

# Innovation Everywhere: Computing for 9 billion People

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## ABSTRACT

The world's population is expected to reach over 9 billion people by 2050. The FAO estimates that food production will need to increase by 50% on 2005 levels by 2030, and food price rises led to civil unrest in many countries in 2008. Many of the Millennium Development Goals (MDG) are unlikely to be met by the target year of 2015. The MDG progress report [5] notes that MDG 1 on halving world poverty had been 'derailed' by the recent economic crisis, with respect to MDG 5 of maternal health that "giving birth safely is largely a privilege of the rich", whilst MDG 7 of global environmental sustainability suffered a serious setback with the lack of comprehensive agreement at the 2009 Copenhagen summit. The world faces serious challenges in security, health and climate change.

Computing, computing researchers and organization such as the British Computer Society & the Association for Computing Machinery could make a significant contribution to addressing these challenges. This paper presents a grand challenge of configuring technologies, research and organizations such that they can contribute to different futures for the climate, for global health, and security.

## Categories and Subject Descriptors

K4.2 [Computers and Society]: Social Issues.

## General Terms

Management, Design, Grand Challenge.

## Keywords

ICT for Development.

## 1. INTRODUCTION

The world's population is expected to reach over 9 billion people by 2050. The FAO estimates that food production will need to increase by 50% on 2005 levels by 2030, and food price rises led to civil unrest in many countries in 2008. Increased agricultural demand is leading to the destruction of rain forests areas accelerating the dangers of climate change. Targets for maternal health are not being achieved.

Information and Communication Technologies (computing technologies) could make a significant contribution to improving global economic and social development to address these challenges. There are many stories of how ICT innovations have been applied for and by people in developing countries to improve their lives and livelihoods. There is also increasing

evidence of how new 'web 2.0' platforms are contributing to the development of democratic freedoms worldwide, whether it is the use of Twitter by Iranian opposition demonstrators, or monitoring of post-electoral violence by Ushahidi in Kenya. However, if the computing community is going to contribute to the tools that make this possible, it must join and contribute to an interdisciplinary effort that spans technical, creative, economic, social, educational, medical, philosophical and political domains.

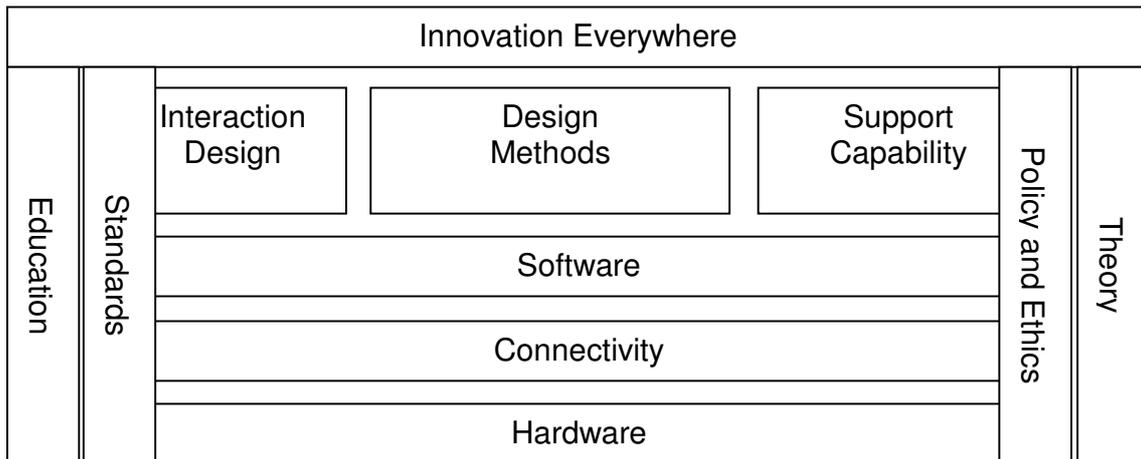
As a starting point for thinking about the role of computing in contributing to global development, it is useful to begin by clarifying our understanding of *development*.

