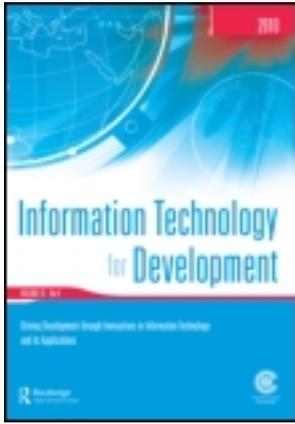


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Internet as freedom - does the internet enhance the freedoms people enjoy?

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Internet as freedom – does the internet enhance the freedoms people enjoy?

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This study evaluates the capacity of the Internet to enhance development in emerging regions through Sen's freedom perspective. The paper begins with a qualitative evaluation of the Internet's *potential* as a freedom enhancer through examples and literature study. It then presents a quantitative evaluation based on web access logs obtained from the AirJaldi network in rural India. We categorize the data based on Sen's freedoms to contribute an information and communication technology-freedom taxonomy and note the challenges in doing so. The usage logs indicate that indeed users may have experienced enhancement in all of Sen's freedom categories; yet our qualitative evaluation suggests there is much unexploited potential. We conclude that it is important to look at the Internet-based Information and Communication Technologies for Development (ICTD) projects through Sen's freedom lens and call for such projects to be evaluated based on these broad freedom goals rather than on focused development goals.

Keywords: ICTD impact evaluation; adoption and diffusion of IT and rate of uptake; Internet; social choice theory; Sen

1. Introduction

Development, as suggested by Sen (2000),¹ is the process of expanding the actual freedoms people enjoy. We believe that Internet access, through its distributed, decentralized, and diversified nature, could serve as a propellant for freedom and not just as a step in improving people's education levels or livelihood (Pal, Nedeveschi, Patra, & Brewer, 2006). Nevertheless, as the technological, social, and political efforts to avail the Internet to the world's poor are not yet settled, it is important to evaluate the qualitative and quantitative opportunities that the Internet may bring about.

1.1 Technology, development, and freedom

According to Sen, people need freedom to lead the kind of lives they have reason to value. Wealth, for example, is a means to having more freedom and freedoms are the true measures for development. Therefore, freedoms are not only the primary ends of development, but also among its primary means. Technology is discussed by Sen as a broad concept which includes any technology-based progress and it is described as one of the instruments for expanding human freedoms. Nevertheless, Sen points out that freedom should remain the end goal rather than technological development being an end goal.

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While Sen does not relate specifically to information and communication technology (ICT), his own general perspective on technology focuses on its influence on production possibilities and, therefore, emphasizes its contribution to economic freedom. Other broader perspectives on the influence of technology on development exist. Brewer et al. (2005) suggest that ICTs do not offer a panacea to economic development; at best, they can enable new solutions when applied with a broad understanding of the local circumstances and while taking a multidisciplinary approach. Similar recommendations for using cross-disciplinary teams and greater adjustments to local needs when deploying ICTs in developing regions are given by Thompson (2008) and Heeks (2008). Toyama (2010) suggests that “Technology is a magnifier of human/institutional intent and capacity,” yet, he adds that intent is hard to gauge and may be both positive and negative. Some scholars indeed emphasize the negative impact of technology on development: Ullrich in Sachs (1992) illustrates the connection of technology to growth by describing the large infrastructure that technology requires and the variety of industries it supports, technical and psychosocial.² The dominance of Western society in technological development, Ullrich claims, makes technology a form of “friendly imperialism” – another way in which developing countries depend on Western societies. More recently, Morozov has shown how the Internet may restrict people’s freedom, focusing mostly on political freedom (Morozov, 2011).

While we agree that technology has both positive and negative impacts, these past studies have predominantly evaluated development from a GDP or economic growth perspective with little emphasis on social or political influences. A broader overview accounting for a variety of influences through Sen’s freedom perspective is, therefore, called for. We believe that looking at ICT and particularly at the Internet through a broader freedom perspective may shed light on diversity of influences and give a more complete evaluation of its impact.

This study evaluates the complex relationship between the Internet and freedom. As Sen emphasizes, both “the process” and “the opportunities” are necessary for freedom to enhance development. We will, therefore, examine Internet access at two levels – the potential freedom it can bring or restrict (Section 2) and the actual opportunities created in rural areas (Section 3). Throughout this process, we also evaluate whether Sen’s categorization of freedoms fits the World Wide Web.

Lastly, as the importance of quantifiable measurements for development is acknowledged (Stiglitz, Sen, & Fitoussi, 2009), in Section 3, we also present a first step toward quantifying the actual influence of the Internet. We evaluate how people in developing regions actually use the Internet and which of Sen’s freedoms are mostly influenced by its use. In this exploratory case study, we use actual web-traffic logs from the AirJaldi³ network in rural India.

2. Sen’s instrumental freedoms and the Internet

Sen sees the five types of freedoms – political, economic facilities, social opportunities, transparency guarantees, and protective security – as both an instrument for development and as the goal of development. While each freedom may stand on its own, these freedoms are interconnected and work together toward freedom as an end goal. This section will present the complex relationship between the Internet and freedom and will consider how the Internet can influence each freedom as well as freedom as an end goal.

2.1 Political freedom

Sen emphasizes the importance of political freedom. He attempts to discredit the claim that non-democratic regimes are advantageous to development, by suggesting that the power of democracy comes into play especially during times of crises. Online political freedom seems as complex as the non-digital version, and many issues of freedom of expression and

counteraction are now defining the struggle. Organizations such as the Electronic Frontier Foundation (EFF, 2012), which set their goal as fighting for online freedom of speech, are an example of the active process this fight for freedom is going through. This section will discuss these complexities by presenting examples of Internet use for both freedom enhancement and freedom restriction.

