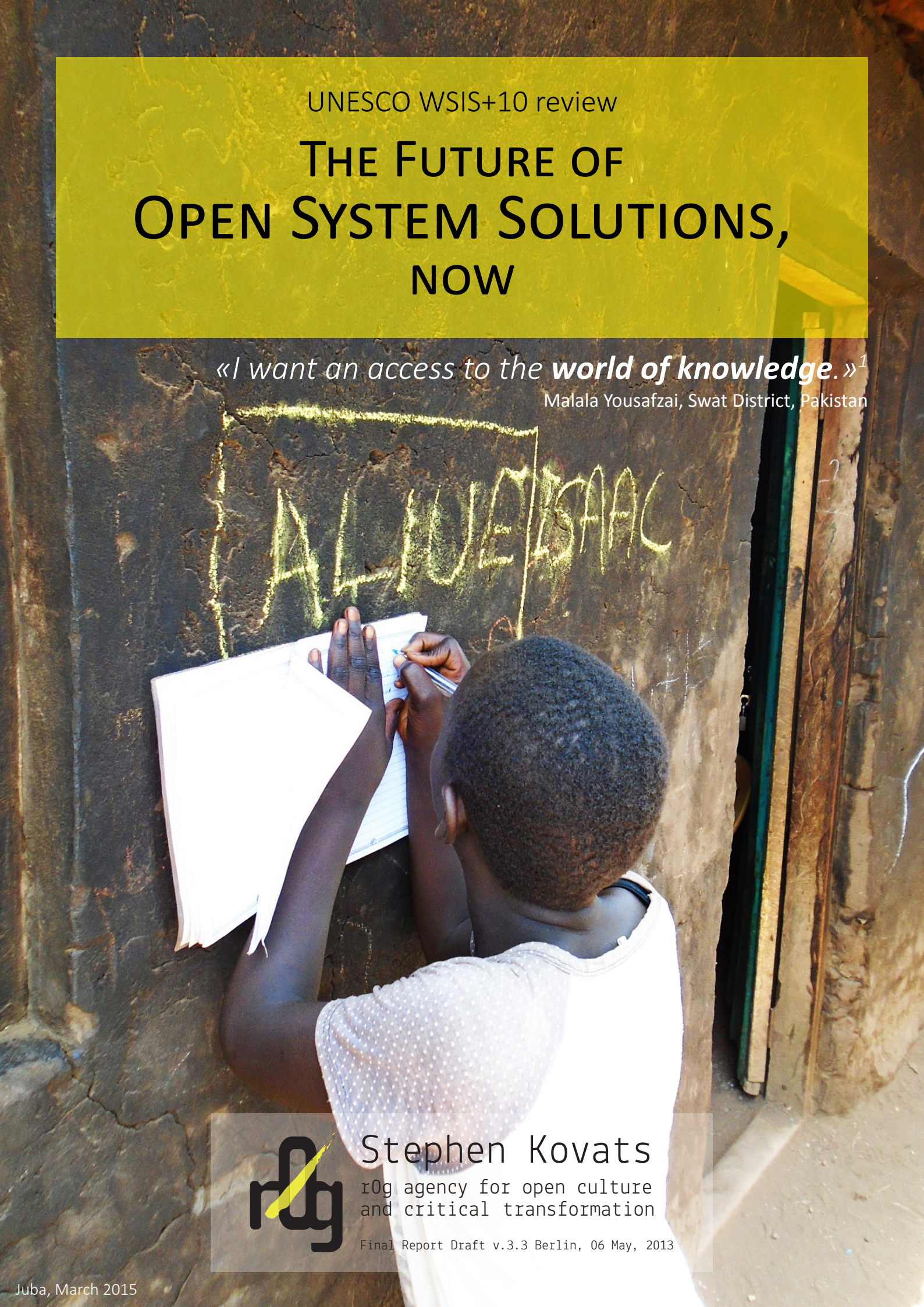
UNESCO WSIS+10 review

The Future of Open System Solutions, now

*«I want an access to the **world of knowledge**.»*[1]

Malala Yousafzai, Swat District, Pakistan



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Abstract

The aim of this report is to provide an overview and analysis of WSIS Action Line C3 'Access to Information and Knowledge', with regards to the effects and applications of free and open ICTs and their related methodologies, referred to hierupon as 'Open Systems' on mitigating the effects of four identif ied United Nations global challenge areas :

- Climate Change and Environmental Responsibility
- Access to Quality Education and Knowledge
- Post-Conf lict and Post-Disaster Response
- Gender and Minority Empowerment

The report focusses on action, implementation and connections between open systems solutions, particularly in regions of rapid societal and political transformation where simple access to technology and the internet are limited or infrastructurally challenged. It outlines the needs and means with which to interconnect a wide range of free and open ICT tools, frameworks, concepts and methodologies to create comprehensive open systems solutions to tackle the identified challenges.

The report encompasses three levels of detail. In the first or basis level, it introduces the leading concepts and historical frameworks behind the notion of 'open' that have emerged of the free and open source software (FOSS) movements, and their subsequent application in much broader realms of activity and social enterprise. It identif ies the open source model as one of sustainability and collaborative practice based on publicly available knowledge and content which in turn acts as a key resource to social development, freedom of expression and self-determination. As such it provides rationale for governments, communities and its citizens to recognize the value of open systems in addressing their development, education, ICT literacy goals and challenges.

The second level of detail links the defined notions of open systems to the actual implementation of solutions and strategies. It emphasizes the ways in which open systems help cultivate new competencies for citizens to access and participate in global knowledge societies, thus breaking down the lingering effects of digital divides and promoting greater equality in dialogue between South and North. Innovative cross-disciplinary cases studies that show the interconnectivity between the identif ied challenges and how open systems solutions, rapidly moving from policy theory to implementation fact, have the potential today to address the mitigation of some of the most complex problems, particularly in the contexts of international development.

The concluding segment regards the possibilities to create a comprehensive Open Systems Strategy for the newly independent state of South Sudan. Presented in the form of a very specif ic challenge that brings together the aims and elements of WSIS Action Line C3, applying these in an exemplary manner in which the international community has the opportunity to address the mitigation of deep-rooted conflict, bypassing the digital divide and helping set the scenarios for tangible freedom of expression and access to knowledge.

Seven recommendations are set forth to support universal and pro-active access to open knowledge and technology. As urgent calls to policy makers, the recommendations capitalize on the global acceleration of the technologies that have become the generators of prosperity and progress for many parts of the world. They emphasize the need to create comprehensive knowledge commons that, especially in conjunction with the rapid development of Open Educational Resources (OER) have the ability to become the‘libraries of the future’, today. The vast and cross-disciplinary forms of knowledge and content that have been generated by the collaborative enterprise that has emanated of network culture must now be reaped to support the active participation of all players in strong, open and pluralistic knowledge societies.

«I want an access to the ***world of knowledge****.»*[1]

Malala Yousafzai,
Swat District,
Pakistan

Introduction

This simple plea, penned by Pakistani schoolgirl and human rights activist Malala Yousafzai, a few days before she was shot by militant civil society opponents, sums up one of the greatest challenges faced by today's globalized media and communications society. She pleads not for the fundamental right to be able to go to school, not for the institution, but for the right to access the world of knowledge that lies just beyond her grasp. The statement graphically illustrates the basic problem of access to learning for many children worldwide. It points to the potentials of the vast resources for education, scientific research as well as social and economic development lying behind firewalls of fear and ignorance. It also signals the urgency attached to WSIS Action Line C3 'Access to Information and Knowledge' in in which UNESCO is the responsible facilitator, and to which governments are committed to provide freedom of access to public information and facilitate the technical accessibility to ICTs and the internet, especially for disadvantaged, marginalized and vulnerable groups.

