Available online at www.sciencedirect.com
ScienceDirect
Telematics and Informatics 25 (2008) 99–116
TELEMATICS AND INFORMATICS
www.elsevier.com/locate/tele

Africa and the digital divide

Christian Fuchs [a,*], Eva Horak [b]

[a] ICT&S Center for Advanced Studies and Research in Information and Communication Technologies and Society, University of Salzburg, Sigmund Haffner Gasse 18, 5020 Salzburg, Austria
[b] University of Vienna, Austria

Received 14 March 2006; received in revised form 18 June 2006; accepted 19 June 2006

Abstract

The digital divide is a phenomenon linked not only to the topic of access to the Internet, but also to the one of usage and usage benefit. In this paper we take a look at the global digital divide concerning Africa, we analyze the situation with the help of macro-data and by discussing specific examples (Ghana, South Africa). We also address suggestions that have been made for closing the global digital divide and point out that such solutions require more fundamental changes of society and cannot be achieved by technology alone.
© 2006 Elsevier Ltd. All rights reserved.

Keywords: Information society; Digital divide; Africa; Developing countries; Globalization; Capitalist development

1. Introduction

The aim of this paper is to discuss the digital divide in Africa and possible solutions. We first develop a theoretical concept of the digital divide (Section 1), then we present empirical macro-data and two specific examples (Ghana, South Africa) concerning the digital divide in Africa (Section 2), we discuss different strategies for closing the global digital divide (Section 3), and finally make some conclusions (Section 4). The following research questions are addressed in this paper:

* How does the digital divide affect Africa?
* Which solutions for the global digital divide are suggested?
* Which role do neoliberal policies play in the discourse on the global digital divide?

The topic of the digital divide concerns the unequal access to and usage of new technologies. Why is Africa of special interest in this discourse? The UN Human Development Report shows that Sub-Saharan Africa is the least developed region of the world in terms of life expectancy, school enrolment ratio, income (UNHDR,

* Corresponding author. Tel.: +43 662 8044 4823.
E-mail addresses: christian.fuchs@sbg.ac.at (C. Fuchs), evahorak@gmx.net (E. Horak).

0736-5853/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tele.2006.06.004

2005, p. 222), and undernourishment (UNHDR, 2005, p. 243). Somebody born in a Sub-Saharan country can expect to live 33 fewer years than a person born in a rich country (UNHDR, 2005, p. 26). Africa is the continent most struck by poverty and other global problems. Globalization is based on an unequal geography that excludes larges part of Africa. The issue of global inequality is connected to the topic of the digital divide because technology is one aspect of material wealth and wealth production is more and more based on technology and knowledge. Africa is of particular importance here because it is the most marginalized and excluded region of the world. This fact brings up the question if Africa benefits more or less than industrialized countries from the rise of the Internet and new media.

Also UN Secretary General Kofi Annan has pointed out that communication and the access to communication technologies are just like social security fundamental human rights and that the digital divide is a pressing humanitarian issue: "Three days from now, the world's population will pass the six billion mark. Five out of those six billion live in developing countries. For many of them, the great scientific and technical achievements of our era might as well be taking place on another planet. (...) The capacity to receive, download and share information through electronic networks, the freedom to communicate freely across national boundaries – these must become realities for all people. (...) These people lack many things: jobs, shelter, food, health care and drinkable water. Today, being cut off from basic telecommunications services is a hardship almost as acute as these other deprivations, and may indeed reduce the chances of finding remedies to them." (Annan, 1999).

Ghana and South Africa are two of the seven African countries that signed the WTO Telecommunications Agreement in 1997 (the others are Cote d'Ivoire, Mauritius, Morocco, Senegal, and Tunisia). The agreement requires countries to liberalize their telecommunications markets and to open these markets for foreign investors. We focus on Internet in Ghana and South Africa as two examples in this paper because liberalization policies are of particular importance there. Hence, the frequently voiced hypothesis that the digital divide can be reduced by market liberalization can be put to test in these cases.

Manuel Castells defines the digital divide as "inequality of access to the Internet" (Castells, 2002, p. 248). Access to the Internet is moreover "a requisite for overcoming inequality in a society which dominant functions and social groups are increasingly organized around the Internet" (Castells, 2002, p. 248). Jan van Dijk who can besides Manuel Castells be considered as the most important theorist of the network society defines the digital divide as "the gap between those who do and do not have access to computers and the Internet" (Van Dijk, 2006, p. 178). Pippa Norris sees it as "any and every disparity within the online community" (Norris, 2001, p. 4), Ernest J. Wilson III as "an inequality in access, distribution, and use of information and communication technologies between two or more populations" (Wilson, 2006, p. 300).

Which types of the digital divide can be identified? Van Dijk and Hacker (2003) argue that there are four types of barriers to access:

- The lack of "mental access" refers to a lack of elementary digital experience.
- The lack of "material access" means a lack of possession of computers and network connections.
- The lack of "skill access" is a lack of digital skills.
- The lack of "usage access" signifies the lack of meaningful usage opportunities.

Van Dijk has demonstrated that in terms of physical access to computers and the Internet, the digital divide is closing in developed countries, whereas in developing societies it is still growing. In terms of skill access and usage access, the digital divide is both widening and deepening. He argues that information skills (the skills needed to search, select, and process information in computer and network sources) and strategic skills (the capacities to use these sources as the means for specific goals and for the general goal of improving one's position in society) as aspects of the skill access are "extremely unevenly divided among the populations of both developing and developed societies" (Van Dijk, 2006, p. 181). Concerning usage access van Dijk has found that people with high levels of education and income tend to use database, spreadsheet, bookkeeping, and presentation applications significantly more than people with low levels of education and income who favour simple consultations, games, and other entertainment (Van Dijk, 2006, 182sq).

It is naive to believe that mental and material access is enough so that problems of skill access and usage access will diminish (Van Dijk and Hacker, 2003). But faith in bridging the digital gap in this way is widespread in science.

Norris (2001) describes the digital divide as a multidimensional phenomenon, she distinguishes between the global digital divide, the social divide, and the democratic divide (Table 1).

For Norris the social divide includes the income gap, which makes a difference between those who can afford computer and Internet access and those who cannot. Castells furthermore identifies an education gap, an ethnical divide, an age gap, a family/single gap, and an ability/disability gap (Castells, 2002). For Wilson (2006) there are eight aspects of the digital divide: physical access (access to ICT devices), financial access (cost of ICT services relative to annual income), cognitive access (ICT skills), design access (usability), content access (availability of relevant applications and information online), production access (capacity to produce one's own content), institutional access (availability of institutions that enable access), and political access (access to the governing institutions where the rules of the game are written). Wilson relates these eight aspects to six demographic dimensions of the digital divide: gender, geography, income, education, occupation, and ethnicity.

The core of society consists of three subsystems (cf. Fuchs, 2003a, 2005a): the economic system in which use values and property that satisfy human needs are produced, the political systems in which power is distributed in a certain way and collective decisions are taken, and the cultural system in which skills, meaning, and competencies are acquired, produced, and enacted in ways of life. This distinction can, e.g., be found in the works of Anthony Giddens who says that symbolic orders and forms of discourse are concerned with the constitution of rules (culture), that political institutions deal with authoritative resources (polity), and that economic institutions are concerned with allocative resources (economy) (cf. Fuchs, 2003c); as well as in the works of Pierre Bourdieu who distinguishes economic, political, and cultural capital as the three structural features of society (cf. Fuchs, 2003b). Hence, we argue that besides general social forms of the digital divide, there is also an economic divide, a political divide, and a cultural divide.