“On December 10, 2003, using information provided by Yahoo!, Li Zhi was sentenced to eight years imprisonment for ‘inciting subversion.’ ‘Subversion’ turned out to be the use of online discussion groups to criticize Communist Party officials for corruption. In 2005 China jailed 62 persons for posting dissident views on the Internet” (Dann & Haddow, 2008). China is an example of using the Internet to enforce its political “counter-freedom” through pervasive use of censorship and surveillance as means of counter-insurgency. Moreover, China demands the removal of certain search terms from Google’s China service and to enforce massive blocking policies based on diverse criteria. This large-scale filtering system known as “The Great Firewall of China” (GFC) or “China’s Golden Shield” is designed to block access to sites deemed inappropriate by the government (Walton, 2001).

Effective tools and methodologies for bypassing the GFC to allow access to restricted sites exist, as do tools to hide, anonymize, and encrypt sensitive information flows sought after by the system (Ben-David et al., 2011). Nevertheless, the public debate around China’s firewall led to the recognition that the Internet could facilitate easier surveillance which may also be used in democratic countries as well as by commercial entities. Countries can shut down Internet access completely, as indeed had happened in times of crisis (Ben-David, 2011; Richtel, 2011); yet surgically enforcing selective access is extremely challenging, as is monitoring the activities of knowledgeable users.

The Open Net Initiative⁴ produces maps (Figure 1) showing a variety of countries which control, at different levels, the access to political content through the Internet.

Interesting to note is that regulatory enforcement using non-technical means is often also challenging, such as when Germany tried to prohibit neo-Nazi websites from being hosted on German servers, these were quickly copied to other servers around the world.

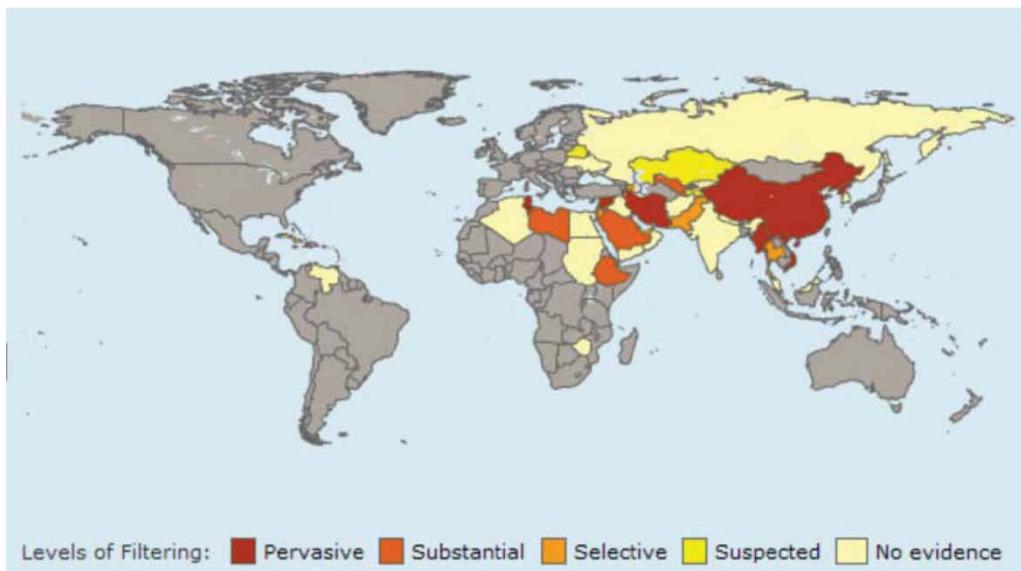


Figure 1. Global Internet filtering map – political content (OpenNet Initiative, 2012).

Apart from censorship and surveillance, the Internet influences other aspects of politics. As a positive example, we note the use of online media by the Tibetan community and the Tibetan Government-in-Exile (TGiE). Being dispersed from its original unifying territory, and without political recognition, the Tibetan community finds itself reunited online.⁵ Through this virtual presence, which includes news sites, online elections, and even a tax-payment system, the Internet provides an opportunity to maintain political structure without territorial control, in addition to facilitating preservation of culture, language, and history (Jardin, 2006). Others may argue that the online effort may reduce the active political effort for an offline solution. From a freedom perspective, while Tibetan websites may not reach the Tibetans' end goal of political freedom on their own land, and while they may contain some risks, they do provide freedom on the individual level by creating an additional channel of action which is more accessible to many people these days.

Finally, we note the potential of the Internet, especially applications such as Facebook and Twitter, as a platform for organizing rallies and protests (Lister, 2011). This may be regarded as an ability to "scrutinize and criticize authorities", which Sen finds to be an important part of political freedom. The contribution of this platform to political change is argued by Morozov (2011): "Tweets, of course, don't topple governments; people do," this perspective reinforces Toyama, which views technology as a magnifier of human intent and which emphasizes the importance of humans behind (or in front of) the technology as opposed to technology as a free-standing solution to fit any condition. Furthermore, as governments invest significant efforts in controlling the Internet and ways to bypass these controls keep coming up, Morozov suggests that political freedom may need a political solution rather than a technology race; yet the former is more challenging to achieve.

2.2 Economic facilities

Economic freedom as expressed by the free market is, according to Sen, extremely important to development. Yet, he adds that the market mechanism is important only once the freedom of interchange (words, goods, and gifts) is acknowledged. Sen echoes Adam Smith in viewing "freedom of exchange and transaction" as "part and parcel of the basic liberties that people have reason to value." He mentions two crucial challenges in developing countries: access to product market and open labor market.

The Internet provides a platform for markets as well as for economic growth. The connection to traditional goods varies: from eBay (2012), where anyone could open a shop selling real or virtual products, to Second Life,⁶ which created the first real-life millionaire from virtual goods.⁷ Moreover, Weber and Bussel (2005) emphasize the importance of the Internet in reducing transaction costs as well as facilitating interaction between owners and buyers.

