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Programming for Cognitive Justice

Towards an Ethical Framework for Democratic Code

by Maja van der Velden¹

Abstract: This paper contrasts two approaches to knowledge sharing for socio-economic development to examine how assumptions about knowledge are reflected in computer-based information systems. The paper argues that socio-technical systems for global knowledge sharing possess a bias resulting from choices about technology and from assumptions about knowledge, and that this bias may adversely affect the diversity of knowledge. To overcome this bias, the concept of cognitive justice is proposed and, on this basis, a framework is suggested to guide the design of information systems based on a principle of the equal validity of all knowledges.

1. Introduction

The message of the spinning-wheel is much wider than its circumference. Its message is one of simplicity, service of mankind, living so as not to hurt others, creating an indissoluble bond between the rich and the poor, capital and labour, the prince and the peasant. That larger message is naturally for all. (M.K. Gandhi in *Young India*, 17.9.1925)

M. K. Gandhi took up spinning to protest the fact that Indians had to buy expensive British-made textiles, produced with cheap Indian-grown cotton on industrial looms in the UK. Gandhi's spinning wheel became a symbol of liberation and development. His example was widely followed and played a crucial role in the protection and cultivation of diversity in Indian textiles (Shiva, 2001).

Gandhi's understanding of technology seems mostly forgotten. It has been replaced by today's dominant technological rationality that obscures the fact that all technology is socially and culturally constructed. In an age in which technology mediates the access to and content of much of our information and knowledge, we are confronted with questions about not only what we know, but also how we know. We need to critically assess how information technology affects the conceptualisation of knowledge and its diversity and how concepts of knowledge influence technological designs.

In this paper I propose a critical approach to information and communication technology (ICT) for global communication, with a focus on the social and economic development

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sector. Two examples of ICT-based knowledge sharing will be discussed to show how knowledge is conceptualised in a system's design and how this creates a bias that affects issues of control, trust and access. I argue that the way these systems structure user interaction shapes how users conceptualise knowledge and establish trust with other users, as well as the institutions that own or operate these systems. This bias of technology affects the diversity of our knowledge, in particular the knowledge of the people whose interests social and economic development claims to support. In order to overcome this bias, I will suggest an ethical framework, based on the concept of cognitive justice, to guide new designs and initiatives that can support civil society's global communication.

2. Information systems for knowledge sharing

Knowledge has become a pervasive concept in social and economic development policy. The World Bank played a key role in promoting new ways of networking, managing and sharing knowledge. In 1996, James Wolfensohn, President of the World Bank, declared that the World Bank had become a "Knowledge Bank" (Wolfensohn, 1996). In 1999 the World Bank published its 1998/1999 World Development Report with the title 'Knowledge for Development'. At the same time, consultations started on how to open up the Bank's vast information resources via the Internet and to combine these resources with other credible development knowledge produced by organisations around the world. These efforts led in 2001 to the establishment of the global Development Gateway, a web-based portal for the sharing of ideas and development knowledge.

The Development Gateway (www.developmentgateway.org) is based on a centralised database, offering a one-stop portal website with tools to access, share, and discuss development-related information and knowledge. It edits and organises "inaccessible, fragmented development knowledge of unknown quality" (Development Gateway, 2001) into credible Knowledge for Development. Content is organised in tens of topic areas and the management of the topics' content is a combination of actively identifying "the best available information and knowledge resources and highlighting quality resources or significant developments" (Development Gateway, n.d.). The user community can submit resources to each topic area. The editorial policy of the Gateway is implemented by an editorial committee selected by the members of the board of the Development Gateway Foundation. It is based on the "deferred publishing" approach, that is, content submitted by users will be subjected to prior review by the topic guides or editors who will judge the contributions on relevance, suitability, and the perceived needs of the Gateway's audience (Development Gateway, n.d.).

World Bank knowledge

There is a direct relationship between the 1998/99 World Development Report (World Bank, 1999) and the Development Gateway. The Report discusses "the extended reach of knowledge through new information technology" (p. 56-70) and "managing knowledge for economic development" (p. 138-143). The Gateway was introduced as an "initiative [that] will expand the World Bank's knowledge management system to incorporate local knowledge from countries and sectors in which the Bank is active" (p. 140).

