

Open Model as Instruments of an Effective Knowledge Ecology: Some Reflections with a Focus on the African Environment

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1. INTRODUCTION

It is undeniable that the Internet and the world wide web have brought about major changes in every area of citizens' lives. The revolution of digital technology radically changes the economics (the system of incentives) and the law (the principles and rules) governing the production and dissemination of knowledge.

Open models (implying open access, Open Data, open source, open content) become both models for organizing the production, distribution, and usage of knowledge and expression of a new value system which is being developed in an electronic environment.

Therefore, open models should be considered as alternative as well as parallel to the actual commercial publishing models in the international information market and to international copyright regulations. In this context the emphasis is on the principle that the dissemination process must be subordinated to users' needs, and not the reverse. Open models also relocate knowledge in society: they challenge the existence of thresholds, barriers and boundaries, leading to effective access to knowledge.

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2. OPEN MODELS AS NEW INSTRUMENT FOR KNOWLEDGE ECOLOGY

The ultimate goal of open models is to give information a “sense” that is transforming raw data into useful things and applications, directly, easily and without too much rework. To achieve this Open Data “chain” the data should be:

- open and raw so to be machine readable and easily reusable;
- public or publicly available (on the Internet);
- free from restrictions on their use which can be of a commercial nature;
- identifiable through metadata;
- linkable so that by a simple URI, data can be point to, metadata be examined, and information be downloaded.

The role of open models is to create a new concept of knowledge as a commons which derives from the “knowledge ecology” concept. Knowledge ecology is about studying and enhancing the ways in which the parts and wholes of knowledge-generating systems relate to one another. It provides a framework for organizations who want to maximize their benefits from emerging technologies to facilitate effective collaboration among their members. Therefore, the central objective of knowledge ecology is to achieve the goal of people-centered, inclusive and sustainable knowledge societies. A participatory and representative knowledge ecology can achieve readability, findability, connecting disparate and closely related information, enabling communication between users in order that new knowledge is created¹.

A new consensus needs to be achieved on traditional concepts such as freedom of information and science, intellectual property and authorship. Nowadays, with the crisis of the market paradigm, there is a chance for a rebirth of the old idea of the commons and for the creation of an Open Data ecosystem.

Some of the key premises underlying the notion of knowledge ecology may be extrapolated, based upon the observations of the natural ecosystems². These are as follows:

- Knowledge ecology primarily focuses on social networks of individuals in contrast to the overly technological emphasis of traditional

¹ B. BOWONDER, T. MIYAKE, *Technology Management: A Knowledge Ecology Perspective*, in “International Journal of Technology Management”, Vol. 19, 2000, n. 7-8, pp. 662-684.

² Y. MALHOTRA, *Knowledge Management for Organizational White-Waters: An Ecological Framework*, in “Knowledge Management”, March 1999, pp. 18-21.

knowledge management systems on computers and information technology networks.

- In a knowledge ecology environment impacted by sudden and pervasive change, mode of survival is adaptation instead of optimization.
- Knowledge ecology is made up of knowledge nodes and knowledge exchanges or knowledge flows. In this context the basis for cooperation and survival is differentiation and similarity between the knowledge nodes.
- Within a knowledge ecology environment, focus on people does not only imply understanding of knowledge exchanges and relationships based on such exchanges. It also implies understanding of how such knowledge influences action or potential for action based on such exchanges.
- Just as natural ecologies thrive based on species diversity, knowledge ecology thrives on diversity of knowledge.
- Knowledge ecology treats knowledge creation as a dynamic evolutionary process in which knowledge gets created and recreated in various contexts and at various points of time.

The traditional view of knowledge management primarily focuses on information, whereas the knowledge ecology adds the context, synergy and trust necessary for translating such information into actionable knowledge.

To contextualize the concept of knowledge ecology and make it more tangible, it is useful to briefly examine, in a global perspective, some of the open models, aiming at relocating knowledge at the heart of our civilization. At operative level the activity of the Open Knowledge Foundation³ and the experience of Africa as a case study show the legal, sociological and ethical issues that open models bring about.

3. A GLANCE TO OPEN MODELS

3.1. *Open Data and Linked Data*

Open Data refer to a philosophy that is also a practice. This implies that some types of data are freely accessible to everybody without restriction of copyright, patents and other forms of control which limit their reproduction. Open Data are situated in the broader framework of Open Government, allowing public administration's transparency and citizens' partici-

³ See <http://okfn.org/> and for details par. 4.

pation through the use of new communication technologies⁴. The ethic is similar to a number of other open movements and communities like open source and open access. In the technical sense of the expression Open Data refer to the open format in which digital data can be distributed on the web to make them accessible, reusable and integrable.