Besides products, services are also sold online. Sites such as www.rentacoder.com enable people to bid for software development, and software developers from around the globe offer their services (more than 60,000 such developers are registered from India alone⁸). This opportunity may give some advantages to software developers from the developing world who can afford lower wages.

In addition to online market for product and services, the Internet is a supporting platform for traditional markets. By enabling effective communication to bridge geographical and cultural gaps, the Internet has the potential to support and nourish small local business in developing regions. Sen emphasizes that the freedom to participate in economic interchange has a basic role in social living. Therefore, the value of the Internet to this freedom should not be measured solely by profit gained. Nevertheless, the potential of the Internet to improve economic freedom should be treated cautiously, keeping in mind Toyama's (2010) claim

regarding the myth that Internet access makes the world flat and allows equal opportunities in a globalized world. Rather, Internet access is a magnifier: it can grow seeds that are already planted, but by itself would probably not make a poor, rural farmer into a successful entrepreneur.

Another area considered beneficial to economic development is microfinance. While such marketplaces exist offline, the Internet appears to make these more efficient. The implementation and operation costs of online microfinance markets are low, making the barrier to entry for smaller and localized organizations easier to surmount while also making smaller loans viable. In addition, personalized and often direct connection between lenders and borrowers becomes a reality, leading to increased diversity of both lenders and borrowers (Bruett, 2007; Mohan & Potnis, 2010). Nevertheless, just as traditional banks exclude some populations, as do offline microcredit marketplaces (Kabeer, 2001), we expect that Internet-based solutions may similarly exclude populations. Especially worrisome are exclusions based on the type of business as they may influence borrowers to engage in businesses that are easier to micro-fund.

2.3 *Social opportunities and societal freedom*

Social opportunities, as defined by Sen, go well beyond opportunities for social interactions to include “the arrangement that society makes for healthcare, education, etc.” Therefore, social opportunities provide better living but at the same time enable other freedoms; for example, literacy, provided through universal education, enables a person to read newspapers and thus obtain jobs which require literacy, enhancing both political and economic freedoms.

In thinking of social opportunities online, the immediate connotation would be to social networking and its influence, as described under Political freedom; nevertheless, keeping in mind Sen’s definition of social opportunities, which indicates some organizational or structural advantages of a society, gives this freedom a much broader coverage online. To avoid a narrow understanding of Sen’s social opportunities online, we will refer to it as “societal freedom” – people’s accessibility to organized solutions for better living. When questioning the relevancy of the Internet to societal freedom of the poor, we make a distinction between formal and informal social freedoms. The formal social freedoms are provided or recognized by the state, while the informal ones are created by local initiatives or individuals and are not certified in any way.

Internet for formal and informal education. Universities and colleges publish admission information online, which is especially beneficial to people from rural areas for whom physical distance may hinder their ability to even consider these options. Additionally, some educational institutes offer the pursuit of formal degree online. When it comes to informal education, the Internet offers unparalleled wealth of opportunities and makes access to information simple and affordable.

Internet for health. Similar to the education sector, formal and informal opportunities exist for healthcare. Collaborative projects such as that of Aravind Eye Hospital and TIER group from UC, Berkeley, which leverages Internet Protocol (IP) infrastructure to allow remote medical diagnosis, improve access to formal healthcare for rural communities (Surana et al., 2008).

As for informal access to healthcare, the wealth of medical information online allows for specific search as well as interaction with professionals and other users. This wealth of information may also have disadvantages, given that reliable information is hard to distinguish from unreliable one. Therefore, the Internet seems to have greater potential when formal and informal systems are combined, such as a system in which informal healthcare information

provided to the community through a local, human healthcare provider or a formal healthcare provider gives some degree of online consultations to online users.

2.4 Transparency guarantees

Sen's transparency relates to "the freedom to deal with one another under guarantees of disclosure and lucidity." Transparency guarantees can play an instrumental role in preventing corruption, financial irresponsibility, and other forms of underhanded dealing.

The Internet can increase transparency both directly and indirectly. On a direct level, when using the Internet for administration (e-governance), it may reduce direct human contact and the ability of government employees to demand bribes. On an indirect level, the Internet offers freedom to report and expose and to increase public awareness contributing to transparency. Sites such as WikiLeaks (2012) recently reminded us of the Internet's potential in this regard. Many variations for sites illuminating governance and the public sector exist with growing popularity and influence.⁹ Of note is the large-scale Information and Communication Technology for Development (ICTD) initiative – Bhoomi, in the state of Karnataka – India, to computerize land records and thereby improve both economic transparency and political transparency (Parthasarathy, 2004). Nevertheless, recent studies suggest that the Bhoomi program offers ample opportunities for corruption (Thomas, 2009) and "it could be that e-government leads corruption to migrate elsewhere in the economic system" (Andersen, 2009).

Apart from the public sector and governance, we believe that the Internet may also contribute to transparency in the private sector, especially in the context of financial accountability and reporting,¹⁰ which connects strongly to economic freedom as described previously.

2.5 Protective security

Protective security is "a social safety net for preventing deprived population from being reduced to abject misery." Sen refers both to "fixed institutional arrangement such as unemployment benefits and statutory income supplements" and to "*ad hoc* arrangements such as famine relief or emergency public employment." He concentrates on the institutional level of security as a social tool to prevent poverty.

Insurance programs, especially health insurance, whether private or public, hold a potential to prevent people from falling into poverty (Ruger, 2007). As access to these securities via the Internet is growing worldwide, it may improve protective security of people who otherwise face difficulties in establishing a face-to-face meeting with a broker, especially in rural communities. Furthermore, the Internet may play a role in increasing the awareness to such offerings, while also facilitating affordable means for brokers to manage portfolios, obtain training, and recruit additional resources.

