poverty line, indicating that many people in the Global South had narrowly escaped poverty before COVID-19 (World Bank 2020). Why is poverty so prevalent in the world? Although poverty has numerous manifestations, its origins

include the inability of certain populations to work because of unemployment, social marginalization, and excessive vulnerability to natural disasters, diseases, and other events.

According to the World Bank (2020), COVID-19 will send 115 million people back into poverty, reversing decades of progress, with the Global South bearing the brunt of the impact. Ghana's poor predicament reflects that of the Global South. Ghana had a poverty rate of 51.7% in 1991/92, but this dropped to 23.4% in 2016/17 [Ghana Statistical Service (GSS) 2018]. This means about 24.2% of Ghanaians numbering some 6.4 million cannot afford to spend GH¢3.60 (US\$ 1.16) a day on food and necessities (GSS 2018). Moreover, about 8.4% of the population live in extreme poverty, which indicates they cannot afford to spend more than GH¢2.17 (US\$ 0.36) on food in a day (GSS 2018). Future Earth (see also [www.icsu.org/future-earth](http://www.icsu.org/future-earth)) will provide a new platform and paradigm for integrated global environmental change research that will be designed and conducted in partnership with society to produce the knowledge necessary for societal transformations toward sustainability. Regarding The 2030 Agenda for Sustainable Development, The United Nations interagency task team on science, technology, and innovation will foster coordination, coherence, and cooperation within the United Nations system on related issues, increasing

synergy and efficiency, particularly to strengthen capacity-building initiatives. The statement shows that to run the milestone for 2030, all elements need to work together from any discipline or what we used to call transdisciplinary in the research field.

In the case of transdisciplinary research, learning from experience requires special effort because of the heterogeneity of the fields and the participants. There is a lack of strong institutional structures for transdisciplinary research that are necessary for establishing scientific communities in which a state of the art can be developed. Attention has to be paid to the mutual interrelations between these two forms of knowledge, such as “Human-Computer Interaction and Communication Crisis Fields.” The investigation of systemic processes has to be related to the societal purposes and practices on which they depend and which they influence. If the needs, interests, and reasons of practitioners and stakeholders are ignored or if systemic processes are not taken into account in developing transformation knowledge, major unexpected obstacles and unintended effects may result.

The lack of communication between the two fields “is making it difficult or impossible for us to take good action” (Snow, 1964). By “good action” Snow meant solving the problem of unequally distributed wealth and goods on earth. His motivation for stressing the difference between cultures was to show that it hindered effective problem-driven research. Many of these activities have helped to raise awareness among the scientific community of new approaches to the organization, HCI design, and conduct of global change research, and have identified research challenges and related research questions that Human-Computer Interaction and Communication Fields should tackle.

Human-Computer Interaction courses should stimulate people thinking and guide them to build up a knowledge base of direct experience in solving various usability problems [2]. It is also stated that designers and developers of systems must understand the user, the technological system, and the tasks that the users expect to perform. Therefore, an ideal designer of these systems would have expertise that ranged in a wide variety of topics [3]. Another recommendation is that this course should encompass the themes central to the HCI discipline and integrate the paradigms from various discipline-oriented perspectives [3]. This study aims to understand the need of designing effective communication between Human-Computer Interaction and Communication Fields and the type of users and the computers they use. The surroundings of the device, relevant from the point of view of running an application, are often referred to by the term context. Devices able to adapt their functionality to changing surroundings are called context-aware devices. While few commercial applications exist to support the concept of “context awareness”, several prototypes have been introduced. However, more research is needed as the technology for recognizing context is not yet widely available, and many problems remain unsolved.

Researchers in the Human-Computer Interaction (HCI) field study, design and encapsulate the rich interaction between different kinds of users, information technology systems, and contexts of use at personal and organizational levels with implications for shaping society at large. HCI addresses different levels of analysis in human-technology interaction, utilizes different theoretical perspectives, practices, and paradigms from other disciplines, cooperates with other academic disciplines to study human-technology interaction, crossing boundaries and contributing to other disciplines, and has the design of human-technology interaction in its core. As a research and practice field, HCI is very suitable for and oriented towards inter- and multi-disciplinarity, but “Transdisciplinarity in HCI” is not yet fully explored. This study outlines and reflects upon the concepts of transdisciplinarity, HCI, Communication Fields, and transdisciplinarity in HCI.