Technologies enable and constrain human practices, their main dimensions are the material access to them (in modern society mainly with the help of money as technologies are sold as commodities), the capability to use them, the capability to use them in such ways that oneself and others can benefit, and embedding institutions. The digital divide refers to unequal patterns of material access to, usage capabilities of, benefits from computer-based information- and communication technologies that are caused by certain stratification processes that produce classes of winners and losers of the information society, and participation in institutions governing ICTs and society. Material access refers to the availability of hardware, software, applications, networks, and the usability of ICT devices and applications. Usage and skills access refers to the capabilities needed for operating ICT hardware and applications, for producing meaningful online content, and for engaging in online communication and co-operation. Benefit access refers to ICT usage that benefits the individual and advances a good society for all. Institutional access refers to the participation of citizens in institutions that govern the Internet and ICTs, and to the empowerment of citizens by ICTs to participate in political information, communication, and decision processes. Stratification patterns are on the one hand social hierarchies such as age, family status, ability, gender, ethnicity, origin, language, and geography (urban/rural). These categories have resulted in different types of the social divide. On the other hand unequal patterns of material access, usage capabilities, benefits, and participation concerning ICTs are also due to the asymmetric distribution of economic (money, property), political (power, social relationships), and cultural capital (skills). Hence, there is also an economic divide, a political divide, and a cultural divide. In modern society structures take on the form of capital that is accumulated and unevenly distributed so that different social classes and class fractions with a different (high, medium, low) total amount of economic, political, and cultural capital are created (cf. Fuchs, 2003b). The reason why there are gaps in access, usage/skills, benefit, and participation

Table 1
Pippa Norris' dimensions of the digital divide (Norris, 2001, p. 4)

Types of digital divide	Signified by
Global divide	Divergence of Internet access between industrialized and developed societies
Social divide	Gap between information rich and poor in each nation
Democratic divide	Difference between those who do, and do not, use the opportunities of digital resources to engage, mobilize and participate in public life

Table 2
Aspects and dimensions of the digital divide

	Economic capital	Political capital	Cultural capital	Age	Family status	Gender	Ability	Ethnicity	Origin	Language	Geography
Material access											
Usage and skills access											
Benefit access											
Institutional access											

concerning ICTs is the multidimensional class structure of modern society that creates structural inequalities. People with high income, far-reaching and influential social relationships, good education and high skills are much more likely to have access to ICTs, to be capable of using ICTs, to benefit from this usage, and to be supported in political participation by ICTs than people who are endowed with only a little amount of economic, political, or cultural capital. Table 2 summarizes aspects and dimensions of the digital divide.

James (2003, p. 45) defines the global digital divide as "the strikingly differential extent to which rich and poor countries are enjoying the benefits of information technology" and as "the unequal distribution of computers, Internet connections, fax machines and so on between countries" (James, 2003, p. 23). What Pippa Norris and Jeffrey James call the global digital divide is mainly an aspect of the economic divide because it concerns the difference in access to and usage of ICTs between rich countries and poor countries. Poor countries are those endowed with little economic capital, people there are much less likely to be able to access ICTs, to know how to use them, to benefit from usage, and to participate in embedding institutions. Developing countries are not only economically excluded, but also deprived of political power and cultural skills needed for active participation in the information society.

2. Africa and the global divide: data and examples

The following scale shows the urgency of the problem of the global digital divide in Africa. Table 3 presents an actual Internet usage statistic for Africa (Africa Internet Usage and Population Stats, data from 2006). An Internet user is in this statistical analysis defined as a person having available access to an Internet connection point and the basic knowledge required to use the Internet (http://www.internetworldstats.com/surfing.htm).

Although Africa makes up 14.1% of the world population, only 2.6% of all Internet users live in Africa.

A case-study by Oyelaran-Oyeyinka and Nyaki Adeya (2004) on Internet access in Africa shows as an example of the global digital divide that the costs of Internet use in Kenya and Nigeria are extremely high: "The mid-2002 average cost of using a local dial-up Internet account for 20 h per month is about $60 (including usage fee and local call time but excluding telephone line rental). In the US, the average cost is less than this cost including telephone charges" (Oyelaran-Oyeyinka and Nyaki Adeya, 2004, p. 71).

2.1. Human development and Internet access in Africa

Table 4 shows the Internet access and human development of African countries (data from 2006).

Table 3 shows that in 2005 15.2% of the world population had access to the Internet. Table 4 demonstrates that of the 57 African countries only three countries have an access rate that is higher than the worldwide

Table 3
Internet usage in Africa and on the globe 2006

Region	Population (2006 Est.)	Share of world population	Internet users, latest data (March 2006)	Internet penetration (% population)	% Users in world
Total for Africa	915,210,928	14.1%	23,649,000	2.6	2.3
Rest of the world	5,584,486,132	85.9%	999,214,307	17.9	97.7
World total	6,499,697,060	100.0%	1,022,863,307	15.7	100.0

Source. Internet World Statistics: http://www.internetworldstats.com/stats1.htm.

Table 4
Internet access in and human development of African countries, March 2006

Africa	Internet usage statistics				
	Population (2006 Est.)	Internet users – December 2000	Internet users, latest data	% Population (penetration)	UN HDI rank (UNHDR, 2005)
Algeria	33,033,546	50,000	845,000	2.6	103
Angola	13,115,606	30,000	172,000	1.3	160
Benin	7,513,946	15,000	100,000	1.3	162
Botswana	1,856,800	15,000	60,000	3.2	131
Burkina Faso	12,113,523	10,000	53,200	0.4	175
Burundi	7,909,395	3000	25,000	0.3	169
Cameroon	17,378,386	20,000	167,000	1.0	148
Cape Verde	485,355	8000	25,000	5.2	105
Central African Rep.	3,268,182	1500	9000	0.3	171
Chad	8,720,110	1000	60,000	0.7	173
Comoros	666,044	1500	8000	1.2	132
Congo	3,672,441	500	36,000	1.0	142
Congo, Dem. Rep.	58,731,656	500	50,000	0.1	167
Cote d'Ivoire	19,617,714	40,000	300,000	1.5	163
Djibouti	779,684	1400	9000	1.2	150
Egypt	71,236,631	450,000	5,000,000	7.0	119
Equatorial-Guinea	1,102,748	500	5000	0.5	121
Eritrea	4,189,934	5000	50,000	1.2	161
Ethiopia	72,238,014	10,000	113,000	0.2	170
Gabon	1,430,453	15,000	40,000	2.8	123
Gambia	1,471,863	4000	49,000	3.3	155
Ghana	21,355,649	30,000	368,000	1.7	138
Guinea	8,080,211	8000	46,000	0.6	156
Guinea-Bissau	1,460,253	1500	26,000	1.8	172
Kenya	34,222,866	200,000	1,500,000	4.4	154
Lesotho	2,453,810	4000	43,000	1.8	149
Liberia	3,108,312	500	1000	0.03	N/A
Libya	6,135,578	10,000	205,000	3.3	58
Madagascar	18,475,940	30,000	90,000	0.5	146
Malawi	11,359,669	15,000	46,100	0.4	165
Mali	10,751,139	18,800	50,000	0.5	174
Mauritania	2,897,787	5000	14,000	0.5	152
Mauritius	1,280,579	87,000	180,000	14.1	65
Mayotte (FR)	188,483	–	–	–	N/A
Morocco	30,182,038	100,000	3,500,000	11.6	124
Mozambique	19,881,392	30,000	138,000	0.7	168
Namibia	2,038,791	30,000	75,000	3.7	125
Niger	12,226,270	5000	24,000	0.2	177
Nigeria	159,404,137	200,000	1,769,700	1.1	158
Reunion (FR)	791,167	130,000	200,000	25.3	N/A
Rwanda	8,807,212	5000	38,000	0.4	159
Saint Helena (UK)	4893	–	1000	20.4	N/A
Sao Tome & Principe	170,319	6500	20,000	11.7	126
Senegal	10,842,622	40,000	482,000	4.4	157
Seychelles	84,189	6000	20,000	23.8	51
Sierra Leone	5,093,570	5000	20,000	0.4	176
Somalia	12,206,142	200	89,000	0.7	N/A
South Africa	48,861,805	2,400,000	3,600,000	7.4	120
Sudan	35,847,407	30,000	1,140,000	3.2	141
Swaziland	1,147,741	10,000	36,000	3.1	147
Tanzania	37,979,417	115,000	333,000	0.9	164
Togo	5,399,239	100,000	221,000	4.1	143
Tunisia	10,228,604	100,000	835,000	8.2	89
Uganda	27,771,997	40,000	200,000	0.7	144
Western Sahara	442,291	–	–	–	N/A

