A Mobile Voice: The Use of Mobile Phones in Citizen Media

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An Exploration of
Mobile Citizen
Media Tools and
Projects

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All links inserted in this publication are correct as of November 8, 2008.

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Mobile phones and related software applications are new tools in the global effort to improve communication and to capture, access, and share information. They are also often the only technology to which people in low- and middle-income countries have access.

Introduction

With mobile phone subscriptions in the world nearing an estimated four billion at the end of 2008, there is an explosion of activity related to the use of mobile phones to access information, express opinions, and for producing and consuming media. There are many individual innovations and creative uses of existing mobile platforms. We are also seeing new applications that facilitate the generation and broadcasting of mobile content.

Concurrently, mainstream media and broadcasting outlets are grappling with how the Internet and mobile technology impact media consumption and production. Traditional media organizations are starting to engage viewers, listeners, and readers who can contribute content through mobile and web-based platforms. Media organizations are also increasingly making content available for mobile devices. Additionally, mobile phones with more sophisticated and varied functionality and Internet access provide new interactive channels for a better informed and more active global society.

In this report we explore the dynamics of the role of mobile phones in enhancing access to and creating information and citizen-produced media. We explore trends in the use of mobile telephony with a focus on software and platforms that make content creation and broadcasting easier. We also present an inventory of current and potential uses of mobile phones to promote citizen media and freedom of information, and present short case studies of examples. We further discuss security considerations that might impact citizen media and freedom of information. Finally, we describe some direction for medium-term media assistance and investments.

We conducted the following research activities:

- A survey and analysis of available and soon-to-be-available mobile software applications that can be used to produce or consume media, including software and mobile-based web applications facilitating journalistic activity, communication between mobile phones, secure communications, and audio/video platforms.
- In-depth interviews with stakeholders in the news and mobile media fields.
- Discussion and review related to current and potential security issues for citizens and journalists using mobile technology.
- An inventory of who is using mobile phones for citizen media and how, including an exploration of projects and areas of activity.
- Ideas and recommendations for strategies supporting the use of mobile telephony to promote freedom of information and engage in citizen media activities.

Like other information and communication technologies, mobile phones and related software applications are new tools in the global effort to improve communication and to capture, access, and share information. They are also often the only technology to which people in low- and middle-income countries have access.

While this review is overall optimistic about the continued paradigm shift and the opportunities that mobile phones create for producing citizen media and access to information, we note there have been instances in which mobile technology in particular has been used to divide people, incite violence, and promote repression.

This is not a complete inventory of tools and projects. It is, by definition, episodic and not meant to be comprehensive--a close to impossible task in this fluid field. We encourage submission of other tools and projects to make this document more complete, and to this end, have added a wiki on MobileActive.org that will collect additional applications and use cases. We encourage correction and additions to make tis as much of a living document as possible. We have also added web links in this document that provide additional information or the source for an assertion. These links (underlined) were checked and accurate as of November 8, 2008.

Key Observations

We note a number of key points that emerged from our exploration of this field. Several of these observations are consistent with the state of

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mobile technology in other areas of practice which we note where appropriate.

Mobile is the 7th Mass Media

Toni Ahonen, a commentator and author on new and social media, has called the mobile phone the "7th Mass Media." He notes,

> "Differing from the internet, mobile as the 7th mass media channel is similar to the five legacy mass media, economically viable with a stable business model from day one. Yet, differing from the legacy mass media, all of which are witnessing a decline in their audiences and revenues, mobile like the internet, is an interactive media enabling it to fully capitalize on social networking and digital communities.

He points out that the convergence of mobiles combining voice, text, video, audio, geo-location, and a host of applications, pose

> "similar to the introduction of the Internet before it, an "inherent threat" mass media channel. Today the mobile phone can replicate everything that all previous six mass media can do. So from an abilities point-of-view, cellphones can be at least as disruptive as the Internet has been so far."

This is good news for participatory media, and bad news for mainstream media companies. There are limitations of mobiles as a fragmented and still relatively closed medium--the hype notwithstanding, but the short of it is, mobile media--produced and consumed--is here to stay: diverse, pluralistic, innovative, and definitely disruptive.

Fragmentation of the Mobile Market

Mobile technology is an extremely fragmented field. This makes mobile application development and deployment difficult and expensive for media development organizations and NGOs which, unlike commercial companies, lack capitalization and business models.

Fragmentation is the inability to "write once and run anywhere." In other words, it is currently almost impossible to write a single version of a mobile application that can run on every (or at least a majority of) mobile device available.

This fragmentation is due to a number of factors: Hardware diversity; the presence of additional hardware (camera, voice recorder); connectivity options (bluetooth, IR, GPRS); platform diversity (Symbian, Nokia OS, RIM OS, Apple OS X, PalmOS, Mobile Linux, Android); API standards; differences in multimedia support; user-preference diversity (language, accessibility requirement); and environmental diversity in the deployment infrastructure (e.g., branding by carriers, compatibility requirements of the carrier back-end APIs, gateway characteristics, restrictions on access to outside the network etc.).

As this short list shows, fragmentation in this market is a serious problem that has hindered development of useful social purpose applications. This characteristics of the market is likely going to continue for some time. Growing numbers of new device models will mean that more operating platforms need to be supported. Economics play a role in this as well with carriers exacerbating fragmentation by imposing various restrictions to gain economic advantages. It has been noted elsewhere that mobile developers need access to relevant information (e.g., how many phones support a given feature?) and much better tool support to access such information. However, even better information is not going to make the problem any less severe for civil society or media development organizations aiming to develop mobile applications.

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The Shift in the Landscape

In a recent BBC World Service Trust report on *The Unmet Need of Information in Humanitarian Response* an interesting point was made that is applicable to the fields of citizen media and media development as well. The report notes:

> "One of the most profound shifts in this sector is coming not from aid agencies or the development world [or media development organizations, for that matter] but from the rapid commercial development of communications on a global level. The speed with which populations in the developing world are adopting mobile phone and internet technology and finding innovative uses for new communications is far outstripping the levels of understanding of these new trends in the aid world--and the sector is still growing fast. The ability of local populations to source, share, and transmit information is being completely transformed."

This shift and transformation profoundly affects donors and media development organizations as well as citizen media organizations. First, it puts into focus what the appropriate role for donors and media organizations should be in regard to mobile applications and deployment for the purposes of citizen media, given that this market is developing just fine all on its own.

As we note, there is a plethora of applications that exist solely in the commercial space that have reached global critical mass and that have played a role in the rise of citizen media--including media generated by mobile. YouTube, Blogger, and Facebook come to mind as the most prominent. But there are many more that we describe.

At the same time, there are very few scaleable citizen media efforts involving mobiles that are produced by NGOs or media organizations to date and, with some exceptions, there has been very little donor involvement in the development of mobile applications. And yet, this is the area--mobile application development--where donors seem to be most interested. We reason in our recommendations that donors may want to focus on other areas of media that take into consideration both the fragmentation and the commercial nature of the mobile space.

Secondly, there is a another trend, noted recently by Shanti Kalathil in a report to the Center for International Media Assistance. She writes,

> "...the field of media development is rapidly converging with the "ICT for development" field, which unlike media development situates itself more in the traditional poverty-reduction realm of development, as opposed to democracy and governance. This poses some interesting questions....In essence this is what convergence of these fields is pushing toward: an enabling environment that encompasses telecommunication reforms..."

Kalathil raises a very valid point that requires the fields of media development to rethink some of its approaches and alliances. We have some thoughts on where donors and media organizations should focus in the last section of this report that describes some recommendations and future directions.

Definitions

To better understand the role of mobile phones for professional journalists and everyday citizen reporters, we need to define what we mean by "freedom of information" and "citizen media" for the purposes of this review. Within each area, mobile phones are being leveraged to varying degrees of formality and levels of engagement to both produce content and improve access to information.

Freedom of Information

Freedom of information refers to the freedom to produce, access, and consume information as part of a well-informed and active public sphere. It is characterized by such qualities as transparency, inclusion, equality, and rational public exchanges about the society in which one lives. In repressive regimes, freedom of information is hampered and media production and consumption may be subject to government

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censorship, self-censorship, or filtering systems that impede full access to information.

More recently, countries known for censorship, such as China and Iran, are struggling with increased access to and use of the Internet and mobile phones by its populations. People can read about themselves in foreign uncensored media, and journalists can access and broadcast information instantaneously with new media tools. Increased access to the Internet and mobile web fosters explosive growth activities such as blogging as an interactive form of expression that is engaging people in dialogue and action that is becoming increasingly difficult for governments to control.

Citizen Media

The term 'citizen media' refers to forms of content produced by private citizens who are otherwise not professional journalists. Citizen media is characterized by everyday citizens producing, collecting, and sharing information. Examples of citizen media delivered via the Internet include blogs, podcasts, collaborative wikis, and videos. There are millions of blogs, photos, and videos worldwide created every day as a form of personal expression and commentary. Postings can be organized, synthesized, and broadcast as well as subscribed to. RSS feeds and Google alerts, tagging, and searching make content globally accessible.

Organizations like Global Voices aggregate and translate citizen blog media from around the world. On the Argentinian site Gooh, citizens share stories that do not normally get told by the conventional media. The much-cited South Korean site Ohmynews is a full-fledged participatory news site where citizens post all articles that are then edited and published.