The purpose of this study is to provide an overview of the state-of-the-art current context-awareness research to tackle The Sustainable Development Goals and to argue for the increasing role of the concept of Human-Computer Interaction and Communication Fields in future human-computer interaction baseline. Both applications and implementation issues are covered. In addition, the authors’ findings and future research on the technology for context recognition are described. The authors of this study are researchers in the field, mainly studying activity recognition using a real-world approach. They address certain key problems associated with the use of the technology which provides a wide range of examples of applications that employ context-awareness. In the “Context of framework development,” section, common transdisciplinary approaches to the formulation of the context are described. Finally, the “Main concerns” section analyzes the concerns and major problems raised by new context-aware applications for Sustainable Development Goals.

The birth of science is based on a strict dissociation of scientific knowledge from the various aspects of practical knowledge. The ideal of scientific knowledge as it was shaped in antiquity is still influential today, although the conception of science and the relationship between science and the life-world has undergone major changes. The emergence of transdisciplinary orientations in the knowledge society at the end of the 20th century is the most recent step.

while interdisciplinary studies start from a discipline and develop a problem around it, transdisciplinary (TD) studies start from a problem and find the related disciplines which facilitate solving it. TD studies are hard to design, since they require highly prepared and motivated intellectuals (Aalborg University Copenhagen, 2011). As the prefix “trans” indicates, TD concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines (Nicolescu, 2002). Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge. The word itself is quite recent; it was introduced by Jean Piaget in 1970 (Piaget, 1972). TD was recognized as a form of disciplinarity nearly 40 years ago at meetings about interdisciplinarity held by the Organization

for Economic Cooperation and Development (OECD). In fact, the term TD appeared in academic texts as early as the 1970s (Schneider, 2003). However, there has been substantive progress in TD approaches during the past two decades (Hirsch Hadorn et al., 2008, p. vii). While some scientific disciplines such as social sciences have been studying technology as part of human life and practices from their own perspectives for a very long time already, other disciplines such as Human-Computer Interaction (HCI) have only recently started to address the social science perspectives of technology facing tremendous problems when trying to include them into their own research and practice (Resende et al., 2017). It can be argued that Human-Computer Interaction (HCI), as the most human-oriented discipline within ICT, is responsible for studying and understanding the relationships between individuals, practices, organizations and different contexts in which they use ICT technologies as part of their everyday work and practice to achieve their goals and intentions.

As a relatively young discipline, HCI has had freedom in its efforts of developing, expanding and evolving together with technological advances, drawing concepts, theoretical lenses and paradigms conveniently from other disciplines, such as “social sciences, cultural anthropology, and engineering,” to name a few. HCI is clearly inter- and multidisciplinary by nature, but the role and possibilities of transdisciplinarity in HCI have not yet been fully explored. The purpose of this paper is to outline and reflect upon the transdisciplinarity in HCI through tackle The Sustainable Development Goals. We will answer questions such as what are the distinguishing features of the HCI research and practice? what is transdisciplinarity? and what transdisciplinarity in HCI entails related to The Sustainable Development Goals primarily in the issues about Global Poverty. In the core of HCI research and practice is the interaction between the individual and the computer, technology, software, or hardware through a user interface, which is the only gateway for the user to reach the intended functionalities of the technology. The design of this gateway is at the heart of HCI research and practice (Iivari, 2019). This interaction between humans and technology is encapsulated in the concept of usability to achieve a better and more sustainable future for all.