The World Development Report (World Bank, 1999) is built on two important assumptions. First, that there is a linear connection between knowledge and development: “knowledge is development” (p. 19). The Report is based on an economic theory that views knowledge as the most important resource for economic growth. It discusses poverty in so-called developing countries as the result of knowledge gaps and information problems (p.1). In its market-economy approach it takes a utilitarian stance: what is good for the market is good for people. It ignores knowledge that isn’t relevant for building knowledge economies. In this, the World Bank’s understanding of knowledge builds forth on corporate sector approaches to the exploitation of knowledge, most importantly Knowledge Management (King and McGrath, 2004; van der Velden, 2002a).

The second assumption is knowledge as a public good, in so far as markets fail to provide the knowledge needed for development (p. 16). This ‘public good’ knowledge is presented as a neutral commodity that can “travel as light” (p.1), i.e. easily be transferred and managed.

These assumptions have important consequences for Knowledge for Development as a policy and for the Development Gateway as a tool. The first is a conceptual narrowness about what is knowledge. In Knowledge Management, knowledge is defined in its relation to information (see e.g. Brown & Duguid, 2000; Wilson, 2002) as well as according to its characteristics. It is common to differentiate between explicit and tacit knowledge, and a variety of tools and techniques, such as ICT-based knowledge systems, communities of practice and story-telling, are employed to make tacit knowledge explicit (see e.g. von Krogh, Ichio & Nonaka, 2000). The World Development Report is ambiguous about the difference between information and knowledge, focussing mainly on the informational aspects of knowledge, on the explicit knowledge that can be codified in computer-based information systems.

The second consequence is that the World Development Report rules out the compatibility of contested definitions of knowledge, thus it positions the Gateway to dominate terrain that includes alternative knowledge. The Gateway’s draft Business Plan (Development Gateway, 2001) discusses its competitors in the Knowledge for Development market, stating that the success of the Gateway will depend on a successful branding of the Gateway as well as on its ability to complement or replace existing sources of information on the Web. This oblique reference to the existence of alternative knowledges is more strongly worded by Joseph Stiglitz (2000), who wrote in his capacity as Chief Economic Officer of the World Bank:

“ [The World Bank] can perform another role: certifying the quality of the messengers and messages; in a noisy world, with many alternative theories vying for centre stage, there needs to be some ways of sorting through the cacophony, establishing credibility.”

The focus on the informational aspects and credibility of knowledge leads to a conceptualisation of the knowledge important for Knowledge for Development as objective, value-free and universal knowledge. As with the emphasis in the corporate sector on ICT in the provision of KM ‘solutions’, the Development Gateway perpetuates conceptualisations of knowledge as neutral, universally applicable and transferable from where it is available to where it is needed.

ICT to manage knowledge for development

The Development Gateway opted for a one-stop web-based portal solution, a widely used platform for the facilitation of Knowledge Management and online Communities of Practice. This platform fits the knowledge concept of the World Bank as it provides an efficient content management system based on a central database, which allows for the selection of ‘credible’ Knowledge for Development. On a technical level, centralised control provides a high level of security and trust as well as reliability to its users. This solution has also clear technical advantages for its users; they do not need to use a specific type of software to access and share information (see Fig.1).

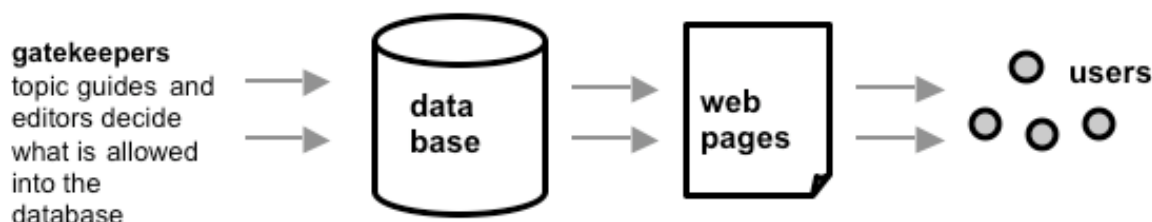


Figure 1. Design of the Development Gateway (simplified)

The disadvantage is that all information first needs to be added to the central database in order to become accessible to Gateway users. It is this point that drew the most criticism from civil society representatives during the design phase of the Gateway because of the opportunity to centralise control and monitor access to the database by the World Bank.² The civil society organisations demanded a transparent and accountable system in order to promote relationships of trust among the users of the system.