While the web has flourished as a channel for citizen media for some time, media produced and delivered through mobile

Mobile Web: Limited But Getting Better

by Brough Turner, Chief Technology Officer NMS Technology

Mobile phone networks provide the best telephony coverage in the world and, for more than a decade, mobile operators have had a "data" story. Unfortunately, the data side of mobile telephony has been slow, expensive and limited in what it can access.

The first widely available mobile data service, called GPRS, was launched in 2000-2001. Typically, GPRS provides 30-40 Kbps data rates with fairly long delays (600ms to 1 second, round trip). In principal, it can deliver speeds over 100 Kbps but in practice voice service takes priority so usable data rates can drop to zero during periods of peak voice calling.

But the biggest problem with mobile data service is limited access to the Internet. Today, virtually all GSM networks have GPRS capability but many service providers operate "walled gardens." This means they allow access to their own web pages and those of partners. Access to the public Internet is either not available or available only at a significant extra cost.

Luckily, this situation is improving and there's good reason to believe we will see affordable open access to the mobile web, i.e. the real Internet, in coming years. Two things are driving this change -- technology and competition.

Just like computers, the performance of wireless technology regularly doubles, at less-than-two-year intervals. This means speeds go up and costs come down. Today, 3rd generation (3G) technology is being widely deployed in developed markets and on the verge of sweeping all markets. At some point it becomes cheaper to deploy 3G than 2G, so everyone gets the 3G technology.

Even more important, most countries have real mobile competition. Fixed line services are limited by monopoly or duopoly ownership of the physical cables. In countries with four or more viable mobile operators, rampant competition rapidly drives prices down and mobile subscriber adoption up. We are beginning to see similar effects on data plans where 3G data services have become available.

Globally more than 80% of all mobile phones are 2G or 2.5G GSM phones but that will change. While it will be still a few years before 3G technology costs less than 2G, it is certain that within the next decade, virtually all the 2G phones will be retired. Everyone in every mobile market will be using 3G technology and, in any remotely competitive mobile market, affordable mobile web access will be available.

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phones has emerged as a powerful form of citizen journalism only in the last few years. While there are many titles for this new form of journalism, such as mobile citizen media, mobile citizen journalism, and mobile reporting, the basic concept is the same: citizens posting media directly from a mobile phone to the Internet or other mobile phones, and an online public. The media published may include groundbreaking news, or stories, pictures, and information that is neglected by mainstream media organizations. Individuals with mobile phones and other media tools are able to capture 'news' in real or close-to-real time -- much more immediately and rapidly than professional journalists. For example, the use of camera and video phones by passengers provided the only photos of the London Underground bombing in 2005. In 2007, the citizen protests in Burma were largely reported to the world through photos and video captured on mobile phones.

Cameras are built into hundreds of millions of camera phones and are demonstrating extraordinary power to expose, for example, human rights abuses. Twenty years ago very few images reached the world of the widespread protests in Burma. Five years ago it took several weeks for footage of state violence from Burma to reach the media. Last year, through pictures and video taken with camera phones, monks marching in Burma reached a global online public in a matter of hours, moving the world.

Citizen reporters need to be in the location where events are taking place. In rural or poor communities this means that local citizens need tools that allow them to collect and share information when there is limited access to traditional communication tools such as computers, the Internet, or landline telephones. In order to report breaking stories, citizens need a device that allows them to instantly publish information to the world. This tool is the mobile phone.

And of course, not only are mobile phones useful for recording and sharing events and newsworthy information--producing media--they are also essential for accessing information and consuming media. Finally, mobile phones are also used as tools to engage, organize, mobilize, and inform people by citizen groups and activists around the world in advocacy and social action campaigns.

Trends in News Production and Consumption

Mobile technology creates new pathways for content generation and broadcasting. We describe here trends in news production and consumption, and outline how mobile technology--as an extension of other technologies and on its own--is being used.

Media Focus on Africa

In the most recent Kenyan election in 2007, mainstream media focused mostly on the perspectives of people in cities or urban areas, neglecting rural communities. A collaboration between Media Focus on Africa and the Arid Lands Information Network (ALIN) gave mobile phones to "Community Information Volunteers" to use as a reporting tool. Linda de Kooning, a media consultant at Media Focus on Africa, said that the program was conceived as a way to give a voice to rural communities in Kenya and promote electoral participation. People in these communities were recorded with short video interviews, all of which were filmed on Nokia N73 mobile phones. The "Community Information Volunteers," or CIVs were the reporters for the program.

The CIVs who have degrees in communications or journalism, attended a workshop to learn about how to use the phones, interview techniques, and background on the issues that they would be focusing on in their reporting. Issues included poverty, political accountability, youth leadership, and electoral participation. The videos, posted to Media Focus on Africa, focus on a variety of issues and produced in a combination of English, Swahili, and other local languages. In one video from the Laikipada District, Susan Kuria asks questions about women's participation in the political process. "I don't know why women have not been vying for political positions and I want to find out for my own person whether Kenyans are ready to vote for women leaders in the coming general elections," she says in the video.

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Mobile phones are changing the way people consume and produce media throughout the world. They have become the most widely used form of information communication technology in human history. Individuals prioritize them in an effort to maintain contact with family and friends, and to enhance business opportunities--sometimes even at the expense of food and medicine.

Mobile phones also facilitate professional journalism and allow everyday citizens to participate in reporting. Since many web-based services couple with mobile phones for immediate posting of media, local citizens who have mobile phone access can become citizen journalists without a computer or access to an Internet connection. For example, citizens can send videos from a phone directly to a designated YouTube account by using a mobile email address or by logging into the mobile YouTube site.

During the SARS epidemic in China, the Internet and mobile phones increased transparency of government in a country that traditionally would not allow information about disease outbreaks to be broadcast publicly and without control. Similarly, the use of photos and video to document news by citizens in countries like Afghanistan and Pakistan is helping to illustrate what is happening through the eyes of people on the ground.

How do these trends in mobile use that we are describing in this review fit into the larger context of media consumption and production? What are the changes that we are seeing worldwide in the media landscape? According to _The Future of Media Report,_ an analysis by Ross Dawson, major forces are shaping new media production and consumption.

- Overall media consumption is increasing globally. At the same time, as there are more and more traditional and new media channels available to people around the world, the media landscape is becoming more and more fragmented.

- Participation is increasing as well. Already, a large proportion of content online is user-generated and people's media activities are increasingly focused on participatory channels such as social networks. These trends are visible particularly among certain demographics with a higher percentage of younger people producing media--indicating that a profound generational shift is underway that will affect the media landscape for a long time to come.

- Personalization is soaring with every user able to control how to receive, filter, and view their preferred choice of media content whenever and wherever. For example, individuals are now able to customize news feeds based on their interests through subscription-based services that also help suggest additional news items based on choice patterns. This sort of service that has been available on the Internet and through e-mail for many years, is now being shifted to a mobile platform that includes text, audio, and video content.

- Lastly, Internet and mobile bandwidth are soaring, with a variety of technologies contributing to pervasive high-speed access to content in both developed countries and increasingly developing countries as well.

This is creating an enabling environment for global awareness without borders in which citizens are becoming more demanding of their governments with exposure to other ways of living. The role of reporters and journalists to abstract information from key events and present the news is changing radically as a result.

In an insightful essay for Vodafone's _Receiver_ newsletter, Kazys Varnelis, the director of the Network Architecture Lab at Columbia University, recently noted the impact of this fragmented and highly personalized media sphere,

> "Mass media" has changed as well. Ours is a world of networked publics, in which consumers comment on and remix what they consume. Composed entirely of clips uploaded by individuals, YouTube threatens television networks. Snarky commentary on media is now the norm, much to the broadcasters' chagrin. Individuals often create their own media – posting on blogs and on-line venues set up to display their creations, such as photo-sharing sites.

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The world of micro-publics can also threaten place as well. With access to more information than ever, we can find a community perfectly tailored to our political, social, and cultural interests.... [But] there is a dark side to this....As people worldwide gravitate to the places where others most like themselves live, face-to-face debate and dissent evaporate."

We argue here that mobile technology and its potential for media production and consumption opens up new ways of participation for people who have been largely marginalized for lack of access to a public media sphere. But if the developed world is any indication, there may be increased polarization amongst some communities as well.

Industry Trends

The mobile industry has seen rapid changes in just the last two years that have significant implications for global media participation. We describe some of the key trends here.

Mobile phones are an all-in-one media collection and broadcasting tool. Camera phones are now widely available around the world. In a recent report, for example, the <u>market research organization AC Nielsen/ORG MARG in India,</u> found that camera phones now account for 36% of the total mobile phone market in that country. Many manufacturers are producing camera functionality even in low-end phones. Smart phones that make up a growing percentage of the global market also include video and audio recording functions and are capable of instant messaging and mobile Internet access. Bluetooth and radio capabilities are also becoming more common in even low-cost handsets.

Nokia, the world's largest handset manufacturer, for example, which has a keen interest and presence in emerging markets, is rolling out a series of low-cost phones priced at 40 EU that are equipped with a browser, FM radio, camera, email, and Nokia Life Tools--SMS agricultural and educational information aimed at rural markets.