Raising awareness is a key strategy of ending global poverty. Raising awareness around global poverty helps bring people together who share the goal of eliminating global poverty. There are several factors to consider when channeling awareness. Public interest and celebrity involvement can play a factor in successful events involving raising awareness. The United Nations raised awareness on the issues of global poverty by marking October 17, 2020, the International Day for the Eradication of Poverty. It used the day to raise awareness of how those living in poverty suffer and what others can do to make a difference. The U.N. used “#Endpoverty” to raise awareness and educate the public about global poverty. The U.N. recognizes and promotes many international focus days throughout the year which raises awareness on issues that those living in extreme poverty

face. These international focus days include World Tuberculosis Day and World Refugee Day.

Public awareness is important to increase enthusiasm and support, stimulate self-mobilisation and action, and to mobilise local knowledge and resources. Raising political awareness is especially important as policy makers and politicians are key actors in the policy process of adaptation. Awareness raising requires strategies of effective communication to reach the desired outcome. The combination of these communication fields strategies for a targeted audience for a given period can broadly be described as an “awareness raising campaign.” The aim of awareness raising campaigns differs between contexts, but generally involves informing the targeted audience of the specific concerns, and suggesting ways to change behaviour to overcome or reduce these concerns. Although awareness raising is often considered to be important at the first stages of the adaptation process, research (e.g. Manuti, 2013) shows that levels of awareness fluctuate through time under the influence of external variables. Therefore, raising awareness is not only important at the first stages, but is integral throughout the entire process.

Awareness campaigns can address groups of people in a region affected by a particular climate threat, groups of stakeholders, businesses or the public in general. The ultimate aim of such campaigns is to achieve long-term lasting behavioural changes. Awareness raising increases the knowledge of individuals, business and industry managers, organisations and decision makers. It aims to ensure that all relevant regional and sub-regional bodies understand the impacts of global poverty, and take action to respond to certain impacts. However, they also can focus on a specific impact that is considered as the most critical for a given place, e.g. as in the case of “The Netherlands Live with Water” public awareness campaign focusing on coastal and river flooding. Awareness campaigns are considered more effective if several communication fields strategies are used, such as: story telling with comedy, dissemination of printed persuasive materials; organisation of public meetings and training; professional consultation; communication and information through social and mass-media, and use of informal networks for information dissemination. Awareness campaigns can be combined with the establishment of community self-protection teams (see for example the case study Vrijburcht: a privately funded climate-proof collective garden in Amsterdam) that promote self-reliance among residents and businesses to minimize the risk to personal safety and property damage (e.g. during flood events).

Social media is an effective method many nonprofits use to help raise awareness about global poverty. A U.S. study revealed that 47% of those surveyed were able to learn about important causes such as global poverty via social media. Moreover, it showed that 15% gained an awareness of issues relating to ending poverty through social media. Additionally, social media compelled 56% of its consumers to contribute to missions relating to global poverty eradication. The study showed that 59% of people who engaged with a post donated money, while about 53% acted by volunteering, 52% donated

items such as clothing or food, 43% became involved in an event for the cause and about 40% purchased a product that supported the cause monetarily.

