Helpdesk Research Report: New ICTs for Development
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Query: Please provide a comprehensive list of new information and communications technologies being used to enhance development outcomes in developing countries, a brief description of each and some key illustrative examples of each tool (where possible providing a brief description of the results achieved with numbers and how the tool works in practice).

Enquirer: Equity and Rights Team, DFID

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1. Overview

This short report provides a list of new information and communications technologies (ICTs) being used to enhance development outcomes. The use of ICTs among poor people is growing rapidly. In 2009, there were an estimated 2.2 billion mobile phones in the developing world and 305 million computers. In 1998, two of every 100 inhabitants in developing countries was a mobile phone subscriber - by 2008, that figure was 55 out of every 100 (Heeks 2010, 22). ICTs are being used to support development outcomes in five primary areas. First, they have helped to improve poor people's access to markets, financial services and employment. Second, they have helped to improve the provision of services to poor people by governments, the private sector and NGOs, and to make these services more responsive to the needs of poor communities. Third, they have supported improvements in accountability, transparency and participation, by allowing citizens to publicise their concerns and grievances, share ideas, present information and hold governments to account. Fourth, they have contributed to improvements in security and supported efforts to protect human rights. Fifth, ICTs have affected the operational approaches of donors and other development actors.

Many of the approaches and tools mentioned in this report are still relatively new, and have not been subjected to rigorous evaluation.[1] Very few ICT4D[2] activities have proved sustainable (Unwin 2009, 3). Recent research has stressed the need to shift from a technology-led approach, where the emphasis is on technical innovation towards an approach that emphasises innovative use of already established technology (mobiles, radio, television) (Heeks 2009, 5). The first section of this report assesses the various applications of ICTs for development, while the second section provides definitions of selected ICTs.

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[1] Recently there have been some attempts to review the evaluation literature - see Sey (2009) and Aker & Mbtini (2009).
[2] ICT4D is an abbreviation of 'ICT for Development'.

2. Applications of ICTs for development

2.1   <u>Economic development, financial services, and employment</u>

ICTs have been widely used to promote economic development - by generating new job opportunities, by improving market access and efficiency and by improving the access of poor people to financial services. These benefits have had the greatest impact in rural areas, where producers, job-seekers and traders typically face high barriers to job and commodity market participation. The rapid expansion of mobile phone networks across the developing world has driven many of these trends.

A. **Mobile banking (M-banking).** Mobile phones are being used to provide banking and financial services to poor people in rural areas, where it is difficult to access banks directly. Banks can confirm cash requests by users, who can then receive cash from a travelling agent or local shop. These services can also be used to transfer money, collect savings and receive remittances from overseas. In the **Philippines** there are currently 3.5 million users and in 2006, over $200 million was processed through these services. These services have also proven popular in **Kenya** where Safaricom's M-Pesa scheme had 8.6 million subscribers in November 2009 (25% of Kenya's population).[3] Users of this service can buy digital funds at an M-Pesa agent and transfer to other users in Kenya or pay bills, without having an official bank account.   M-banking services have also recently been launched in South and Central America, South Africa, the Middle East and South Asia.   These services may prove particularly useful in regions affected by natural disasters. The Bill Gates Foundation recently provided $10 million to jumpstart mobile financial service provision in **Haiti** to speed up the delivery of cash assistance to people affected by the earthquake.[4]

B. Microfinance institutions such as Grameen Bank have used mobile technology to improve **access to microcredit loans**. *Kiva.org* allows individuals to lend to an entrepreneur from a different part of the world. By November 2009, Kiva had facilitated over $100 million in loans.[5]

C. Similarly, mobile technology has been used to facilitate social protection activities such as providing **micro-insurance**. The *Kilimo Salama* scheme uses low-cost mobile phone payment and data systems to provide 'pay as you plant' insurance to thousands of Kenyan farmers. By providing a slightly higher price for agricultural inputs, farmers can receive a mobile insurance policy via their mobile phone. When the system's weather stations record a drought in a particular area, farmers receive a pay-out via the M-Pesa system.[6]