A major problem concerns the commercial value of data. These are usually controlled by organizations, public and private, which often show reluctance to disseminate information. Control of data may be achieved through access restrictions, to be issued by means of licenses, copyright, patents and rights to reuse. Faced with these forms of control over data, and in general over knowledge, supporters of the Open Data philosophy argue that these restrictions are a limit to the commons of the community and that data should be made available without restrictions or form of payment. It is also important that data, having been published, are re-usable without further permission, even if certain forms of use, such as creation of derivative works, may be controlled through specific licenses like Creative Commons⁵.

A typical representation of the necessity of opening data is given by John Wilbanks, executive director of Science Commons⁶: “Numerous scientists have pointed out the irony that right at the historical moment when we have the technologies to permit worldwide availability and distributed process of scientific data, broadening collaboration and accelerating the pace and depth of discovery... we are busy locking up that data and preventing the use of correspondingly advanced technologies on knowledge”.

The Open Data philosophy is also closely linked to the Linking Data Initiative⁷. It was born around 2007 in a World Wide Web Consortium

⁴ D. ROBINSON, H. YU, W.P. ZELLER, E.W. FELETEN, *Government Data and the Invisible Hand*, in “Yale Journal of Law & Technology”, Vol. 11, 2009, pp. 160-176.

⁵ Creative Commons is a non-profit organization that has been striving to provide simple, uniform, and understandable licenses that content creators can use to issue their content under. These licenses provide a solution to the problem of copyright on the web, while ensuring that the culture of reusing existing works to foster creativity is not hindered. At operative level Creative Commons, crafted by Stanford University law professor Lawrence Lessig and others in December 2002, provides a set of copyright licenses free for public use. <http://creativecommons.org/>.

⁶ Science Commons is an exploratory project to apply the philosophy and activities of Creative Commons in the domain of science. Their goal is to encourage stake-holders to create areas of free access and inquiry using standardized licenses and other means. <http://creativecommons.org/science>.

⁷ See <http://esw.w3.org/topic/SweoIG/TaskForces/CommunityProjects/LinkingOpenData>.

(W3C) interest group dedicated to the development of technical solutions of the Semantic Web (SWEO - Semantic Web Education and Outreach interest group)⁸.

The aim of the project is to bootstrap the Web of Linked Data by identifying existing data sets that are available under open licenses, converting them to Resource Description Framework (RDF) according to the Linked Data principles, and publishing them on the web⁹.

It would be possible to move the Semantic Web from being a “vision” to being a reality by educating the web community to technology.

The Linking Open Data Initiative has developed guidelines for the construction of this new type of web and encouraged a variety of institutions to publish content not covered by any license in the form of RDF triples linking them through the URI.

From a technological point of view linked data is based on two web key technologies: the URI to identify resources, and HTTP for their retrieval associated with RDF as format of the content.

Linked data is simply about using the web to create typed links between data from different sources. These may be as diverse as databases maintained by two organisations in different geographical locations, or simply heterogeneous systems within one organisation that, historically, have not easily interoperated at data level.

Technically, linked data refer to data published on the web in such a way that are machine-readable; their meaning is explicitly defined, they are linked to other external data sets, and can in turn be linked to from external data sets.

While the basic language of web hypertext documents is HTML (Hyper-Text Markup Language), linked data is based on documents that contain data

⁸ See <http://www.w3.org/2001/sw/sweo/>. E. BERMÈS, *Linking Open Data: A Case for Releasing Library Data on the Semantic Web*, in “Satellite Meetings IFLA 2009, Emerging Trends in Technology: Libraries between Web 2.0, Semantic Web and Search Technology”, Florence, 19-20 August 2009.

⁹ C. BIZER, *The Emerging Web of Linked Data*, in “IEEE Intelligent Systems”, Vol. 24, 2009, n. 5, pp. 87-92. Participants in the early stages of the project were primarily researchers and developers in university research labs and small companies. Since that time the project has grown considerably, to include significant involvement from large organisations such as the BBC, Thomson Reuters and the Library of Congress. This growth is enabled by the open nature of the project, where anyone can participate simply by publishing a data set according to the Linked Data principles and interlinking it with existing data sets.

in RDF. Rather than talking about web data, we should more accurately say “web of things in the world, described by data on the web”¹⁰.

This is a way to publish information that encourages reuse, reduce redundancy, maximizes the actual and potential interconnections between data, uses network effects to add value to the data¹¹.

Following Sir Tim Berners Lee’s speech at the Expo 2010 Gov2.0¹² entitled “Open, Linked Data for a Global Community”, the five stars with which Linked Open Data should be published on the web are listed below:

1. make your stuff available on the web (whatever format);
2. make it available as structured data (e.g. excel instead of image scan of a table);
3. adopt non-proprietary format;
4. use URLs to identify things, so that people can point at your stuff;
5. link your data to other people’s data to provide context.