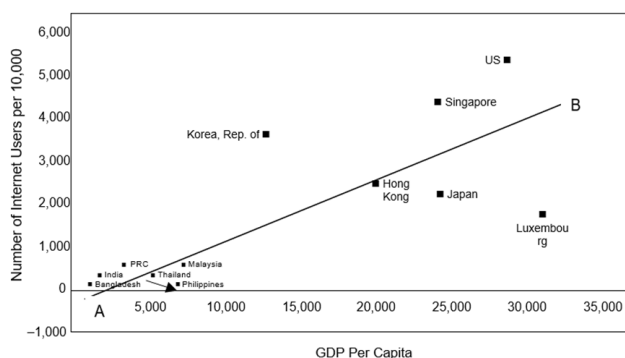


Figure 1. GDP Per Capita and Internet Users

Note: The straight line in Figure 1, which shows the positive relationship between Internet use and GDP per capita in purchasing-power parity exchange rate, has been derived from a cross-country regression analysis for 157 countries. The estimated equation is  $y = 0.144x - 360.02$ , with  $R^2 = 0.75$ . The coefficients are also statistically significant at conventional levels. Data sources: World Bank (2000b), International Telecommunication Union (2000) and Nua Internet Surveys (2000). More than half of all Facebook users have said that they support a charity or cause pertaining to ending global poverty so that their friends can see their support. Also, those engaging in fundraising efforts have seen results up to 10 times greater when incorporating Twitter. While the numbers show how effective using social media to raise awareness can be, it is important that nonprofits strategically approach issues and carefully consider target audiences. While there is evidence that shows the effectiveness of raising awareness, there are those that argue the effectiveness. In an article entitled "Stop Raising Awareness Already" by Ann Christiano and Annie Niemand, the writers caution about the dangers of raising awareness and that it can have the opposite of the desired effect causing people to disregard the message if it does not receive proper execution and result in action. While proper execution of raising awareness is crucial to action, no action can occur without awareness. Again, raising awareness around global poverty helps bring communities together to help create change on issues. Awareness can bring enthusiasm to people and help them feel inspired to create change or act. While awareness alone cannot end global poverty, it is a crucial and effective first step.

Human-computer interaction (HCI) is often perceived as a largely technical, practical, and industry-centered field of study, focusing on the usability and design aspects of technological products or services. Although such a perception is partly true, HCI is really a transdisciplinary integration that requires theoretical thinking of why and how humans interact with technology in a certain way. It chooses transdisciplinarity as the methodology best able to mobilize new ideas and generate a different approach to HCI, one that

will develop fresh insights and produce critical ways of thinking about the problems of contemporary life in relation to our interaction with technologies (in the broadest sense of the term). This sense of knowledge will give an overview of transdisciplinary HCI scholar, utilizes a multitude of theories not only from his home fields of human-computer interaction and communication field, but also from the disciplines of design, engineering, psychology, and sociology, to synthesize new and broad theoretical lenses—that cut across time, culture, and discipline—for examining the use and effect of emerging technologies, including the Internet of Things, autonomous vehicles, and social robots.

Furthermore in Communications: Communication is one of the most important aspects of modern life. Typically, it has been classified into one of two forms: one- and two-way communications. The most common form is one-way communications and includes broadcasting media such as radio and television. Two-way communication devices, such as telephones, telegraphs and pagers, constitute perhaps the most important component of the information revolution, having improved significantly over the last two decades or so. The Internet's growth is largely a function of two-way communication links (telephone lines) and personal computers (PCs), as we will examine later. However, in most developing countries, mobile telephones are easier to get than traditional phones based on fixed land lines, so the movement of the Internet and Internet applications onto mobile phone systems will become an important trend in those countries. The marginalization of the poor extends to information and communication activities as well as economic processes in society. In societal communication, the plight of the poor is frequently misunderstood or overlooked. The impoverished are also unable to speak up for themselves, which prevents them from accurately describing their reality or participating in decision-making processes (Burke, 1999; Hills, 2000).

The undermining character of communication (or lack thereof) about the poor in society and the poor's incapacity to participate in those communication processes on an equal footing are two features of poverty that reinforce one another. The intricate relationship between communication and poverty is now being acknowledged by current communication initiatives in international development. A lot more emphasis is now placed on conversation, user participation, and connections to social decision-making processes than there once was on increasing and improving the flows of development information "downwards" to the poor. The notion that "more information equals more development" or that "better communication will necessarily reduce poverty" is no longer universally accepted (Hamelink, 2002; Kasongo, 1998). The need to strategically consider communication in the context of the larger field of international development and how it can most effectively contribute to poverty has instead been highlighted by the interactive and flexible nature of communication processes and their relationship to larger political and economic processes.