Mobile phones are cheaper, smaller, and more portable than other digital communication devices such as laptop computers, video recorders, MP3 recorders, and digital cameras--and the cost of mobiles continue to decrease. As such, they enable a growing number of people to record a live broadcast, photograph or videotape an event, conduct an interview, write an article, or conduct a survey or poll, all of which can immediately be posted to the Web through the mobile network. The table below illustrates some of the recent trends in handset capabilities towards higher functionality.

For many developing countries, the availability of more advanced handsets many be limited to wealthier segments of the population or those whose work (such as media professionals) might warrant the investment. However, as we illustrate, there are tools and platforms available that are able to maximize the benefits of even basic voice and text. This means that having Internet access is not a necessary component of being able to participate in today's global world.

However, the trends are clear: The enhancement of mobile networks and build-out of fast 3G networks are already enabling more significant use of mobile web-based applications.

Category (Unit: million)	2004	2005	2006 (e)	2007 (e)	2008 (e)
Smartphone	18	57	88	120	156
3G handset	20	50	110	223	363
Mobile TV handset	-	-	19	39	55
Total	38	107	217	382	574
Market Size (All Handsets)	646	796	956	1070	1167
Penetration Rate (%)					
Smartphone	3.0%	7.0%	9.0%	11.0%	13.0%
3G handset	3.0%	6.0%	12.0%	21.0%	31.0%
Mobile TV handset	-	-	20.0%	4.0%	5.0%
Total	6.0%	13.0%	23.0%	36.0%	49.0%
Annual Growth (%)					
Smartphone	-	217.0%	54.0%	36.0%	30.0%
3G handset	-	143.0%	121.0%	102.0%	63.0%
Mobile TV handset	-	-	-	105.0%	41.0%
Total	-	178.0%	103.0%	76.0%	50.0%

Source: Deutsche Bank Research, ROA Group

Smartphone, 3G and Mobile TV Handsets, Market Share 2004-2008

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By using mobile phones with web access through enhanced networks to capture, report, and retrieve information, there will be even more opportunities for the average citizen to report news and participate in journalism.

There is currently quite a bit of discussion of the timeframe by which we can expect to see rollout of the next generation of mobile connectivity. The market research is conflicting and experts disagree on the timeframe with some noting that given current trends, we could see significant coverage by 2010. Even so, many observers rightly point out that mass adoption of high-end mobile internet devices and affordability of data rates is not likely before 2012 to 2015. However, as there is no 'mass market' consumer price point yet for mobile internet devices and data tariffs in emerging markets, the best lowest-common denominator mobile technologies are still SMS and voice.

Initiatives like the Spoken Web, an innovative initiative piloted by IBM India, however, are promising. The Spoken Web aims to transform how people create, build and interact with sites on the Web using speech instead of text. IBM ultimately envisions that people can host and browse "VoiceSites," traverse "VoiceLinks," even conduct business transactions by talking over the existing telephone network.

Regardless of the varying projections, it clear that there are key trends in the mobile phone industry that will likely have an impact on media production and consumption. These include:

- Rapidly increasing connectivity in rural areas throughout the world, including in countries with limited foreign direct investment and access to information from outside;

- Rapid uptake of basic and mid-level handsets and mobile subscriptions;

- Increased functionality of low-cost handsets for mobile applications and mobile Internet access. Players like Intel and Nokia have strong interest in and products for emerging markets, including low-cost handsets with wifi and camera capabilities;

- Increased competition among operators resulting in lower costs for voice and text, as well as value-added and bundled data services;

- Issuance of licenses for 3G networks in most emerging markets in the next few years that will enable widespread mobile Internet access over the next 10 years;

- Increased exploration of voice and other, related media such as radio through lower-end handsets;

- Decreasing data rates globally that will accelerate with increased competition, and are moving towards more affordable flat rates.

Mobile Phone Functions and Their Use in Citizen Media

Mobile phones can be utilized to collect and broadcast written, audio, and video media to the Internet and to other mobile devices. While some types of mobile media dissemination such as video are costly, requiring high-speed bandwidth and are subject to expensive data tariffs, others are inexpensive and need little bandwidth, such as text messaging.

As we discussed, phones have increasingly more memory, more processing power, better peripheral devices such as cameras, and more connectivity options. Many can run scaled-down mobile versions of PC communication applications, such as email, Voice-over-IP (VOIP) calling, instant messaging (IM), and even radio.

Even though most people will not have the bells and whistles increasingly available on mobile phones, we think it is nonetheless important to explore the types of citizen media production and consumption that can be accomplished with some of these advanced phone features to better understand what products and tools are currently available, to assess where there are gaps, and to describe opportunities for media development organizations and donors.

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SMS Text Messaging

The cheapest and easiest way to communicate information and news is through SMS text messaging. SMS allows 160 English characters (or less in other languages) to be sent per text message. In most countries text messaging is less expensive (and more reliable) than making a phone call or using voicemail services. Text messages can be sent to large numbers of mobile phones at one time and/or posted on a Website.

Almost all mobile phones have text messaging capabilities. SMS is the main news delivery channel for many people in the world--for receiving information on news-breaking events as well as for "live reporting."

SMS news services exist around the world. Jasmine News Wire, for example, is an innovative news service in Sri Lanka that, since 2005, has been delivering news to its subscribers via text message and on the Web. In the Eastern Indian state of Orissa, a journalist started an SMS-based news-service in the Oriya language which is spoken by some 31 million people. Odisha.com partnered with SMSGupShup, a free group messaging service, to deliver the SMS. Started in November 2007, the service has currently about 60,000 subscribers.

Many larger media outfits like the BBC and CNN have been offering SMS news alerts in the last few years as well for urgent updates or topical news on specific subjects. However, given the number of mobile subscribers of major news outlets and the costs associated with sending a large volume of SMS, many mainstream news media have to consider how to monetize text news services.

Community organizations also use SMS as a way to deliver news to their constituents. In Brazil, for example, a community SMS news program--Alô Cidadão! (Hello Citizen!)--brings information about jobs, educational and cultural events, and local news to low-income people in Belo Horizonte in southern Brazil. The messages have been overwhelmingly popular -- over 90% of subscribers forward the SMS to family or friends and rely on the text messages for daily information. The platform is powered by a commercial vendor, and the content is provided by a Brazilian NGO, the Instituto Hartmann Regueira.

However, most text/SMS news are not from reliable news services but news spread from person to person virally by forwarding text messages--both with legitimate information but just as often with unverified rumors. The stories of SMS as a primary vehicle for news abound, particularly in times of social turmoil and in restrictive media environments. A few examples:

After the elections in Zimbabwe in Spring 2008, mobile phones were used as a vital communication tool to disseminate news and information. Dumisani Ndlela, a journalist in Zimbabwe, wrote about the use of SMS jokes to make sense of the election stalemate at the time. "One reads: "We would like to apologise to the nation for the late release of the presidential results. This is due to the rigging process, which is proving to be more difficult that we had anticipated."

Another one reads, "If ZEC fails to supply us with the presidential election results by the end of today, we will have no choice by get them from the black market."

At the same time, halfway across the world, Malaysian Prime Minister Abdullah Ahmad Badawi was quoted as saying that he regretted that his governing party ignored alternative media like SMS in the elections there. "It was a serious misjudgement. We made the biggest mistake in thinking that it was not important," he said in a speech in April 2008. "We thought that the newspapers, the print media, the television was supposed to be important, but the young people were looking at SMS and blogs."

In the days both leading up to and after the election in Malaysia in March 2008, SMS messages flew between the mobile phones of the voters, relaying political jokes, messages about speeches and political events, and election results. The use of SMS and alternative media was largely credited with helping the opposition party to dramatically increase its seats in Parliament.

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SMS was also a much-used news source after the election, as the mainstream TV stations, controlled by the ruling party, didn't announce seats that had been won by the opposition and the Malaysian Election Commission didn't initially update its website with election results.

And then there is Twitter, the increasingly popular 'micro-blogging' site. Users can text message news as they occur to Twitter or the dozens of local twitter clones around the world. Users who subscribe to a given user's Twitter account can immediately see the posts. Since many online services like Twitter also allow subscribers to get updates via SMS, people without Internet access can still receive the information they want.

Twitter, one of the more popular so-called micro-blogging sites, had short codes and free text messaging in a number of countries but they were discontinued due to cost. India has still a local Twitter number but SMS delivery costs for startup companies like Twitter are hard to overcome, limiting the benefits for the public and for media stakeholders in developing countries.

Micro journalism delivered in160 character text messages that supplement on-line blogs and other news fora, is on the rise. Media outlets are engaging their readers in reporting activities and news events in small sound bites to liven up news blogs and promote their stories, creating a new type of journalist sometimes referred to as a *ReporTwitter*. The BBC, Reuters, CNN, and a number of other mainstream media outlets in the United States and UK have an active presence on Twitter.

In India, a new and free service by Google--SMS Channel--allows anyone to set up a group to text message to. The group can be set up as a broadcast SMS service or as a group chat where everyone in the group can text to each other. The service currently supports messages in several languages including English, Hindi, Telugu, Tamil, Malayalam and Kannada. Although just launched in October 2008, there are already dozens of news services, including CNN and the BBC, as well as local and citizen news outlets, that are using the channel.