A Slice of Open Evolution in the WSIS Process

In its efforts to promote and encourage global knowledge sharing and enabling unhindered and equitable access to the information that people around the world, be they urban citizens, remote rural land-workers, digital rights activists, policy makers or political representatives, UNESCO seeks to create a picture of the world of Open Systems ten years after the first World Summit on the Information Society – WSIS in Geneva in 2003, and its succeeding summit in Tunis in 2005.

This report, beginning with the core notion that the guaranteed and unhindered access to information and the sharing of knowledge are fundamental human rights, will explore specific and real results, degrees of implementation, successes and hindrances in the development of diverse ICT-led knowledge creation and dissemination scenarios. It will have a strong focus on social, political and cultural empowerment in regions that are experiencing the most rapid forms of societal transformation including Africa, Latin America, Central and South East Asia. Creating a clear picture of the world at WSIS +10, given the literal explosion of social media and the rapid expansion of Free and Open Source Software (FOSS) and its many related elements over the past decade is a complex task given the highly diverse global communities with often equally highly divergent agendas that are now actively applying 'Open' strategies. Alone the term 'Open Source' is no longer adequate when considering the vast realms of open technologies, and their concepts and methodologies – be they Open Data, Open Access, Open Education Resources (OER), Open Hardware, Open Design, Collaborative Digital Systems and Platforms, Device or Data Journalism[3], Free Culture, Sharism[4] and so on. For the sake of this report, and in order to better ref lect the true value, intentions and complex interconnections of open, publicly available and sharable information, data and knowledge, the inference here will be to the broader realm of Open Systems and Open Cultures, rather than strictly Open Source, unless we are specif ically discussing FOSS or related structures or methodologies.

Interaction between the UN's Four Challenge Areas

The Open Source model as a fundamental key philosophy has always been one of effective collaboration and innovative sustainability. Applying these elements to the broader view that an Open System provides, we are better equipped to address some of the UN's key global challenge areas:

- Climate Change and Environmental Responsibility
- Access to Quality Education and Knowledge
- Post-Conf lict and Post-Disaster Response
- Gender and Minority Empowerment

These key global challenges are themselves highly interdependent and as is the case with the 'systems' approach to the realm of Open Source, addressing one element of these challenges ultimately directly benef its or inf luences the others. This global paradigm of interconnectivity coupled with the desire and attitude to attain just, free and prosperous civil societies acting collaboratively and responsibly is a key element in both understanding and applying Open Systems Solutions. It would be potentially misleading, for example, to speak of the applications of open data for education without making the potentially resultant connections to environmental responsibility and gender empowerment that the use of open data can enable.

Open Systems : A Global Model for Access and Action

By the time the WSIS convened for the first time in 2003 the notion of 'Open Systems' had begun to be understood in numerous sectors of society as a much broader field of activity beyond the very technical and software-associated terminology of 'Open Source'. In science, academia, media and cultural theory, digital activism and the many emergent fields of data-based knowledge creation, Open Systems emerged as the signif ier of a new and uniquely sustainable form of collaborative practice. Systems based on the FOSS principles of free and sharable knowledge have application today in an inf inite spectrum of creative and innovative development. These have included such diverse realms as robotics (i.e. swarm intelligence technologies), navigation, geo-mapping and orientation (i.e. via locative media) to demographics and citizen response (i.e. via real time data polling and crowdsourcing). The notion of a source 'code' for computer languages and software platforms being open, i.e. freely available, distributable and

amendable without license – as a great deal of software code had been before the advent of the World Wide Web in the early 90's – was only one, albeit significant element of the 'open' realm. It was also felt by many of the pioneers of these ideas that since the word 'open' was diff icult to clearly def ine across sectors and in a philosophically appropriate way, that distinctions must be made between what had become known as the Open Source Movement, as opposed to that which should more distinctly be known as the Free Software Movement. The term Open Source could in fact be interpreted to mean software that had proprietary elements, or was not as free to use as intended. Richard M. Stallman, a leading Free Software pioneer, squared off the argument by making the distinction an ethical one:

«The fundamental difference between the two movements is in their values, their ways of looking at the world. For the Open Source movement, the issue of whether software should be open source is a practical question, not an ethical one. As one person put it, 'Open source is a development methodology; free software is a social movement.' For the Open Source movement, non-free software is a suboptimal solution. For the Free Software movement, non-free software is a social problem and free software is the solution.»[5]

This debate essentially put both sides of a very similar coin into camps based on ethics and ideology rather than making them partners in ethical creativity and macroeconomic jurisprudence. Stallman remarked that people are afraid of what they think is "free software", it makes them uneasy because "talking about freedom, about ethical issues, about responsibilities as well as convenience, is asking people to think about things they might rather ignore. This can trigger discomfort, and some people may reject the idea for that. It does not follow that society would be better off if we stop talking about these things."

And today we do talk about these things, more than ever before. The connections between ethics, sustainability, collaborative enterprise, freedom of choice and expression empowerment and self-determination are all elements beyond the basic questions of technical eff iciency within the philosophies of Free (or Libre) and Open Source Software (OSS). It is the fused worlds of FLOSS that have spawned so many 'open' and 'freedom-enabling' technologies, methodologies and movements. In turn these have their greatest impact where people are allowed to have simple access to them, and can adapt them for the particular situation in which they find themselves. This allows those global regions central to UNESCO's mission where basic ICTs, access to information, knowledge and data, are emergent practices to embrace and better understand the advantages and implications of such 'open' systems.

Defining 'Open'

For the sake of this report, the criteria of 'open' as defined by the Open Knowledge Foundation (OKFN[6]) 'Open Def inition' (Version 1.1)[7] will be followed. This def inition, created shortly after the inception of the OKFN in 2004, is based in large part on the Open Source Def inition set out by the Open Source Foundation in 1998[8], but covers a much broader realm than software to include the carriers of knowledge in general including:

- Content such as music, films, books
- Data be it scientific, historical, geographic or otherwise
- Government and other administrative information

Brief ly summarised, this def inition of 'open' entails a work whose manner of distribution satisfies the following conditions[9]:

1. Access The work shall be available as a whole, without limitation of access by indirect means, for example by only allowing access to a few items of a database at a time.
2. Redistribution The license shall not restrict any party from selling or giving away the work either on its own or as part of a package made from works from many different sources. No royalty or other fee for such sale or distribution is applied.
3. Reuse The license must allow for modif ications and derivative works.
4. Absence of Technological Restriction The work must be provided in such a form that there are no technological obstacles to the performance of the above activities.
5. Attribution The license may require as a condition for redistribution and re-use the attribution of the contributors and creators to the work.
6. Integrity The license may require as a condition for the work being distributed in modified form that the resulting work carry a different name or version number from the original work.
7. No Discrimination Against Persons or Groups The license must not discriminate against any person or group of persons or exclude them from the open knowledge process.
8. No Discrimination Against Fields of Endeavor The license must not restrict anyone from making use of the work in a specif ic field of endeavor, be they commercial or otherwise.
9. Distribution of License The rights attached to the work must apply to all to whom it is redistributed without the need for an additional license or non-disclosure agreement.

10. Must Not Be Specif ic to a Package The rights attached to the work must not depend on the work being part of a particular package.
11. Must Not Restrict the Distribution of Other Works The license must not place restrictions on other works that are distributed along with the licensed work.