## 2. Understanding Development

Development is a complex social phenomenon. Sen [6] presents development in terms of freedom – increasing people's freedom to make their own choices and enabling their capability to act on those choices, furthering their own goals. Sen identifies a range of types of freedom that should be considered: political freedoms (such as freedom of speech and democratic governance), social opportunities (such as education and social mobility), guarantees of transparency (from agents of government and other wielders of power), protective security (health care and other social safety nets), as well as the economic freedom in the form of opportunities and capabilities to earn or create a livelihood. All of these elements contribute to people's freedom to determine their priorities and to improve the quality of their own lives.

Expanding these freedoms will contribute significantly to the ability of the developing world to address local challenges in respect of climate change, security and health.

A consequence of development as freedom is that, since development activity involves power, the intended beneficiaries must have the right to engage in, influence and critique interventions made in the name of development. The OECD argues that to be sustainable, development must be locally owned [4] with external agents providing resources to support local capacity building. Participatory development approaches [1] promote a two-way dialogue that recognizes marginalized people as the best people to interpret their needs and objectives and to mobilize local capability to achieve change. Participatory ICT design also sets people in context as experts on their own situation and objectives [3]. Designers and end-users collaborate to make informed choices. Over time, designers become more attuned to the context, and users become more aware of the potential of technologies, and more innovative in their proposals. Both innovative thinking and awareness of context contribute to success.



### 3. The grand challenge

The penetration of mobile devices into parts of the world previously without ICT offers one means of reaching communities worldwide and a new range of hardware platforms on which innovative systems may be built. Issues of low cost, low energy consumption hardware, that can operate under conditions where power supplies are unreliable are relevant.

Connectivity is also an important issue in this context. Building networks and applications that can deal with intermittent services will be important.

Software frameworks and toolkits that are easy-to-configure, interoperable, open and extensible, working across devices and platforms, from which appropriate solutions can be created by local organizations and local programmers. The Health Information Systems Project ([www.hisp.org](http://www.hisp.org)) is an example of a global toolkit, for one domain, that can be tailored to the needs of local health service providers, with local adaptation being conducted by local developers [3].

However, technical fixes alone are insufficient. To match the challenges at local levels, skills and services will be required. Not just in terms of technical support. Designing systems when we believe we actually understand the culture and user requirements is already a challenge - to address it when it is clear we do not understand the issues or reference points will be a bigger one. New interaction styles and new interaction designs will be required, that acknowledge the very different cultural assumptions and understandings of their users, and that are usable with small devices.

Cutting across these aspects of the challenge are the need to:

- improve education in computing disciplines worldwide;
- support open standards to encourage interoperability of emerging technical solutions;
- build a deeper understanding of the policy and ethical implications of ICT interventions in development activity
- develop better theoretical understandings of the relationship between ICT and social and economic development.

One significant difference between some previously recognised grand challenges and the one proposed here is the location of the challenge. In addition to ingenious computing solutions that can a) operate in any conditions, b) over any platform c) with low maintenance needs and no budgetary implications, and d) using limited or intermittent power of the kind that currently fuels our appliances, the product is to be used by people with different understandings of knowledge, culture and the role of technology. For this reason, the challenge lies at the interface between computing and HCI and requires considerable research in application as well as fundamental science. Acknowledging that grand computing challenges should in some way offer an improvement in life by virtue of addressing some core human challenges: climate change, assisted living, security and/or health, ([www.bcs.org/server.php?show=nav\\_12810](http://www.bcs.org/server.php?show=nav_12810)) we offer "Computing for 9Bn People" as a way of synthesising these themes into one grand challenge, a challenge that requires collaboration from researchers worldwide and in doing so offers new researchers worldwide the means to participate in the future.

### 4. REFERENCES

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