Two additional specific technical roles have been identified as a source of added value for a pan-European portal¹³:

1. becoming an authoritative registry of conceptual models to be used by national initiatives for structuring their own data;
2. becoming an authoritative provider of codes or identifiers to be reused by national initiatives for structuring their own data.

In conclusion, linked data aims at breaking the technological barriers that hamper free sharing of data. On the other hand the Open Data philosophy aims at breaking down social barriers, cultural, legal and economic obstacles to free sharing of data. Side by side, Linked Data and Open Data are the prerequisites for a more open, free, and shared web.

At practical level, in the United States a big boost to the emerging Open Data philosophy in government has been given by the President Barack

¹⁰ C. BIZER, T. HEATH, T. BERNERS-LEE, *Linked Data. The Story So Far*, in “International Journal on Semantic Web and Information Systems”, Vol. 5, n. 3, 2009 (available at <http://tomheath.com/papers/bizer-heath-berners-lee-ijswis-linked-data.pdf>).

¹¹ T. HEATH, *An Introduction to Linked Data*, presentation on February 13-14, 2009 at Austin, Texas, p. 13 (available at <http://tomheath.com/slides/2009-02-austin-linkeddata-tutorial.pdf>).

¹² Gov. 2.0 Expo 2010: Participation, Collaboration & Transformation, Washington D.C., May 25-27, 2010.

¹³ EUROPEAN COMMISSION. *Report of the technical workshop on the goals and requirements for a pan-European data portal*, 3rd November 2010 (available at http://ec.europa.eu/information_society/policy/psi/docs/pdfs/paneuropeanportal/report_paneuportal_03112010.pdf).

Obama with the Directive on Open Government¹⁴ promulgated in December 2009, which quotes: “To the extent practicable and subject to valid restrictions, agencies should publish information online in an open format that can be retrieved, downloaded, indexed, and searched by commonly used web search applications. An open format is one that is platform independent, machine readable, and made available to the public without restrictions that would impede the reuse of that information”. The practical result of the Directive is represented by the web site *Data.gov*¹⁵, launched in May 2009 by the Chief Information Officer (CIO) of the American Public Administration. The site was created with the objective to gather all the information made available to the public by U.S. agencies in an open format, without preventing the reuse of information in a single portal. In Europe, excluding the United Kingdom (*data.gov.uk*), there is not a specific digital strategy. In many respects, Europe is lagging behind on the adoption of Open Data: some national governments, including the Italian one, have started independent programs but have not established a common model.

In Italy there are some good examples. In May 2010 the Region of Piedmont has created its portal of Open Data¹⁶. The site is currently the most successful national experience on open structured data. In October 2010 the Foromez Institute has issued the Italian Open Data License v1.0 (IODL), the first Italian license specifically dedicated to open public data. The IODL is compatible with Creative Commons licensing models 2.5 and Open Data Commons¹⁷. At the same time, the Region of Sardinia has issued a license on their geographic data.

As concerns linked data, Italy lags behind other countries, and for this reason it is essential to move quickly from the mere publication of “raw data”, to integration into the “web of data” for making them Linked Open Data.

With this idea, the *LinkedOpenData.it*¹⁸ was launched. The portal was created to make a contribution to the Italian community of Open Data in an area which in this country is still largely unexplored. The aim is to create a repository where as many data sets as possible are gathered, by providing

¹⁴ See http://www.whitehouse.gov/omb/assets/memoranda_2010/m10-06.pdf.

¹⁵ See <http://www.data.gov/>.

¹⁶ See <http://www.dati.piemonte.it/>.

¹⁷ See <http://www.opendatacommons.org/> and paragraph 4.

¹⁸ See <http://www.linkedopendata.it/>.

basic tools to query data for the use and consumption of external applications.

At European level a special mention is to be made of Linked Open Data Around-The-Clock (LATC) project¹⁹. LATC is a specific support action currently under negotiation in the context of the FP7 ICT Programme. Its mission is to support people and organisations to better publish and consume Linked Open Data²⁰.

Finally, it is a promising indication for the future the decision to convene a workshop on Open Data and public sector information (PSI) reuse on the first day of the Assembly for the Digital Agenda for Europe at the European Commission (June 16th-17th). The workshop will bring together stakeholders to help the Commission develop its strategy for Open Data for the EU, taking into consideration the review of the Public Sector Information Directive (Digital Agenda action 3). The workshop will build on the results of Share-PSI.eu²¹, a multi-stakeholder initiative initiated by W3C Consortium and the European Telecommunications Standards Institute (ETSI) which is holding a first workshop in Brussels on 10-11 May 2011.

3.2. Open Content

Open content relates to any kind of creative work, published under an open content license (OPL) that explicitly allows copying and modifying information by anyone, not exclusively by a single organization, firm or individual. The concept of open content (from the French “*Œuvre libre*”) draws its inspiration from the open source philosophy.