The World Bank’s focus on the informational aspects of knowledge, with knowledge understood as a commodity, results in technological solutions to manage and transfer knowledge (see table 1) . In the Gateway’s technical assessment (Quigley, 2000), hardware

Table 1. Knowledge for development and ICT

Knowledge for Development is:	Technology must provide:
Causal/linear knowledge (knowledge <u>is</u> development)	Transmission system
Commodity and a public good	Efficient delivery system
Inaccessible and fragmented knowledge	Content management; Repackaging of knowledge

² This doesn’t mean that civil society hasn’t found good uses for this type of system. For example, Environmental Defence successfully uses the same platform, ArsDigita Community System, for Scorecard (www.scorecard.org) an activist clearinghouse where people can check local facts on pollution and polluters in the USA.

	knowledge
Credible knowledge	Hierarchical and centralised system with options to monitor, censor, and select
Neutral knowledge	One solution fits all (with some adaptations in language and web design); Knowledge selection by expert organisations

and software options are discussed in an instrumental and managerial framework. The selection of the technical platform for the Gateway is based on the discussion of knowledge as digitalised content, files and links to files, and how to best access and manage them. Differentiations in user needs are made in terms of speed of access and the diversity of signs, that is, the language and cultural implications of web interface design. In line with the understanding of knowledge as neutral, the technology is perceived as neutral, providing non-gendered and non-political tools for knowledge sharing.

Open Knowledge Network

During the development of the Development Gateway, the World Bank initiated consultations with organisations around the world, assuming that civil society would become the largest Gateway user group. During these consultations, civil society representatives expressed their information and knowledge sharing needs not only in terms of local and regional development concepts and priorities. They also articulated these needs in terms of critiques of obstacles to development and the need to discuss and highlight issues such as racism, neo-liberalism, conflict, gender inequity, theories of development, and the World Bank itself (see table 2). They called for locally-owned and operated, decentralised knowledge sharing structures that would build forth on existing initiatives and that would support and facilitate the strengthening, sharing, and creation of a diversity of knowledges for development (see van der Velden 2002b).

Table 2. Civil society knowledge and ICT

Civil Society Knowledge Critique:	Technology must provide:
Knowledge is power-related, tacit, situated, embodied, gendered	Decentralised and distributed network of local systems, with each system catering first of all to the needs of their own communities; Knowledge selected in network of peers
Knowledge, and the people/organisations conveying knowledge, must be legitimate/trustworthy	Locally-owned and controlled systems to enhance trust, transparency and credibility
Certain kinds of knowledge can obstruct development	Efficient system to locate and discuss what is knowledge for development

It was in this context that OneWorld International, a coalition of more than two thousand partner organisations from 90 countries, working for social justice and sustainable development, presented an alternative technical platform to the World Bank in a proposal called *A Distributed Global Gateway for Knowledge-Sharing in Civil Society* (OneWorld, 2000). The World Bank staff didn't discuss the proposal with OneWorld and it went nowhere in discussions of the Gateway (Armstrong, 2003). The proposal resurfaced later in the Digital Opportunities Task Force of the G8 and was accepted by the Local Content and Appropriate Tools Working Group (Dot Force, 2002). It is now being implemented under the name Open Knowledge Network (www.openknowledge.net) (see figure 2). Pilots have been implemented in India, Kenya and Senegal and the OKN was presented to the public at the World Summit on the Information Society in Geneva, December 2003.

The Open Knowledge Network (OKN) is a system that provides “a flexible framework or dynamic to link and support information initiatives among poor and marginalized communities through shared standards and values: local content, local people, local languages” (OKN, 2003). OKN is a distributed structure of independent hubs – intermediaries with Internet access – and local communities, organisations, grassroots, and individuals with or without Internet access, in which relevant development information can be shared. Users can publish or access information via the Internet but also by telephone, wireless, radio, etc. The OKN does not repackage knowledge but provides local knowledge owners, producers, and seekers a decentralised, global structure to share information via their existing, locally owned organisations and networks.