The National Democratic Institute (NDI), an American NGO, has designed a simple SMS-based system (using a customized low-cost bulk SMS application) for trained volunteers to monitor and report on irregularities during election campaigns throughout the world. NDI works with local citizen groups to move from impression-based election monitoring to systematic, data-based monitoring. The information gathered is used to generate awareness and increase accountability, and to promote greater transparency in election processes. Some of the countries in which it has been used are Albania, Bahrain, Indonesia, Montenegro, Palestinian Territory, and Sierra Leone. Several countries now have the capacity to use mobile phone technology to monitor their own elections, including Sierra Leone and Montenegro.

There have also been other, impressionistic and less systematic, election-day efforts to monitor and report on the election process, most recently in Nigeria where organizers published a phone number for citizen to text to any observations of irregularities, crowdsourcing incidences. The organizer, a grassroots group in Nigeria, utilized FrontlineSMS, a desktop SMS bulk messaging application focused on NGOs, to capture and record incoming SMS.

Bunge SMS, a commercial vendor in South Africa, has designed a platform for holding Kenyan Members of Parliament accountable. By sending an SMS to a Kenyan short code, citizens can tell their Member of Parliament what he or she must do for them. Many of the complaints registered through the system so far are related to infrastructure, including access to electricity, better road quality, and reliable sources of water.

Besides sending basic messages, SMS also allows for mobile voting, polling, billing, searching, and chatting. These can be used to support a sense of community through the development of SMS-based community newsletters or provide a link to other media, including community radio.

A recent report, Radio 2.0 for Development, highlights the underutilized link between SMS and community radio, which is just now starting to gain traction in low- and middle-income countries.

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Media Focus on Africa and its partner Butterflyworks, a Dutch company, used SMS messaging to engage the public in dialogue linked to television and radio programming prior to the 2007 election. The initiative engaged 20,000 people with SMS and many more through TV and radio. The project sought to encourage individuals to share their opinions on the political leadership. With the violence and tensions that followed the election, the partnership is now exploring the use of its platform to promote ongoing peace-building efforts.

Voice and Audio

While in most areas of the world voice calls are more costly than text messaging, they are still relatively inexpensive. With the assistance of some free or low-cost applications, a phone call can become a recorded audio file that can be published online. There are a number of companies that provide applications for mobile phones to create instant podcasts. One of these is Utterli, a free commercial service that allows anyone to call a country-specific number and record a podcast that that can then easily be published on a web site. Utterli also recently announced free text messaging from Utterli users to others in several popular social networks, including Facebook.

There is a plethora of innovative other audio services that can be leveraged for media purposes. Talkshoe is a service that allows users to create, join, or listen to live discussions, conversations, podcasts or audioblogs. Any user can sign up and host a free Community Call for discussions, conversations, talk shows, press conferences, or podcasts. Recorded Community Calls can be listened to, downloaded, or subscribed to. While many of these commercial services are currently focused on and only available in the United States and Europe, some are emerging in developing countries as well. Zoopy is a popular video, audio, and photo sharing service in South Africa. Zoopy provides a Java application for mobiles that allows users to upload content from their mobile easily.

Unfortunately, there are few user-friendly open source options in this field as of yet. Kubatana, a Zimbawean NGO is trying to change this.

Developed by Kubatana, with a grant from the Knight Foundation, Freedom Fone will provide a voice database where users can access news and public-interest information via land, mobile or Internet phones. Similar to a telephone PBX system, users can call in and then follow audio prompts to find the information they need. Independent radio station content will be broadcast, along with frequently updated audio reports created specifically for Freedom Fone. Users will be able to pose questions and leave answers on a voicemail system. The system, which employs both new and old technologies, allows even illiterate citizen to receive and contribute more substantive information than is possible via 160-character text message in a practical and relatively economical way. The system is being tested and deployed in Zimbabwe. It is based on an open-source audio platform, Asterisk, and FrontlineSMS (which has not been open-sourced at the time of this writing), and will be available for use by other groups and media outlets once technical development is completed in 2009.

IBM India Research just produced a similar system, the so-called VoiKiosk, a voice-based service that uses the telcom network. IBM envisions two types of users: the voice kiosk operator who configures the system and operates it as a microbusiness, and end-users who access or post voice information (such as news, advertisements for their businesses, event information, etc). The project is being rolled out in Andra Pradesh in the local language, Telegu.

The fact that many more mobile phones globally have FM-radio capabilities (though precise data on the prevalence is sparse) indicates that convergence with radio, and specifically community radio, is an additional area media organizations need to explore. Radio is still the most available form of mass media worldwide. If mobile telephony is added to this medium as a delivery channel for radio, there are new opportunities for engagement and participation that have not been explored. We are not aware of any significant projects in this area yet but believe that radio and mobiles warrant attention.

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Photos

Mobile phones that have cameras can use MMS (multi media messaging services), email, or bluetooth to send images to other phones. Many popular photo sharing websites allow users to send and publish mobile photos on their sites. Flickr, the popular Yahoo-owned photo and video repository and community, gives every account a mobile email address to send photos to from a mobile device.

This feature is used by The People's 311, a citizen-created website that encourages New York City locals to document non-emergency conditions around the city. New Yorkers are asked to take a mobile picture of a public nuisance and send it (along with the location) to a public Flickr account. The information is posted on a map, encouraging the local city government offices to respond.

Photos can also be posted from a mobile phone directly to a blog. Blogger, the Google-owned free blogging tool widely used around the world, allows anyone with a blog on the site to send a photo to go@blogger.com and the system will create an instant web blog. Tumblr enables people to share text, photos, quotes, links, music, and videos, from a browser, phone, desktop, or email.

There are many other, often grassroots, citizen media efforts that encourage mobile blogging via email, SMS, and MMS. For example, MoBlog Ukraine is a grassroots site that encourages Ukrainian citizens to report their own stories to a web blog by sending a photo, video, or text message to a specified email address. Ukrainians are encouraged to use their own mobile phone to send reports and media via SMS or MMS to the mobile blog. NowPublic is a Vancouver based worldwide citizen journalism site where anyone can publish news stories via a mobile phone. NowPublic uses an email address to send a text, photo, or video directly to NowPublic. NowPublic allows citizens to subscribe to a text alert system. Citizens share their phone numbers with NowPublic and when breaking news is occurring in their local community, they receive a text message. NowPublic has

partnered with commercial vendors such as Shozu, a commercial application that lets user easily mobile post content from the phone to various social networking sites. Shozu users can also post their media to the BBC, CNN, Reuters, and iTV.com web sites--all of which are integrated with the Shozu application.

Videos

Mobile video is still the most expensive and least available mobile citizen media options. Streaming, recording, and sending video requires a higher-end handset with video capture and consumes significant bandwidth. Yet, mobile video can also be one of the most effective ways to share important information and current events not covered by conventional media. Individuals can record and send short videos to popular video sharing sites such as YouTube. Videos can also be posted directly to web blogs. A number of higher-end phones have built-in video editing tools that may be hard to maneuver on a small phone but that allow for voice-overs, music and other video editing without ever having to access a PC, making video production possible from anywhere.

Recently, the Associated Press broke a story videos taken by mobile phones about Afghan children killed by US military forces. Similar stories were reported from Kashmir where hundreds of people, touted by the BBC as "Kashmir's mobile phone chroniclers', used their mobile phones to document atrocities during recent demonstrations that were then posted on YouTube. These are not coordinated activities; there is no organization or entity that is moderating this in any way. Citizens the world over have discovered the utility of mobile phones and distribution tools such as YouTube and Blogger to produce their own coverage of news.

Phones in areas with good mobile bandwidth can even broadcast live mobile video feeds to the Internet and on other mobile phones using software from companies such as Flixwagon, Qik, or Kyte. Qik, a commercial company, is aggressively courting a mass market. It's software supports even lower-end phones given away by carriers in

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the US, making the production of live video streaming available to a much broader audience. Qik has also teamed up with the BBC's "Have Your Say" program to feature live video commentary from the audience. Similarly, Flixwagon, an Israeli company with a similar service set, is offering a white-label version of its software platform for media companies as more and more news and media outlets develop "have your say" or "I-report" methods of user engagement. Other companies like Adactus also provide mobile video platforms for media companies; Adactus has a product called "Reporter," a platform for transferring mobile video content easily to the newsroom.

Finally, videos on mobile phones are also shared routinely via bluetooth from mobile phone to mobile phone, though ethnographic data on the prevalence of this practice is sparse. However, anecdotes suggest that it is a common practice in many countries like Egypt and Iran, for example, to share popular video content easily and privately undetected by carriers.

Bluetooth and Wifi

Another project, the Comm.unity Platform, developed by a group of MIT students, creates a local interactive workspace that can be used to collect and distribute information locally through bluetooth and wifi. Designed at the MIT Center for Civic Media with funding from the Knight Foundation, the tool enables journalists and individuals to share content and information while remaining off the mobile network and thus undetected. The distributed secure environment is configured by the individual users and creates an environment in which both people and devices can selectively interact. Data, images, and video footage can be automatically duplicated to those within a certain proximity making it difficult to control the spread of information simply by confiscating a camera or phone. By using physical proximity, information can be shared quickly. Because the system is off-grid, it can be accessed in remote areas without connectivity.