How then do the interrelated 'Open' elements that make up comprehensive Open Systems contribute to the positive mitigation of the UN's four key challenge areas? How have governments perceived these challenges, what has been done to directly address them using FOSS and Open Systems methodologies? What have been the roles between those 'on the ground' in developing and implementing such solutions independently or in direct response to government initiative? How in fact have Open Systems themselves acted to open government itself, making it more transparent and accountable to the population?

Opening Knowledge and Education: struggles between crisis and vision

Unhindered access to shared knowledge is a key factor in cementing the fundamental right to quality education. In Malala Yousafzai's Pakistan, the numerous FOSS and Open Data initiatives that emerged in the late 1990's, and accelerated through the Geneva and Tunis WSIS rounds, have created a successful and commercially driven provision of internet services to a broad a segment of the population, both rural and urban.[10] A number of major programs and organisations formed in the period 2003 – 2005, such as the OSSFP: Free and Open Source Source Software Foundation, an independent FOSS advocacy group and the Open Source Resource Center (OSRC), set up by the Pakistan Software Export Board (PSEB), aimed at the widespread implementation of innovative FOSS and Open Systems programs to catalyze the widespread adoption of a truly open information and knowledge economy in Pakistan. While this development has undoubtedly contributed greatly to the high level of media literacy in Pakistan – Malala's shooting stresses the fact that access to basic education and knowledge especially for girls and women, remains a major challenge. Compounding this challenge, the organisations mandated by the government with research, development and advocacy of FOSS, OER and open systems as a major cornerstone of Pakistan's development have since disappeared[11].

Despite the turbulence in Pakistan's political establishment vis-a-vis FOSS and Open Access "there's much positive work which is liberal, progressive and for public benef it which tries to reverse the negative trends"[12] with the success in widely anchoring organisations such as B4A in Pakistan being one of these. "Media and new technologies, especially those that pronounce a FOSS direction weigh in on many conf licts and fault lines that run across Pakistan."[13] Digital culture advocate Yasir Husain points to a number of such fault lines such as dysfunctional school systems in which

open systems methodologies, open data, open access and FOSS are actively working together to improve the access to quality education, to help increase environmental awareness, especially among children.

As a member of the Greener Karachi Trust[14], a group that works to promote green living in Karachi, Husain has begun a collaboration with The Federation of Pakistan Chambers of Commerce & Industry (FPCCI)[15], a leading trade body, partnered with municipal government schools in Karachi to to develop a radical climate and environmental awareness program for the pro-active greening of 700 schools (over 700,000 students) through hands-on sustainable urban farming practice, IT and media development, access to environmental data, and environment auditing. Aimed at real ecological capacity building, adhering to ISO 14000[16] environmental management and impact standards, the 'Eco-Literacy Project for School Systems'[17] will re-generate interest about valuable lost practices (i.e. urban gardening), real time and space biodiversity as well as the value of an individual's carbon footprint with an intention to spread the education into the realm of the pupil's everyday life, extending the 'classroom' to the home and neighborhood. The project, divided into thematic sub-sections and elements such as 'The Learning Garden', 'Environment Improvement Projects' and 'Materials Development' is set to teach the relationships between urban life, pollution, resource management and natural ecosystems with their connections to the realities of climate change. Using open source platforms, tools, public domain data sets, DIY technologies – in some cases even open hardware and robotics[18] the initiative is an unique example of OER being applied, in perhaps one of the most challenging public education systems anywhere. It is estimated that of Karachi's 2700 public schools roughly 50% are completely dysfunctional.[19]

The forms of awareness the Eco-Literacy program is intended to cover include the increasing frequency of natural calamities – especially flooding which have been occurring in Pakistan. As living and threatening signals of climate change, the floods were, and remain, a graphic reminder of the interconnections between the natural and our built environment. For the first time in a major flood situation in Pakistan relief coordination was carried out by open source tools, crowdsourcing and public data using the Sahana Eden platform[20]. The Sahana Pakistan flood crisis management platform includes a complex multi-layered, real time and collaborative map with comprehensive information on the affected areas (including for example: damage, rescue equipment in use, requests, warehouses, shelters, dam status reports). The platform allows users including those directly affected by the flooding to request relief via SMS, find shelters as well as review reported incidents and potential errors in the information or data.

From Disaster Response to Real Time Crisis and Data Mapping

The Sahana Software Foundation's 'Open Source Humanitarian Platform' Eden[21] used in the 2010 Pakistan floods is based on a rapid deployment open source solution originally sought out and "developed by members of the Sri Lankan IT community in the immediate aftermath of the 2004 Indian Ocean earthquake and tsunami. The community of Sahana developers has since grown to include experts in emergency and disaster management as full partners in the software development process. This is extremely unique in the governance of software projects, and a unique strength of the Sahana Software Foundation"[22]. The Lanka Software Foundation (LSF)[23] was the first owner of the intellectual property making up Sahana software, and under its stewardship, Sahana software grew into a global free and open source software project supported by hundreds of volunteer contributors from dozens of countries. It has supported national and local authorities and relief agencies in their response to numerous large-scale, sudden-onset disasters globally in developing countries and as well as highly industrialised regions including rapid response earthquake and flood management in Japan, China, Peru, Bangladesh, Indonesia, Haiti, Pakistan, Chile, USA and New Zealand among many others[24]. In 2009 Sahana was spun off the LSI into its own non-prof it open source organisation, 'The Sahana Software Foundation' which now operates three primary channels of response[25]:

- Eden - flexible humanitarian platform to provide effective solutions for critical humanitarian needs management either prior to or during a crisis.
- Vesuvius - disaster preparedness and response for the medical community, contributing to family reunification and assisting with hospital triage.
- Mayon - emergency personnel and resource management, highly scalable to manage large numbers of events, persons and resources.

It is perhaps through mapping, crisis management and post-crisis relief, user driven and crowdsourced data that FOSS and Open Data solutions have become the leading disaster relief systems worldwide. Next to highly successful and innovative organisations like Sahana, Nairobi based Ushahidi has emerged as one of the world's leading FOSS organisations, creating software, platforms and interfaces for extremely user-friendly information collection, data visualisation and interactive mapping. Non-profit Ushahidi (meaning "testimony" in Swahili) prides itself with "building tools for democratizing information, increasing transparency and lowering the barriers for individuals to share their stories."[26] Begun as a website to map reports of violence in Kenya after the post-election fallout at the beginning of 2008, the Ushahidi platform anchored itself in the collaboration of Kenyan citizen journalists during a time of crisis. The original website was used to map incidents of violence and peace efforts throughout the country based on reports submitted via the web and mobile phones. The original website[27] had 45,000 users in Kenya, a fact that became the catalyst for the Ushahidi team to realize that there was a need for a platform based on this service, which could

be used by others around the world. Since 2008 Ushahidi have grown from an ad hoc group of volunteers to a focused organization that have spun off a rapidly growing and vast spectrum of crowdsourced and independent data mappings and systems enabling the voices of citizens across the globe. In only four years of existence, there have been over 24,000 deployments of the Ushahidi platform, either from its own servers, outside of the organisation, or as rapid Crowdmap[28] deployments.[29] Whether it has been to crowdsource women's tech organisations in Africa[30], mapping gun culture in Serbia[31], monitoring elections across Africa and beyond[32], or fighting the culture of bribes and corruption in Zimbabwe[33], the Ushahidi Platform has perhaps also overtaken the most popular social media sites for the rapid, sharply detailed sharing of live and citizen based data.