As for *ad hoc* arrangements, we observe the critical role of the Internet in disaster recovery and suffering alleviation (Summer, 2010), especially wireless networks that may not only survive through some disasters but also present a viable choice for rapid post-disaster deployment.

2.6 Freedoms – conclusions

Sen's instrumental freedoms offer a high-level understanding of the overall aims of development. As Sen notes, these freedoms are tightly interconnected and their means and influences are hard to separate. This is similarly true with the Internet, which has a wide-ranging influence on all freedoms.

The Internet can potentially enhance freedom; however, it can also allow for freedom restrictions emphasizing the importance of human/institutional intent (Toyama, 2010).

Freedom, according to Sen, requires the process to allow freedom of action and decision as well as the actual opportunities to implement these freedoms, considering the specific conditions of different people. That is, if a highly qualified doctor exists in a village but most people cannot afford his services, the process is there but the opportunities are lacking. In the following section, we take a bottom-up, induction approach and evaluate the actual use of the Internet by local people. As we have established the potential of the Internet as a process to enhance freedom in this section, the next section will examine which opportunities for human freedom development are mostly supported by Internet use. The use of Sen's lens to evaluate and quantify the influence of the Internet-based ICTD projects is a unique and important step in understanding technology from Sen's holistic freedom point of view.

3. Internet as freedom – a quantitative approach

In this section, we analyze web usage logs from the AirJaldi network in rural India, collected over 8 months. We hope to gain insight into the process of freedom enhancement through quantitative analysis of how users in a rural area of a developing nation are using Internet access. Though some similar studies which have analyzed Internet traffic in developing regions exist (Du, Demmer, & Brewer, 2006; Pal et al., 2006), these studies did not consider usage behavior from Sen's freedom perspective. Using Sen's framework as a mechanism to evaluate the development impact of ICT projects offers a broader perspective on these interventions.

3.1 *AirJaldi and the Dharamsala wireless network in a nutshell*

AirJaldi is a social enterprise harnessing wireless networks for the empowerment of rural communities in developing countries. Thanks to deregulation of some wireless technologies, and the resulting widespread introduction of low-cost wireless networking products, AirJaldi can integrate these products into economically and technically viable networks.

At the time of sampling, serving approximately 10,000 users over a 70 km radius, the network had become financially viable and technically sustainable, based on a cost-sharing model. The objective of AirJaldi is to further develop the technology and the revenue models needed to successfully replicate and scale the solution to other deprived rural communities in India and other developing nations.

Dharamsala is the headquarters for the TGiE. This unique community has attracted many NGOs to set roots in the area, along with numerous monasteries, schools, medical facilities, and other services, as well as a constant influx of tourists. These unique social and economic characteristics were enablers for the rapid network growth and possibly the main catalysts for its creation, though they do not represent typical rural areas in India.

3.2 *The data set*

Web-traffic logs were collected from September 2007 to April 2008 from the whole AirJaldi network, including more than 2100 computers serving an estimated number of 10,000 users in schools, monasteries, nunneries, medical clinics, and various NGOs. We emphasize here that protocols other than HTTP are not included in our logs. For example, network traffic using HTTPS, a common protocol used by banking sites or others sensitive exchanges, is not shown, which could explain why we have not seen any online-banking access. To protect users' privacy, the IP addresses of the client computers were removed from the logs prior to

processing. These large log files were processed using numerous text-parsing tools and analyzers, chief among which is Cyfin Reporter, a commercial logfile analyzer. We used Cyfin to produce a report ranking the top 1000 most visited websites.

It is important to note that a single visit is defined as the set of traffic exchange between a client and a web server over the maximal duration of 30 minute. Hence, even if there were hundreds of such object exchanges during a 20 minute time frame, these would count as a single visit, and hundreds of such exchanges over 35 minutes will count as two visits. For further clarification, if a user spent 25 minutes browsing different directories under www.berkeley.edu, for example, <http://www.berkeley.edu/about/> or <http://www.berkeley.edu/sports/>, these will count as one visit. Yet, if he or she visited different sub-domains of Berkeley.edu, for example, <http://www.ced.berkeley.edu/> or <http://www.eecs.berkeley.edu/>, each of these will count as one visit whether he or she spent 3 or 29 minutes in each. Longer than 30 minute visits will count as one visit for every 30 minutes spent.

3.3 *Categorization*

As a first step, we had to categorize each URL into a relevant category. Though the reporting tool automatically categorizes some of the URLs, these categories were mostly created for tasks such as monitoring web access of employees in a corporate environment. Other existing databases attempting to categorize Internet sites do exist, yet these are mostly aimed at the creation of black-lists and other security-related limitations and are ill-suited to our study for the following reasons:

- Over 30% of the URLs in our top 1000 report were uncategorized.
- Existing categorizations do not suit our search for opportunities; they are focused mostly on what is considered negative usage of the Internet.
- Since most of these lists are made for Western-based consumers, it is unclear how much of the local (Indian, Tibetan, Chinese, etc.) content is categorized within these lists.
- Mistakes are common with automatic categorization – for example, <http://www.indianrail.gov.in> was categorized under government though it is used for finding information about train schedules and purchasing tickets and, therefore, should fit the “transportation” category.

We note a potential limitation with the decision to analyze the top visited sites over a random sampling. Although the top 1000 accounted for 85% of all visits, there would be visits that fall under the radar and not be assessed. Such visits may well be to sites uniquely valuable from a freedom enhancement perspective, yet would be missed in our report.

We, therefore, decided to create our own list of categories and manually categorize the top 1000 most visited URLs. The list was created to fit the freedoms based on Sen’s view, yet adjusted to fit the Internet diversified nature. Without these adjustments, it felt as shoe-horning Sen’s freedoms onto the data set, when often these are too wide or too narrow for the various Internet sites. We, therefore, devised a list of slightly different freedom categories, based on Sen’s freedom ideology, yet which expresses the Internet activity more closely. This methodology fits the “Essentialist” theory of classification (McKelvey, 1982) as it relies on the few main characteristics of the otherwise highly diversified websites.