Another interesting effort is a project out of the University of Capetown dubbed "Big Board" and devised by Gary Marsden, a usability expert

and professor at the University. The Big Board is a multi media screen that can be queried for information by taking a picture of an icon and then sending that picture via bluetooth to the board to, in turn, receive information. Likewise, users can bluetooth information such as pictures or stories to the board to display. Already used by many advertisers to deliver content to phones, bluetooth is a promising and free proximity delivery mechanism. The Big Board takes this a step further by allowing users to send and display content, making it an interactive news and bulletin board.

Location-Based Services and Mapping

Some NGOs and community-based organizations are using mobile phones and GPS devices to engage communities in social mapping activities for advocacy as well as local reporting linked to locations. The best-known is Ushahidi, a platform used during the Kenyan election to crowdsource and map incidences of violence. The software is now being rebuilt and will be open-sourced and thus available to other efforts that aim to combine SMS/mobile content submitted by a public with geo-mapping.

Other efforts already combine mobile sensing--transmitting various data through the mobile network such as environmental or location data-- and mapping it for information mining. These efforts are largely focused on aggregating population movement and environmental data right now but could be applied to citizen reporting efforts.

Location-based services are the holy grail for advertisers and NGOs alike but they are only a very recent mass-market phenomenon. Arguably, it was Google which was the real innovator here. Google's Mobile Maps was released in late 2006. In 2007, Google added a game changing feature to this product: My Location. This feature, built into all Mobile Maps clients, can automatically detect where a user is located through the phone's GPS or, for phones without GPS, by automatically detecting situating a phone within a few hundred meters accuracy by triangulating the location of mobile masts. This innovation, combined with the increase in GPS-enabled handsets, has provided the catalyst

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for new location services. In a recent article, mobile expert Andrew Grill describes why:

> Since the late 1990s, the only way to locate a mobile phone was by taking a location "feed" from one of the mobile operators, assuming that they had a location platform deployed in their network. In simple terms, the way this works is that the location server checks which base station the handset is logged onto (ready to accept a waiting call) and the location of the base station is used when calculating a rough approximation of where the user is currently located. Many in the industry predicted that this service would launch a range of location based services but as we have seen this did not eventuate.

> One of the reasons behind the very small take-up was that each time the user was located, the operator would need to charge the equivalent of an SMS. For regular location updates, this could become quite costly and the resulting accuracy returned from these location platforms was quite poor. As there were almost no GPS enabled handsets available when these location services were launched, this was the only real way to gain access to a handset's location. There are also the obvious privacy concerns around any location service, so great care and attention was paid to the proper authentication around providing a user's location to third parties. In the end, many in the industry would agree that cost, poor accuracy and privacy issues all but killed any new initiatives in the location space.

That is, until Google introduced My Location, changing the game. Commercial services such as Brightkite and other location-based mobile social networks have followed suit. They are also useful citizen media tools. Perusing the postings from Brightkite users, there are numerous examples of 'news.' Brightkite just recently added international SMS capabilities, making it more useful for non-Western locations. Lastly, there is Fire Eagle, a Yahoo! service which keeps track of location by serving as a broker between various websites.

David Sasaki from Global Voices writes in a recent blog post:

> "Fire Eagle allows you multiple ways to specify your location and to let other web services know where you are. There are different ways to let Fire Eagle know where I am. First, I could simply update my location on the Fire Eagle website. Or I could send a text message from my cell phone to Twitter-user firebot with a description of where I am. Now that Fire Eagle knows where I am, how does that help me? For one, I can use Wikinear or Geopedia to automatically search for Wikipedia articles that are relevant to my location. I can also allow my friends, my social networks, and of course my favorite news sites to all access my location. By interfacing with Fire Eagle, a news aggregator like EveryBlock or outside.in, for example, can provide customized information and news."

The possibilities of geo-location for citizen media purposes are just beginning to emerge but clearly, this is an area to watch closely as the technologies become more pervasive around the world.

The Mobile Web

The mobile web for the developing world has had no small share of controversy in the development community but the trends are clear. According to the Economist, "the number of mobile phones that can access the internet is growing at a phenomenal rate, especially in the developing world. In China, for example, over 73 million people, or 29% of all internet users in the country, use mobile phones to get online. And the number of people doing so grew by 45% in the six months to June —far higher than the rate of access growth using laptops."

The Mobile Web refers to the access to the World Wide Web using a mobile device connected to a public network.

Opera Mobile and Opera Mini, web-browser software for mobile phones, show rapid growth in mobile-web browsing in developing countries. The company releases monthly usage statistics that are helpful as a proxy for gaging mobile Internet uptake worldwide. The

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fastest growth is in developing countries including Russia, Nigeria, Egypt, Indonesia, India and South Africa. These trends have implications for media outlets and NGOs alike.

Already all major news outlets have mobile sites viewable from a mobile browser. There are dozens of free commercial services that turn almost any website or blog into a mobile site. Viewing websites on mobile phones is only an option for people who have Internet-ready mobile phones, of course. However, for those who do not there are products such as Podlinez that can turn Internet-based audio and blogs into a dial-in number that can be heard on a mobile phone.

The mobile Web will only grow in importance as Web access from phones grows and data costs come down in low- and middle-income countries. Media organizations and those concerned with citizen participation and media are well advised to consider the implications when much of the world is online through their mobile devices.

Citizen Media Projects

There are numerous citizen media projects deploying mobile technology around the world. We profile here some of the more noteworthy ones that illustrate how mobile technology can promote or produce citizen media. This is an arbitrary catalog, not meant to be complete, but rather a compendium of projects that illustrate the possibilities of mobiles in citizen media. Some of the projects described here are still in their early stages without tangible products or impacts yet.

Mobile Voices is a new grassroots media initiative based in Los Angeles that focuses on digital story telling on mobile phones with immigrants in the United States. Still in its infancy, Mobile Voices nonetheless is an interesting effort that showcases how grassroots organizing combined with low-cost technology may be used amongst marginalized communities. The all-volunteer group is using free and open source tools to to try to integrate digital content from mobiles that can be easily uploaded and displayed.

The news is coming. This is what Guy Berger's project with a grant from the Knight Foundation hopes to deliver. He aims to connect diverse populations in Grahamstown, South Africa to news through mobile phone-based citizen journalism and news delivery. "This is hyperlocal," Berger, the head of the School of Journalism & Media Studies at Rhodes University, Grahamstown, South Africa, says. "The project aims to expand the town square of Grahamstown for information and opinion flows." The "citizen journalists" are high school students who submit news stories via SMS. A selection of the SMS contributions will be printed in the school-owned community newspaper, Grocott's Mail, and SMS messages with news will also be sent to community members. The content will reflect issues of importance to young people. Possible stories could include reports on teen pregnancies and authorities neglecting school infrastructure and services.

In the future Berger hopes that the program will expand and possibly include other technologies like MMS (multimedia) messages. "We want to interface with the newspaper website, and we're developing open source software to link the two," he said. Berger notes that there would also be research into the effectiveness of the project. "Is it making a difference? What does it mean for democracy to have young people contributing to the public opinion?"

Voices of Africa is a pilot project that invites mobile citizen journalists to report on different events and news from around Africa. Launched in May 2007 with the support of the Africa Interactive Media Foundation, Voices of Africa has hired citizens in five African countries to teach and equip local citizen with the tools necessary to become mobile citizen journalists for their respective countries: Kenya, South Africa, Mozambique, Ghana, Nigeria and Zimbabwe. The equipment used for the project is basic; a mobile phone with GPRS and a small folding keyboard that plugs into the cell phone to make writing quicker and easier. Because they have some funding, Voices of Africa was able to install special software on a secure server that transfers mobile media to the Voices of Africa interactive website for publication.

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News Agencies and Media Companies

The advent of the Web, and particularly the concepts inherent in the term "Web 2.0"--user-generated content, the ability for anyone to organize and speak online, and the potential inversion of gatekeeper functions and power dynamics--is radically transforming traditional news organizations. Much has been written about this elsewhere. Suffice it to say here that this is an age in which there are dramatic changes in how news is being produced and delivered. It is also creating a new cadre of journalist-the "mojo" or mobile journalist.

Al Jazeera, the Arab news service, launched its mobile services in 2006. Since then its coverage and accessibility has grown significantly. The service enables people to subscribe to SMS-based news updates in Arabic and English and features a platform for interactive engagement with the network. The Mobile Media Unit has also equipped its journalists with mobile tools to report directly from the field.

Similarly, Reuters, in partnership with Nokia, has developed a mobile journalism toolkit. In a trial that began in 2007, Reuters journalists were given a lightweight "mobile toolkit" that included a multi-media Nokia N95 mobile phone, a tripod, a folding bluetooth keyboard, a Sony microphone, and chargers, including solar chargers. According to Nokia, metadata facilities combine everything that the phone already knows about the story, such as GPS location, time, date and other information. The toolkit allows journalists to write and publish stories from the field to deliver up-to-date news and instant reporting. The trial involved journalists reporting on stories ranging from New York Fashion Week to the US presidential campaign. Archived stories are still available on Reuters Mobile Journalism website.

Although the mobile toolkit's usage has been confined to professional journalists, usage could be expanded in the future to include non-professionals as well. Timo Koskinen, project manager with Nokia Research Center, notes:

"The term 'citizen journalism' has been in use for several years, but technological innovations--particularly the introduction of mobile multimedia computers--have transformed the concept. 'Citizen journalism' is beginning to embrace a wide range of public engagement with the media, from groups of contributors organized around subject or geographic areas to the casual participation of observers at the scene of a newsworthy event."