Where Ushahidi has created a unique framework for virtually inf inite forms of citizen based data mappings, the actual maps themselves - whether topological or political must also be generated. The fundamental content of most maps are based on satellite data processed by national governments and geodetic institutes, with detailing, updates and fine tuning being done by either local authorities or citizen reporting to major mapping publishers including, among others, Google Maps[34], and the open source user generated OpenStreetMap.org[35]. The accuracy and level of details that maps provide also helps form the basis for citizen representation vis-a-vis governments, def ining how budgets are allocated, where schools, hospitals and other essential services are located. Often satellite data may be outdated, or the topographic detail of the landscape may be obscured, or comparatively underdeveloped, leaving undef ined for areas that may be inconvenient for local authorities to publish blank. People living in such areas and their neighourhoods, commonly high-density, and in terms of urban planning relatively unregulated or informal districts, are - due to their technical invisibility - left without a voice or legitimate representation. «Kibera in Nairobi, Kenya, was such a blank spot on the map until November 2009, when young Kiberans created the first free and open digital map of their own community. Map Kibera has now grown into a complete interactive community information project.»[36] By taking advantage of open systems tools and platforms, including OpenStreetMap.org and Ushahidi's crowdsourcing methodologies the residents of Kibera were not only able to address local authorities with the sudden appearance and reality of their community, the building of the map has created a new found sense of place that has spurred economic development, activated dialogue that has helped reduced violence and strengthened democratic process.[37]

Climate Change, Open Data and Collaborative Enterprise

As one of the most abstract of challenges faced by the world's population, tangibly participating in its mitigation is often met by resignation coupled by a lack of specif ic tools and the knowledge to understand its tangible effects. Sauti ya wakulima (The voice of the farmers)[38] is a collaborative knowledge base and FOSS communications tool created in 2011 by farmers from the Bagamoyo District in Tanzania for the purpose of engaging them in the creation of an open knowledge platform about the effects of climate change, using smartphones as tools for observation, audiovisual evidence gathering and a web page to organise the recorded images and sounds.[39]

The Bagamoyo farmers struggle because of insufficient infrastructure and unreliable markets for their products, and are now also facing the challenges of a changing local climate. Less rains, less underground water and unprecedented threats caused by pests and plant diseases are some of the pressing issues that they have to deal with. However, they know that by sharing their knowledge on how to cope with these problems, they can become stronger and find ways to overcome them.

The participants of Sauti ya wakulima use laptops and a 3G Internet connection at local agricultural stations to view the images and hear the voice recordings that they have posted. They pass the available smartphones on to other participants, turning the phones into shared tools for communication. The smartphones are equipped with GPS modules and an application that makes it easy to send pictures and sounds to the Internet. Daily practices and observations regarding changes in climate and related issues are documented, while interviews with other farmers expands the growing network of social relationships. By communicating their observations to extension off icers and scientif ic researchers, who are often in remote locations, the farmers actively participate in the design of new strategies for adaptation.

The project directly addresses the social components of agriculture by tracking the tangible effects of climate change and is now an autonomous entity, with the local government providing support and financing for the data credit needed to send images and sounds from the phones. Sauti ya wakulima uses exclusively FOSS tools based around the ojoVoz mobile app[40] and web-based scripts, is published under a GPL license[41] and was nominated for the WSIS Stocktaking Prize in 2012. The platform is now also being used by researchers in Mexico City to map legal and illegal dumps, a youth group in Medellin, Colombia, is using it to map the situation of trash in their neighborhoods,[42] and the pilot for a Children's Pavilion and Interactive Landscape[43] using ojoVoz is being developed in the new state of South Sudan.

Challenging traditional notions about what makes a ''modern city'' and who decides on the planning of the urban landscape, the Children's Pavilion and Interactive Landscape aims to involve women and children directly in the development of their physical environment. The initiative, intended as a collaboration with the Ghanaian Mmofra Foundation[44] to create a network aimed to reverse the increasing 'compound

mentality' and subsequent erosion of real, physical, public urban space for children in many African cities. Users - preferably children from Africa and beyond, will be able to upload their own content onto the site - show their playspaces (real, imagined, or desired) creating an interactive map and knowledge base giving users and planners more info and comparisons between particular urban or rural areas, from a child or care-giver's point of view.

Media Literacy and Empowerment: Networking Open Systems Initiatives

Initiatives such as these also illustrate ways in which FOSS and Open Data can be applied to support media literacy. Being able, not only to access, but to effectively use Open Systems tools and platforms to create, to learn are key elements to in making an individual's voice heard. Beyond the state or formal education level, where there are often gaps in effectively linking education with livelihoods and empowerment a growing number of independent civil society organisations specialising in media literacy and open technologies have emerged - particularly to act as catalysts of empowerment for women[45].

For example The MAUJ Collective for Open Technology, Art and Culture in Karachi, founded in 2008 addresses digital media and open technologies in an artistic and cultural context from a grass-roots perspective. In pursuing their aims in applying open technology 'to empower society and people' MAUJ follows a strategy of narration coupled with media competency education, telling and disseminating the stories of women, cultural landscapes and marginalised groups in Pakistani society[46]. They are one of very few public domain organisations that provide access to media technologies – as well as media literacy training to the Karachi community, outside of the commercial or institutional academic sector. On their work as open technologies and cultural empowerment advocates one of the co-founders of MAUJ, architect and film-maker Atteqa Malik notes however that in the "fog of ineptitude that civil society is faced with today, the real game changer has not been the many well meaning open source initiatives Pakistan has embarked upon, but social media. For many citizens Facebook IS the open internet, providing the mechanisms for creating genuine forms of empowerment and emancipation, especially for women who are able to start companies and other economic ventures that they would otherwise not be able to engage in."[47]

Where MAUJ applies art and open culture as a vehicle in media literacy training, Bytes for All (B4A)[48] acts as a broad citizen's network in South Asia. It identif ies, discusses and builds networks on emerging issues related to ICTs and their impact to development (ICT4D), as well as playing an active role in training and providing open access to technology for women. Active in Pakistan since 2010, B4A's globally acclaimed 'Take Back The Tech Campaign' for example, focuses on the strategic use of ICTs by women and girls to fight violence against women in Pakistan."[49]

These groups are only small nodes in a number of open cultures, technologies and FOSS based networks actively working to promote and support empowerment issues. One such network, bricolabs[50], has formed specif ically to promote FOSS based environmental awareness, open access, OER, re-appropriated technologies, and freedom of expression. In 2010 a bricolabs-led initiative in Indonesia drafted the Bandung Declaration on Open Cultures, Technologies and Ecologies[51] which seeks to set a framework for creating organised and identifiable places, primarily in the Asia-Pacific region, that actively support, encourage, promote and provide :

1. Open platforms for communication, dialogue and interaction
2. Open and unhindered forms of artistic and cultural expression
3. The use and development of open and free technologies
4. New forms of collaborative, inclusive and emancipatory digital practice
5. Multi-disciplinary, cross-generational and trans-regional dialogue and exchange
6. Open access to information, networks and knowledge
7. Dedicated physical spaces committed to long-term and stable community-building

Although the concept of the ‘community centre’ itself is not new, the focus on creating ‘open culture’ spaces in which ‘free’ and ‘open’ culture can be practiced unhindered is aimed specif ically at fostering open dialogue, promoting the use and understanding of open and public domain data and technologies - as well as providing hands-on training for making and applying FOSS (code, applications, methodologies), open hardware as well as a range of skills in which technologies act together creating new forms of enterprise.