We acknowledge the limitations of this method; yet relying on URL data alone may mask the layers of each activity. To further clarify, richer categories such as communication are separated from more specific ones such as education. While the lack of detailed data may create a superficial picture of the online reality, it gives an understanding of the freedoms affected directly by the use of the Internet and allows the reader to gauge where and how broader potential for influence may exist. Table 1 presents the correlation between Sen’s freedoms and our ICT-freedom taxonomy.

Table 1. "ICT-freedom" taxonomy.

Sen's freedoms	"ICT-freedom" categories	Examples
Economic freedom	Economic (and economical transparency)	Shopping, selling, financial news, etc.
Political freedom	Political and transparency	News websites, official government websites, etc.
Transparency	Protective security	Insurance, disaster relief
Protective security	Transportation	Flights, railways, etc.
Social opportunities/societal freedom	Education	Schools, universities, academic search websites
	Entertainment	Games, music, videos
	Social networking	hi5, Facebook, photo-sharing, etc.
	Communication	Webmail, chat
Unmatched by Sen. Often completely of technical nature or too broad to match a single category	Active technical	Visits to software company websites
	Unknown	Any unrecognized URL
	Passive commercial	Pop-up advertisements
	Passive technical	Automatic software updates
	Search	Google and other search engines

3.4 Results

The top 1000 visited URLs that we analyzed represent 2,934,578 visits out of 3,461,977 visits recorded throughout the period, accounting for nearly 85% of all websites visited. Figure 2 shows the distribution of the visits according to the ICT-freedom categorization.

3.4.1 Communication

The highest use of HTTP traffic was under communication category. These include chats and email access through webmail applications. Since most of the computers in the AirJaldi network are shared computers, most users will use webmail services for reading email; yet it is clear that the traffic that we monitored does not represent all email traffic as many users do use email client software and that traffic does not appear here. This is true for non-web-based

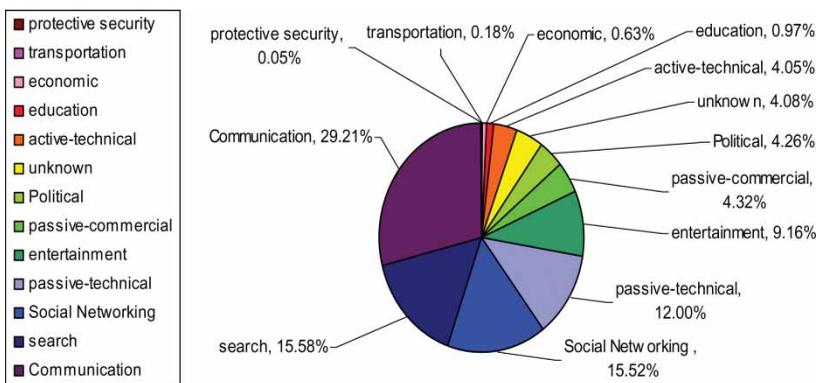


Figure 2. Distribution of visits using ICT-freedom categorization.

chat traffic as well. Therefore, we expect communication to account for a much larger percentage of the overall traffic.

3.4.2 *Search engines*

More than 15% of the visits were to various search engines and portals. Similar to communication, search engines can enhance many kinds of freedoms, depending on the terms searched, and they were, therefore, left as a separate category. Commonly, most of the searches resulted in a visit to websites which are later further categorized. This number is a bit lower¹¹ than that found by Du et al. (2006) in data monitored in Cambodia (with 26% of traffic to portals) and Ghana (with 20.70% of traffic to portals). Google.co.in and Google.com are the most popular search engines used by AirJaldi users with 92,858 and 64,776 visits respectively, resulting in ranking them as the fourth and fifth most visited URLs among all categories. Yahoo is ranked as the seventh most visited URL with 57,085 visits. Similar to the findings reported by Du et al. (2006), non-USA-based portals were less extensively used (rediff.com with about 4600 visits and Sify.com with about 380 visits, both India-based companies; several China-based portals were also found).

3.4.3 *Social networking*

This type of content is nearly as common as search engines, with 15.52% of the visits. By far, the most popular social networking website is Hi5.com, which is the second most visited URL from any category with 256,313 visits, representing nearly 60% of the social networking visits analyzed and 7% of all visits monitored. Other traffic under the social networking category is related to image-sharing (<http://www.flickr.com>¹² with 11,146 visits), general personal webpage creators (e.g. googlepages.com with nearly 24,000 visits), greeting cards, pages, etc. There are some India-based social networking sites; yet these represent a small percentage of the traffic (e.g. <http://www.ibibo.com/> with 1750 visits). As noted, social networking today is used for a variety of activities, from communication with friends to political and commercial organization. Our data set cannot follow as to how social networking is being used; such an analysis may require a separate research.

3.4.4 *Passive technical*

This category represents 12% of the visits made for automatic updates of software. These include MS-Windows updates, antivirus updates (with most visits to eset.com, a free antivirus software – NOD32), and other applications. Surprisingly enough, the most visited passive technical website was the Yahoo toolbar, a toolbar by Yahoo which plugs into web browsers. The plug-in allows Yahoo to collect information about the users. In the AirJaldi network, it was ranked as the third most visited URL (<http://us.update2.toolbar.yahoo.com/> with nearly 103,000 visits). Important to note is that the traffic volume generated by these visits is higher than 12% of total traffic, demonstrating how ill-suited some Internet services are for rural locations where bandwidth is scarce and costly (Ben-David et al., 2011).