Verve Wireless is building a business with a platform that has enabled over 4,000 newspapers to create mobile versions that can be viewed and searched with links to interactive visual and audio content, complete with text alerts for breaking news stories. We have already described some other businesses aimed at transforming traditional media companies to make them socially and commercially relevant in a world where people are truly 'mobilized.' It remains to be seen how, in this fast-changing and fluid environment, mainstream media companies and their suppliers survive.

To quote *Scaling a Changing Curve*, the report to the Center for International Media Assistance:

"The overarching theme....is the rise of a pluralized, diverse and multi-mediated public sphere, with individuals, groups, corporations, governments, and other entities freely co-mingling to influence public opinion. The traditional media, long the gatekeepers and shapers of public opinion, are now forced to jostle in this space--substantially and financially--with millions of alternative voices."

Security Considerations

As useful and promising mobile technology is for advancing citizen media and access to information, there are also significant security issues. These become especially relevant in countries where there is repression of media and access to information and surveillance.

> "The term 'citizen journalism' has been in use for several years, but technological innovations - particularly the introduction of mobile multimedia computers - have transformed the concept. 'Citizen journalism' is beginning to embrace a wide range of public engagement with the media, from groups of contributors organized around subject or geographic areas to the casual participation of observers who are lucky - or unlucky - enough to be at the scene of a newsworthy event."
>
> Timo Koskinen, Nokia

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Most people probably do not realize that whenever a mobile phone is on, the location is known to the network operator. Or that each phone and SIM card transmits a unique identifying code, which, unless very careful about how someone acquire the phone and SIM, can be traced uniquely to that person. With cameras, GPS, and the mobile Internet come more surveillance possibilities, allowing an observer, once they have succeeded in gaining control of the phone, to turn it into a sophisticated recording device. However, even a simple phone can be tracked whenever it is on the network, and calls and text messages are far from private. Particularly where surveillance is undertaken in collusion with a network operator, both the content of the communication and the identities of the parties involved is able to be discovered, sometimes even retrospectively. In addition, the network operator is able to surreptitiously install software on phones on the network, potentially gaining access to any records stored on the phone. Given the sometimes shaky track record of network operators when it comes to privacy issues, not to mention the interests of governments that ultimately regulate their operations, this is understandably disquieting to individuals involved in sensitive work.

Obviously, the most secure way to use a phone is not to use one at all. Even so, most organizations, even if they understand the risks involved, find that phones are too useful to discard completely. The best approach then becomes one of harm reduction: identifying and understanding the risks involved, and taking appropriate steps to limit exposure. We identify these risks, and offer some suggestions for securing mobile communications.

Information transmitted by phones on the network

For every phone currently on the network (receiving a signal, regardless of whether the phone has been used to call or send messages) the network operator has the following information:

- The IMEI number – a number that uniquely identifies the phone hardware

- The IMSI number – a number that uniquely identifies the SIM card
- The TMSI number, a temporary number that is re-assigned regularly according to location or coverage changes but can be tracked by commercially available eavesdropping systems
- The network cell in which the phone is currently located. Cells can cover any area from a few meters to several kilometers, with much smaller cells in urban areas and even small cells in buildings that use a repeater aerial to improve signal indoors.
- The location of the subscriber within that cell, determined by triangulating the signal from nearby masts. Again, location accuracy depends on the size of the cell--the more masts in the area, the more accurate the positioning.

Information stored on the phone

All mobile phones have a small amount of storage space on the SIM card. This is used to store:

- The phone book with contact names and telephone number
- The call history
- SMS sent or received
- Data from any applications, such as a calendar or to-do list
- Other data: Photos taken using the phone camera, if available. Most phones store the time the photo was taken, and may also include location information. For phones that allow web browsing, browsing history may be stored on the phone as well as passwords for sites accessed from the phone. Emails are a further potential danger should an attacker obtain access to the SIM card or phone memory.

Like the hard drive in a computer, the SIM memory of a mobile phone keeps data ever saved on it until it is full, when old data gets written over. This means that even deleted SMSs, call records and contacts can potentially be recovered from the SIM (here is a free application to do this using a smartcard reader).

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Can SMS be intercepted?

Standard SMS are sent in plain text, include location, phone and SIM card identifiers, and are visible to the network operator. Interception by third parties without the assistance of the operator is less likely, but over the last few years there have been various loopholes related to phone cloning that have allowed more than one phone to register to the same number and receive SMSs sent to that number. So, even though some networks assure that SMSs are not stored beyond the time needed to deliver them (and many make no such guarantees), it is worth thinking about who might be able to access messages during that time.

According to a recent paper by the Open Net Initiative, discussing the role of SMS as a carrier for political jokes in China, the Chinese government has an established SMS monitoring programme:

> As deviant ideas spread rapidly through SMS, the government started to establish mechanisms to monitor and censor textual messages, with 2,800 SMS surveillance centers around the country. In June 2004, a Chinese firm, Venus Info Tech Ltd., announced that it had received the Ministry of Public Security's first permit to sell a real-time content monitoring and filtering system for SMS. The system uses the Chinese Academy of Science's tests of information content as the basis of its filtering algorithm, which covers a wide range of "politically sensitive" combination of characters.

In addition to searching for keywords in message content, monitoring systems may also flag messages based on suspicion attached to the sender or receiver. Plain-text SMS should not be considered secure, particularly when it is possible that the sender or receiver of the message may have been identified for surveillance.

Can mobile calls be eavesdropped?

The idea of someone 'listening in' to sensitive phone calls is a familiar legacy of the era of analogue phone systems. Eavesdropping in digital systems is technically complicated, although entirely possible using commercially available equipment. However, a much simpler way to listen in to phone call is to capture the conversation on the phone, and transmit a recording to the eavesdropper. This can be done with small software applications surreptitiously installed, or with a bugging device attached to the phone.

It has also emerged that the network operator is able to remotely activate a phone as a recording device, independent of calls or SMS or even of whether the phone is switched on. Network operators have always been able to send undetectable control messages to phones on the network. This capability exists to allow operators to update software stored on the SIM card, but could also be used maliciously to transform the phone into a listening or tracking device, or to access messages or contact information stored on the SIM card. Once surveillance is being conducted with the cooperation of the network operator, there is very little that can be done to prevent this.

Mobile Viruses, spyware and keyloggers

Modern high-end phones are essentially scaled-down PCs, with the processing power, memory and connectivity to run all kinds of applications - including malicious ones. Thankfully, mobile viruses are still rare, and affect mostly high-end phones. However, security experts predict that malicious mobile applications will become increasingly common. This includes not only viruses, but also mobile spyware and keyloggers, which could secretly spy on mobile activities to glean passwords and other sensitive data.

Buying a very simple phone is one measure of protection, perhaps even one that does not allow third party applications to be installed. If a user needs to use a smartphone, only trusted applications--many viruses masquerade as a useful little application, but wreak havoc when installed (or worse, compromise the data stored on the phone). Bluetooth in particular has proven a popular way for mobile viruses to spread, and should be turned off when not in use. Additionally, anti-virus protection software is advisable.   Most of the major antivirus vendors, including Norton, Kapersky and F-Secure have recently brought out mobile security products.

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Tools and precautions

MobileActive.org has previously published security tips for activists. To recap this advice:

- Use a pre-paid SIM card
- Buy a SIM card just for the specific project and dispose of it afterwards.
- Make it routine to delete the information on the phone. Check the settings on the phone to see if can be set to not store call logs and outgoing SMS.
- If conversation is sensitive, don't discuss it on the phone and consider taking the battery out of any phones in the vicinity.
- Consider turning the phone off at certain times in your journey. Move the phone to places that it can be established you are not at so that all activity on the phone is not linked to the user.

Avoiding being identified

There are many countries now that require identification for purchasing a SIM card or phone. If a user is concerned about revealing the identity, there are some tips, that should be considered:

Digitally Networked Technology in Kenya's 2007–2008 Post-Election Crisis

Joshua Goldstein and Juliana Rotich

Written largely through the lens of rich nations, scholars have developed theories about how digital technology affects democracy. However, largely due to a paucity of evidence, these theories have excluded the experience of Sub-Saharan Africa, where meaningful access to digital tools is only beginning to emerge, but where the struggles between failed state and functioning democracy are profound. Using the lens of the 2007-2008 Kenyan Presidential Election Crisis, this case study illustrates how digitally networked technologies, specifically mobile phones and the Internet, were a catalyst to both predatory behavior such as ethnic-based mob violence and to civic behaviors such as citizen journalism and human rights campaigns. The paper concludes with the notion that while digital tools can help promote transparency and keep perpetrators from facing impunity, they can also increase the ease of promoting hate speech and ethnic divisions.

For a copy of the full case study visit:

http://cyber.law.harvard.edu/node/4703

- Check whether you have a legal obligation to provide any personal details to the shop.
- Make a purchase in a shop away from where you live. Avoid places that are likely to have CCTV - town centres, malls and larger chain stores are obvious examples.
- Get the simplest phone you need, avoiding extra features unless necessary
- Always ask for the phone on pay-as-you-go, even if this is much more expensive.
- Buy top-up vouchers to load credit onto the phone. When buying the vouchers, follow the same rules as for buying the phone: avoid CCTV, pay cash, don't give out your details.
- Change the SIM card and phone regularly. Also, users should recognise that the location of each call or message sent or received is know, as is the phone and SIM card involved.