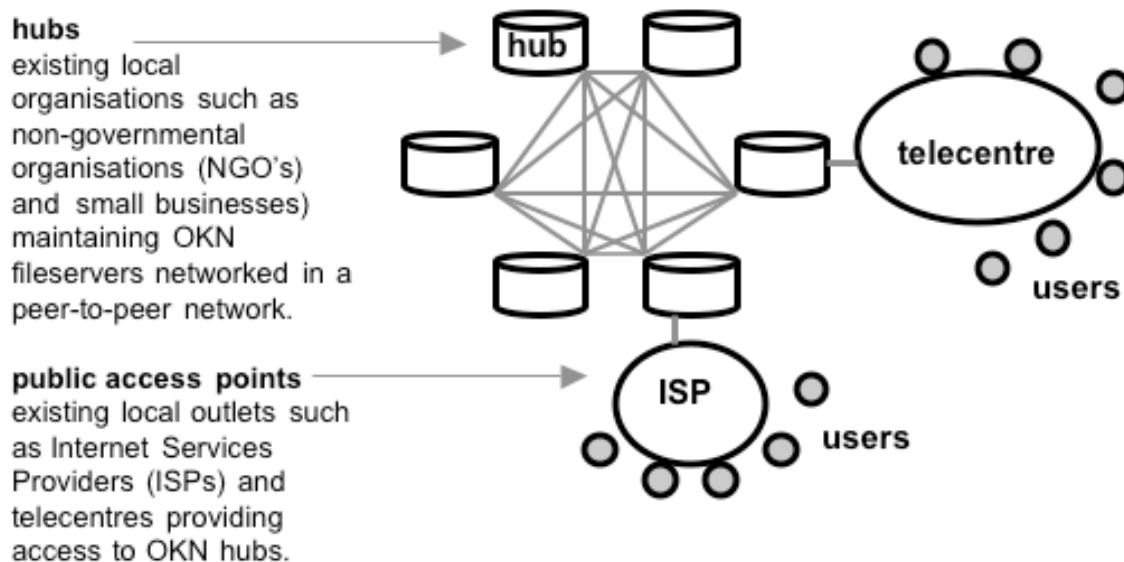


Figure 2. Design of the Open Knowledge Network (simplified)

While Knowledge for Development is generally understood as a public good, the Open Knowledge Network conceptualises knowledge as public domain knowledge with public domain understood as a kind of social structure in which common goods are shared (see

Bollier, 2002). One of the OKN's challenges is to prevent 'the market' from privatising 'common good' local knowledge while at the same time protecting local hubs from possible liability for the infringement of copyrights. The OKN will be offering the Open Knowledge License (OKL) for propriety materials shared over the OKN (OKN, 2003). It is working together with the Berkman Center for Internet & Society at Harvard Law School to develop a strategy to protect OKN hubs from possible liability for the dissemination of copyrighted or potentially libellous materials.

ICT to Share Open Knowledge

The OKN's approach is based on a peer-to-peer (p2p) file sharing system. It can be compared to p2p systems such as Freenet and Gnutella as there is no central database or 'command centre' that can control or monitor the flow of information between the users of the system. Because control is decentralised, the system is highly flexible. Communication between the hubs is ad-hoc as the hubs can come and go and high levels of anonymity and transparency can be created. Hubs do need to install OKN software on their computers in order to be able the exchange files. The network does not present documents via web pages, as the Gateway does, but focuses on the type of access of the users, providing files via different kinds of connections (Internet, radio, mobile, as well as offline access to users with expensive or slow Internet connectivity) and on the diversity of the users.

The OKN's technical assessment (West, 2002) is based on the objective of facilitating knowledge sharing that is relevant to neighbourhoods and villages in so-called developing countries. The focus is on local communities and a maximum of 10 minutes dial-up connectivity per connection. Files are shared within 'channels' and each channel is identified with an information-producing organisation. For example, <oxfam.reports> may be the name of the channel identified with the aid organisation Oxfam, containing only reports published by Oxfam. Hubs that deem Oxfam a trusted organisation may subscribe to this channel in order to receive the files made available in this channel. In addition, the association of channels with organisations allows for the formation of webs of trust: for example, hub A adopts the same channels selected by organisation B because A has a high degree of trust or confidence in the work or judgements of B.

The bias of knowledge and ICT

At first glance it seems possible to dismiss the difference between the Development Gateway and the Open Knowledge Network as a difference in interests. The Gateway seems to focus on global knowledge sharing and the OKN on local knowledge sharing. Global knowledge can be defined as knowledge with almost universal value, truth or applicability, while local knowledge, including indigenous knowledges, is knowledge that has value, truth and applicability in a local context. It may thus seem that it is the difference in focus that accounts for the choice of different systems. This perception obscures crucial biases underlying our understandings of both knowledge and ICT.