A new educational perspective, focused on collective knowledge’s sharing and reuse of learning and scholarly content, has been gaining ground across the globe for nearly a decade. Open content has now come to the point that it is rapidly driving change in both the material we use and the process of education. At its core, the notion of open content is to take advantage of the Internet as a global dissemination platform for collective knowledge and wisdom, and to design learning experiences that maximize the use of it.

¹⁹ See <http://latc-project.eu/>.

²⁰ The project brings together a team of linked data researchers and practitioners from Digital Enterprise Research Institute of the National University of Ireland, Galway, Vrije Universiteit Amsterdam, Freie Universität Berlin, Institut für Angewandte Informatik. This team supports the production and consumption of linked data in a 2-year project.

²¹ See <http://share-psi.eu/>.

Open content, as described here, has its roots in a number of seminal efforts, including the Open Content Project (now concluded) and succeeded by Creative Commons, the MIT's Open Courseware Initiative (OCW)²² and work by the William and Flora Hewlett Foundation²³. Of course the largest open content project is the popular Wikipedia undertaking. Many of these projects focused on creating collections of sharable resources and on devising licenses and metadata schemes. The role of open content producers has evolved as well, away from the idea of authoritative repositories of content and towards the broader notion of content being both free and ubiquitous.

3.3. *Open Access*

As a result of a number of economic and institutional factors, the model of scholarly publishing approach is broken (especially the publication of articles published in periodicals). Due to the exponentially increased price of journals, the business model is based on the idea that the reader, in particular the researcher through the research institution, must pay the price of publication. This leads to a restriction of the chances of accessing scholarly information as library budgets are struggling to hold the weight of more and more expensive subscriptions. Moreover, the relationship between price system and public funding of research implies the paradox of public institutions paying several times the costs of research, subsidizing researchers and acquiring books, journals and databases. In this scenario new digital technologies play a very important and decisive role. On the one hand, the digitization of the scholarly information strengthens the rigid and centralized control of information by a few large commercial publishers. On the other hand digital technologies allow to publish online open articles, free of charge and without any technological barriers, what precisely constitutes the core of Open Access (OA)²⁴.

²² See <http://ocw.mit.edu/index.htm>.

²³ See <http://www.hewlett.org/>.

²⁴ OA can be delivered in two ways: "green": the author can self-archive at the time of submission of the publication (the 'green' route) whether the publication is grey literature (usually internal non-peer-reviewed), a peer-reviewed journal publication, a peer-reviewed conference proceedings paper or a monograph; "gold": the author or author institution can pay a fee to the publisher at publication time, the publisher thereafter making the material available 'free' at the point of access (the 'gold' route). The two are not, of course, incompatible and can co-exist. C.W. BAILEY, *Open Access Bibliography: Liberating Scholarly Literature*

A number of major events have occurred in the last years: in 2002 the Open Society Institute²⁵ launched the Budapest Open Access Initiative²⁶. In 2003, the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities²⁷ was drafted and in 2005 the World Summit on the Information Society²⁸ included open access in its Declaration of principles and plan of action.

Open access normally covers three sides of a single issue, with parallel lines, but closely linked together²⁹. The first side refers to the institutional and political movement that developed in universities and research centers, with the objective of establishing a knowledge equitable and sustainable society. On this platform, some of the actors of economical and social contemporary life, such as George Soros and two Nobel prize winners in Economics, Joseph Stiglitz and Elinor Ostrom³⁰, have spent fortunes and works on it.

Parallel to this mobilization, a number of very heterogeneous initiatives, particularly in the United States and Europe, have been launched sharing the same principles of free access to information.

The second side of the phenomenon regards a multitude of institutional open access projects, more often public initiatives or non-profit organizations which publish material on the web in various formats.

The third side concerns the technological issue as result of a storage protocol for freely available works. This protocol includes two components:

with E-Prints and Open Access Journals, Washington, D.C., Association of Research Libraries, 2005, 107 p.

²⁵ The Open Society Foundations seek to shape public policies that assure greater fairness in political, legal, and economic systems and safeguard fundamental rights. The Information Program supports initiatives which enhance access to the knowledge-based public goods that underpin open societies, especially in disadvantaged parts of the world (available at <http://www.soros.org/>).

²⁶ See <http://www.soros.org/openaccess>.

²⁷ See <http://oa.mpg.de/lang/en-uk/berlin-prozess/berliner-erklarung/>.

²⁸ See <http://www.itu.int/wsis/index.html>.

²⁹ It is impossible to report here in a comprehensive manner the numerous studies on Open Access. For the Italian side a Bibliography in Italian language is available on the Portal of Pleiadi <http://wiki.openarchives.it/index.php/>. For legal and theoretical issues see R. CASO, *Pubblicazioni scientifiche, diritti d'autore ed Open Access: il punto di vista di ricercatori, editori e biblioteche* in "Quaderni del Dipartimento di Scienze giuridiche", n. 79, Università di Trento, 2009 (available at <http://eprints.biblio.unitn.it/archive/00001589/>).