D. **Better access to market information:** The expansion of mobile phone networks has greatly reduced the cost of accessing market information, particularly for those living in rural areas. This reduces distribution margins and breaks the dominance of the buyer. Mobile phones are widely used by farmers and small business across the developing world. In **Mozambique**, female traders use mobile phones to request new stock, reducing travel costs considerably (Buskens & Webb 2009, 26). In **Uganda**, farmers use mobile phones to communicate with friends and colleagues in urban areas, who can relay price information.[7] In **Rwanda**, the government has supported a new scheme to facilitate the use of these techniques among illiterate farmers by providing 3,500 specially adapted mobile phones to co-operatives.[8] These techniques have been taken further using specialist software designed to work on ordinary mobile phones, which can provide more detailed market information. The DatAgro project, for example, provides information about supply prices, product prices, the weather,

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[3] http://www.telecomcircle.com/2010/01/m-pesa/
[4] http://tiny.cc/edub3
[5] http://www.kiva.org/about
[6] http://www.sciencedaily.com/releases/2010/03/100304202242.htm
[7] http://www.guardian.co.uk/katine/2009/jan/04/katine-uganda-africa-mobile-phones
[8] http://allafrica.com/stories/201002040063.html

and international markets to farmers' co-operatives in **Chile**.[9] Research has demonstrated that the use of mobile phones is more associated with improved outcomes for farmers in perishable crops (e.g. for bananas, but not maize) (Aker & Mbiti 2010, 13).

E. **Agricultural improvement:** Mobile technology has also been used to provide more general advice to farmers. Kencall is a farmer's helpline established in **Kenya**, which provides cheap advice to farmers about farming and livestock strategies. 43% of Kencall's users have no other means of accessing expert advice. Practical Action used Participatory Video (see full definition in section 3) in **Peru** as part of a farmers' livelihoods project as a means of improving coordination, dialogue and collaboration between farmers and as a way of sharing techniques and lessons with other farmers.[10] Practical Action has also used tele-centres in **Peru** to provide podcasts by experts on locally-specific themes such as grape cultivation or raising cattle. Audio files were then recorded onto CD or cassette tapes to be used by local people.[11]

F. **Job creation in servicing mobile phones:** The spread of mobile technology provides an array of ad-hoc profit-making opportunities for men and women, who can sell airtime cards on the street, gain income from providing phone battery charging services and renting mobile phones.

G. Mobile phones can provide people reliant upon casual labour (such as drivers) with an easy way of **finding short-term job opportunities**, reducing wasted job-seeking trips to urban areas. Babajob is a website that allows potential employers in **India** to contact people looking for low-skilled jobs. It has an SMS job alert system that allows people without access to the internet. More than one million alerts are sent out every month.[12] Recent research in **South Africa** has demonstrated that mobile phone coverage is associated with a 15 percent increase in employment, with most of the effect due to increased employment by women. The research finds that mobile phone coverage tends to promote greater employment for poor people outside of agriculture (Aker & Mbiti 2010, 14).

H. ICTs can also **create opportunities for new kinds of work** through crowd-sourcing (see full explanation in section 3). **Txteagle** is an initiative from **Kenya**, which takes simple tasks suitable for voice and SMS phones and outsources them to people with a mobile phone and time available. Activities include translating text into local languages and transcribing audio clips. Recipients can be paid using the M-Pesa system (Heeks 2010, 23).

I. **'Social outsourcing'** refers to the contracting out of goods or services to social enterprises. This has the potential both to cut costs of the government or business organisation that is outsourcing and to increase incomes of the poor or socially excluded. In the case of governments there is a 'triple win', since social outsourcing may accrue political benefits (Heeks and Arun 2010).   Social outsourcing can be used in relation to a range of services, but there are particular opportunities in the area of ICTs. Data Digital Divide, a social enterprise based in Cambodia, delivers IT services such as data entry and digital publication to international customers while providing job opportunities for poor youth in **Cambodia** and **Laos**. In eight years, they have provided training to 1,500 people.[13]

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[9] http://www.datadyne.org/programs/mip/datagro
[10] http://practicalaction.org/markets-and-livelihoods/participatory_video
[11] http://www.scidev.net/en/new-technologies/features/pod-ready-podcasting-for-the-developing-world.html
[12] http://www.babajob.com/
[13] http://www.digitaldividedata.org/about/