(continued on next page)

Table 4 (*continued*)

Africa	Internet usage statistics				
	Population (2006 Est.)	Internet users – December 2000	Internet users, latest data	% Population (penetration)	UN HDI rank (UNHDR, 2005)
Zambia	11,249,789	20,000	231,000	2.1	166
Zimbabwe	12,247,589	50,000	820,000	6.7	145
Total Africa	915,210,928	4,514,400	23,649,000	2.6	

Source. Internet World Statistics: http://www.internetworldstats.com/stats1.htm.

internet usage rate of 15.7% (Reunion 25.3%, Saint Helena 20.4%, Seychelles 23.8%). Only six of 57 African countries have an access rate higher than 10% (Mauritius, Morocco, Reunion, Saint Helena, Sao Tome and Principe, Seychelles). Twenty of the 57 countries have an access rate that is lower than one percent: Burkina Faso, Burundi, Central African Republic, Chad, Congo Democratic Republic, Equatorial-Guinea, Ethiopia, Guinea, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, Tanzania, Uganda.

This shows that the digital divide is a very pressing problem for Africa; most African countries are excluded from the information society. If the information society shall really be a global village (Marshall McLuhan), a digital agora, or virtual community (Howard Rheingold), Internet access and usage for developing countries would have to be assured because communities and democracy are inclusive and participatory rather than exclusive and segmented. Cyberspace in its current form as a socio-technical system that only gains meaning through human activities and communication (Fuchs, 2005b) is a segmented space that reflects the inequalities of society. Concerning Africa one hence can also speak of a digital apartheid that has real-world causes such as the unequal global distribution of resources. Digital apartheid means that certain groups and regions of the world are systematically excluded from cyberspace and the benefits that it can create.

Empirically, digital apartheid can be verified by taking a look at the UN Human Development Report 2005. Sixteen of the 20 African countries with Internet access of less than 1% are considered by the UN as ranging among the least developed countries in the world measured by the Human Development Index (these are those countries ranked 146–177). The HDI is based on measurements of life expectancy, education, and income. The only two exceptions are Equatorial-Guinea and Uganda that are considered by the UN as medium-developing countries, but have a low Internet access rate. For Liberia and Somalia, which are also two extremely poor countries, no HDI data is available (Table 5).

Table 5
Human development index of those African countries with Internet access below 1%

Burkina Faso	HDI rank 175
Burundi	HDI rank 169
Central African Republic	HDI rank 171
Chad	HDI rank 173
Congo Democratic Republic	HDI rank 167
(Equatorial-Guinea)	(HDI rank 121)
Ethiopia	HDI rank 170
Guinea	HDI rank 156
Liberia	No data available
Madagascar	HDI rank 146
Malawi	HDI rank 165
Mali	HDI rank 174
Mauritania	HDI rank 152
Mozambique	HDI rank 168
Niger	HDI rank 177
Rwanda	HDI rank 159
Sierra Leone	HDI rank 176
Somalia	No data available
Tanzania	HDI rank 164
(Uganda)	(HDI rank 144)

For example, the data for Niger seem to indicate that high poverty and low human development correspond with low Internet access. Niger is the country with the third lowest Internet access rate in Africa (only Liberia (0.03%) and Congo Democratic Republic (0.1%) have a lower rate; Ethiopia has an equal rate of 0.2%), and it is ranked the lowest developing country in the world in the Human Development Report (2005, p. 222). 61.4% of the population in Niger live on less than 1$ per day which is considered as the measure of absolute income poverty by the UN, 85.3% live on less than 2$ per day (UNHDR, 2005, p. 229).

The statistical data show that almost all African countries with very low Internet access are among the least developed countries in the world in terms of health, education, and income. This indicates that there seems to be a connection between global social gaps and the global digital divide. The UN in this context argues that "the network society is creating parallel communications systems: one for those with income, education and literally connections, giving plentiful information at low cost and high speed; the other for those without connections, blocked by high barriers of time, cost and uncertainty and dependent upon outdated information" (UNHDR, 1999, p. 63).

Correlating the data on Internet access and HDI for 51 African countries (as presented in Table 4) results in a correlation coefficient of −0.733, which means a very high correlation. This shows that higher rates of literacy, health, and income of a developing country have positive effects on Internet penetration.

The digital divide concerns not only material access, but also skills and usage patterns. Material access is a necessary, but not sufficient pre-condition for skills access and usage access. As most African countries lack and are deprived of basic economic, social, educational, and technological resources that result in a lack of material Internet access, one can assume that this also results in a lack of digital skills and meaningful Internet usage. For benchmarking eEurope 2005 the European Union used information society indicators, some of which also focus on skills and usage. For example, one indicator measures the percentage of individuals using the Internet for specific purposes (broken down by purposes: sending/receiving emails, finding information about goods and services, reading/downloading online newspapers, playing/downloading games and music, Internet banking) in the previous three months; other ones focus on the percentage of individuals having used the Internet in relation to training and educational purposes or the percentage of population (aged 16 and over) using Internet to seek health information whether for themselves or others (cf. Fuchs, 2006a). Unfortunately such statistics are hardly available on the global level, global studies such as the Global Information Technology Report (Dutta et al., 2006) and the World Telecommunication/ICT Development Report (ITU, 2006) focus mainly on material access and infrastructure. For measuring digital literacy, i.e., the capacity to use ICT hardware and software in meaningful ways, the United Nations use the UNDP education index which is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio with two third weight given to adult literacy and one third to the gross enrolment ratio (United Nations, 2005). The same indicator for measuring digital literacy is used in a study on "Measuring Infostates for Development" by the ITU (Sciadas, 2005) and in the ITU's Digital Access Index (ITU, 2006). No data relating directly to digital literacy is collected. Concerning global information society indicators there is not yet a unified standard and corresponding data available in a database. A "Partnership on Measuring ICT for Development" has been formed by the ITU, the OECD, the UNCTAD, the UNESCO Institute for Statistics, the UN Regional Commissions (UNECLAC, UNESCWA, UNESCAP, UNECA), the UN ICT Task Force, and the World Bank. Its aims include to achieve a common set of 42 core ICT indicators and to develop a global database on ICT indicators. In 2005 a core set of ICT indicators was established and adopted at the WSIS Thematic Meeting on Measuring the Information Society (Partnership on Measuring ICT for Development, 2005). Concerning usage access the indicator on "HH10 Internet activities undertaken by individuals in the last 12 months" is of particular importance (Partnership on Measuring ICT for Development, 2005, p. 4). But there are not yet global statistics available for this indicator. The UNESCO has proposed 33 indicators for measuring ICT in education (UNESCO, 2003), but data based on these indicators is not collected. Digital capacities are enabled by digital education, digital experience, and the provision of online applications and services. If the technological foundations for digital practices are missing for most people as in Africa, one can expect that there is also a global divide concerning usage access and skills access.

Jan van Dijk based on the class concept of the Marxist Erik Olin Wright who defines a social class in broad terms in the dimensions of ownership of the means of production, control of organization, and ownership of

skills and qualifications, argues that there is a tripartite class structure of the network society (Van Dijk, 2006, pp. 174–177, 185–186):

1. The Information Elite consists of people with high levels of education and income, the best jobs and societal positions, and a nearly 100% access to ICTs.
2. The Participating Majority which contains a large part of the middle class and the working class who do have access to computers and the Internet, but also possess fewer digital skills than the elite, information and strategic skills in particular, and use fewer and less diverse ICT applications.
3. The Disconnected and Excluded who are largely excluded from participation in several fields of society and have no access to computers and the Internet.