3.4.5 *Entertainment*

Entertainment-related URLs accumulate more than 9% of the visits. These include video websites (e.g. YouTube with 61,000 visits, Crackle with 49,000 visits, and Google video with nearly 18,000 visits), radio websites (Yahoo radio with more than 13,000 visits), gaming websites (game.com, most popular with more than 8000 visits), and sports-related websites (<http://www.cricbuzz.com>, a Bangalore-based cricket information site with 2500 visits), as well as some

pornography websites (12,000 visits), which do not represent real demand as pornography is mostly filtered by the AirJaldi network.

3.4.6 *Passive commercial*

This category includes advertisement pop-ups from different websites and accounts for 4.3% of the visits. These advertisements are mostly irrelevant to AirJaldi subscribers. This number is lower than 10% and 11.6% of the advertisement requests presented by Du et al. (2006) in data taken from Cambodia and Ghana. This may be due to ads-removal technologies tested by AirJaldi during the sampled time period.

3.4.7 *Political and transparency enhancing content*

The political and transparency category is the main reason which brought us to manually categorize the data. Situated in Dharamsala, AirJaldi serves mostly the Tibetan community in exile. Much of the Internet content created by many NGOs in the area has to do with servicing the Tibetan community and preserving the Tibetan identity. It is, therefore, that the political category includes not only the automatic category of news and media (with the highest rank being given to <http://news.google.co.in> with 5500 visits) but also more than 40 different URLs dedicated to different aspects of the Tibetan community in exile. These sites are mostly categorized as “others” by the automatic software reporter, but they, in fact, represent the ability of the Tibetan community in exile to preserve a political identity through the Internet without having a formal international political recognition. The most common Tibetan website is <http://www.phayul.com>, a Tibetan portal, with more than 14,000 visits ranked 29 among all the visited URLs in all categories. Such a portal, beyond being a gateway to Tibetan-related content including news, radio, and shopping, is also a gateway for many Tibetans to the whole Internet. It directly represents political Tibetan interests. Other Tibetan contents include anything from the official website of the TGiE (<http://www.tibet.net> with more than 5700 visits), to Tibetan schools, monasteries, NGOs, to a website dedicated to the Miss Tibet beauty pageant with the declared objective that “Young Tibetan women deserve the chance to be seen as part of their traditional culture and also beyond their culture, as contemporary, modern young women.”¹³ Such content was, therefore, placed under the political category though its freedom influence can be debated.

3.4.8 *Uncategorized content*

A little more than 4% of the visits were still categorized as unknown. These websites were not found and we believe that they mostly represent Intranet access within the AirJaldi network itself to local servers of different organizations using the network (Intranet traffic within the Dharamsala wide area network). Other unknown websites are Chinese websites which we could not recognize.

3.4.9 *Education*

Only much less than 1% of the visits could be directly categorized as education. Under this category, we included reference sites (e.g. <http://books.google.com> and <http://books.google.co.in> with together nearly 6500 visits; <http://en.wikipedia.org/> with 3689 visits; <http://maps.google.com> with 2900 visits; etc.) These websites bring different aspects of informal education where people can acquire knowledge in any field. In addition, we also found that the Internet is used in assisting users to get to formal education opportunities, under which we included

263 visit to Delhi university, nearly 700 visits to <http://www.ets.org/>, a non-profit organization organizing all tests (GRE and TOEFL) required to enter higher education institutions, and we also found 1024 visits to <http://www.cbse.nic.in> – The central board of secondary education in India. Based on these results, it seems that though WWW access mostly enhances informal education, it does influence, to some extent, the formal educational opportunities as well.

3.4.10 *Economic content*

The economic category includes financial and commercial enhancing websites. We found that 0.63% of the visits fit under the economic category. The highest ranked website (ranked 96 among all URLs in all categories with 4296 visits) is <http://eforexindia.com>¹⁴ – an India-based platform for managing financial tools as well as providing financial information; <http://in.finance.yahoo.com/> had 2671 visits, and <http://www.nseindia.com/> – the National Stock Exchange of India – had 410 visits. Other websites include shopping sites, for example, <http://shopping.yahoo.com/> with 476 visits, as well as India-based shopping sites such as <http://www.futurebazaar.com/>. Unfortunately, based on these data alone, we cannot know whether these websites are used for actual purchases or for a price comparison which could be regarded as economic transparency. We also found 391 visits to <http://my.monsterindia.com/> – an India-based job-listing website – which can enhance job-finding opportunities. We did not find within the top 1000 URLs almost any commercial company selling widely distributed products from food and drinks to cars or motorcycles. We did find 749 visits to <http://www.aeceuro.co.uk/> – a UK-based company selling generators and power supplies – but no visits to any other commercial international or local companies. We also did not find within the top 1000 visited URLs any websites of banks, though we know that several Indian banks, including some with branches in Dharamsala area, provide online services. As mentioned earlier, the reason for this might be that the logs did not include encrypted traffic such as HTTPS; nevertheless, Al Sukkar and Hasan (2005) suggest that cultural aspects affecting trust of users in online banking should also be considered.

3.4.11 *Transportation*

Transportation achieved 0.18% of the visits, which include 1200 visits to <http://www.indianrail.gov.in/> – Indian Railways Passenger Reservation Enquiry – as well as 1125 visits to the Indian Railway Catering and Tourism Corporation,¹⁵ <http://www.irctc.co.in>. In addition, we found 816 visits to <http://www.makemytrip.co.in/> and other websites for inquiring and buying national and international flight tickets online. We also found 267 visits to <http://www.godubai.com/>, a website with information about Dubai, which may represent people inquiring about the possibility to go there for work (the top 1000 websites did not include tourist information about any other destination).

3.4.12 *Protective security*

Finally, 0.05% of the visits were categorized as protective security. These include only three URLs with a total of 1363 visits to insurance-related websites: 593 visits to <http://www.licindia.com/> – Life Insurance Corporation of India, which is the government-owned company's portal for its agents – as well as two other insurance companies (517 visits to <http://www.bajajallianzlife.co.in/> and 253 visits to <http://www.iciciprulife.com/>). This indicates the penetration of protective security tools into this rural community.