2.2   **Service Delivery**

A. **E-government** refers to the 'use of new information and communication technologies (ICTs) by governments as applied to the full range of government functions' (OECD 2002). Electronic services can improve access to information and services and the efficiency of delivering them. One of the most famous examples is the *e-seva* project in Andhra Pradesh, **India**. The scheme provides more than one hundred services, ranging from the payment of utility bills to the registration of motor vehicles. E-Seva was launched with 43 service centres in the city of Hyderbad then expanded to 213 towns and later rural areas. As a measure of success, e-Seva completes over 1.6 million transactions per month in the city of Hyderbad alone.[14] ICTs can also make it easier to gather and present data about expenditure. Better information changes power relationships and helps citizens exercise their rights. It also helps to fight corruption. When the government of Uganda started to publish information about school funding, the amount of funding actually reaching each school went from an average of 13 percent in 1991-95 to about 80 to 90 percent in 1999 and 2000.[15]

B. **Targeting programmes:** Governments have used geographical information systems (GIS) (see full explanation in section 3) to map poverty and to improve the targeting of poverty reduction interventions and investments. In the Maradi region of **Niger**, GIS software has been used to assist the government in planning poverty reduction programmes.[16] These systems have been used to update established **participatory mapping techniques** such as participatory rural appraisal. This process is useful not only because it provides a community-driven perspective, but also because the process of participatory mapping itself can encourage community members to take a more prominent role in decision-making. These techniques have had a range of uses in planning development intervention – in water and sanitation, mapping mobility, agriculture and education. In **Malawi**, participatory mapping was used to correct a census, highlighting a major underestimate in the official data's estimate for rural population of approximately 35%.[17]

C. **Land Registration:** Many people in the developing world find it difficult to access services because they do not have an address. The absence of a functioning land registration system can act as a significant barrier to economic development. In **Ghana**, International Land Systems (ILS) – a private company - designed a GIS-based property survey to provide citizens with cheap land titles (known as paralegal titles), which can be processed relatively quickly. These enabled citizens to receive bank loans and improve access to government services.[18] A similar scheme - the *Bhoomi* project - has been supported by the National Informatics Centre of **India**, computerising 20 million records of land ownership of 6.7 million farmers in the state of Karnataka.[19] The Bhoomi system was much more accurate than the existing system and users found it easier to use. Under the old system officials asked for bribes in approximately half of all cases– under the new system only 1% report having to pay bribes (Heeks 2010, 23).

D. Crowd-sourcing techniques have been used to enhance the provision of **humanitarian aid**. *Ushahidi* (meaning 'testimony' in Swahili) is a Kenyan website that provides a platform that allows any person or organization 'to set up their own way to collect and visualize information'.[20] This platform has been used to facilitate a number of initiatives including

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[14] http://tiny.cc/mdh7r
[15] http://opendev.ning.com/forum/topics/my-opening-remarks#opendevcamp
[16] http://proceedings.esri.com/library/userconf/proc04/docs/pap1985.pdf
[17] http://www.iapad.org/publications/ppgis/robert.chambers_participatory_mapping_en.pdf
[18] http://tiny.cc/fb8t3
[19] http://bhoomi.karnataka.gov.in/
[20] http://www.ushahidi.com/about

election monitoring and conflict prevention activities.[21] One of the most potentially significant applications of this technique has been in the humanitarian field. In **Haiti**, Ushahidi has been used to develop a 'crisis map of Haiti', where information is mapped in near real time from reports coming from inside Haiti from a number of sources (including SMS, email, phone, twitter). These reports are then mapped by volunteers based in the US, who identify GPS coordinates for the reports and 'geo-tag' them on the Ushahidi map.[22] This kind of initiative is potentially very significant in overcoming the challenge of coordination in humanitarian crises, and enhancing the work of agencies such as UNOCHA.