This class model first of all describes the social structure of contemporary Western societies, but it also has relevance on the global level for the relationship of developing and developed countries. Interpreting Van Dijk's class structure of the network society and connecting it to the statistical data just mentioned, we can argue that the gap between the information elite, the participating majority, and the disconnected and excluded in developing countries is larger than in developed countries. Applying the class model to the global level means that on the global level most African countries and people living in Africa are part of the class of the disconnected and excluded. Van Dijk argues that the Matthew effect (the effect that strong and powerful actors tend to become more powerful and important which results in an increase of inequality) plays an important role in the class-divided network society (Van Dijk, 2006, pp. 183–186): In a network society that is characterized by structural inequality there is a tendency of centralization of information, knowledge, and power, the already powerful gain more and more (material and immaterial) resources, hence based on a divided social structure usage gaps would be likely to grow. "Progressively, more and more people will even be completely excluded from particular fields of society. The result will be first-, second-, and third-class citizens, consumers, workers, students, and community members" (Van Dijk, 2006, p. 184).

Van Dijk says that structural inequality means that the disconnected class has less chances on the labour market, less educational opportunities, and less chances of participation in politics and society. The network society is a global society in terms of the extension of communication and markets, but it is also as important scientists in the area of information society research as Van Dijk and Castells have shown a society characterized by polarization and structural inequality. For Africa this means that in the current form of the global network society the continent has much less possibilities for participating in economy, polity, culture, and technology; i.e., economic wealth, global political decision making, worldviews and lifestyles that shape globalization, and technological standards and applications are controlled by Western countries. Globalization is an uneven process that is dominated by a hegemonic triad made up of the United States, Europe, and Japan (Fuchs, 2003a). Michael Hardt and Antonio Negri argue in this context that a new global system that they term Empire emerges that is "composed of a series of national and supranational organisms united under a single logic of rule" (Hardt and Negri, 2000, p. xii). A few Western economic and political actors define this global single logic of rule that aims at the restructuration of capitalism and domination (Fuchs, 2003a, 2006b). This logic is the fundamental force causing the divide between developed and developing countries, it has resulted in the global digital divide and other effects. For improving the situation of Africa an alternative network society that is based on alternative principles of production, distribution, and regulation is needed.

In global network capitalism the accumulation of economic, political, and cultural capital (in the sense of Bourdieu) is shaped by knowledge and computer-based information and communication technologies. This has resulted in flexible, networked, and transnational regimes of accumulation that allow the increase of profit and the minimization of the turnover time of capital. The class of the Disconnected and Excluded identified by Van Dijk is poor in and deprived of economic, political, and cultural capital and lacks benefits from as well as material access and usage capacities to the technological capital that shapes accumulation processes in global network capitalism (Fuchs, 2006b). Most Africans are part of this new class.

In the book "Knowledge Societies. Information Technology for Sustainable Development" edited by Robin Mansell and Uta Wehn there is a chapter on "The Potential Uses of ICTs for Sustainable Development" that wants to focus on ICT applications that could assist developing countries to reap the "social and economic benefits associated with extremely rapid innovation in advanced ICT-based goods and services"

(Mansell and Wehn, 1998, p. 82). Sustainable development is here understood as social and economic development. The chapter lists and discusses a number of ICT applications in the areas of e-travelling, e-government, e-transport, e-health, e-education, e-inclusion, and e-learning. Mansell and Wehn show the urgency of the problem of the digital divide.

We do not think that Western technologies can be the main means for solving the digital divide. The Third World is not only largely excluded from wealth, but also from technological progress. There is a total value transfer from developing countries to developed countries. We think what is needed for improving the situation of developing countries is on the one hand the radical global redistribution of wealth starting with measures such as the increase of human aid, basic income for the absolute poor in the world, the elimination of debt burdens on Third World countries, and on the other hand a non-colonizing technology that is adapted to the needs of people in Third World countries and integrates their traditional knowledge and technologies.

Solutions to the global divide cannot be provided by Western technologies that are applied in Third World countries. Such positions are an expression of cultural imperialism that neglect that local and traditional ideas are of high cultural importance in solving the problems of the Third World. Western habits, colonialism, and post-colonial practices are part of the causes of the problems that Third World countries are facing today. What is hence needed in addressing issues such as poverty and ICTs in the Third World is unity in diversity management.

Another aspect of cultural imperialism is "the Washington Consensus", a policy package of the World Bank focusing on "good governance" combined with Structural Adjustment Loans (SAL). It was developed in the 1980s and 1990s and stresses privatization and deregulation of the telecommunication sector and other economic areas (Stovring, 2004). Western institutions such as the World Bank demand such measures as a condition for providing developing countries with credits. The SALs of the early 1980s didn't produce the expected economic effects and poverty-reduction could not be achieved (Stovring, 2004, p. 13). "The implementation of privatization and deregulation in Africa has produced very weak results compared to Latin America and South East Asia in terms of growth of service provision of telecommunication services" (Stovring, 2004, p. 12). "For the African States the average penetration level [of fixed lines] only grew from 0.4 in 1990 to 0.75 per 100 inhabitants in SSA in 2000" (Stovring, 2004, p. 19). SSA-countries are countries south of the Sahara and north of South Africa and Namibia. Only in a few smaller countries like Cape Verde, Reunion, Seychelles, Botswana, and Mauritius higher penetration rates could be achieved. None of these countries belong to the least developed countries in the world (in terms of the HDI-index). Therefore it is not surprising that examples in the scientific literature focus on smaller countries, which have had some success in the de-monopolization and privatization of the IT-sector.

Now we will discuss two examples for the digital divide in Africa. Section 2.2 concentrates on Ghana in the context of ICT-sector reforms. Section 2.3 considers ICT connectivity in South Africa. Both cases make clear that opening the ICT-market can mean more possibilities for access to telephone lines and Internet connections, but does not automatically resolve the digital divide because the central influence is whether or not people have the financial capability of purchasing access and the skills and time that are needed for using computers and the Internet.

2.2. Internet in Ghana

Ghana's tele-centres offer a low cost opportunity to phone or Internet connection. One tele-centre includes two telephone lines, two phones, a fax, a photocopier, and one or two computers (Falch, 2004). The tele-centres outside the capital Accra are generally less advanced. In 2001 there were about 150 tele-centres with Internet access, 90% of these were located in Accra. Tele-centres in Ghana are usually created by the initiative of small entrepreneurs. Most of them are not very profitable and competition is increasing. The managers of the tele-centres are sometimes not able to gain enough profit in order to pay their bills to Capital Telecom. In the business centre of Accra the density of tele-centres is lower than in the surroundings because people there are better equipped with fixed phone lines and mobile lines. The main problem of the tele-centres seems to be that low incomes disable the large-scale use of tele-centres and telecommunications services (Falch, 2004).

The liberalization of Ghana's telecommunication sector began in 1996 with the privatization of 30% of Ghana Telecom. In 1997 two other providers were licensed (Westel, Capital Telecom), between 1992 and

Table 6
Internet and PC access in Ghana + telecommunication investment

Year	Internet users per 100 inhabitants	PCs per 100 inhabitants	Telecommunication investment (in million US$)
1995	0.0	0.12	
1996	0.01	0.14	7.32
1997	0.03	0.16	41.29
1998	0.03	0.21	23.96
1999	0.10	0.25	86.78
2000	0.15	0.30	
2001	0.19	0.33	37.55
2002	0.78	0.38	59.4
2003	1.17	0.45	
2004	1.72	0.52	59.4

Sources. Internet, PC: United Nations Statistical Databases – http://unstats.un.org, 1995–2002; International Telecommunication Association, ITU – http://www.itu.int, 2003–2004; Investment: International Telecommunication Association Statistics, ITU – http://www.itu.int.