Open Hardware - the next Free and Open Systems generation

Open Hardware is the logical extension of the FOSS movement into the actual creating of physical things. Where for example FOSS coupled with the potentials of crowdsourcing has established itself as one of the most powerful mechanisms for creating transparency, empowering otherwise silent – or silenced – groups, as illustrated in the many thousand implementations of platforms such as Ushahidi or Savana, serious attempts to create viable Open Hardware systems are now beginning to emerge. Long a domain of tinkerers, creative hacktivists, technology labs[52], academic physical computing[53] and artists[54] - as well as being, out of necessity, the backbone of many developing economies[55] where new and expensive machines, parts, technologies and industrial production are simply unavailable, the notion of Open Hardware is also not that new. Applying the principles of FOSS and growing knowledge sharing methodologies such as DIWO[56] Open Hardware will be, if it is not already in a number of contexts, an absolutely indispensable element in the realm of the Knowledge Society with huge potential for UNESCO's focus areas. As with FOSS, there are numerous interpretations and def initions of what exactly constitutes 'Open Hardware', with considerable attention being given to the Open Source Hardware and Design Alliance (OHANDA) '4 Freedoms' proposal[57]:

- Freedom 0: The freedom to use the device for any purpose.
- Freedom 1: The freedom to study how the device works and change it to make it to do what you wish. Access to the complete design is a precondition to this.
- Freedom 2: Redistribute the device and/or design (remanufacture).
- Freedom 3: The freedom to improve the device and/or design, and release your improvements (and modif ied versions in general) to the public, so that the whole community benef its. Access to the complete design is a precondition to this.

Of the many streams of Open Hardware innovation that have crossed paths in contemporary FOSS culture, the development of the Arduino[58] open source circuit board by Massimo Banzi and David Cuartielles in 2005 and its predecessor Wiring[59] by Hernando Barragán have had profound global impact on people making open source electronics systems for a wide range of uses in the physical world. Arduino, a cross between hardware (the circuit board) and software (the Arduino programming language) "can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators."[60] As such Arduino, and to a certain extent Wired, which is being developed in Colombia, can be considered a form of sharable 'stem-cell' that has the potential to impact the world of Open Knowledge and ICT for Development in terms of hardware – machines, tools, robotics, environmental sensors etc., that the crowdsharing platform Ushahidi achieved with citizen generated Open Data. Learning how to use Arduino is an integral part of most open source technology curricula as well as being central to the understanding, research

and development of FOSS tools and systems at events globally such as the African iHub 'Afrilabs'.[61]

iHubs and Fablabs: Rhizomatic Global FOSS Initiatives

Injecting 'Open Hardware' methodologies to the idea of the 'open culture space' creates additional new forms of open knowledge and specialised skills transfer. The prevalence of such maker labs can be perhaps best seen through the global development of Fablabs (from fabrication laboratories). Coming out of the MIT Media Lab[62] and demonstrating an applied collaborative practice in Open Hardware spaces, the Fablab allows citizen driven education in design and production methods with access to high-end fabrication technology.

"Fablabs are a global network of local labs, enabling invention by providing access to tools for digital fabrication. They began as an outreach project from MIT's Center for Bits and Atoms (CBA)»[63]. CBA assembled millions of dollars in machines for research in digital fabrication, ultimately aiming at developing programmable molecular assemblers that will be able to make almost anything. Fablabs fall between these extremes, comprisingroughly fifty thousand dollars in equipment and materials that can be used today to do what will be possible with tomorrow's personal fabricators, including:

- A computer-controlled lasercutter, for press-fit assembly of 3D structures from 2D parts
- A larger (4'x8') numerically-controlled milling machine, for making furniture (and house) sized parts
- A signcutter, to produce printing masks, flexible circuits, and antennas
- A precision (micron resolution) milling machine to make three-dimensional molds and surface-mount circuit boards
- Programming tools for low-cost high-speed embedded processors

Fablabs have spread from inner-city Boston to rural India, from South Africa to the North of Norway. Activities in Fablabs range from technological empowerment to peer-to-peer project-based technical training to local problem-solving to small-scale high-tech business incubation to grass-roots research. Projects being developed and produced in Fablabs include solar and wind-powered turbines, thin-client computers and wireless data networks, analytical instrumentation for agriculture and healthcare, custom housing, and rapid-prototyping of rapid-prototyping machines." And more than just an international network, they are a collaborative ecosystem fostering true FOSS and Open Systems forms of work, education, as well as specialised ICT training - very

often where the facilities for and access to such training do not exist at all.

The Fablab charter[64] states that:
"Fablabs share an evolving inventory of core capabilities to make (almost) anything, allowing people and projects to be shared. The (international) Fablab network provides: operational, educational, technical, financial, and logistical assistance beyond what's available within one lab. Available as a community resource, offering open access for individuals as well as scheduled access for programs.»

Some of the most interesting fablabs are in so-called 'developing nations', such as the Indonesian based Yogyakarta HONFablab which provides access for schools, individuals, businesses and beginners "to create (almost) anything"!

HONFablab[65] is a local laboratory connected with other Fablabs around the world in a global network where everyone can engage in a creative learning process, share ideas and techniques, and even open their designs to one another. "HONFablab was created in accordance with the vision and mission of the House of Natural Fiber (HONF)'s Education Focus Program (EFP). The EFP is a curriculum carried out by HONF and conducted independently for more than 10 years, that concentrates on interdisciplinary scientif ic and academic exchange on complex societal transformation issues including alternative forms fo energy and biodiversity. The EFP aims to build an open mindset and mentality in society by bridging culture, science and technology through focussed and accessible educational activities."

One of its current initiatives is the Low-Cost Prosthesis Project «which is developing a low- cost fabrication method for below-knee prostheses that utilize local materials and meet ergonomics and aesthetics standards. The method can thus be shared to and applied by any individuals and institutions in need of prostheses."[66]

The proposed Fablab Burkina in Burkina Faso[67] will be the first of its kind in Francophone Africa, where after an intensive phase of the InnovAfrica week, a digital milling machine was developed. "Facilitating the fabrication of thousands of devices for agriculture could have very benef icial results. Currently, machines in Burkina Faso are, for the most part, controlled manually. The equipment is ageing and the work is manual and time-consuming. There is potential to use Fablab equipment for many purposes, including:

- Cutting calabash[68] in organizations working with people with disabilities
- Projects to avoid desertif ication resulting from the manufacturing of burners
- Replacing inefficient manufacturing of biogas burners, whereby the digitalization of covers using a computer program manufacturing be 7 times more efficient

Fablab Burkina was developed following a meeting of people with multidisciplinary skills: electricians, computer scientists, and electronics engineers who put their heads

together to build a digital milling machine." The potential for revitalising and creating more eff icient tools to facilitate agricultural practices is immense.

In conjunction with the global networking of the Fablab movement, particularly as catalysts for Open Education Resources (OER), the rapid growth of innovation and technology hubs act as highly popular and technologically cross-disciplinary engines of economic growth. Networked hubs such as the ice (Innovation - Collaboration - Entrepreneurship) hubs in Addis Ababa and Cairo[69], or Nairobi based iHub[70] promise an "Open Space for technologists, investors, tech companies and hackers."

Appropriate technologies (AT) - Enabling Open Sustainability

Appropedia is a wiki for Open solutions in sustainability and development[71] based on the 'Appropriate technology (AT) notion of technology that is designed with special consideration to the context of its use - including environmental, ethical, cultural, social, political, and economical aspects of the community it is intended for. With these goals in mind, AT proponents claim their methods require fewer resources, are easier to maintain, and have less of an impact on the environment compared to techniques from mainstream technology, which they contend is wasteful and environmentally polluting.'[72]

It focusses on knowledge management and knowledge sharing, while participating people and programs do the actual on-the-ground projects. The Appropedia vision is very much aligned with UNESCO's «Open solutions for enhancing access to information and knowledge» stream. With the continued development of Open Hardware, FOSS and Open Access accelerating the Appropedia community's growth and expanding its academic partnerships, the platform's mission is now focussed on putting the materials together into a structured OER framework[73].