³⁰ K. RAINER, *Erfolgreiches Scheitern - eine Götterdämmerung des Urheberrechts?*, Boizenburg, Verlag Werner Hülsbusch, 2008, Chapt. 7, p. 425 ff.

the data provider, managing one or more archives (repositories) of collections of digital objects, and service providers that handle value services for metadata sharing (Open Archive Initiative)³¹.

In such an environment open access is considered a spin-off from the digitization process, aiming at restoring important priorities in the area of knowledge production and dissemination. Many are the examples highlighting national and international policies which are supporting free access to publicly funded research results³².

4. THE OPEN KNOWLEDGE FOUNDATION

A central role in the management and promotion of open models is playing by the Open Knowledge Foundation (OKF).

This Foundation is a not-for-profit organization, dedicated to promoting open knowledge in all its forms. It is a leader in this field nationally and internationally. In particular, it promotes the idea of open knowledge by developing, supporting and promoting projects, communities and tools that foster and facilitate open knowledge creation, access and dissemination. The Foundation's activities are organized around individual working groups and projects, each focused on a different aspect of open knowledge, but united by a common set of concerns, and a common set of traditions in both etiquette and process. Founded on May 24th 2004 in Cambridge (United Kingdom), the Foundation has provided an official definition of open knowledge

³¹ The Open Archives Initiative develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content. OAI has its roots in the open access and institutional repository movements. Continued support of this work remains a cornerstone of the Open Archives program. Over time, however, the work of OAI has expanded to promote broad access to digital resources for eScholarship, eLearning, and eScience (<http://www.openarchives.org/>).

³² Some of them are the following: the establishment in 2004 of the OECD Declaration on access to research data from public funding on behalf of OECD Committee for Scientific and Technological Policy at Ministerial Level as an incentive to develop international and national policies for free access to public funded research. The National Institutes of Health (NIH), the largest funder of medical research in the world, since 2005 asks every scientist who receives an NIH research grant, and who publishes the results in a peer reviewed journal, to deposit a digital copy of the article in PubMed Central (PMC), the online digital library maintained by NIH. PMC will then provide free online access to its copy some time after the article is published in a journal, the length of the delay to be determined by the author. The Study on the Economic and Technical Evolution of the Scientific Publication Markets of Europe published by the European Commission in 2006 has made a number of recommendations to improve the visibility and usefulness of European research outputs.

and participates in several projects. It is worthwhile to look at some of the OKF's projects.

The Comprehensive Knowledge Archive Network (CKAN)³³

It is a catalogue of projects on Open Data (including some non-Open Data) created to make it easier to find, share and reuse data and free content. CKAN provides support for publishing and versioning Open Data packages and includes robust Application Programming Interface (API) support. However, the metadata about the data packages is recorded utilizing free tagging which does not support hierarchical, view-based search and does not contain semantic relation data between different tags. The CKAN software and the related website are designed and maintained by the Open Knowledge Foundation.

Open Knowledge Definition (OKD)³⁴

The Open Knowledge Definition is based on the open source software definition. The OKD sets out principles to define "open" in open knowledge. The term knowledge is used broadly including all forms of data, content such as music, films or books as well any other types of resources.

A work is open if its way of distribution satisfies these conditions:

1. access;
2. redistribution;
3. reuse;
4. absence of technological restriction;
5. attribution;
6. integrity;
7. no discrimination against persons or groups;
8. no discrimination against fields of endeavor;
9. distribution of license;
10. license must not be specific to a package;
11. license must not restrict the distribution of other works.

³³ See <http://www.ckan.net/>.

³⁴ See <http://opendefinition.org/>.

Open Data Commons³⁵

Open Data Commons provides legal solutions for Open Data, including the Public Domain Dedication and License (PDDL) and the Open Database License (ODbL). PDDL is a license that implements the Science Commons protocol for open access data, explicitly placing it in the public domain. ODbL is a ShareAlike license³⁶ for data, that obviates the problems of inapplicability of copyright to facts, and greediness of the ShareAlike clause when it comes to use of maps in PDFs, etc.

Furthermore, the Open Knowledge Foundation has recently published a list of Open Data catalogues from around Europe on its website³⁷. The list is currently being expanded, but already offers around 50 catalogues collecting initiatives and ongoing projects on Open Data.

5. GENERAL OVERVIEW OF THE SOCIO-ECONOMIC AND LEGAL ENVIRONMENT WITH RESPECT TO OPEN CONTENT IN AFRICA

Open models for distribution of content hold the promise of supporting a nascent knowledge economy in Africa. Purely commercial models of distributing information have clearly failed in many instances. The knowledge ecosystem in many African countries is characterized by scantily available local digital content – both of the free and open (government, private or user-generated) and of the commercial kind. Furthermore, regional leaders, such as Kenya and South Africa among others, provide much of what accounts for African content³⁸.