2000 four mobile operators were licensed. Ghana is "one of the most liberalized telecom markets in Africa" (Sciadas, 2005, p. 67). "In 1997 Ghana became the first developing country to introduce privatization and competition in all areas of service, in all parts of the country" (World Bank, 1999, p. 68). Liberalization of telecommunications markets has not resulted in a significant increase of phone and Internet users in Ghana: The number of fixed lines increased from 0.4 per 100 inhabitants in 1995 to 1.35 in 2003 (Sciadas, 2005, p. 68). Although the number of mobile lines meanwhile is much larger than the one of fixed lines, the problem is that lines are clogged because of a shortage of cell stations and that the price of "a one-minute wireless conversation, under the most common plan, is 10 times higher than it would be in the United States. [...] After all, development experts have long presumed that lags in technology, much like lags in medicine, stem from poverty – and only reducing poverty can close the technology gap." (Zachary, 2002). It should be added that eradicating poverty does not automatically close the digital divide because also needed is the establishment of technological infrastructures, applications, and digital literacy. But poverty eradication is a necessary pre-condition for overcoming the digital divide. Systems struck by poverty probably will not find the time, income, resources, and human capacities needed for building information societies.

Table 6 shows the evolution of Internet and PC users in Ghana. Telecommunication investment refers to "the annual expenditure associated with acquiring ownership of property and plants used for telecommunication services and includes land and buildings" (ITU, 2006, p. 187). The material access data refer to personal computers in use per 100 population and Internet users per 100 population.

The data show that Internet and PC access is still very low in Ghana although some growth has been achieved recently. The example of Ghana makes clear that the neoliberal recipes of market liberalization and privatization do not automatically close the digital divide and the lack of access to ICT because poverty and social problems are major hindrances. "The low economic and development status of Ghana and most other African nations will also continue to be a major problem for telecommunications users and a hindrance to the introduction of new technologies." (Addy-Nayo). The United Nations Human Development Report 2005 shows that in Ghana the poorest 20% have 5.6% and the richest 20% have 46.6% of the total income, there are nine physicians per 100,000 people, the adult illiteracy rate is 45.9%, and 78.5% of the population has less than $2 per day (UNHDR, 2005, p. 272, 238, 228).

Wilson (2006) argues that "progressive and visionary leaders" (Wilson, 2006, p. 174) such as Edward Salia – the former Minister for Transport and Communication – , and Nii Quaynor – CEO of the Ghanian telecommunications corporation Network Computer Systems (NCS) – that opposed "conservative" strategies of regulating markets helped advancing Internet in Ghana by pressing for continuous liberalization, deregulation, and privatization of the Ghanian telecommunication market. For Wilson the social and economic problems that Ghana is facing are a result of selfish and corrupt governments, not of structural inequality in the world system, i.e., of Western colonialism and the unequal distribution of global wealth. The goal of the "visionaries" was to open markets for foreign investment. As a result, e.g., Malaysian Telecom bought 30% of the privatized shares of Ghana Telecom and the foreign direct investment in Ghana increased. Opening up markets has

resulted in more investment in telecommunications since the mid 1990s as Table 6 shows. But this does not correlate with a corresponding increase in Internet and PC access. Correlating data on Internet access and telecommunication investment (Table 6) for the years 1996–1999, 2001, 2002, 2004 results in a correlation coefficient of 0.373. Correlating data on PC access and telecommunication investment for the same years (Table 6) results in a correlation coefficient of 0.494. Both coefficients show that there is no significant relationship between capital investment and telecommunications and ICT access. Hence, opening markets and attracting investment will not automatically increase ICT usage significantly and other factors such as political and institutional ones seem to be important. Wilson (2006, p. 306) argues that one measure for solving the digital divide should be the enhancement of competition and the promotion of investment. But analysis shows that neoliberal policies do not guarantee increased access, hence public or communal ownership of telecommunication infrastructure might be a better solution for poor countries.

2.3. Internet in South Africa

In South Africa the telecommunications sector has since 2003 been continuously liberalized and privatized. The State-owned Telkom was given a 25-year-license for providing fixed telephone lines and hence controls this area of telecommunications. One condition was that it should build 2.69 million new telephone lines by May 2002, of these 62% should serve under-serviced areas, including townships and rural areas (Barendse, 2004). Penalties for underachievement were fixed. Liberalization of the telecommunications market started in 1993 with the licensing of two mobile operators (Vodacom and MTN), which, as a condition for licensing were committed to covering 70% of the population within four years. In 2001 a third mobile operator (Cell C) entered the market. An increase in fixed main lines from 4.3 million in 1996 to a high of 5.5 million in 1999 was achieved, but an increase in local call costs by 25% between 2002 and 2003 resulted in a drop to 4.8 million in 2003 (Sciadas, 2005, p. 76). Following liberalization of telecommunications SBC Communications (US-owned) and Malaysia Telecom together acquired ownership of 30% of Telkom from 1997 to 2003. Telkom was listed in 2003, the South African governments is the biggest shareholder with a 37.7% equity stake. Telkom controls the fixed line broadband Internet access infrastructure; ISPs can rent bandwidth in order to sell Internet access. In 2005 there were more than 200 ISPs (Lewis, 2005, p. 7) and there are numerous providers of wireless broadband such as Sentech, WBS, Burst, Vodacom, or MTN. In November 2001 the Telecommunications Amendment Act introduced the licensing of a second telecommunications infrastructure provider, but to date no license could be issued (Lewis, 2005, p. 20).

In 1997 the Universal Service Agency (USA) was established, one of its tasks is to finance tele-centres with the help of the Universal Service Fund. In May 2002, 72 tele-centres were set up, most of them located in disadvantaged areas (Barendse, 2004). In 2002, the Telecommunications Amendment Bill was passed, it allows the issuing of licenses for small telecommunications businesses in geographic areas where less than 5% of the population have access to telecom services or facilities. Barendse (2004) in a paper on ICT connectivity in South Africa argues that the number of market players should be considered as the major success criterion and that market liberalization automatically results in reduced costs and higher access rates for low-income customers. The South African example shows that market liberalization has resulted in a higher potential for access, but not in solving the digital divide because the existence of phone lines, mobile lines, and Internet connections does not mean that low- and medium income classes can afford access. Hence, it is a false conclusion that the number of market players in the telecommunications sector is the relevant criterion for success. Neoliberal discourse focuses on market access, but leaves out the role of income distribution and educational and skill barriers. The paper by Barendse does not focus on aspects of the digital divide in South Africa such as the ethical divide, the regional divide, and the gender divide.

Table 7 shows the evolution of Internet and PC users and of telecommunication investment in South Africa.

The table makes clear that there has been a continuous increase in the number of South African Internet and PC users. Correlation analysis shows that there is no significant relationship between telecommunication investment on the one hand and on the other hand Internet usage (correlation coefficient = −0.261) or PC usage (correlation coefficient = −0.103). Although private annual telecommunication investment after a first increase decreased, Internet and PC usage increased in South Africa during the last decade. This shows that the neolib-

Table 7
Internet and PC access in South Africa + telecommunication investment

Year	Internet users per 100 inhabitants	PCs per 100 inhabitants	Telecommunication investment (in million US$)
1995	0.71	2.79	1,130,535
1996	0.88	3.54	1,116,448
1997	1.70	4.37	1,790,380
1998	3.00	5.46	3,038,920
1999	4.23	6.04	1,947,627
2000	5.49	6.64	1,743,516
2001	6.49	6.96	1,393,728
2002	6.82	7.26	712,049
2003	7.17	7.58	871,164
2004	7.89	8.27	

Sources. Internet, PC: United Nations Statistical Databases – http://unstats.un.org, 1995–2002; International Telecommunication Association, ITU – http://www.itu.int, 2003–2004; Investment: International Telecommunication Association Statistics, ITU – http://www.itu.int.

eral assumption that capital investment automatically brings technology to the people is a myth and that the main interest for corporations is not enabling access for all, but enabling opportunities for capital accumulation. That the major interest is an economic one has been verified by a global survey of business leaders conducted by the Global Information Infrastructure Commission in 2001 that shows that "the search for market opportunities was their principle motivation for caring about the global digital divide" (Wilson, 2006, 181sq).

