Free Knowledge Movement

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What is this?

Acclaimed mathematician J.S.Milne quotes in his website while advocating for open access to knowledge the following letter to The New York Times dated March 7, 1999,

"Not only are universities forced to pay unbelievably high prices for scientific journals but they also face the ignominy of buying back the research their own scientists have produced. They use university (and quite often, Federal) money, yet scientists must sign over all copyrights to publishers to get their research published. The publisher of a scientific journal pays nothing for the articles, and its other costs are minor: the journal editor usually receives a small stipend, and the article reviewers are volunteers. Considering the actual costs in producing a scientific journal, the prices charged can appear obscene"

Many of my peers and I have photocopied books and have use scanned books from the Internet to meet our course needs. Some times even instructors have implicitly or explicitly suggested such practices. Many people have advocated that there is no other alternative given the pricing and poor availability of these reference works. However, I felt pangs of guilt about breaking the law. This led me to learn more about sustainable efforts to provide freely accessible knowledge while respecting copyright frameworks and author rights. In this article I discuss some of these efforts, the merits and hurdles in developing innovative approaches to solve this problem and how and why we should all get involved.

Free knowledge movement or Open-access movement aims at putting peer-reviewed scientific and scholarly literature on the Internet and making it available free of charge and free of most copyright and licensing restrictions. It is about removing the barriers to serious research and hence making knowledge available and accessible to a larger audience and to everyone in principle. The movement aims at not only eliminating the price barriers but also resolve the complicated copyright questions that inhibit distribution of knowledge resources.

I first started such attempts during the second year of my undergraduate at Chennai Mathematical Institute (CMI) and some of my seniors took more intensive efforts towards it and continue to do so.We have tried to contribute in our own little ways to the movement. In the parlance of a corporate consultant we are yet to precisely "attach a dollar value" to the returns from the movement though we realize deep down that it is invaluable.

For a expository yet detailed description of this idea the reader is requested to read the booklet on this available from the website of *Centre of Educational Research and Institution (CERI)* at `http://www.oecd.org/document/54/0,3343,en_2649_35845581_38664182_1_1_1_1,00.html` More detailed references and recent updates on these ideas can be had from `http://www.earlham.edu/~peters/fos/`

A glimpse of the progress till now

Talking of free knowledge resources the first things that come to my mind are Wikipedia, Google Search and Linux. Under the Wiki concept we need to include all its variants like Wikipedia, Wikiversity, MediaWiki, Wikibooks etc. But then as many people around the world have realized that Wikipedia isn't really the right way to go ahead towards open access though it is definitely a great start. It is structurally not built or propagated to become a quality reference and probably will remain limited to only being a pamphlet for the topics. Apart from being a repository of links to deeper references, it will only serve as a lazy option when the seeker isn't serious enough and is only interested in quizzing level information. We recognize the sharp line between just "information" and "knowledge/understanding". Unfortunately Wikipedia is often good enough to get marks in most assignments I have had to face in the institutions! (time to rethink the course structures?)

For many serious technical topics, for example Mott Scattering, I think Wikipedia is far from becoming a standard learning resource. And obviously these issues have led to more extensive specialized efforts like Wikibooks (especially the state of the art Wikibooks on LaTex and C++) and individuals hosting MediaWiki sites like this extensive resource on Group Theory at `http://groupprops.subwiki.org/` created by Vipul.

Endeavours have been made to create more specialized free resources for serious seekers of knowledge. Some of the most high-quality free knowledge resources in the Internet that I have personally used are for example the monographs in physics and mathematics made available by Clay Mathematics Institute and Mathematical Sciences

Research Institution, the texts on Algebraic Topology on the home page of Allen Hatcher at Cornell University, videos of lectures on String Theory and Supersymmetry by Shiraz and Sunil Mukhi at TIFR respectively, (a similar effort by Sunil Mukhi for General Relativity is currently under progress), detailed lectures on various advanced mathematical topics by J.S.Milne at Michigan University and J.P.May at University of Chicago, economics writings of Paul Krugman at MIT, MIT OCW, MIT World. Special mention should be made of the gigantic effort by thousands of particle physicists across the world to compile and make freely available to everyone online as well as in print, what is called the "Reviews of Particle Physics". (one should also note the myriad of web resources indicated there from Page 20-27 in the 2006 edition of that voluminous book version). These efforts might not be an indicator of a concerted international effort but is definitely indicative of a rising global consciousness.