How Can HCI and Communication Field Help Reduce Poverty? HCI and Communication can potentially enhance

the welfare of the poor in two ways: directly and indirectly. Direct applications of HCI and Communication Field to address the welfare of the poor include the following (not necessarily in order of importance): Information about markets, opportunities, etc.—information is critical to any well functioning market and the Internet is being used to assist in the collection, and delivery and use of such information. Employment— HCI and Communication are being used to provide information on new employment opportunities as well as becoming a source of new employment opportunities. Skills and education—new and innovative experiments exist with respect to the provision of both formal (curricula-based or certifiable) and informal education through the HCI and Communication. Health care—innovations are being made to deliver health care to the poor through effective utilization of HCI and Communication. Delivery of government services— new HCI and Communication are used to enhance the efficiency of governments and reduce corruption. Empowerment— HCI and Communication are being utilized to improve communications between the government and the governed, thus allowing the poor new avenues to air their grievances. By using a soft campaign

## II. RESEARCH METHODS

Transdisciplinarity Approachment, Since everyone is free to define/refine research concepts, a plurality of integration concepts can be found in the literature. Transdisciplinarity, interdisciplinarity, multi- disciplinarity, pluridisciplinarity, crossdisciplinary and their mutual relationships, as well as their impact on how to actually do research, have been issues of intensive debate in general science and education as well as in research on global change and sustainability. Degrees of integration and stakeholder involvement in integrative and non-integrative approaches according to Tress et al. (2005).

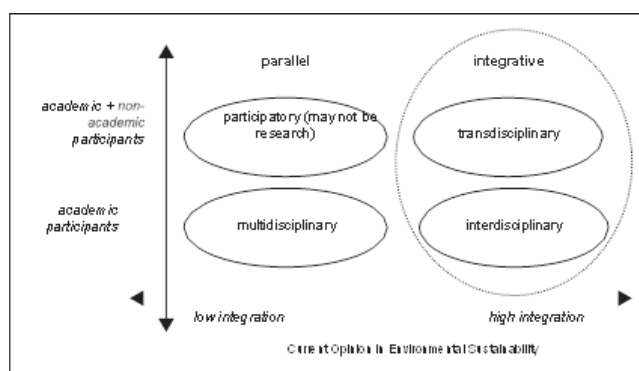


Figure 2. Degrees of integration and stakeholder involvement, Tress et al. (2005)

According to Tress et al. [25] the strength of integration varies across research concepts, from low (participatory, multidisciplinary) to fully integrated (interdisciplinary, transdisciplinary). Much of the literature stresses that transdisciplinarity, in comparison to

interdisciplinarity, is also characterized by the involvement of non-academic actors in the research process (Figure 2).

1. Research on complex sustainability problems requires input from various communities of knowledge (e.g. science, business and government). Since it is not clear from the beginning what knowledge from different disciplines and actor groups will be relevant in a given context, an open, integrated process involving insights from many potential actors is required;
2. Solution-oriented research requires knowledge production beyond problem analysis and the provision of system understanding. Goals, norms and visions need to be included, as they provide guidance for transition and intervention strategies;
3. Collaborative efforts between researchers and non-academic stakeholders promise to increase legitimacy, ownership and accountability for the problem, as well as for the solution options.

Regarding sectoral integration, three critical aspects were identified by the workshop participants:

1. How can HCI and Communication Fields between the different actors from state, knowledge institutions, market and civil society sectors be best organized to become effective? The common difficulty of communication among scientists from different disciplines takes on a further dimension when it is joined by discussion on the same topic with stakeholders from different societal sectors. Therefore, it is not clear how to embed such discussions and how to establish a common knowledge platform for the partners.
2. How to define sectors and relevant actors in each context according to the research issue identified? No mechanisms are available to decide in a non-exclusive way which sector should participate in the definition and solution of a research issue.
3. How to best translate results from research into knowledge that is useful to society, and how to best translate societal needs for knowledge into science questions and operational research programmes? A number of initiatives have been started or are in the process of design. It will remain to be seen whether these attempts will be capable of providing an appropriate platform for fruitful, integrated communication between science and society.