E-government, however, is steadily gaining ground in most African countries. With websites ranging from simple information about those that govern the land, to more comprehensive documents collections as well as advice for citizens. One of the pillars of Open e-Government – the Open Data –

³⁵ See <http://www.opendatacommons.org/>.

³⁶ The Attribution-ShareAlike license requires that you attribute the works to their original authors/musicians (attribution), and that any derivative works (anything you make using the sound files) be licensed under the same license (share alike). See <http://creativecommons.org/licenses/by-sa/2.5/>.

³⁷ See <http://lod2.okfn.org/eu-data-catalogues/>.

³⁸ UNECA, 'African Content Development: Creation and Dissemination', E/ECA/DISD/CODI.1/6, 1999 (available at <http://repository.uneca.org/bitstream/handle/123456789/15582/Bib-62485.pdf?sequence=1>).

has not yet been implemented comprehensively in a country on the African continent.

On a separate note, the literature on open access models in Africa reiterates the problems created by the digital divide, the predominant flow of information from the rich North to the poor South and the insignificant quantity and impact of African scientific research³⁹. As African countries work on closing the gaps, these problems are still worth mentioning to canvass the constraints to information flows, where information is a building block of the knowledge ecology.

5.1. Socio-economic Constraints to Open Models in Africa

Any discussion on open models of dissemination of information in Africa should be placed against the canvass of the constraints in the use of Information and Communication Technologies on the continent. Internet World Stats⁴⁰ show that Africa enjoys the highest rate of increase in Internet penetration – 2367% growth in users over the past ten years. The current 110 million users, however, represent only 10.9% of the continent's population and 5.6% of the total number of Internet users in the World. Some African countries experienced growth percentage in the high thousands (between 10 and 70 thousand per cent). While the figures still show that the African community of Internet users is relatively very small, they are encouraging in the sense that the community is growing rapidly due to intensive measures taken to enhance regional and international connectivity links⁴¹.

5.1.1. New Communication Channels and New Modes of Knowledge Presentation

A major reason for the slow uptake of the Internet, and consequently the consumption and production of local African content, is also the overall low percentage of functionally literate adults in Africa. The average across the continent hovers around the 40% mark with South Africa exhibiting the largest group of literate adults at over 60%. Local content production

³⁹ W.E. NWAGWU, A. AHMED, *Building Open Access in Africa*, in "International Journal of Technology Management", Vol. 45, 2009, n. 1-2, pp. 82-101.

⁴⁰ See <http://www.internetworldstats.com/stats1.htm>.

⁴¹ Projects such as SEACOM (<http://www.internetworldstats.com/stats1.htm>) and EASSY (<http://www.eassy.org/>) have dramatically improved connectivity options, including price and speed, for African countries.

follows this trend. It could also be argued that Open Government Data initiatives and open content would benefit mostly functionally literate adults on the Internet.

If the latter thesis is to be adopted, this leaves a huge majority of Africans outside of the scope of information and knowledge initiatives. A proposed solution is the development of voice-based web access and multimodal interfaces to make ICT services available to the illiterate people and underprivileged communities.

In order to reach citizens in African countries, projects adopting open models must also consider local distribution constraints. For instance, bandwidth and infrastructure expense and unreliability limit the utility of an exclusively Internet-based distribution strategy for African data. Whereas Internet penetration is at a low 10.9% Africa has become the fastest growing mobile market in the world with mobile penetration ranging from 100% to 30%⁴². Open models in Africa, to be successful in providing inclusion of the poor and marginalized, would have to employ mobile distribution channels. Many envision the mobile web opening up opportunities for democracy (via mobile social platforms and cheap data on mobile networks), as well as m-Learning (mobile learning through traditional data channels and new innovative ways of combining learning material)⁴³.

When considering the adoption of alternative channels of distribution of data, standardization and appropriate choice of technology become of paramount importance. This represents a further challenge in terms of technology and policy choices that cannot be fully developed in this article.

5.2. Legal and Policy Constraints to Open Models in Africa

The legal environment that impinges on the dissemination of content on the continent is quite heterogeneous and generalizations are difficult to apply from country to country. Freedom of information, privacy and intellectual property rights regimes and policies, where available, are mostly outdated, constraining open models of information dissemination.

The existence of a strong freedom of information framework, while not necessarily a requisite for the carrying of out Open Government Data projects, for example, is undoubtedly beneficial in creating a general expectation

⁴² See <http://www.developingtelecoms.com/>.