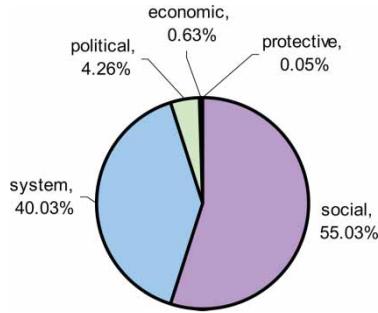


Figure 3. Distribution of visits based on Sen's freedoms.

3.5 ICT-freedom categories and Sen's freedoms

As communication can be used to enhance different freedoms, we left communication as a separate category in the ICT-freedom classification. Nevertheless, when matching the data with Sen's categories, we assumed that the freedom to communicate would primarily fall under social freedom as Sen defines it, although it may also contribute to political or other freedoms. Social networking, while used to facilitate social connection between people, may also have commercial or economical motives and could also be used to support political freedom, as was shown in the qualitative analysis in Section 2.1.

Figure 3 shows the distribution according to Sen's freedoms, a broad picture of Internet use in which 40% goes for maintaining the system itself and 60% mostly used for social freedoms. Despite social interaction accounting for the majority of traffic and though economic freedom and protective security seem to be underused in comparison, it should be noted that 0.05% of the use means 1363 different visits of half an hour or less duration to a single website (in this case, insurance companies). Albeit the low number of visits in some categories, the fact that the Internet is used, to some extent, for enhancing all freedoms supports its importance as an opportunity enhancer.

3.6 Data granularity – top 100, top 500, and top 1000 visits

Given that the top 1000 most visited sites resulted in 85% of all visits, we opted to base our study on this methodology, favoring quantity over granularity. An interesting alternative would have

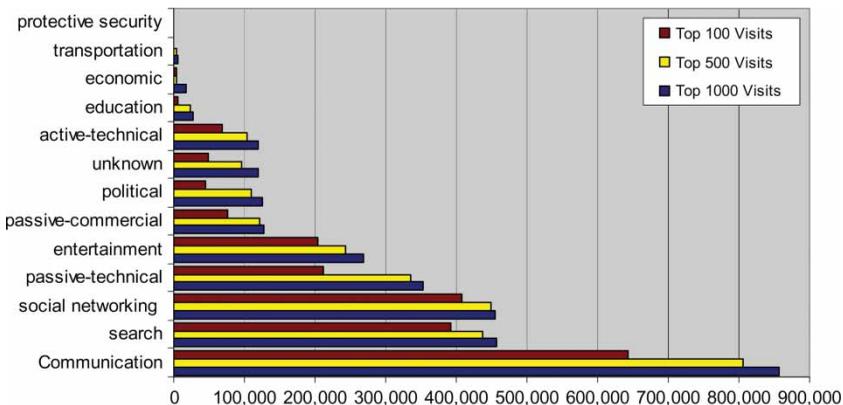


Figure 4. Distribution of visits for all categories, in the top 100, top 500, and top 1000 ranked URLs.

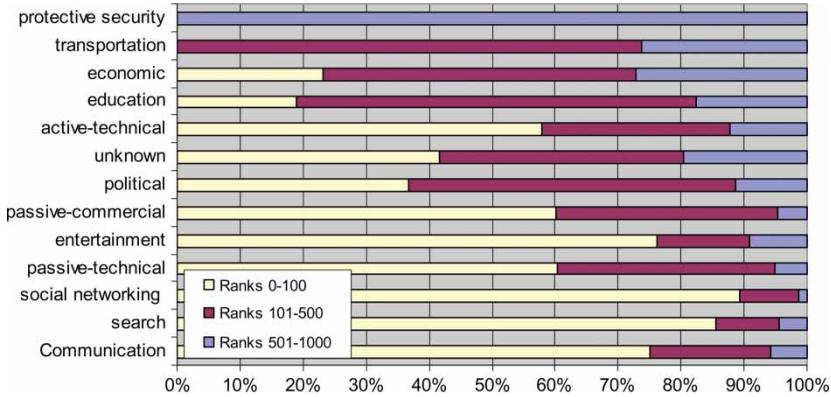


Figure 5. Distribution of visits for all categories, in the top 100, top 500, and top 1000 ranked URLs, presented out of 100%.

been to randomly sample a similar number of destinations, yet which would have resulted in a smaller percentage of all traffic. We, therefore, discuss our top-visit approach and especially note categories of importance that may have gone under our radar.

We compare the results from the top 100 used URLs to the top 500 and the top 1000 URLs. Figure 4 shows the results of this comparison.

Looking at the changes between the categories in correlation to the number of visits shows minor differences (Figure 4). Yet plotting the top 1000 visits in each category as 100% and looking at how much of these were found in the top 500 and 100 reveal interesting differences (Figure 5):

- (1) Some categories, such as protective security, start to show up only when looking at the top 1000 visits, indicating that many qualitative visits never cross the top 1000 threshold, yet are instrumental to freedom enhancement substantially more than the leading entertainment sites.
- (2) Some changes in the relative order of the top categories do occur at different levels. For example, when looking at the top 100 and the top 500 visits, social networking scores higher than search engines; yet when looking at the top 1000 websites, search engines scored almost the same as the social networking.