The Development Gateway is built on the assumption that "[p]oor countries - and poor people - differ from rich ones not only because they have less capital but because they have less knowledge" (World Bank, 1999:1). The knowledge they do have is perceived as

inferior or incomplete. Civil society's critique of the World Bank's Knowledge for Development paradigm points to issues of power implicit in this understanding, one which effectively invalidates or renders invisible the knowledge of people who are considered poor.

Civil society's critique of the Development Gateway also points to the bias of technology exacerbating the worst effects of globalisation. Globalisation, in this view, is understood as a process of technological change that has been taking place for centuries across periods of colonisation, development and free trade (Apffel-Marglin & Marglin, 1996; Escobar, 1995; Shiva, 1997). The Gateway is thus understood as a tool to help people to fill these knowledge gaps with what is deemed to be credible knowledge. This assumes that knowledge is as an objective, value-free tool in a development policy, an assumption characterised as an "instrumentalisation of knowledge", one of the "inherent pathologies" of the development sector (Nustad & Sending, 2000: 45-46). In practice, local knowledges are often overwhelmed with infusions of global knowledge, decreasing the diversity of local knowledge systems, resulting in a loss of knowledge.

In addition, while assumptions about knowledge guide the design and selection of technology for sharing knowledge, technology in turn shapes our understanding of knowledge. Feenberg (1999, 2002) builds his critical theory of technology on the understanding that technology is neither neutral nor determinist. Information systems are not neutral technologies that only acquire their meaning through use. Social, cultural and political interests are embedded in the technology, encouraging certain uses while discouraging others. The specific bias of information and communication technology lies in that it promotes a transmission model in which communication is seen as product delivery, moving information around over long distances as fast as possible, focussing on connectivity, speed and packaging. Based on the work of Carey (1989) and Innes (1991), Menzies shows how information technologies developed to support the global economy: "it provides cheap, fast, long-distance communication that will strengthen the relations between centres and margins while weaken everything in between; it supports centralised decision-making and authority while decentralising 'location', i.e. work; it will go further and faster while saying less about more" (Menzies, 1996:146).

The bias of knowledge exists in the ability of power to decide whose knowledge matters and in the importance of knowledge in legitimising power (Foucault, 1980). The same interrelationship can be found between knowledge and technology. Each technology, as shown in the examples of the Development Gateway and the Open Knowledge Network, is the result of certain choices based on certain assumptions and interests. There is a clear linkage between the designs of the Gateway and Open Knowledge Network and the specific ways in which power and authority are organised in, respectively, the World Bank and OneWorld International (Winner, 1985). Menzies (1996) argues that these biases can only be overcome if its structures are redesigned and renegotiated on the bases of a communitarian principle, which assumes more spiritual and cultural values.

3. Knowledge and Diversity

Gandhi understood people's capacity for autonomous self-organisation as the basis for communication between cultures. His Satyagraha was the resistance against the British colonisers limiting Indian self-organisation. Building forth on Gandhi's politics of knowledge, Shiva (1997) proposes the cultivation of diversity, the reclamation of the right to self-organise, to self-govern and to self-rule. Self-organisation supports diversity through self-regulation, decentralisation and local control, while a diverse system, in turn, facilitates self-organisation by providing space for give and take, symbiosis and reciprocity (Shiva, 1993, 1997).

Self-organisation, flexibility, decentralisation, and pervasiveness are key characteristics of a diverse system (De Landa, 1997; Johnson et al., 1998; Shiva, 1997). Self-organisation is closely connected with the capacity of a system for local control and to interact with its environment in order to adapt, heal and renew (Shiva, 1997). Designs that strengthen a community's capacity for self-organisation help to cultivate the diversity of the knowledge found in that community. It is within this diversity that effective approaches for local development are found.

It is in this flexibility and responsiveness that ICT design falls short. Experiences with knowledge systems in distributed organisations indicate that centralised systems provide efficient consistency and quality control in the global context (inter-organisational) but lack effectiveness when it comes to adaptation to local contexts. Local users are unable to use the system for the sharing of information in local formats and languages or are unable to connect the system with existing local media such as radio. It is precisely the flexibility of a system that will allow users to adapt it to the variety of the local, such as local technical capacities or local knowledges, in order strengthen self-organisation.