One of Appropedia's highlighted projects is the Hexayurt, a model Open Hardware zero- waste «autonomous building» refugee shelter system[74]. It provides not just a shelter, but a comprehensive family support unit which includes drinking water purif ication, composting toilets, fuel-eff icient stoves and solar electric lighting.[75] The Hexayurt is ideally suited to large scale disasters within a couple of day's drive of urban centres or other scenarios where large numbers of people reside, such as coastal regions that tend be relatively close to ports.

Although there is no common procedure for testing new shelter technologies prior to their use in the field, Hexayurt units are currently being evaluated by Haiti Communitere[76], a Haitian based disaster recovery organization and in Sri Lanka by Sarvodya the country's largest civil society organisation, engaged in relief efforts in the war-torn north of the country as well as ongoing development projects. However Shelter Centre, a Swiss NGO that responds to the transitional settlement and reconstruction

needs of populations affected by conf licts and natural disasters[77] has actively blocked the hexayurt and similar Open Hardare shelters in favour of their own Shelter Module. Hexayurt initiator Vinay Gupta notes that «since Shelter Centre control both the standards and their own shelter prototype, they rewrite the standard to favour their own system.»[78]

Open Source Ecology (OSE)[79] is an international network of people and organisations working on a broad spectrum of ecological, social and technical systems according to sustainable criteria and providing the designs, solutions and methodologies as FOSS or open hardware via the internet. According to OSE, «an Open Source Economy thus gets created, an economy that optimizes both production and distribution, while providing environmental regeneration and social justice. From tractors to wind turbines to cars - all technologies are designed to be modular, scalable, simple, low-cost, Do It Yourself (DIY) and suitable for flexible fabrication. This form of open development promotes quicker innovation, open access to economically significant information supporting and creating strong local economies, which ultimately replace resource conflicts with common welfare.»

Open Publishing: Transparency, Empowerment and the Case of OpenOil

If we consider the complex interrelations between climate change, environmental sustainability and post-conf lict response (with signif icant effects in the realms of access and empowerment) there is no greater generator of closed, anti-democratic and opaque systems than the global oil industry. Whether it is combating CO2 emissions, fossil fuel dependency or simple measures of good governance and equitable distribution of income to provide such basic needs as quality education, viable infrastructure, health care – as well as affordable and functional energy – the world's oil and gas industries have the power and resources to play a key role in positive forms of development. OpenOil.net is an Open Systems "energy consultancy and publisher aimed at creating transparency while seeking market-driven solutions to produce better outcomes from the oil and gas industry for the people of producing nations." Under its motto "Imagine an Open Oil Industry ..." OpenOil is "founded in the belief that creative, practical and socially progressive policy making in the oil and gas industries is both vital to our collective future, and possible within current constraints."

The OpenOil book, published in Arabic in November 2012 about the Iraqi electricity crisis is being released under a creative commons attribution and share alike license[80]. As a public domain book it is intended to 'break apart' and reveal the various elements of the oil industry's chain of power delivery, control and economy. By acting to open up opaque systems makes them become both real and legible to citizens, as

well as elected off icials. In fragile post-conf lict states such as Lybia, Iraq and South Sudan OpenOil's series of country-by-country Oil Almanacs[81] have the potential to play a crucial, if not pivotal role in the much larger and longer battle for transparency, accountability, and empowerment, working against corruption, sectarianism as well as the further destruction of the delicate balances that are being attempted in the climate change battles.

Using the book sprint[82] methodologies in conjunction with the FOSS Booktype[83] editorial platform, the OpenOil publications reference real data and survey results from states that have enacted functional mechanisms for open data including Brazil and Kenya as well as media sources, CSO's and reliable UN material. Booktype, as well as the FLOSS Manuals[84] initiative out which its software and collaborative editing format was developed, provides a means to 'rapid-prototype' all forms of publications using live authoring techniques (as was the case with the many groundbreaking manuals that emerged to help cement the documentation of FLOSS) as well as the ability to custom create books using mixing, matching and collating chapters, notes and materials for new publications, while clearly referencing the source materials. As an aggregator tool implemented in conjunction with today's vast Open Educational Resources, customized, low-cost and easy-to-produce libraries can be created just about anywhere.

Autopoeisis: Latin America's Four Decades of Open Systems

Chile, one of the pioneering countries in Latin America on information society policies, adopted a digital strategy after a Presidential Commission for New Technologies of Information and Communication was established by presidential decree in 1998. This committee produced the report 'Chile: Towards the Information Society', which helped establish the country's incorporation into the knowledge society where «the significance of which has been such that several Latin American countries have opted for inclusion in the Knowledge Society»[85]. In preparing this report, published in 1999, participants from the public and private sectors, coordinated by the commission, were grouped into four categories:

- Law and trade regulation
- New technologies and digital networks for productive use
- Technological modernization of the state
- New technologies and information society in equality and cultural development This led to the creation of a large number of projects, particularly in the field of e- government, «placing Chile among the most developed countries in this area.»[86]

Chile has a long history in systems theory, with many of the concepts in computer

and network theory in relation to our current use of the term 'open' stemming from the work of Chilean neuroscientists Humberto Maturana and Francisco Varela. Attempting to def ine the rules of living organisms, they concluded in 1972 that a way to explain the nature of living systems was that of «an autopoietic machine, organized as a network of processes which: (i) through their interactions and transformations continuously regenerate and realize the network of processes that produced them; and (ii) constitute the machine as a concrete unity in space in which they exist.[87]» Using this model of autopoiesis a relationship is established between open systems and social organisations where a continuous interaction is necessary in order to keep the social system alive, nurtured and most of all, «connected». This ability of a project to maintain itself, finding the right network, placing elements in organisational units not defined by a central entity, is akin to the model of continuous user input and development which marks the sustainability of many FOSS and open culture communities.

The Chilean government emphasizes the importance of this notion due to the country's own geographic marginalization where "in the digital world, there are no longer countries at the center and others on the periphery. Some observers have proclaimed the death of distance."[88] These notions help fuel Chilean open systems projects, many of which reflect the education, social empowerment and environmental goals of UNESCO's primary challenge areas. These include initiatives as diverse as:

- La Huerta del Pez, a pioneering independent ecolab, developing aquaponics, an agricultural technique that uses fish to feed plants, in pools with ceramics instead of soil. Located in Cental Chile's Quillota, Valparaiso region, they are an independent, privately funded group researching ways to grow food under extreme conditions, including Chile's Northern desert regions.
- Karol School Comuna Pedro Aguirre Cerda in Santiago where a system of 'free' money and services exchange aimed at engaging students in more successful learning has been implemented
- Ciudadano Inteligente[89] - a Latin American civil society development and transparency platform that develops and connects FOSS and OER programs across the Caribbean and Latin American region, with projects emphasising open knowledge and collaborative technologies, such as Sentido Comunes[90], which implements simple interfaces for civil society to query the judicial system on information about laws and decrees.