All three dimensions need to be realized if a successful transdisciplinary global poverty change research system is to be implemented:

1. Co-creation of knowledge

We propose a framework for integration (Figure 4) within the HCI and Communication Fields context. The process of co-creation of knowledge — as it was developed during the literature review — consists of three fundamental steps throughout which both academia and stakeholders are involved to varying degrees: co-design, co-production and co-dissemination. During these consecutive steps the three dimensions of integration are of varying importance to the overall knowledge creation process. It starts with the co-design of the research agenda through sectoral integration

between stakeholders and decision makers from the relevant societal sectors and science to develop a viable research issue to the point at which it can be handed over to the broader scientific community. The process of co-design starts with the joint framing of sustainability challenges faced by society. The next step concerns the translation of the sustainability challenge into a definition of the required knowledge that needs to be offered through research. Important issues are the scale, both spatial and temporal, of the required research and the necessary depth of international and scientific integration. In the process of research definition, the research questions are portioned into manageable research projects.

### 2. Co-production

The second step consists of the co-production of knowledge. Here, the transdisciplinary focus is on scientific integration. During this phase integrated research is conducted as a continuous exchange among the participating scientists and with the stakeholders. Scientific integration takes care of proper interdisciplinary primarily on HCI and Communication Fields approaches and interfaces, which ensure consistency of the research process across the participating disciplines and also deal with questions of the uncertainty of the results. Scientific integration also ensures that the necessary disciplinary research questions are derived from the overall needs of the project and then researched by the respective discipline, and that the scientific quality is maintained in the research process. Finally, dialogue between stakeholders and scientists ensures the exchange and interaction of their respective knowledge and thereby ensures the societal relevance of the research related to HCI and Communication Fields.

### 3. Co-dissemination

The last step consists of the co-dissemination of the results among the different societal groups. This includes publication of the acquired knowledge also in accessible language, translation of the results into comprehensible and usable information for the different stakeholders, and an open discussion on the valuation, applicability and relevance of the results among groups of conflicting interests in HCI and Communication Fields. This open discussion of the results and the consequential actions taken by society towards reaching the goal of sustainability leads to new research questions to tackle of Global Poverty issues, which will then jointly be framed, which initiates a new transdisciplinary research cycle. Figure 2 demonstrates that integration is an iterative process that involves ostacking reflection among all participants.

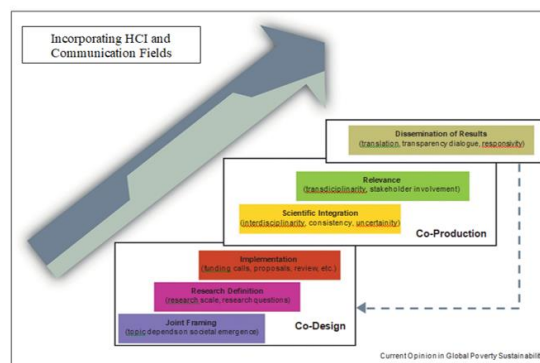


Figure 3. Framework for interdisciplinary and transdisciplinary co-creation of the knowledge castle incorporating HCI and Communication Fields

## III. RESULTS AND DISCUSSION

Carrying out research that will fulfil the ambitions of incorporating HCI and Communication Fields means committing to do science together with society: in other words, to commit to transdisciplinary and thus integrated processes of co-designing research agendas and to co-producing knowledge with researchers, decision makers and stakeholders for addressing challenges for global sustainability and developing possible solutions. Integrated research provides a better understanding of the multiple drivers, interdependencies and complexities of global sustainability challenges. It provides knowledge that is better able to contribute to the development of robust policy solutions and their effective, equitable implementation.

Integrated research works across scientific disciplines, across regions and across societal groups. It is problem-oriented, driven by contexts of application, and starts with the joint framing of research topics and questions. It requires the involvement of researchers, stakeholders and decision makers throughout the entire research process, from co-design through co-production to effective delivery, and thus demands clarity about the roles and responsibilities of those involved. Integration upholds scientific integrity in reflexive learning processes that bring together different actors and knowledge practices. It builds on, and supplements, traditional processes of disciplinary research. Co-production of knowledge in global change research changes the way research is done and needs new methods and concepts. It requires appropriate communication tools, institutional arrangements, and tailored funding possibilities.