According to Milojevic et al. (2002), centralised systems are more familiar, secure, trustworthy and are easier to maintain. In the case of the Development Gateway, centralised quality control became a liability once the system's ownership and governance structure was perceived as problematic or compromised. This "value conflict" (Friedman et al, 2003) was a tension between the security and reliability of the Gateway's performance and the trustworthiness of the World Bank as the owner/operator of the Gateway. This led to civil society intervention in the form of letter to the World Bank's President Wolfensohn (Bretton Woods Project, 2000) as well as a campaign to boycott the Gateway (Voice of the Turtle, 2001). The lesson is that a centralised system may technically be more secure and reliable but these same qualities can also be perceived in terms of censorship, editorial control and privacy violation when there is no relationship of trust between the users and the institution that owns or operates the system. Even online, trust is based on a relationship between people, not between people and a technology (Friedman et al, 2000).

The flaw at the heart of centralised knowledge-sharing systems is that they are designed for the discussion and transfer of codified explicit knowledge or information (Wilson, 2002). As argued above, the bias inscribed in most existing information and communication technology is towards transmission, transferring knowledge from where it is available to where it is needed. The assumptions underlying existing information systems design are

that the transmitting technology is ethically neutral and the knowledge it transmits is true. This technological rationality, as Feenberg (2002:4) argues, assumes that “technical feasibility will transform prevailing practice, overriding the cultural ethos handed down from the past.” For example, concerns about the linguistic and economic transactions costs of participation in the global knowledge economy have led to initiatives to adapt language scripts such as Arabic and Taiwanese so they can be written from left-to-right in order to make them more compatible to information systems (BBC, 2004; Chartrand, 2004). Thus, in centralised knowledge-sharing systems, knowledge diversity is reduced to a variety in language models and culturally appropriate designs and images.

Diversity is not just the plurality of ways in which we express our explicit knowledge; it refers to different ways of knowing. When knowledge is understood as located in a knower, as situated and gendered knowledge, then diversity is defined by the plurality of ways in which people know. In other words, diversity acknowledges that people have different knowledges.

Can this conception of knowledge and diversity be expressed in technology? Feenberg (1999) argues that users can undermine the bias embedded in technology with tactical resistances and interventions. In addition to this creative appropriation of technology, Feenberg (1999) also describes the “deep democratisation” of technology, the embedding of social and political values in technical code. In other words, diversity, self-organisation, and the understanding of knowledge as situated and gendered need to be embedded in ICT-based systems for knowledge sharing in order to support the cultivation of diversity and the self-organising capacity of knowers.

The history of civil society involvement in the Gateway, in the context of the development of the Gateway, can be understood as an attempt to appropriate the Gateway’s technical platform. When this attempt failed, the idea of a distributed system was further developed, attempting to embed different social and political values in the technical code than the ones embedded in the Gateway, resulting in the Open Knowledge Network. Peer-to-peer systems, such as that deployed by the OKN, can offer high levels of ad-hoc and self-organising behaviour, a high level of anonymity for users, as well as higher levels of decentralisation, transparency and pervasiveness (Milojicic et al., 2002).

The main challenge for information systems designers will be to ensure that the plurality of values found in the different cultures and civil societies are embedded in the technical code of ICT-based tools for global communication, not the particular interests of the project managers, technology owners or funding agencies. On the face of it, this seems an impossible and large task. In the following section I will propose the outline of a solution in the form of an ethical framework that can guide the design and development of ICT-based applications for civil society’s communication and knowledge sharing based on the diversity of knowledge and the equal validity of all knowledges.

4. Cognitive justice

Gandhi took up spinning in order to challenge the dominant politics of knowledge and technology. He didn’t seek to replace British knowledge and technology but to resist its

dominance over local knowledges and technologies. Gandhi argued that communication between cultures is only possible when we can accept that no one culture possesses the truth, but that we are all joined, as equals, in the pursuit of the truth via a dialogue of knowledges.

Gandhi's critique focused on the modern claim to be able to produce absolute, objective and value-free knowledge. More recent critiques of modernity's knowledge claims (see e.g. Escobar, 1995; Foucault, 1980; Haraway, 1995; Latour, 1993), argue that our knowledge is embodied and embedded, it cannot be separated from our bodies, language, and social and cultural history. In Haraway's (1995) words, knowledge is situated, it is always located, offering a partial perspective or, as Suchman (1987) discusses in *Plans and Situated Actions*, our material and social circumstances shape our understandings and actions.