However when what was seen as major def iciencies in institutionalized education in Chile surfaced in 2011, where the systemic failures in meeting the needs of students resulted in the massive 'Chilean Winter' street protests, riots and even the occupation of elementary schools by its pupils[91], independent FOSS oriented open access and social technology incubators helped to counter the unrest. A number initiatives, for example these in Valparaiso rose to greater prominence filling the gaps left in the traditional education system:

- Ciber Pancha[92] - a FOSS Hacklab installed in a school to improve the technological skills of students using i.e. the SCRATCH[93] programming environment to develop animations, games, art and music. The experiment, seen as added value to the school environment giving the students the freedom they lacked to develop their own interests with absolute freedom, is now being repeated at other locations.
- Espacio G[94] - an autonomous socio-political space for free expression, cultural self management and biological sustainability founded in 2004 to foster critical thinking and empower local communities
- Teatro de Tierra[95]- a multimedia theater group that develops projects in remote locations such as Putre (2000-2011), Mapuche (2006-2008), Porvenir (2010). Using various digital media techniques and cultural tactics their activity is aimed at strengthening local communities, the role of women and the conservation of traditional cultures and knowledge. The re-creation of oral stories and its distribution through a knowledge commons that forms the narrative of their sound and theater helps communities exercise their living patrimony, cultivating, compiling and passing these on as oral knowledge[96].

Brazil and India: Bridging the Gaps between Grass-roots and Policy

Many of the Open Systems initiatives and solutions, including the majority in this report, are not a direct result of governmental input, incentive or policy asserting the implementation of FOSS solutions to meet pressing challenges. They grow out of a broadly identif iable need, clear sense of purpose, probably lack of adequate existing solutions, a collective interest - often pressing or urgent, or a combination of these factors. Even in the case of Chile, which has had a strong and globally inf luential history in open systems theory, there is often little trickle down from policy - or decree - to effective sustainable real-world solutions. Solutions are often bottom-up rather than policy induced, showing serious gaps in the means of flexibility, discourse and effective development between governments and developers. While not an ideal situation by any means, this nonetheless a situation that has its pros and cons. FOSS creators and users on the one hand can act more independently and create crucial transparency, accountability, economic and social development links between government and civil society. As such, they can act neutral partners, or if necessary in critical opposition roles. On the other hand the reach and ability to scale FOSS and open culture initiatives nationwide or globally can often be hindered without strong government commitment, limiting their effectivity.

One prominent exception to this is the successful - long term - strategy of India's Kerala State Government in the implementation of FOSS in education and other key sectors. With programs such as the IT@School[97] integration of FOSS in education, reaching upwards of 2 million students, this high level government initiative constituted itself in 2011 as ICFOSS, the International Centre for Free and Open Source Software.[98] Coupled with highly engaged and internationally active NGOs such as Bangalore's CIS - Centre for Internet and Society that «critically engages the areas of digital pluralism, public accountability and pedagogic practices, with particular emphasis on South-South dialogues and exchange»[99]India has taken a global leadership role in promoting the effective implementation of FOSS, coupled with open access to online knowledge and resources, as tools of empowerment, quality pluralistic education and economic development.

Alongside India for many years Brazil has also been a 'global role model' of effective and successful development and implementation of open systems and FOSS policy. Beginning in 2003 the country has followed a politically pro-active open source and civil digital rights strategy that was coupled with the inclusion of open culture practitioners inside sectors responsible for digital inclusion programs. This fostered a wide policy connectivity with the population, helping to create the foundations for an open and free access oriented sharing of popular culture, knowledge and data. For example, the developers of the CulturaViva programme, responsible for a network of Cultural Hotspots, were also partners in the first drafts of policy bills whose focus was to strengthen the freedoms in the digital age.[100]

Alone CulturaViva was implemented in over 600 communities across the country to encourage cultural production using open-source tools.[101] Emanating from these policies and initiatives, or working concurrently with them have been a number of local as well as internationally recognised organisations, networks or projects which have been directly engaged in the issues of social empowerment of women and marginalized groups. Also towards creating active forms of environmental awareness, in particular towards resource management, recycling and the systemic effects and conditions of climate change open culture, FOSS and enabling the access to ICT for all segments of the population has been results. Most are embedded in solid open access, shared knowledge and education practice constructs, involving community practitioners and scientific researchers, cultural hactivists and technologists as well as policy makers and political representatives.

Of these the MetaReciclagem[102] network operating since 2002 has had perhaps the greatest community and international impact addressing the UNESCO challenge areas through the development of decentralized, hands-on, user and community oriented actions using appropriate technology. One of the first organisations to openly and demonstrably address the recycling of computer equipment MetaReciclagem (or 'Meta' / 'Recycling') began as a partnership in São Paulo with the NGO Agente Cidadão (Citizen Agent) collecting and refurbishing used computers that were later distributed to social projects. With an ideology based on the re-appropriation of hardware, the use of free software and open licenses as a networked action in the support social transformation.[103]

MetaReciclagem now has about 500 members internationally with 10 local points of articulation, known as spores, in operation. Theirs is an eminently socio-political network aimed at providing solutions to complex environmental, education, social transformation issues and the linkages therein. As one key method for designing and implementing large- scale government open culture initiatives such as the Culture Points and Casa Brazil, MetaReciclagem's use of technological reappropriation has been noted as an 'Information for All' (IFAP) success story by UNESCO[104].

#OSJUBA - Responsive Open Systems Solutions in South Sudan

"Sometimes practice needs to come before policy."[105]

On July 9th, 2011 South Sudan became the United Nations 193rd Member State. It's nascent civil society, emerging from four decades of shattering conf lict and revolution is faced with the challenge to (re)construct an entirely new nation. It is a post conf lict tabula rasa where everything from the political system, state identity, economic self-determination to the entire infrastructures for health, education, food security, the basic freedoms of expression, respect for human rights and the necessary mechanisms of reconciliation among resolute opponents has to be addressed. Considering this seemingly overwhelming scenario in the age of social networks, collaborative enterprise and open technologies a broad international, multi-stakeholder and cross-disciplinary initiative, #OSJUBA, is coming together to create a comprehensive open systems strategy for the development of South Sudan. At the point in time where South Sudan has a unique window of opportunity in defining it's path into the future as a truly new and innovative state, an equally unique opportunity to apply the power of open systems solutions in creating a model of rapid development and sustainability presents itself to the international community. By applying the means, methodologies and resources of the world's diverse open source and open knowledge communities #OSJUBA, working with South Sudanese civil society organisations, government agencies and ministries to examine how open source software and comprehensive open systems solutions can help create a framework of sustainable development for the country as a whole.

In fusing diverse cultural traditions into existing, established and highly engaged global communities, the elements of cultural collaboration, grass-roots enterprise and economic innovation inherent to Open Systems Solutions that are intended to support and augment the mitigation of South Sudan's most complex development issues and scenarios include:

- Creating forms of inclusive participation & involvement of all citizens and Civil Society Organisations (CSOs)
- Creating access to data and information as citizen accessories for socio-political development (i.e. via creation of a South Sudan Open Server Backbone)

- Establishing accountability and transparency models for participation and interaction with policy making in government
- Improved resource management, including better use of existing existing UN structures and local resources
- Augmenting literacy training with media and ICT literacy training
- Increasing digital mobility, networking and communication for freer expression and cultural diversity
- New forms of citizen-based, community or device journalism, incl. SMS, radio, data streaming
- Creating new economies and user-based technologies informed by local knowledge
- Enabling OER methodologies and open peer to peer education formats complementing traditional learning structures
- Supporting user centered design, scalability and sustainability (assessment and application of open and appropriate technologies)
- Giving priority consideration to skills exchanges, maker & DIY culture, and better collaboration between diaspora and local residents
- Fusing information, reports and other forms of data from the international development community into accessible knowledge banks (i.e. an Open Humanitarian Information Management System)
- Creating Task Force on ICT4D (i.e. w/ Gov't. line Ministries, WB, UNICEF, relevant NGOs)