⁴³ See *Mobile Trends 2020 Africa* (available at <http://www.slideshare.net/rudydw/mobile-trends-2020-africa>).

and culture that government data or information should be made available to citizens. For example, currently only six African countries have freedom of information laws in place⁴⁴. In all of these countries though, the system is somewhat dysfunctional and practically non-conducive to ensuring the free flow of government information to the citizens⁴⁵. In all of these countries, without exception but in different degrees, government information reaches the citizens with difficulties and transparency and social deliverables of freedom of information laws are limited⁴⁶. Many open access activists and project managers would concede, however, that it is more often the case in Africa, that public data or information would be released through the more informal, as opposed to freedom of information requests, channels where organizational decision makers act as local champions for releasing government data.

The regulation of privacy and data protection is another legal issue to consider when discussing the availability of open content. Information privacy regulation could either promote or stifle the development of open repositories. Open access projects in many African countries have had to carefully draft information privacy policies to apply to content, as often the legislation and policy on this topic is unclear or underdeveloped. For example, South Africa's information privacy legislation has been in the works for the past ten years, leaving issues of privacy rights of individuals whose personal information appears in government data appearing online, to be decided based on outdated norms appearing in sectoral rules. While some open content project managers may see the lack of comprehensive regulation of privacy as an opportunity to advance the rapid publication of data, the lack of careful management and regard for personal rights may cause for public backlash against the open access initiative. The Southern African Legal Information Institute (SAFLII) – an open content publisher of judicial opinions from fifteen African countries – has good experience in achieving

⁴⁴ A list of FOI Laws on the African Continent is available at http://www.africafoicentre.org/index.php?option=com_docman&Itemid=419.

⁴⁵ M. KEITA, *Freedom of Information Laws Struggle to Take Hold in Africa* (available at <http://www.modernghana.com/news/262406/1/freedom-of-information-laws-struggle-to-take-hold-html>).

⁴⁶ See generally for the situation in South Africa C. DARCH, P.G. UNDERWOOD, *Freedom of Information Legislation, State Compliance and the Discourse of Knowledge: The South African Experience*, in "The International Information & Library Review", 2005, n. 37, pp. 77-86.

such a balance. SAFLII's Terms of Use⁴⁷ tell us that the project strives to achieve privacy compliance by checking and anonymizing data (court judgments) prior to their online publication. At the same time, the project continues to advocate for a consistent policy of legislative treatment of the issue of privacy in public documents which is lacking in South Africa and across the jurisdictions in which SAFLII operates.

The impact of a stringent intellectual property regime on access to knowledge is a contentious discussion topic between rights holders, and user groups and librarians. The African Copyright and Access to Knowledge Project (ACA2K) conducted a study to establish the relationship of national copyright environments and access to knowledge in African countries⁴⁸. The detailed exposition of the intellectual property regimes of the participating countries show that at times, when the laws are abided by, they do little to encourage open access to knowledge. However, where copyright regimes are restrictive, authors could use open licenses such as the Creative Commons licenses, to ensure the unimpeded dissemination of their work.

The ACA2K team also looked into the public domain nature of government works and government-funded works. The legislator across the studied countries seems to have placed such works in the public domain with minor variations around translations and contracted work.

A recent legislative development in South Africa jeopardizes access to local publicly funded research. The Intellectual Property Rights from Publicly Funded Research and Development Act No. 51 of 2008⁴⁹ and its Regulations adopt the default position that such research should be commercialized, where possible, through a patent system. Research outputs that are in the public interest or are important for social development may, on application to a government agency, be released to the public domain. This, as Pria Chetty notes, should happen through the vesting of a royalty-free right of the state rather than a more desirable licensing solution⁵⁰. Commentators are in general agreement that the legislation may lead to a decline in research

⁴⁷ SAFLII's Policy (available at <http://www.saflii.org/content/terms-use>).

⁴⁸ C. ARMSTRONG, J. DE BEER, D. KAWOYA, A. PRABHALA, T. SCHONWETTER (eds.), *Access to Knowledge in Africa: The Role of Copyright* (available at http://www.aca2k.org/attachments/281_ACA2K-2010-Access%20to%20knowledge%20inAfrica-s.pdf).

⁴⁹ Intellectual Property Rights from Publicly Funded Research and Development Act, no 51 of 2008 (available at <http://www.info.gov.za/view/DownloadFileAction?id=94343>).

⁵⁰ P. CHETTY, *Review of the IPR Act and Regulations: Intellectual Property Rights from Publicly Financed Research and Development Act, Act No. 51 of 2008, Republic of South Africa*,

output in general or public domain research output. The solution also runs contrary to international best practices.

Overall, however, and complexities aside, the intellectual property regime does not seem to differ much from the international norm. The point in argument here being that enabling policies could be crafted similarly to other jurisdictions.

Many efforts are underway to overcome the challenges of the socio-legal environment and work towards increasing the availability of free and open African content.