E. **E-learning** refers to electronic supported learning and teaching. Since the 1990s, e-learning has combined computer-based and web-based learning applications, providing facilities for interaction between the teacher and the student and between students themselves. ICTs can improve education services in a number of ways: by improving teacher training, by increasing the employability of students, by improving access to educational services, and by promoting distance learning programmes. One successful example of e-learning, is the African Virtual University (AVU), which has established more than 30 learning centres through its partnerships with higher education institutions in 19 countries, offering a variety of courses with a primary emphasis on teacher training and upgrading.[23]

F. **Open Educational Resources** are teaching, learning and research resources that reside in the public domain or have been released to allow their free use or re-purposing by others. These resources can significantly cut the cost of education, and encourage more collaborative approaches to learning and teaching. The Teacher Education in Sub-Saharan Africa (TESSA) project is a research and development initiative that creates open educational resources for teachers working in the region. It links 13 institutions in the regions and 5 international centres.[24]

G. Research has demonstrated that the increasing use of mobile phones has helped to promote **adult literacy** in Africa. In **Niger** – a country with no local language newspapers or village libraries – the use of text messaging on mobile phones has made literacy functional, and provided an incentive for illiterate adults to learn to read (Aker and Mbiti 2009, 23). In a similar scheme, UNESCO partnered with a **Pakistani** company, Mobilink, to use mobile phones to boost literacy among young women. The project demonstrated how mobile phones can be used to increase the reach and effectiveness of basic education programmes (GSMA 2010, 19).

H. **E-health** refers to healthcare practices that are supported by electronic information or communication technologies. These have a range of applications including the use of **tele-clinics**, where clinics in remote areas provide video or telephone consultations with experts based in capital cities or overseas.[25] Mobile phones have also been used to monitor the outbreak and spread of diseases such as measles, to map water quality[26], and to send health education messages in many African countries. In **South Africa**, mobile phones have been used to send reminders to HIV-positive patients about their anti-retroviral therapy schedule. Project Masiluleke broadcasts health messages every month to mobile phones users across South Africa – to encourage people to seek testing and treatment for HIV/AIDS. Calls to use National Aids helpline rose from 1,000 to 4,000 when the pilot system was used. **Low cost**

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[21] A range of examples can be found at these sites - http://www.ushahidi.com/platform, http://mobileactive.org/texting-it-in.

[22] http://haiti.ushahidi.com/page/index/1. CrisisCommons have a similar initiative - http://crisiscommons.org/gps/.

[23] See http://www.infodev.org/en/Publication.353.html (many more examples of e-learning initiatives in Africa are available here).

[24] http://www.tessafrica.net/index.php?option=com_content&view=article&id=2&Itemid=353

[25] See, for example, http://www.keneya.net/site/

[26] http://mobileactive.org/testing-waters-water-quality-reporter

medical imaging systems have used mobile technology to transmit data and images from the field to be processed at a central site.[27] A 'plug and play' microscope has recently been developed, which can connect to ordinary mobile phones and be used by healthcare workers to provide basic medical diagnostics. Web 2.0 applications such as *Episurveyor* allow governments or NGOs anywhere in the world to establish mobile-phone based data collection systems for public health.[28] Mobile phones have been used to create **virtual support communities**, for people living with HIV/AIDS, who are often socially isolated. One three-month pilot scheme in Mexico was very successful, with group members sending an average of 80,000 text messages per month to each other (GSMA 2010, 24). In the Congo, *AIDS Rights Congo* uses social media such as videos and blogs[29] to document the stories of people affected by AIDS in **Congo**, and then employs these materials as part of an effort to educate others about the disease and advocate for their rights.

2.3   **Accountability, transparency and participation**

A. **E-Governance** is government use of information and communication technologies (ICTs) with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective (UNESCO, 2010). Recent research has shown that whilst ICTs are capable of reinforcing participation and democracy at the local level, they can under some circumstances be controlled by, and enhance the power of, local elites. Web-based social media (see section 3 for full definition) have encouraged more interaction and collaboration and have a range of potential functions in governance processes.[30]

B. ICTs can be used to empower local citizens, by providing a channel to **voice grievances to government.** Lokvani is a public-private partnership which targets 3.6 million citizens in Sitapur, **India**, where 88% of the population live in rural areas, and there is a 38% literacy rate. Local people can submit grievances and petitions online or by mobile phone, and these petitions can then be tracked online. These can then be forwarded to the relevant local government officer. They can then track the status of their petition. The programme gives citizens the opportunity to interact with the government without physically travelling to a government office (UNDP 2007). FixOurCity allows citizens of Chennai, **India**, to report local problems, share ideas and best practices and collaborate to address civic issues.[31]