Although the total number of Internet users has been continuously increasing, mainly white male well-situated individuals have benefited, whereas black and female individuals are largely excluded. In 2003 18% of black households had a telephone service compared to 82% of white households (Barendse, 2004, p. 53). The South African market research company Webchek found out that only 0.1% of black men and women have Web access at home, 0.6% of black women have Web access at work, 1.2% of black men have Web access at work, 0.9% of black women have a PC at home and 2.9% at work, and 1.3% of black men have a PC at home and 4.7% one at work (Webchek: What percentage of black South Africans have Web access? http://www.webchek.co.za/library_black.html). A study conducted one year later showed that there had been no growth in Web access for black South African males and females, whereas the number of male white Web users had increased from 35.6% in April 1999 to 37.4% in April 2000 and the number of female white Web users from 7.4% to 10.6% (Webchek: Growth rates in black and white male and female South African Web Users between May 1999 and May 2000. http://www.webchek.co.za/library_growth.html). Even Andrew Barendse who is keen on stressing liberalization admits that liberalism has not been successful in addressing "the problem of affordability" (Barendse, 2004, p. 65).

These data show that because there are decisive underlying social, ideological (racism), and economic factors that result in structural inequalities, the digital divide is not closed by fostering privatization and liberalization. South Africa is still facing major social problems. The UNHDR (2005) calculated that 34.1% of the South African population lives on less than $2 per day, the life expectancy at birth decreased from 53.7 years in 1970–1975 to 49.0 years in 2000–2005, the public expenditures on education decreased from 5.9% of the GDP in 1990 to 5.3% of the GDP in 2000–02, the poorest 20% have 3.5% and the richest 20% 62.2% of the total income (UNHDR, 2005, p. 228, 252, 256, 272). In 2005 South Africa with a gini index of 57.8 ranked number 9 in the list of countries with the highest income inequality (Paraguay ranked evenly, UNHDR, 2005, pp. 270–273). As an effect of the polarization of the social structure there are very high crime rates: In 2003 22.9% of the population became victims of crime, 0.2% of the population were murdered (1 in 500 persons) (Crime Levels in South Africa, National Victims of Crime Survey, http://www.issafrica.org/pubs/Monographs/No101/Chap6.htm).

3. Solutions to the global digital divide?

We agree with Jan van Dijk that "most likely, the digital divide within developing countries and between them and the developed world will continue to rise" (Van Dijk, 2005, p. 185). But this is only the case if the

current unequal economic and social development of global society continues, which clearly is not a foregone conclusion. We will now discuss six potential strategies for dealing with the global digital divide.

Strategy 1: Wait and see, market and technological development will cheapen access.

Some say that historically new technologies such as electricity, the car, the telephone, or television have at first always been expensive and reserved to a small elite before they have diffused into society and have become accessible for the broad masses. Concerning the Internet the same would be the case and hence one should just wait because after a certain time the digital divide would decline due to declining costs of technology and the effects of Moore's law[1] (e.g., Compaine, 2001; Norris, 2001). This argument is not suitable for the topic of the global digital divide because the wealth gap between Western and Third World countries is continuously increasing and developing countries are systematically excluded from wealth and technological progress. Hence, to wait and see will not solve the problem. Also older technologies such as electricity, the telephone or TV are not widespread in developing countries, there is a general global technological divide.

Strategy 2: By entering into markets and competition third world countries will be able leapfrog directly into information societies.

Will ICTs help developing countries in leapfrogging certain stages of technological development and the industrial development stage so that they will catch up with Western societies and become information societies? Technological leapfrogging means "the implementation of a new and up-to-date technology in an application area in which at least the previous version of that technology has not been deployed" (Davison et al., 2000, p. 2). "In developed economies, newer versions of technology are often used to upgrade older versions, but in developing economies where still older versions of technology are often prevalent (if they exist at all), the opportunities for leapfrogging over the successive generations of technology to the most recent version are that much greater" (Davison et al., 2000, p. 2). Leapfrogging might indeed be possible (e.g., establishing wireless communication in developing countries without requiring the earlier stage of a well-developed wire-line infrastructure), but the important question is not if leapfrogging is possible, but if it will benefit all people or only a tiny class. Market liberalization does not automatically result in the affordability of ICTs for all human beings, hence we doubt that liberalization enables leapfrogging as, e.g., argued by Pippa Norris (2001): "Given a high-speed backbone, and market liberalization of telecommunication services, African nations may also be able to 'leapfrog' stages of industrialization through new technology by investing in fully digitized telecommunications networks rather than outdated analog-based systems".

Strategy 3: Attracting foreign capital will increase wealth for all and access in developing countries.

Some stakeholders and scientists argue that liberalizing telecommunications markets in developing countries will attract Western corporations to invest in the ICT-sector in these regions and that this will result in economic growth that benefits all and lowers Internet and phone prices due to competition (e.g., Murelli, 2002). It is naïve to assume that capitalists aim primarily at solving the digital divide, Western investment is only due to the search for new opportunities of expanding capital accumulation. The reality is as we have argued in the prior section of this paper that the economic growth caused by Western investments in ICT markets benefits Western corporations and a small local elite, but does not at all assure access for all to ICTs and benefits from ICTs for all.

ICT applications in the areas of e-commerce, e-travelling, e-government, e-transport, e-health, e-education, e-learning, etc. are mainly developed in Western countries and benefit under current conditions mainly Western corporations if they are exported to developing countries because these corporations can extract profit by establishing dependencies on Western-defined standards. The Third World is not only largely excluded from

[1] Moore's law says that the number of transistors on integrated circuits and hence processing power doubles every 18 months while the costs do not increase.

wealth, but also from technological progress. In 1999 there was 56 billion dollars in Western foreign aid for the Third World and the latter paid 136 billion dollars debt service to Western countries (Fuchs, 2002, p. 370). Hence, in total there was a value transfer from developing countries to developed countries. Although Africans make up 14.1% of the world population, Africa only accounts for 1.6% of the number of global Internet users.

In the Declaration of Principles of the World Summit on the Information Society (WSIS) passed in Geneva in 2003 technology transfer and ICT manufacturing are understood as means for achieving a sustainable information society for developing countries: "33. To achieve a sustainable development of the Information Society, national capability in ICT research and development should be enhanced. Furthermore, partnerships, in particular between and among developed and developing countries, including countries with economies in transition, in research and development, technology transfer, manufacturing and utilization of ICT products and services are crucial for promoting capacity building and global participation in the Information Society. The manufacture of ICTs presents a significant opportunity for creation of wealth. [...] Distribution of the benefits of ICT-driven growth contributes to poverty eradication and sustainable development." (WSIS, 2003a, Principles 33, 43).

WSIS sees a sustainable information society as a society in which ICTs promote participation and poverty eradication. Furthermore sustainable production and consumption patterns, usability, e-health, and e-learning are considered as aspects of a sustainable information society. The WSIS Plan of Action (WSIS, 2003b) argues that for achieving a sustainable information society governments, businesses, civil society, and international and regional institutions must take responsibility. WSIS favours a mixed strategy of political practice and economic investment for achieving a sustainable information society. Governments should devise national strategies for digital inclusion, promote public access, e-government, e-business, e-learning, e-health, e-employment, e-environment, e-agriculture, e-science, etc. For achieving a sustainable information society in developing countries, the WSIS Plan of Action argues on the one hand that debt cancellation is needed, on the other hand that more private national and international markets for ICTs should be provided by developing countries. "D2. c. For those developing countries facing unsustainable debt burdens, we welcome initiatives that have been undertaken to reduce outstanding indebtedness and invite further national and international measures in that regard, including, as appropriate, debt cancellation and other arrangements. (...) d. Recognizing the potential of ICT for development we furthermore advocate

i. developing countries to increase their efforts to attract major private national and foreign investments for ICTs through the creation of a transparent, stable and predictable enabling investment environment;
ii. (...) Based on the priorities of national development plans and implementation of the above commitments, developed countries should increase their efforts to provide more financial resources to developing countries in harnessing ICTs for development;
iii. the private sector to contribute to the implementation of this Digital Solidarity Agenda" (WSIS, 2003b).