Gandhi was not a relativist arguing that all knowledges are mere opinions. He made an ethical argument for cultivating the diversity of knowledge. In his view all knowledges were local knowledges. He didn't compare knowledges but argued that, in principal, all knowledges are equally valid. This claim is based on the premise that there is no objectivist stance that can judge between knowledge and opinion. Gandhi believed, however, that knowledge as truth can be constructed from the fragments of truth in the knowledges of the different traditions found in the world. In other words, global knowledge can be constructed from fragments of local knowledges that obtain universal value. Dialogue was the platform for the communication of the different knowledges, the collaboration between knowers, and the process in which truth was constructed.

Gandhi's idea is best captured by the phrase cognitive justice, the principle that all knowledges are equally valid and co-exist in a dialogic relationship to each other. Cognitive justice was suggested by Visvanathan as a response to the negative impact of Western science on 'developing' countries (Visvanathan quoted in Kraak, 1999). Visvanathan argues that development, conceptualised as the modernisation of poverty (Escobar, 1995), needs to be replaced by a process of cultivating justice. This can only come forth out of a dialogue between global/scientific knowledge and local/indigenous knowledge, not by the domination of one at the expense of the other.

Cognitive justice can provide the framework for this dialogue as it gives meaning and direction to the relationship between the different knowledges engaged in the dialogue. Cognitive justice helps us to overcome the stranglehold of the dichotomies such as global/local, modern/traditional, scientific/indigenous, rich/poor, expert/layman. It implies the cultivation of knowledge diversity instead of knowledge hierarchies, and the rights of peoples and communities to communicate their knowledge. It implies free self-organisation and self-production, the capacity to organise and control one's own knowledge and knowledge creation.

Cognitive justice also implies that there is no such thing as a knowledge gap, a lack of knowledge that can be filled with knowledge provided by a knowledge management system. People always base their actions on knowledge, how imperfect that knowledge may seem to others.

Programming for Cognitive Justice

The importance of cognitive justice for the design and development of information systems is that it provides a framework that challenges the assumed neutrality of the technology and the technology designer. With cognitive justice there is no objective ‘expert’ position from which to design and develop technology. Cognitive justice focuses information systems design on the knowers and the environments in which their knowledge is situated. As a result, the design process itself becomes a dialogue of diverse interests and values. The importance of this dialogue is that it takes place during the design of the “technical arrangements that precede the use of the technology in question” (Winner, 1985; see also Friedman, Kann & Borning, 2003).

In theory, a design process based on cognitive justice would lead to technologies that are more flexible, because they accommodate diverse interests, and more democratic, because they incorporate diverse values. In practice, the full participation of end users, including their diverse knowledges in each phase of the project, leads to technical solutions that provide a better overall fit. As the study of ecological systems shows, diversity plays a crucial role in a system’s ability and capacity to adapt to change and to solve problems. In the absence of diversity, development can stumble and social, economic and cultural disruption will follow (Apffel-Marglin & Marglin, 1996; Lal, 2002; Shiva, 1993).

Cognitive justice enables diversity and it is in this meeting of the knowledges of participants that effectiveness is generated. A knowledge sharing system based on cognitive justice may produce the same or even a higher level of effectiveness or efficiency than a regular system. Johnson et al. (1998) argue that a diverse, non-competitive system is more successful in problem solving than a competitive, survival-of-the-fittest system. This may be the result of diversity enabling self-organisation. Thus the diversity and self-organising capacity of a system are interlinked. Self-organisation, the process in which global order comes forth out of local interactions, builds forth on both the differences and commonalities found in the local entities that form its diversity. A self-organising system uses collaboration and decentralised local control to network the local entities. Similarly, De Landa (1997) describes how a diverse, self-organising system, through meshworking, can create the same economies of scale as a hierarchy of uniform elements.

Escobar (2003) uses the term “meshworks” while Rheingold (2003) uses the terms “swarming tactics” and “smart mobs” to refer to the decentralised, self-organising, flexible, and often mobile, networks that civil society is building in cyberspace. Out of these smart mobs and meshworks comes an emergent, collective intelligence. Embedding cognitive justice in information technology may facilitate these meshworks and smart mobs and cultivate their diversity and capacity for self-organisation. The result may be an increase in their swarm intelligence, the emergence of a more effective solution or a higher problem-solving capacity. Seen in this perspective, cognitive justice is an ethical framework that simultaneously may cultivate more efficient networks and more effective knowledges.