C. **Open government** 'consists of a range of activities including information provision to various forms of participation, interaction and collaboration' (Smith et al 2008, 21). One of the most potentially significant contributions of this approach for developing countries is through e-procurement systems, which have been used in **Chile**, **Brazil** and **Indonesia** and which publish public sector purchasing information online, and require online and open bidding. The system provides a check against corrupt purchasing practices (Smith et al 2008, 22).

D. An **Open society** is one 'where the scope of information sharing and communication creates the opportunity for greater political freedoms and a more inclusive society' (Smith et al 2008, 24). Mzalendo is a project that aims to 'keep an eye on the Kenyan Parliament'. It was founded to deal with the fact that it was difficult for citizens to hold MPs in **Kenya** to account. The site provides up-to-date information about the Parliament, bills and questions and invites discussion from its users.[32] The Norman Green project in **Mongolia** uses **social media** to report on various environmental issues using blogs, mapping, videos and podcasts. The

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[27] http://www.plosone.org/article/info:doi/10.1371/journal.pone.0002075
[28] http://datadyne.org/episurveyor/faq
[29] A blog is a 'shared online journal where people can post diary entries about their personal experiences and hobbies' (http://wordnetweb.princeton.edu/perl/webwn?s=blog).
[30] For a full overview of e-governance, including a large number of case studies see Misuraca (2007)
[31] http://www.fixourcity.org/
[32] http://www.mzalendo.com/about/

project raises these issues, provides maps where citizens can report environmental problems and translates accounts into English and Chinese to raise awareness.[33] ICTs have transformed **community radio**. Through SMS, phone calls, mobile phone clip recordings, and PC-based audio, community members can contribute content and have their voice heard on such radio stations (Heeks 2010, 23).

E. **Use of mobile technology in elections:** Mobile phones have been used to overcome logistical challenges of organizing election volunteers, verifying results, and monitoring electoral fraud and violence. During elections in **Ghana**, 1,000 locally-trained observers were able to transmit voting results via SMS messages, resulting in instant independent verification of the election (Aker & Mbiti 2009). In **Nigeria**, a network of local election monitors used SMS messaging to communicate local examples of fraud to the authorities and international election monitoring agencies.[34] New mobile phone applications have been used to encourage the public to report and comment on events such as recent elections in Mozambique. **Front-line SMS** is a software package that allows organisations to use a computer to send SMS messages to a large number of people, without an internet connection (using a mobile phone signal).[35]

F. ICTs have a number of applications in the fields of **conflict prevention and crisis management.** FAST, a GIS system developed by Swisspeace, has been used by a number of UN agencies and NGOs to support early warning and conflict prevention initiatives. In Sri Lanka, the Foundation for Co-Existence used the FAST system to support its conflict prevention work in the East of the country. Incidents of local violence from field officers with mobile phones were collated into a central database, where they were tagged and used to produce detailed reports of violence levels. This information was used in back-channel mediation and advocacy work.[36] Participatory video techniques have been used extensively in peacebuilding work. Eyewitness Media have worked with local communities in the **Caucasus**, to create films that document real-life stories that address issues of human rights and conflict transformation.[37]

1.4 **Human rights and security**

A. Social media have been widely used in to **support human rights campaigns** across the developing world, and have presented important opportunities for activists in countries with repressive regimes. These include the use of Twitter in Iran, where opposition supporters used the micro-blogging site to highlight violence and abuse in the wake of the 2009 elections.[38] Social media have played a central role in organising global protests against repression. The Burma Global Action Network, for example, helped to co-ordinate rallies and advocacy campaigns in a number of different countries using sites such as Facebook.[39] *Kubatana.net*, a site designed to improve the accessibility of human rights and civic information in Zimbabwe has collated 16,000 documents, reports and articles.[40]