What is missing here is the insight that markets do not automatically eliminate poverty because they do not determine how wealth is distributed. Hence, public institutions and regulatory practices are needed that ensure that all can enjoy the benefits from ICTs and economic production. WSIS sees capital only as a positive factor in achieving sustainable development. It assesses ICT markets as very positive means for advancing social sustainability, it neglects aspects of political regulation of the economy and income distribution, and gives priority to economic logic.

Strategy 4: Technologies for the Third World.

James (2003) argues that one possibility for solving the global divide is to transport old computers from rich to poor countries. The lifetime of a Western business computer is only 2–3 years, this is due to rapid technological progress and the non-upgradeability of most hardware which causes people to buy new computers every 2 or 3 years as well as heavy profits of the hardware and software industry. The danger in exporting old computers to developing countries is that the latter will become dumps for electronic waste just like many Western corporations and countries consider them as dumps for atomic waste. Besides that we see no reason

why developing countries should not have the same right as Western countries to benefit to a full extent from technological progress just like other countries do. Nicholas Negroponte and the One Laptop Per Child (OLPC) association have introduced the $100 laptop as a strategy for advancing computer technology in developing countries. The problem is that this is a technology that is inferior to Western standards (very slow processor, no hard disk and drives, etc.) and hence can be produced and sold rather cheaply. If the $100 laptop is widely diffused in the Third World, Western actors selling these computers will derive profits, and a global divide in technological progress and standards will emerge that separates advanced Western technology users from users of less-advanced technologies in the Third World. What is needed are not new business strategies, but solutions to the material and social causes of the global digital divide as well as free advanced hardware, infrastructure, and software that are based on open standards and copy-left licenses. That Microsoft and Intel are critical of the $100 laptop does not mean that it is automatically a good idea; this is rather a manifestation of the competition for profit and customers in developing countries. Open source technologies have a potential to transcend market logic, what is needed is an advanced $0 laptop with free software for people in developing countries as well as criticism of the capitalist logic that has caused the divide between developing and developed countries and solutions to the social, economic, political, and cultural inequalities that underpin the global digital divide.

Open source software or free software is software that provides four kinds of freedom for the user (Free Software Foundation, 1996):

- The freedom to run the program, for any purpose.
- The freedom to study how the program works, and adapt it to specific needs. Access to the source code is a pre-condition for this.
- The freedom to redistribute copies so that someone can help his neighbour.
- The freedom to improve the program, and release these improvements to the public, so that the whole community benefits. Again access to the source code is a pre-condition for this.

Open source software has been realized mainly within projects such as the Linux operating system. Special licences (termed copy-left) such as the GNU-public license have been developed for assuring that free software has an open access to its source code. Free software hardly yields economic profit; it is freely available on the Internet and constitutes an alternative model of production that questions proprietary production models. The main reason why free software is a good opportunity for developing countries is not that it is cheap (James, 2003), but rather that by using free software developing countries do not depend on Western corporations such as Microsoft which aim not primarily at solving the digital divide, but at accumulating capital in developing regions by creating dependencies on Western technological standards such as Windows. Examples for a large-scale adoption of open source software can be found, e.g., in Mexico, China, Zimbabwe, Ethiopia, and Mozambique (Grassmuck, 2004, pp. 323–328).

Strategy 5: The Third World does not need technology.

Some analysts argue that there is no need for technology in the Third World because there would be more basic problems such as poverty, health issues, and illiteracy. For example, Ted Turner, the founder of CNN, has argued: ''We talk about the digital divide. We talk about it all the time at Time-Warner too. We want to get computers in everyone's hands. But half the people in the world do not have electricity. Over a billion do not have access to clean drinking water. Forget the digital divide, they need food, water, clothing, shelter and a chance for an education''.[2]

Information and communication is just like social security a fundamental human right. This right is explicitly mentioned in article 19 of the Universal Declaration of Human Rights: ''Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers''. In information

[2] http://www.geni.org/globalenergy/library/donor-letters/2000/Donor2000-07.shtml, June 3, 2006.

societies opinions are increasingly expressed and articulated with the help of the Internet and other new media. Hence, material, usage, and skills access to new technologies is a contemporary expression of a fundamental human right. It is unjust that Western citizens enjoy more human rights and economic, social, cultural, and technological resources than citizens in developing countries.

> Strategy 6: An integrated strategy combining the global redistribution of wealth, educational and health programs, digital literacy programs; public and free access to computers and technologies, open source technologies, and computers for the Third World.

All five strategies discussed so far are reductionistic and one-dimensional, they do not see the interconnectedness of technology access, social factors, uneven development, human rights, and global capitalism. In order to tackle the global digital divide a fundamental redistribution of resources is needed as a pre-condition. Modern society is so rich and productive that it could easily afford a modest income, social security, literacy, and free access to computers and the Internet for all humans. If this is a real possibility, then the best and most desirable option is to realize it. But this requires a redesign of global society because the digital divide is not first of all a technological problem, but an economic, social, and political issue. The digital divide is not only a divide in the access to and benefits from technology, but it also an expression of a more general divide in wealth and power. In order to close the global divide first of all measures such as a fundamental global redistribution of wealth, a full cancellation of all debts of Third world countries, a multiplication of development aid, the provision of free public health and educational programs, and a basic income guarantee for all absolutely poor individuals (that could be financed, e.g., by a Tobin tax) could be realized. Based on such a material foundation further measures such as the support of publicly provided free access to computers and Internet for all, the public provision of digital literacy programs, local hardware production that aims at free or cheap local products and the large-scale adoption and production of free software-technologies (that are adapted to local needs) by Third World countries seem to be feasible. Western actors or countries could also provide computers and equipment for free to the Third World, but these technologies should be technologically advanced, non-commercial, non-proprietary, free of cost, and open source in order to avoid the deepening of existing or emergence of new dependencies. Access to technologies should be universal, guaranteed by the public, free of cost, and based on open source. That it should be universal means that it should be guaranteed to all people. This can best be achieved if provided not by private organizations, but by public ones (such as communities) because the latter are not based on profit interests that might undermine universality, but on the common interest in common goods. The best guarantee for avoiding the emergence of capitalist interests in technology that might undermine universal access and the dependency of developing countries on Western capital, technologies, and interests, is the provision and development of technologies that are free of cost (''free access for all'') and open source (accessible source code in order to advance co-operative engineering, high quality, and free access). Open source technologies can advance the emergence of local and regional communities for co-operative technology development that act independently from Western interests and the logic of profitability.

One innovative measure is to establish public funds for free access telecommunication services. In Brazil the Partido dos Trabalhadores (PT) government has established a fund for universal telecommunications services (FUST) financed in part by a one per cent tax on the gross revenues of telecommunications service providers. It provides ICT resources for schools, health facilities, and rural communities. Such funds can be financed as the Brazilian example shows by taxing capital and/or by development aid. An integrative strategy of fundamental redistribution mechanisms, free public access, educational and health programs, a gift economy, open source and open access technologies seems most promising to us. One-dimensional strategies ignore the interconnectedness of technological and societal issues. For overcoming the digital divide more fundamental strategies that aim at changing society and departing from the dominance of capitalist logic are needed.