6. BRIEF EXPOSITION OF AFRICAN PROJECTS EMPLOYING OPEN MODELS

6.1. *Open Data in Africa*

Open Government Data (OGD) portals such as data.gov and data.gov.uk do not exist in Africa yet. The only planned such project, in Kenya, does not function yet⁵¹. The World Wide Web Foundation, through its Open Government Data Initiative, is investigating the development of such a portal in Ghana. The preliminary report examines the feasibility of starting an Open Government Data project in Ghana – the document is a blueprint for future such OGD readiness assessments⁵². The study is based on an earlier research considering OGD initiatives in middle income and developing countries⁵³. The World Bank and UN repositories of Open Data are the only ones that currently provide African data. Google has been actively pursuing a strategy of partnering with African governments to publish some of their data. While this represents a practical solution to a difficult problem (specifically with the expensive scanning and conversion of large volumes of mostly hard-copy data), it is also a questionable practice that a multinational is allowed access to what citizens are not.

in “The African Journal of Information and Communication”, 2009-2010, n. 10 (available at <http://link.wits.ac.za/journal/AJIC10-Chetty.pdf>).

⁵¹ See <http://www.opendata.go.ke/>.

⁵² See http://public.webfoundation.org/2011/02/OGD_ghana_PR.pdf.

⁵³ Hogue Open Data Study, May 2010 (available at http://www.soros.org/initiatives/information/focus/communication/articles_publications/publications/open-data-study-20100519/open-data-study-100519.pdf).

6.2. *Open Content in Africa*

Concomitantly, NGOs and civil hackers continue efforts to practically provide access to Africa's government data⁵⁴. Particularly successful have been initiatives in the legal information domain with models of excellence in the Arab North, in Kenya and in Southern Africa. The Southern African Legal Information Institute employed an open content model in distribution of legal information published on its website, based on the Creative Commons Attribution and Share alike license. This was done because at the time the Institute was the only repository of such content. Five years into its operation users of the service see its greatest achievement in unblocking content flows and creating an expectation of open access and reusability of legal content⁵⁵. This success was re-enforced by the inception of many new services around value adds to legal information provided on SAFLII. Following this model, the African Legal Information Institute (AfricanLII)⁵⁶ was created, sponsored currently primarily by the Open Society Institute and the Open Society Initiative for Southern Africa, to replicate and adjust the model across 25 African countries and bring African legal information online through a variety of channels and in a structured format.

6.3. *Open Access in Africa*

Eve Gray, a South African expert in open access and sustainability models for such access, paints a positive picture of the open access landscape in Africa⁵⁷. With a "growing number of archives and repositories of scholarly content on the continent – there are now 30 repositories in Africa listed in the Open Doar directory"; and with the African Academies of Science promoting the development of open access models; and with CODESRIA – a pan-African social science research organization, publishing a number of journals and books, the open access movement in Africa is well on the way to feeding into an African knowledge ecology.

⁵⁴ See Mzalendo at <http://www.mzalendo.com/> keeping an eye on Kenyan Parliament or PMG <http://www.pmg.org.za>.

⁵⁵ Based on interviews with users of the service conducted by the author as part of a sustainability study.

⁵⁶ See <http://www.africanlii.org>.

⁵⁷ E. GRAY, *Access to Africa's Knowledge: Publishing Development Research and Measuring Value*, in 'The African Journal of Information and Communication', 2009-2010, n. 10 (available at <http://link.wits.ac.za/journal/AJIC10-Gray.pdf>).

7. CONCLUSION

The considerable number of efforts that are being made, based on the open models philosophy, have brought about major changes in the publishing market and in general in the production and distribution of knowledge.

Open and linked data, open content and open access' concepts, originated in the academic and scholarship environment are now gaining increasing importance in many sectors of life.

There is evidence that a new perspective, focused on collective knowledge's sharing and reuse of content can facilitate development of synergy between the data, information processing capacity of information technologies and the original creative capacity of human beings.

As a matter of fact a shift is taking place from the traditional view of knowledge management mainly focusing on information, to the notion of knowledge ecology, which adds the context and thrust necessary for translating information into actionable knowledge.

Knowledge creation, as a phenomenon mainly occurring in the process of social interaction, is more and more based on exchange of information and on varying and complex interpretations of it. This is made possible by adopting more open approaches to the production and distribution of knowledge, while relying on Creative Commons license models with the aim of enhancing the value of reuse as a way to create more and better data.

The creation of a sustainable knowledge ecology based on open models is possible in many African countries even more than before. The past 5-10 years have seen the building of important momentum by key figures in academia, government and civil society, as well as intensified studies into the local environment and applicability of tested models to the African environment. An optimistic view of knowledge ecology in Africa could see the continent beating the odds and fast forwarding through to a collaborative knowledge ecology catering to social needs and offering opportunities for sustainable improvements in the lives of Africans.