Preventing location tracking

If a phone is receiving a signal, the location is known to the network operator. This information can be used to track someone in real time. If an observer is tracking one or several people over a period of time, it could also be analysed to identify meeting places or regular routes. A phone may still be registering on the network when it is switched off--'off' is, in fact, only a software mode. Location tracking can potentially be activated on a phone that is switched off. To be sure, it is best to take the battery out.

SMS Encryption applications for Java-enabled phones

Most phones available today (except some very basic models) allow users to download and install Java applications written by third parties. In general, installing anything additional on a phone that is used for sensitive communications should be avoided. The one exception to

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this may be encryption applications, which allow for securely encrypted communication once installed on the phone of both sender and receiver. SMS encryption applications allow short encrypted messages to be sent and received, using either a standard SMS (which is charged as normal but is scrambled so as to be indecipherable in the records of the network operator) or a data service such as GPRS as the message bearer.

Most SMS encryption applications work by asking the sender to choose a password (or 'key') which is used to encrypt the message. The sender discloses the password to the desired recipient, who then be uses it to decrypt the message. The obvious weakness in this system is that anyone who manages to acquire the password (perhaps by eavesdropping on the conversation in which it is disclosed) is able to decrypt the message. A more secure form of encryption, called public key encryption, uses two keys, uniquely identifying the sender and receiver. There are many commercially developed SMS encryption applications, but some offer a free trial version. There is also an open source SMS encryption application,

Following are some Java-based encryption applications:

- SMS 007 is a commercial application that uses password encryption, but has the added advantage of anonymising the sender and receiver of encrypted messages by creating its own encrypted contacts list. It can be bought online for around €35.
- CryptoSMS offers public key encryption and, as an Open Source application, does not require the purchase of a license. It does not anonymise the message sender and receiver of the encrypted message.
- Kryptext is another commercial product, available online at £5.99 per month for up to 10 licences according to the product webpage. It uses password encryption, but does not advertise additional features such as contact list encryption.

Although it does not advertise encryption, Feedelix is a Java SMS application that allows users with the FeedelSMS software installed on GPRS and Java phones to send cheap text messages. It has versions for Hindi and Ethiopic. It supports bulk messaging and does not use the network's SMS service, making it useful for information dissemination in situations were this may have been disabled.

Applications for Smartphones

Smartphones, many of which use the Windows Mobile or Symbian operating systems, have more memory, more processing power, better peripheral devices such as cameras and more connectivity options. Many can run scaled-down mobile versions of PC communication applications, such as email, Voice-over-IP (VOIP) calling and instant messaging (IM). All can be designed to provide secure communication. Several applications already claim to do this, including Skype, the popular VOIP and instant messaging system.

Skype is peer-to-peer, making it harder to intercept communication as there is no central server. It also uses several layers of encryption. The weakness of the system is that it is closed source and proprietary, meaning that no-one is allowed to review the source code of the Skype client for potential security vulnerabilities. More worrying is the recent discovery of surveillance code in a Chinese skype client, which logged the content of messages containing specific keywords.

Mobile email can be encrypted either by using a peer-to-peer system that requires generation and sharing of a key or keys, as described for SMS encryption, or by making use of an encrypted email service where this is managed on a central server. In the first case, the responsibility for key generation and sharing of keys is entirely with the sender and receiver of the message, involving no third party. In the second, a third party email encryption service handles part of the process, for example, key management or storage of encrypted messages on a secure server. Hushmail is one email encryption services that has released a mobile client. As demonstrated by a recent case involving the service, however, it is important to remember that encryption services are still subject to the laws of the country in which they are based. This means that they could be forced to hand over information to law enforcement. Managing one's own email encryption, for example by using an OpenPGP or S/MIME capable email client, avoids reliance on any third party. This can

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be technically challenging, but a peer-to-peer email encryption system can be a good way to communicate securely from a sophisticated phone.

Open Source Citizen Media Platforms

As we have described, there are numerous tools available that support the production and dissemination of media content on mobile phones. Many of these are proprietary and commercial ventures. As a matter of principle, security, and sustainability, we have been particularly interested in open source platforms and approaches that support mobile citizen media. Open source refers to the ability for users to download, modify, and share the source code of an application.

While not comprehensive, there are a few relevant efforts noted here.

Since its founding in 1996, the Media Development Loan Fund has provided innovative financial assistance, management training and technology support to independent media in emerging democracies. The Media Development Loan Fund's New Media laboratory has released a number of open source platforms: the Campsite newsroom content management system, Campcaster radio playout and automation system, and Cream, a customer relationship management system, that are in use by a wide variety of media organizations in both the developing and developed world. Because they are made by journalists for journalists, the tools are extremely easy to use. Increasingly its partners are looking for solutions to integrate content generated by mobile phones as well as ways to broadcast to the device. However, the suite of tools that MDLF offers that are focused specifically on radio are not well integrated with mobile technology. For example, Campcaster lacks MMS and e-mail gateways for submission of listener-generated content and a mobile phone interface for reporters in the field, including filing by SMS and MMS, voice recording and station management. So far, MDLF has not been able to raise the funds to extend the platform to integrate mobiles. We believe that extending existing open source media and content platforms to integrate mobile is a strategic and leveraged approach.

Another project spearheaded by an American software development firm, Development Seed, shows promise as well. It extends SMS data collection and distribution services to Drupal, a popular open source web content management system.   While in proof-of-concept stage right now, the SMS capabilities would include:

1. Feeding SMS content to a site: An SMS gateway that functions as a bridge to the main website that is set up to store all communication updates received. This requires only a mobile phone and a USB drive with software that turns the phone into an SMS gateway and connects it with a Drupal website.

2. Blasting messages from the site: With the gateway in place, people from anywhere in the world authorized to access the website can login and send out text messages to staff such as reporters in the field, essentially creating a centralized SMS delivery hub.

3. Incoming data: People who have been contacted from the central site via SMS, can hit reply to the SMS, add their data, and hit send. The text message is then sent to the cell phone of the hub operator, read by the software on the USB drive, and shown on the hub website.

Another tool in this area with survey functionality, incoming and outgoing SMS management, and back-end data management is RapidSMS, a SMS/web service developed by UNICEF. FrontlineSMS, a desktop SMS management tool for NGOs that has received quite a bit of attention, has not been open sourced at the time of this writing. Both RapidSMS and FrontlineSMS have been reviewed by MobileActive.org on its website.   Other open source tools already mentioned include Kubatana's Freedom Fone, and all Knight Foundation-funded mobile development projects as a condition of the Foundation's grantmaking.

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Counterproductive Uses of Mobile Phones

While mobile phones are increasing economic and social capital throughout the world and their uses to promote freedom of information and citizen media are generally promising, there are also divisive and dangerous uses that should be acknowledged. The first is hate messaging, whereby discriminatory jokes and/or hateful messages are sent and forwarded to groups of people. The Philippines is one country where mobile phone harassment has exploded. The second, as was demonstrated in Kenya after last year's election, is the use of text messaging to incite and organize violent actions against a particular group of people. The third is the use of mobiles to organize and coordinate terrorist activities. All are despicable. However, it is naive to believe that mobile phones cannot also be used for nefarious uses as much as provide social benefit. As has long been pointed out, mobile phones, just like the Internet, are neutral devices used or social good or ill.

Another threat directed against innocent users is more important in regard to citizen participation, media, and engagement. It involves the use of surveillance to track dissident activities by repressive authorities. As we have pointed out, mobile phones can be tracked and used as a way to find and punish legitimate forms of expression by journalists and citizens.

In addition, there are a number of other challenges that are impeding the use of mobile phones for expression, information, and media. We note several here.

Cost

Despite the cheaper availability of mobile phones worldwide, the cost of being a mobile media citizen remains prohibitive to many. There are two cost factors: The cost of handsets and that for data connection to access and deliver media content. Connecting to the Internet from a mobile phone to access information, or produce or disseminate media files (such as videos) or to post other content can incur high data connection costs. While services that couple with mobile phones for web-based posting are often free, data charges can be high.

Increased competition and flat rate data fees are lowering prices in many parts of the world, but the full potential of mobile technology for media will only be realized when usage charges beyond SMS become affordable to many more people globally.

Knowledge Gaps

While many individuals and organizations are convinced of the potential of mobile phones in promoting freedom of information and citizen media, there is very limited evaluation to determine what works and why. The desire to become more strategic in this area requires a knowledge and evidence base and the study of organically evolving phenomena. So far, while there has been considerable interest in how mobiles can be used to increase media and information production and access, there are only very few research studies and impact data available.

Hardware and Software Gaps

There are a number of ongoing efforts to invest in software platforms that have similar functions by investors and donors. While the "many flowers bloom" approach is part and parcel of an emerging field, a more strategic approach would be to begin to identify gaps in infrastructure to better coordinate and leverage existing efforts, and to minimize the duplication of efforts and wasted resources. At the moment, much development, especially in the civic sector, occurs in isolation and within silos. In this effort, it will be important to engage donors that are investing in building mobile technology to increase their leverage by better coordination. Donors should also invest in projects and ventures that have the potential to advance the entire field, including in

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commercial ventures that are aimed at a higher-end market with the goal of porting promising efforts to lower-resource environments.