Following the first MEDIA MAKERS Open Knowledge and Sustainable Media Forum in Juba, December 2012, co-chaired by Berlin based r0g_agency for open culture and critical transformation and Media in Cooperation and Transition - MICT in collaboration with UNESCO, UNICEF, FOSSFA, the Federal German Foreign Off ice, icehubs and partners in South Sudan including the South Sudan Ministry of Information and Broadcasting, the South Sudan National Bureau of Statistics, the Juba Civic Engagement Center (CEC), AMDISS and the University of Juba the first steps in establishing an Open Systems pilot have been taken. As a result a number of South Sudanese civil society organisations involved directly in post-conf lict mitigation are now adopting Open Systems solutions in the optimization of their work, including the Community Empowerment for Progress Organisation (CEPO) and Kapital Movie Industry Corporation. The latter is a community based, non profit network of ca. 100 visionary young artists, film makers and ICT professionals «who are interested in sharing and nurturing a vibrant civil society through the power of open media. As a group committed to empowering the communities they live, work and study in Kapital Movie's focus messages are about health, conf lict mitigation, and the development of peaceful methods of association through the power of films and short commercials.»[106] In collaboration with such groups and relevant Knowledge Communities oriented international development agencies, the Government of South Sudan's Warrap State is «to embark on an initiative to promote transparency,

empower citizens, fight corruption, strengthen peace and security through participatory conflict management and harness new technologies to strengthen governance and the process of creating a stable and prosperous democratic entity to the advantage of all the citizens of Warrap State. Elements of the Open Systems Warrap Strategy to be developed include, among others, means to create:

- Participatory, accountable, open governance
- Rapid implementation of systems to enable education, communication, economic development
- Conf lict and violence resolution to foster effective peace and security
- Sustainable, transparent and cost effective management of land and key natural resources (incl. water, forest, extractives)
- Innovation in linking traditional with contemporary skills and knowledge» [107]

Some of the key aims of #OSJUBA include fundamental issues where, for example, open source and open data can most effectively be optimized to create tangible results, such as increasing transparency and security, enhancing communication, fostering the utilization of local knowledge and encouraging collaborative learning. Above all, #OSJUBA is aimed to make government institutions and policy, new business innovation, education, independent media and expression, as well as genuine peace efforts and post-conf lict dialogue more sustainable and responsive to the needs of citizens. From the use of wide ranging Open Educational Resources (OER) in jump starting literacy and education systems to citizen empowerment and knowledge building initiatives open systems methodologies are being developed to help create what UNESCO identif ies as strong and independent Knowledge Societies as part of the United Nations' Millennium Development Goals (MDGs), to which South Sudan itself is now a signatory.

Accelerating Active Open Solutions: 7 Key Recommendations

Today the potentials for Open Systems Solutions to address the UN's principal challenge areas based on free, publicly available resources and collaborative practices are readily at hand. This report makes the cross-disciplinary connections, linking innovation to need, context and challenge to illustrate how Open Systems Solutions can have their greatest impact where people have simple access to them. These questions are also not entirely ones of technology or access to the Internet. The creation of secure spaces and places that in themselves are free, open and conducive to an open exchange of ideas, experience and opinion is one of the key overarching challenges linking almost all the scenarios of development, education, and empowerment which are aimed at by the WSIS Action Line C3 on 'Access to Information and Knowledge'. As such, key recommendations to strengthen the application of Open Systems Solutions in the creation and support of Knowledge Societies include:

1. Enabling universal access to the internet as a gateway to Open Data, Open Knowledge and Open Educational Resources. Lower the barriers for youth, women and marginalised groups to effectively access technology, in particular the requirement by public education facilities (i.e. universities, community colleges, elementary schools) to provide free and unhindered access to the internet, doing in open spaces, rooms and means that are inclusive.
2. Securing and enhancing the creation of multi-sector Open Knowledge that enable access to the growing range of public domain Open Systems Solutions, in particular FOSS, Open Educational Resources (OER), Open Data, Open Hardware and their related processes, methodologies and experiences. Enable visible, transnational peer review platforms for endorsing innovative FOSS and Open Systems Solutions (i.e. via http://www.wsis-community.org/)
3. Fostering the use of Open Systems Solutions as both effective rapid-response deployments and sustainable long-term development priorities to address the UN's four identif ied challenge areas of Climate Change, Post-Conf lict / Post- Disaster Response (PCPD), Gender and Minority Empowerment, and Access to Quality Education and Knowledge (in particular OER).
4. Fostering directed Open Systems Media Literacy Training for professionals, extension services mentors and public interface officials (Education of the Educators) as well as making this a basic requirement in children's elementary and secondary education.
5. Acknowledging and supporting grass-roots, small scale or independent FOSS and Open Systems incubators, highlighting the interconnectivity between individual tools and methodologies to create thoroughly comprehensive Open Systems Solutions. Facilitate the networking of (esp. fragile) community and independent Open Culture organisations across regions and continents, mapping these according to criteria incl. resources available, aims and programmes/projects.

6. Developing universal criteria, vocabulary and effective multi-lingual Open Systems ‘Toolkits’ for more rapid implementation and better understanding of FOSS and Open Systems Solutions.
7. Linking the economic and long-term sustainability advantages of Open Systems
8. Solutions in the allocation of public funds and procurement processes.

Conclusions

This report is intended to paint a critical impression of the realm of FOSS and Open Systems Solutions, in particular how innovative and often grass-roots development and implementations can take on model character to address some of the greatest challenges we as an interlinked and global society - reliant on one another across borders, time zones and diverse cultures - are faced with. FOSS and the broad spectrum of open methodologies, tools and systems today already form irrevocable elements of our lives, strengthening such linkages. Indeed the potential of applying the knowledge created through open forms of collaboration, public process and collaborative enterprise will, in the future, be harnessed in ever more realms of social, political and scientif ic activity as the tools to more effectively use, implement and share this knowledge become increasingly accessible, language independent and more economical. The power of Open Systems lays in the hands of innumerable networked users and determined citizens ... global players who recognize - like Malala, no matter what their social status or where their home may be - that access to knowledge, technology and collaborative experience are inevitable keys to development and social empowerment. Not just for individuals and societies, but also the Earth, our common home.

Many themes, significant geographic regions, forms of implementation and explicitly related co-sections such as Open ICT4D[108] could not be taken up directly within the scope of this report. At the same time, the field of innovation, development, trial and implementation of Open Systems Solutions is advancing so rapidly that this report can only allude to the trends that will make up everyday practice in the years to come. Yet common understanding as to what the actual realms of FOSS and Open Systems represent are still unclear to many policy makers, politicians, institutions and organisations charged with developing and mitigating the effects of the world's major challenges. Such unclarity, misperceptions and lack of knowledge about open knowledge, must be addressed with more focus on examples, assessments of successful case studies - as well as failures, as these are also intrinsic to creating new, improved and sustainable methodologies. Better understanding and use of the vast resources representing OER - Open Educational Resources, exploiting the rapid implementation possibilities of crowdsourcing and Open Hardware systems, or effective training in FOSS can, for example, alleviate vast amounts of resource redundancy in re-creating curricula for schools, create rapid, specialized libraries where none exist today, or enable new social and political identity and awareness for historically marginalized peoples. As a global organisation focussed on educational, scientif ic and cultural innovation - the traditional bedrock fields of FOSS and Open Systems development and application - UNESCO has the potential to tap these resources beyond the tip of the iceberg where they sit today, and champion the future of Open Systems Solutions, now!

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Notes