Table 3. Programming for Cognitive Justice

Principles	Participants	Application
Democratisation of Technology (Feenberg, De Landa)	Designers	Wide variety of online and off-line, analogue and digital, wired and wireless tools that can be combined in different configurations, with flexible speeds and formats.
Democratic Representation (Feenberg, Shiva)	Owners	The organisations that develop and operate policies, standards, and tools are locally owned or democratically controlled (e.g. open source software, community-owned ISP or telecentre)
Cultivation of diversity in dialogue of knowledges (Gandhi, Visvanathan, Shiva)	Knowers	Communication tools with flexible language modules, flexible content management modules, support for multiple worldviews/perspectives.
Autonomous self-organisation (Gandhi, Shiva, De Landa, Johnson)	Agents of survival, prosperity and change	Facilitate ‘meshworking’ of knowledges and communication in flexible and user-controlled network configurations, flexible access points to networks.

Viewed through the lens of cognitive justice, the Open Knowledge Network is a positive attempt to support the self-organising capacity of local communities and other civil society organisations. The positive effects of the OKN and similar initiatives can be increased when the facilitating technologies, such as peer-to-peer technology, embed cognitive justice in their code, thus providing for the communication of knowledges within a multitude of worldviews and a multitude of network configurations (see table 3).

The association of peer-to-peer technology with unlawful materials and illegal copying of music files and other copyright infringements has led to legal action by governments and copyright holding companies around the world in order to halt p2p-based file sharing. This situation seems to have slowed down the exploration of this technology for use in the global justice and sustainable development sector. This is unfortunate as the latest generation of p2p technologies offer interesting applications. For example, Freenet (www.freenet.org), exploits the characteristics of p2p technology by providing completely anonymous file sharing, and claims to have networked censored information in China (www.freenet-china.org). Peer-to-peer broadcasting software such as Peercast (www.peercast.org) allows anyone to broadcast streaming media, sound and video on the Internet without high bandwidth or expensive equipment. When Peercast is combined with a p2p Internet radio broadcast terminal, the network moves beyond Internet users.

Peer-to-peer networks prioritise the interconnection between users and their diverse ways of knowing by providing decentralised, locally controlled content management and editorial control. The focus is on the validation and communication of local content in

locally controlled hubs for local development. The importance of each hub and node for the network as a whole is also an important aspect of p2p technology itself. On a technical level the network's features are found in each node and hub and each new node or hub is an asset to the network as a whole. Each node and hub has the potential to add to the diversity of the network and to increase its self-organising capacity.

Concluding Remarks

The bias of information and communication technology and the knowledge bias of the World Bank, which is based on the perception that poor people have inferior or incomplete knowledge, converge in the Development Gateway. The portal system underlying the Development Gateway is biased towards the branding of 'credible' development knowledge in a system designed for centralised content management, centralised editorial control, and a focus on knowledge transfer. Such centralised systems may provide security and predictability but they can also be perceived as potential arenas for censorship and editorial control.

By contrast, the example of the Open Knowledge Network indicates that in a decentralised, locally owned and transparent system a diversity of knowledge can be shared in webs of trust. Peer-to-peer technology, if developed within a framework of cognitive justice, could thus play a role in cultivating diversity and autonomous self-organisation. Cognitive justice argues for the inclusion of knowers as participants in the design and development process of information technology, as well as through their ownership of the tools and the institutions that design, own and operate the systems of communication. Information and communication technology that will facilitate communication and knowledge sharing in a cross-cultural setting needs to be built on a knowledge concept that acknowledges the plurality and diversity of knowers and their knowledges. ICT should support the dialogues of equally valid knowledges, to support the empowerment of users as knowers, as the producers, creators and owners of knowledge and knowledge sharing tools. This is both an ethical challenge as well as a challenge to the effectiveness of information and communication technology in supporting the sustainability of social and economic development.

In a framework of cognitive justice, people are recognised as the agents of change in their communities and societies. They are perceived as knowers, as participants in a communication process in which dialogues of equally valid knowledges take place. The technology used to facilitate change can be democratised on the same principles.

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