There is also a gap between the potential and on-the-ground reality of mobile phone utilization for accessing and producing media. For example, most bloggers in developing countries still use a laptop or desktop computer. The use of the mobile phone is largely limited to its function as a modem as much of the software and hardware useful for higher end functions is cumbersome an expensive. Lastly, as there is a move towards more context and identity-aware systems, there is a great deal more work that is needed to address how information is controlled and secured.

Industry Issues

There is a general notion in this field that openness will create greater uptake and freedom in the use of mobile devices. The current business models in the industry are contrary to this notion and even with some openings, there is a strong commercial interest in keeping the mobile "garden walled."

There are some policy discussions that are beginning to happen, and there are also some interesting technological developments. One area of discussion is the extension of the notion of "net neutrality" to mobile devices, whereby broadband activity is network- and platform-agnostic and users are not constrained by limited spectrum of devices, applications, and pricing structures. A second area is the use of open standards and the potential for connectivity to any network, any handset, and 3rd party software applications. This would enable users to have greater control over customizing their systems. A third area is to change the monopoly on SMS short code purchasing that makes it costly to fully maximize the benefits of text messaging for citizen engagement to a competitive market.

The W3C's Mobile Web initiative is a step in the right direction in exploring how to make mobile phones useful for development and engagement. With the "Mobile Web for Social Development" interest group, it plans to investigate if there is a critical mass of interested parties and funding to start new work and cooperation with involved international bodies around the following themes:

- Understanding regional commonalities and differences in regard needs, context, culture, availabilities of mobile network and devices, etc.

- Gathering data on characteristics of mobile phones available in the developing world.

- Developing guidelines on how to write Web content or develop mobile Web based e-services for developing countries.

- Cooperating with all players from the mobile industry (operators, handset manufacturers, browser maker, etc.) and related International bodies like OMA or GSMA to make low-cost handsets Web-enabled.

The initiative believes that there will be business interest on the part of the operators for these reasons (excerpted from a 2006 position paper):

- For operators, the history shows that voice services always reach a saturation point, and this will happen in developing countries like it happened in the developed world.

- For handset manufacturers, if there is no need for features-phones to render rich Web applications, then also selling very low-end phones is not going to be profitable.

- For browser makers, there is a limited market for them with SMS-only applications. It is their interest to invest and participate in the bootstrapping process of enabling the Mobile Web.

- For service providers, it will be more difficult to develop appealing value-added services based on SMS interfaces.

- And of course, for users, if there is no 3G network deployment, no inexpensive features-phones, no Web-browser on their low-end

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phones, that means no future evolution towards a full Web access, with graphical interfaces, user-friendly applications, multimodal easy-to-use interfaces, etc.

While the focus of the MW4D Interest Group has been shifting a bit since this has been written, it is a worthwhile effort, provided it can focus on key issues and deliverables and increases its input from a variety of additional NGO and donor stakeholders who are currently not participating in the discussions.

In regard to technology developments, there are some glimmers of greater openness as well. Nokia's purchase of Symbian, the most widely used mobile operating system in the world, and recent decision to open source the platform starting in 2009, is a promising development. Likewise, Android, Google's mobile operating system, may contribute to greater openness for application developers for handsets -- of course, provided that there will be significant uptake of the platform globally.

Recommendations

There are a number of areas in which journalism, media, and activist communities, along with donors and media development groups, can maximize the benefits of mobile technology to promote freedom of information and citizen media. This section highlights some recommendations.

1. Engage journalists and activist groups in participatory technology design processes, promoting and supporting the use and adaptation of mobile software and hardware in their work. Nokia piloted in 2007 a design process in several locations around the world that was dubbed "Open Studios." While this participatory research was done in the context of corporate design and R&D, the methods developed and described by Nokia have direct applicability to R&D efforts that should be conducted by donor agencies and media organizations in conjunction with academic institutions and researchers in media and participatory democracy. So for example, there is an emphasis on the need to gather data in

a variety of languages and a variety of levels of literacy and education. The lessons learned from the participatory research that Nokia conducted with residents in three shanty-town locations in South America, India, and Africa indicate clearly the information needs and desires of residents there. Media organizations and donors are well advised to follow the principles and ideas of these kinds of user-centric research methodologies to not attempt to build tools hoping that "they will come" but to systematically maximize usefulness of information and applications for target audiences.

2. Explore the dimensions of an "enabling environment" for mobiles in citizen media and participation. This enabling environment, as we have begun to outline, is situated along a number of dimensions: regulatory issues, industry trends, infrastructure, local capacity, and existing business models. There has already been much talk about what such an enabling environment for mobile services looks like in the areas of m-banking and m-health. The same exploration and concomitant support is necessary in the field of mobiles for media participation and democracy. Key areas of investigation in this vain would include a close look at the regulatory environment, including the 3G license sales in many countries in the next few years, an investigation of capable intermediaries able to deliver technical capacity and channels for innovative products and projects, conversations with key leaders in other areas of 'mobiles for development,' closer cooperation with researchers in this field who are looking at cultural and use patterns as well as information need of specific communities, and a keen understanding of the ecosystem of commercial mobile application developers, grassroots innovations in communities around the world, handset manufacturers, and mobile operators.

3. Tailor promising systems to low-cost phones to promote the ability for any group to adopt them, particularly those in low- and middle-income countries who may not have access to the mobile web for at least several more years. Working with mobile application developers and handset manufacturers, donors and media organizations should consider bundling and porting promising

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applications relevant to media and citizen participation to deliver them through existing channels to target communities. As we noted, there are dozens of mobile applications suitable for citizen media that have been developed all over the world. Many are commercial products for sophisticated smart phones but there is an increasing number of applications that work on simpler phones as well and are suitable for developing countries where new media is flourishing. At the same time, many grassroots media projects around the world are not aware of what exists, what might work in their region, and how to use available tools. MobileActive.org is exploring currently the potential to bundle tools, use cases, and how-to materials for extremely user-friendly application and global distribution.

4. Foster stronger interactions between the use of SMS and radio, particularly community radio where citizens should be actively engaged in content generation. This is an area where there is a scarcity of innovative use cases and applications--surprisingly so, given the trends we have outlined and the prevalence of radio. There are interesting new efforts in this area (such as Radio 2.0 for a Global Society) that should be closely looked at in terms of their relevance and applicability.

5. Encourage shifts towards phone-to-phone-based communication systems that minimize costs, interactions with operators, and censorship.

6. Lastly, think through in much greater depth what information and media content is currently missing in the mobile media landscape and for and in particular communities. We have talked very little here about content but a keen exploration of information needs-- ideally directly with and in the relevant communities--needs to be as much of a focus as thinking about how to deliver it via the 7th screen.

What will the Future Look Like?

At the moment, SMS-based and other low-bandwidth systems are more cost-beneficial and sustainable than higher-end applications and delivery methods. With better connectivity and more sophisticated handsets will come better software applications that enable even more convergence of technologies and applications, people, and ideas. At any given new development, there will be experiments with these new platforms to create innovative new uses. New handsets that enable video in and out can be used in real-time to collect information and broadcast it to larger groups of people. Devices will interact with each other in unprecedented ways and connect to applications on the network without having to have them stored on the phones.

Interactive voice response is also garnering momentum and will prove incredibly useful in low literacy environments. At the moment, individuals are mixing their use of existing applications. For people living in developing countries raising awareness for what tools exist alongside efforts to promote the creation of relevant content, strengthening of software development capacity, and enhancing the ability to use new tools will increase rapidly over the next few years. Handsets with wifi capabilities will also change sharing of information dramatically.

What we will likely see in the next three to five years will be more novel uses of existing technologies and the creation of more novel technologies that will take advantage of more widespread 3G networks. It is also perceived that civic participation will grow as more m-services are provided by government on electronic and mobile platforms. Smartphones are becoming smarter making access to media content and computing power possible in more places. They are also becoming more affordable to people in developing countries.

In Africa as well as in parts of Asia and Latin America, the shift to the mobile web will have profound implications. And as with other ICT-related content-driven platforms, mobile content will have to be appropriate for and responsive to local information and communication needs. As illustrated in this review, mobile citizen media offers an

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opportunity to redefine content production and consumption in a way that breaks some of the barriers posed by the Internet.

Alongside these trends will be one towards smarter networks that are focused on individual preferences with greater tailor-made interactions among trusted groups through location-based systems. These systems will be designed to enable transfer of information and communication for groups and individuals in close proximity to one another. Dynamic interactions through sensors and wifi will enable individuals to engage with their environment to share information and communicate in a way that makes their experience richer.   Such platforms will enable the creation of what David Reed at MIT calls, the "network of me" and the "network of us."

Conclusion

Mobile phones are portable, they are personal, and they as the most pervasive tool for communication between people today. They are intuitively and inherently social, expressive devices. Professional journalists, everyday citizens, and organized groups are capitalizing on the power of mobile technology to produce and consume media.   As articulated by Sameer Padania of the NGO Witness, we will "stop distinguishing between mobile media, new media, digital media and traditional media--and regard them all as parts of the same landscape."

Instead, it behooves us to promote greater collaboration, invest in tools to maximize the strategic leveraging of the devices and networks, and influence policy in a way that creates an enabling environment for a more informed and participatory society.