4. Conclusion

Some authors reduce the digital divide to a technical problem and argue that material access possibilities and the opening of markets will result in a closing of the gap. Important information society researchers such as Manuel Castells and Jan van Dijk have pointed out that structural inequality in society is the main cause for

different types of the digital divide such as the global divide, the gender divide, the ethical divide, the age divide, the income divide, the educational divide, and the abilities divide. In this paper we have focused on the role of the digital divide in Africa. It has been shown that the least developed African countries in terms of income, education, and health have very low Internet access and usage rates. The examples of Ghana and South Africa have demonstrated that neoliberal policies of liberalization, deregulation, and privatization of the telecommunication sector as suggested by the Washington Consensus and Structural Adjustment Programs of institutions like the World Bank and the International Monetary Funds have not succeeded in bridging the digital divide in Africa and the global digital divide. In Ghana markets have been extremely liberalized, but the number of Internet users is still very low, whereas poverty and the income gap are high. Also in South Africa markets have been increasingly liberalized and new economic actors in the telecommunications sector have emerged. The total number of Internet, telephone, and mobile phone users increased continuously, but the ethical digital divide has not narrowed because South Africa is still a country shaken by poverty, social polarization, an extreme unequal distribution of income, and high crime rates. Post-apartheid has brought formal equality, but social and ethnically biased inequality continues to exist. The digital divide is a problem for Africa that is due to structural inequalities of the global network society which is a society characterized by global social and digital apartheid. The global digital divide means unequal material, usage, skills, benefit, and institutional access to new information and communication technologies by different world regions. The globalization of capitalism is a centralizing process that excludes parts of the developing countries, especially Africa is considered as unimportant in economic, political, and cultural terms by Western actors (Fuchs, 2003a). The global digital divide is an expression of the unequal geography of global capitalism. That there is a lack of economic and technological resources in Africa is not the fault of corrupt African governments and not an effect of bad governance, market protectionism, a lack of investment conditions for Western capital, etc., but the effect of hundreds of years of colonial and post-colonial exploitation, exclusion, and dependency of the Third World that has caused the very conditions that Africans have to face today.

References

Addy-Nayo, C., 3G Mobile Policy: The Case of Ghana. International Telecommunication Union (ITU). Available from: <http://www.itu.int/osg/spu/ni/3G/casestudies/ghana/ghanafinal.pdf>.

Annan, K., 1999. Speech at the ITU Telecom Opening Ceremony. October 9, 1999. Available from: <http://www.itu.int/telecom-wt99/press_service/information_for_the_press/press_kit/speeches/annan_ceremony.html>.

Barendse, A., 2004. Innovative regulatory and policy initiatives at increasing ICT connectivity in South Africa. Telematics and Informatics 21 (1), 49–66.

Castells, M., 2002. The Internet Galaxy. Oxford University Press, Oxford.

Compaine, B.M., 2001. Information gaps. Myth or reality?. In: Compaine B. (Ed.), The Digital Divide. Facing A Crisis or Creating a Myth? MIT Press, Cambridge, MA, pp. 105–117.

Davison, R. et al., 2000. Technology leapfrogging in developing countries – an inevitable luxury? Electronic Journal of Information Systems in Developing Countries 1 (5), 1–10.

Dutta, S. et al., 2006. The Global Information Technology Report 2005–2006. Macmillan, Basingstoke.

Falch, M., 2004. Tele-centres in Ghana. Telematics and Informatics 21 (1), 103–114.

Free Software Foundation, 1996. The Free Software Definition. Available from: <http://www.gnu.org/philosophy/free-sw.html>.

Fuchs, C., 2002. Krise und Kritik in der Informationsgesellschaft. Libri BOD, Wien/Norderstedt.

Fuchs, C., 2003a. Globalization and self-organization in the knowledge-based society. tripleC – Open Access Online Journal for the Foundations of Information Science 1 (2), 105–169.

Fuchs, C., 2003b. Some implications of Pierre Bourdieu's works for a theory of social self-organization. European Journal of Social Theory 6 (4), 387–408.

Fuchs, C., 2003c. Structuration theory and self-organization. Systemic Practice and Action Research 16 (4), 133–167.

Fuchs, C., 2005a. Knowledge and Society from the perspective of the unified theory of information (UTI) approach. In: Proceedings of FIS 2005: Third Conference on the Foundations of Information Science. Paris, July 4–7, 2005. Available from: <http://www.mdpi.org/fis2005/proceedings.html>.

Fuchs, C., 2005b. The Internet as a self-organizing socio-technological system. Cybernetics and Human Knowing 12 (3), 37–81.

Fuchs, C., 2006a. Towards a global sustainable information society (GSIS)? tripleC – Open Access Online Journal for the Foundations of Information Science 4 (1), 40–99 http://triplec.uti.at/files/tripleC4(1)_Fuchs2.pdf.

Fuchs, C., 2006b. Transnational space and the "Network Society". In: Contribution to the Conference "Internet Research 7.0: Internet Convergences", organized by the Association of Internet Researchers (AoIR), Brisbane, September 27–30, 2006.

Grassmuck, V., 2004. Freie Software. Zwischen Privat- und Gemeineigentum, Bundeszentrale für politische Bildung, Bonn.

Hardt, M., Negri, A., 2000. Empire. Harvard University Press, Cambridge, MA.

International Telecommunication Union, 2006. World Telecommunication/ICT Development Report, ITU, Geneva.
James, J., 2003. Bridging the Global Digital Divide. Edward Elgar, Cheltenham.
Lewis, C., 2005. Negotiating the Net: the Internet in South Africa (1990–2003). Information Technologies and International Development 2 (3), 1–28.
Mansell, R., Wehn, U. (Eds.), 1998. Knowledge Societies. Information Technology for Sustainable Development. Oxford University Press, Oxford.
Murelli, E., 2002. Breaking the Digital Divide. Implications for Developing Countries. Commonwealth Secretariat, London.
Norris, P., 2001. Digital Divide. Civic Engagement, Information Poverty, and the Internet Worldwide. Cambridge University Press, New York.
Oyelaran-Oyeyinka, B., Nyaki Adeya, C., 2004. Internet access in Africa: empirical evidence from Kenya and Nigeria. Telematics and Informatics 21 (1), 67–81.
Partnership on Measuring ICT for Development, 2005. Core ICT Indicators, UN-ESCWA, Beirut.
Sciadas, G. (Ed.), 2005. From the Digital Divide to Digital Opportunities. Measuring Infostates for Development. NRC Press, Montreal.
Stovring, J., 2004. 'The Washington Consensus' in relation to the telecommunication sector in African developing countries. Telematics and Informatics 21 (1), 11–24.
United Nations Educational, Scientific and Cultural Organization, 2003. Performance Indicators for ICT in Education. UNESCO, Bangkok.
United Nations Human Development Report (UNHDR), 1999. UNHDP 1999, United Nations Development Programme (UNDP), New York.
United Nations Human Development Report (UNHDR), 2005. UNHDP 2005, United Nations Development Programme (UNDP), New York.
United Nations, 2005. UN Global E-government Readiness Report, 2005. From E-government to E-inclusion, United Nations, New York.
Van Dijk, J., 2005. The Deepening Divide. Inequality in the Information Society. SAGE, London.
Van Dijk, J., 2006. The Network Society. Social Aspects of New Media, second ed. SAGE, London.
Van Dijk, J., Hacker, K., 2003. The digital divide as a complex, dynamic phenomenon. The Information Society 19 (4), 315–326.
Wilson, E.J., 2006. The Information Revolution and Developing Countries. MIT Press, Cambridge, MA.
World Bank, 1999. World Development Report 1998/99: Knowledge for Development. World Bank, Washington, DC.
World Summit on the Information Society (WSIS), 2003a. Declaration of principles. Building the Information Society: A Global Challenge in the New Millennium. Available from: <http://www.itu.int/wsis/docs/geneva/official/dop.html>.
World Summit on the Information Society (WSIS), 2003b. Plan of action. Available from: <http://www.itu.int/wsis/docs/geneva/official/poa.html>.
Zachary, P.G., 2002. Ghana's digital dilemma. Available from: <http://www.ghanaweb.com/GhanaHomePage/features/artikel.php?ID=25024>.