4. Conclusions and future work

In applying the broad and qualitative definitions of Sen’s freedoms to the detailed, quantitative usage logs, we contribute an ICT-freedom taxonomy that could be useful for the evaluations of ICTD projects. As in any classification process of this kind, our taxonomy introduced simplifications and generalizations. Using Sen’s freedoms as the basis for the classification of Internet usage logs reveals that Internet use touches all of Sen’s freedoms. In addition, the ICT-freedom taxonomy reinforces Sen’s perspective regarding the interconnection and mutual influences between these freedom categories. Moreover, attempting to divide the various websites into particular taxa often appears to oversimplify the nature of the Internet. In order to address these issues, a number of strategies are proposed as future work:

- *Longer temporal breadth*

Conducting a similar study using data of greater temporal breadth (2007–2011, for example) will expose developmental trends in Internet use as evaluated in the context of Sen’s freedoms. Naturally, one would need to account for the growth of the AirJaldi

network both in the number of users and in their greater diversity beyond the previously dominant Tibetan-related community.

- *Location-based comparison*

Exploring the previous aspect further, we feel that a comparative cross-cultural study would be of interest. This may include comparison between rural and urban use in India and rural use in different locations around the world. Such analysis, especially if supported by interviews, may reveal limitations and cavities in Internet use in different regions or may give insight into the varieties of freedom priorities and freedom needs.

- *Cross-discipline analysis*

We feel that further study using social science research methods such as interviews and questionnaires could reinforce the empirical results presented here. Such research could reveal the subjective understanding of the Internet and freedom by the users themselves, as well as the benefits and drawbacks of the Internet to freedom as seen by both users and non-users of the Internet in this area.

- *Internet as freedom vs. other sources for freedom*

As mentioned, the findings as presented in Figure 3 show heavy use of the Internet for social freedom. Due to the lack of quantitative data about the influence of non-Internet-based human activities (how people are spending their time) on freedom, we cannot say whether our findings are unique to the Internet or are a reflection of the life priorities in this area. Further ethnographic methods such as observations could answer questions such as: Are people spending more of their day time on activities that enhance economic freedom or social freedom? Are these priorities of time-spending based on location, culture, or other characteristics? Does the Internet reflect these priorities or do people use the Internet to compensate for their (non-Internet) life priorities? (For example, does their use of the Internet for social freedom compensate for the long hours they must spend at work to enhance their economic freedom?)

These questions are intriguing as they reflect the value of Sen's perspective in understanding human development by evaluating the things that enhance or hinder a comprehensive set of freedoms.

4.1 Breadth of freedom – directions for decision-makers

In Dharamsala, the Internet is used for a variety of activities encompassing all of Sen's freedoms. However, a comparison of this usage with the Internet's potential for freedom enhancement as discussed in Section 2 leaves much to be desired. The substantial use of the AirJaldi Network in Dharamsala to enhance social freedom supports the findings by Pal et al. (2006) in the research of the Akshaya e-centers. According to Pal et al., "people tend to use Akshaya centers for things such as communications, entertainment, and file transfer – none of which are missions critical to livelihoods". In their conclusions, Pal et al. describe this as a source of frustration they encounter in people involved in telecenters. They state that "it is still unclear how and if applications seeking to improve local livelihoods can be successful."

By applying Sen's freedom categories to Internet use, this study sheds light on the strength of the Internet as a whole. Since the Internet is often used for purposes other than improving livelihood – Sen's economic freedom – Internet-based ICT4D projects focusing on livelihood, or similar narrow objectives, may often appear to fail if evaluated using these narrow metrics. It is, therefore, important for decision-makers to observe the Internet-based ICT4D projects through Sen's freedom lens and to evaluate projects based on these broad freedom goals rather than on narrowly focused development goals. We hope that this first evaluation could set the foundation for other ones to follow.

Notes

1. Our work is primarily based on Sen's *Development as freedom*. Therefore, when we relate to Sen's view, we consistently refer to this reference.
2. Ullrich gives the example of the car that requires physical infrastructure from roads to ambulance service and even lawyers, as well as the psychosocial infrastructure which requires from people to confront all the installations, facilities, and institutions from driving lessons, training children to cross the street till an expert and diligent industrial worker who also need more schooling and disciplining . . . (Sachs, 1992, p. 285).
3. AirJaldi will be discussed in Section 3.1. For details about the technology, see Ben-David, Vallentin, Fowler & Brewer, 2010.
4. Source: The OpenNet Initiative; A collaborative partnership with the University of Toronto, Harvard Law School, the Cambridge Security Program, and the Oxford Internet Institute (OpenNet Initiative, 2012).
5. Tibetan Government in Exile's official website: <http://www.tibet.net/> – though without a root domain like .tb. In the recent opening of the new root domain .asia, AirJaldi was the first to register Tibet.asia; yet after a short legal challenge, it was awarded to Beijing.
6. A Multi-user virtual world: <http://www.secondlife.com/> (Linden Research, Inc., 2012).
7. BusinessWeek cover article "Virtual World, Real Money" published on 26 November 2006 and Hof's (2006) article in that issue, as well as Roger Parloff's (2005) article in Fortune Magazine: "From Megs to Riches".
8. A search on <http://www.vworker.com> on 10 January 2011: Search Coders – Result (Exhedra Solutions, Inc., 2012).
9. An example from the USA: <http://www.maplight.org/> illuminating the connection between political campaign donations and legislative votes in the US Congress (MapLight, 2012).
10. An example from India: the eChoupals give farmers economic transparency by better access to market prices (Kumar, 2004).
11. We note that the much smaller data set given by Du et al. could get skewed easily – for example, by setting the home page of the browser to a search engine, especially, in a highly multi-user environment where the browser gets re-launched often.
12. ibibo.com's mission is to "To empower Indians to create, share and discover people and information", ibibo.
13. Objectives Miss Tibet. <http://www.misstibet.com/aboutus/>. (Miss Tibet, 2012).
14. We speculate that this website may be set as the home page for some of the foreign-exchange offices around Dharamsala – somewhat explaining the high hit rate.
15. This site has advertisements that are linked from the popular indianrail.gov.in; therefore, the number of hits should be similar (or a bit less assuming interrupted page loads).

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