Successful integration calls for critical reflection at all levels among researchers, funders, and science policy makers on the role of science in global poverty and sustainability, and on the practices of research and research management that will be needed to make this new type of relationship between HCI and Communication science and society come to life. We tackled the question of integration of knowledge and to begin a process of reaching a new international consensus on, and commitment to, integrated

sustainability research. HCI and Communication can be used selectively and innovatively to directly enhance the welfare of the poor. However, to reap the full benefits of the ICT revolution and reduce poverty, countries need to address the main impediments to economic development. Improving infrastructure, opening up markets, breaking telecommunication monopolies and improving education for all: these are fundamental to economic development as well as success in exploiting the economic opportunities that ICTs offer. Indeed, without addressing these issues, attempts at securing Internet access would not lead to the same economic dividends at times they can become a recipe for financial disaster. A recent analysis by Pohjola (2000) that investigated the relationship between IT investment and growth in 39 countries over the period 1980- 1995 found a paradoxical result. Whereas IT investment appears to boost growth in developed economies, the same is not necessarily true in developing countries, which need to institute other complementary policies to reap economic benefits from such IT investments.

management processes and structures, as well as funding modalities and other support systems, to make integrated research across scientific fields, national borders and user groups a reality; and fourthly, work with members of the International Science and Technology Alliance for Global Sustainability that established to build a sound of awareness, practical understanding of HCI and Communication Field processes in broader systems of research at national, regional and international levels.

#### IV. CONCLUSIONS

The conclusion of this study is that the challenges of transdisciplinary HCI studies must be considered so that design remains the core of HCI regardless of the disciplinary boundaries that are violated, moving further in transdisciplinary HCI research and practice, and also studying the effects of transdisciplinarity in design from the perspective of communication and collaboration, especially those related to the eradication of global poverty.

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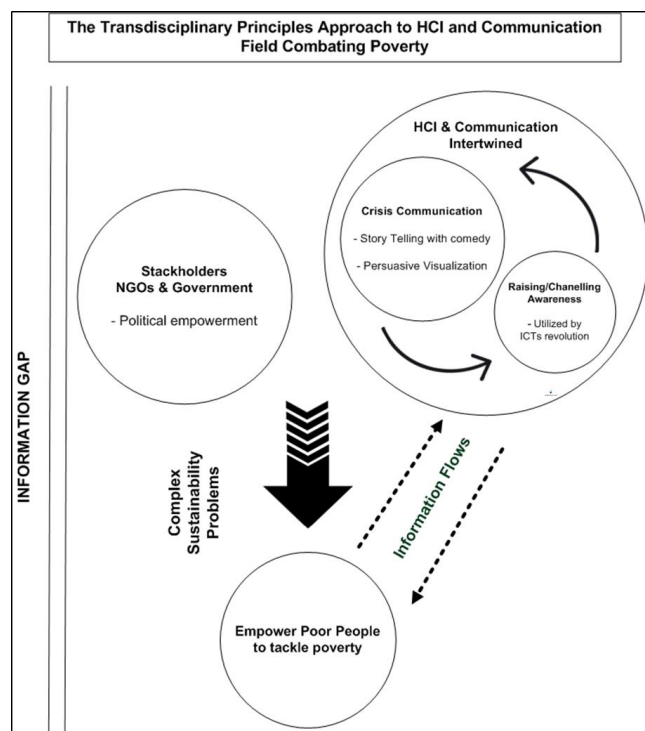


Figure 4. The Transdisciplinary Principles Approach to HCI and Communication Field Combating Poverty

Integration will not happen by itself but needs active support and organizational adjustments in the research process. Incorporating HCI and Communication Fields now in a unique and powerful position to: firstly, promote critical reflection on what kind of science we want for what kind of world; secondly, provide a platform for discussions about the implications of promoting the co-design and co-production of knowledge for tackle global poverty and sustainability; thirdly, suggest the introduction of appropriate research

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