B. ICTs have played an important, though perhaps less tangible role in **strengthening social networks and boosting security,** particularly of women. According to a recent report, nine out of ten women felt safer for having a mobile phone (GSMA 2010). Women traders in Mozambique argued that having a mobile phone makes it easier to contact friends and relatives, and to draw on a wider range of people for support and advice (Buskens & Webb

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[33] http://www.globalcitizencorps.org/blog/2010/05/role-citizen-media-development-work
[34] http://news.bbc.co.uk/1/hi/technology/6570919.stm
[35] http://www.frontlinesms.com/
[36] http://www.itcm.org/pdf/peaceIT_1.pdf
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[39] http://en.wikipedia.org/wiki/Burma_Global_Action_Network
[40] http://www.kubatana.net/

2009, 26). There is also some evidence that owning a mobile phone contributes to a sense of empowerment for women. 85% of women surveyed by GSMA felt more independent as a result of owning a mobile phone (GSMA 2010, 21).

1.5   **ICT and donor strategies**

A.   ICTs have impacted on donors and other development actors' work in a number of ways. By **improving access to information** about donor expenditure, ICTs can improve both co-ordination and accountability to taxpayers, as well as providing more effective monitoring and evaluation tools. Two major initiatives (aidinfo and aidData) have attempted to gather and present current aid information and to change the kind of information that is collected. These initiatives aim to boost aid transparency, make aid information more freely available and to improve the evaluation of aid projects.[41] Aidinfo has estimated that developing a more comprehensive global system of aid data will save donors an average of $7 million per year, by reducing the costs of manually reporting aid information.[42]

B.   At the project level, ICTs can **improve the accountability of development projects** by providing mechanisms with which beneficiaries can communicate directly with funders and voice grievances. ALINe works with development organisations to develop systems for managing farmer voice. ALINe develops 'quantified, real-time summaries of farmer satisfaction based on aspects that are most important to them'. ALINe's partners have included cocoa growers in Philippines, smallholder farmers in Malawi and land-rights campaigners in Nepal.[43]

3. Definitions of selected ICTs

3.1   **Citizen media** refers to forms of content produced by people who are not professional journalists. This content can be shared in a number of ways including blogs, podcasts and participatory video. Citizen media techniques can be used to highlight government oppression or for advocacy purposes.

3.2   **Crowd-sourcing** refers to the practice of out-sourcing a task to a large group of people, who do not receive any payment for their input. It provides a way for government, companies and civil society organisations to get rapid feedback from a number of individuals.

3.3   A **Geographic information system (GIS)** is any system that captures, stores, analyzes, manages, and presents data that are linked to location. As mentioned in section 2.2, these systems have proven particularly useful in improving the targeting of development programmes.

3.4   **Open source software** is software whose code is publicly available. It has allowed greater opportunities for poor people to access and develop software. This not only allows more poor people to use computers, but also provide opportunities for people living in developing countries to develop their own software solutions. One example of this use of open source software is the Ubuntu operating system, founded by the South African entrepreneur Mark Shuttleworth. Ubuntu software is particularly suited to computer users in the developing world – it is free and both easy both to run and to use.

3.5   **Participatory video (PV)** refers to group or community film-making. The approach allows communities to present issues they feel are important, whist bringing community members

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[41] http://www.aidinfo.org/, http://www.aiddata.org/home/index
[42] http://www.aidinfo.org/content/costs-and-benefits-aid-transparency
[43] http://www.aline.org.uk/

together to discuss and explore these issues. It is an effective way of engaging and mobilising marginalised groups and has been used both as a way of improving participation in development projects and for advocacy purposes.

3.6   **Podcasting** refers to sharing digital audio files via the internet. As internet access in the developing world grows, the potential for podcasting to disseminate information has been widely highlighted. Unlike traditional methods of relaying information such as radio, podcasting does not require a license, it is very low cost, and is not restricted by broadcasting limitations. Podcasts are often used to distribute content, which can be broadcast on community radio stations.

3.7   **Social media** are 'works of user-created video, audio, text or multimedia that are published and shared in a social environment, such as a blog, wiki or video hosting site'.[44] They can be used by civil society organisations for advocacy purposes, to promote public debate and to maintain networks (especially trans-national networks).

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[44] http://www.capilanou.ca/help/login-page/active-cms/glossary.html

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5. Additional information

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