We should be very grateful to these institutes and the individuals who have taken great efforts to make such quality knowledge available to all of us for free. All you need to learn these is a broadband! (and of course an open mind)

These efforts are astronomically better than the Wikipedia in their areas primarily because these are very often peer-reviewed resources and are written in a very continuous and coherent fashion unlike the Wiki format which is more adapted for quick referencing rather than deep learning. More importantly these are written by some of the stalwarts and experts in the field which is almost never the case with Wikipedia.

Open access to knowledge is hard to achieve untill we as a society grow out of the race to publish in elite journals which at the end of the day because of high costs will not reach a large audience and hence grossly defeats the purpose of pursuit of knowledge. Many institutes have tried to encourage open access at the level of directive principles like the *Harvard Open Access Policies* and similar efforts by *National Institute of Health*.

As a science student in India, I strongly feel that it is crucially important that India makes an all out effort to proactively shift roles from being the beneficiary of such efforts from other countries to become the creator and contributor to the open access revolution that has started. Continuity of such a delicate movement requires that everyone contributes to the resources and there be no laid-back audiences. One of the important such initiatives from India has been the NPTEL videos and personally I have benefited immensely from the electronics lectures hosted from IITM. Incidentally months later unexpectedly I met Prof.T.S.Natarajan from IITM whose videos I watched from NPTEL and thanked him for his efforts. Though NPTEL is a great beginning, it has a long long way to go in terms of sophistication and especially in terms of tapping invaluable resources beyond the IITs and IISc and beyond just engineering subjects. Like integrating into it many of the exquisite mathematics and computer science lectures at CMI and ISI would be a great way ahead. I have aways hoped that CMI had videotaped and made available for the rest of the world the state-of-the art lectures of Prof.S.Ramanan. (that I was fortunate to attend)

The Incentives

Would you love to go buying in a market where your wanted product is monopolized by some particular brand? Probably not. Precisely this is the danger that Wikipedia is creating online by almost monopolizing the situation. Worse this polarization isn't justifiable by any visible constant progressiveness in terms of quality or attempts to rope in experts to do systematic review. Just by being the sole player it has almost become "the" source of knowledge for non-professional information seekers though potentially always there is so much competition available for it in terms of quality. Creation of options for the buyer in the market is one of the most important effects of the free knowledge movement. The entire idea makes it infinitely easier for the giver of knowledge to distribute it compared to the entire hassle of getting something printed or published (not considering the pure cost ineffectiveness). This movement provides a route to exponentially raise the number of options in the market. And very often when the giver of knowledge is already an employee of some academic institute, the writer's livelihood isn't really dependent on the sales from the book!

Though the free knowledge movement makes the race for quality very fierce and hence doing good to the market, it also facilitates collaborative content creation by its very technological and emotional structure. It lets the feeling of oneness of being members of humanity spring to the center stage while letting the competitive aspect be only at the level of product quality and not at the personal level.

Various economic models are being worked upon for the open access movement. One one hand putting up knowledge resources online can act as a very efficient and non-intrusive form of advertisement for that individual and that institute. On the other hand such efforts are very much in accordance with the deeper principles of learning and the reasons for pursuit of it. There is much to be gained by ensuring that every seeker of knowledge gets the same and hence we move towards becoming a "knowledge society" and there is so much to be lost by getting knowledge confiscated among the elite and the privileged. Very often many brilliant students might not get admitted to an institute of their choice since in principle it is impossible to judge a student's calibre in some 3-hour exam and MCQ testing methods are potentially more fallacious than every other method. In such cases free knowledge movements ensure that in terms of just raw knowledge the student doesn't lose much by not being physically in the institute.

Further at a deeper level there is much to be gained by taking efforts to video tape lectures or to LaTeX detailed lecture notes. On one hand this gives a moral push to strive for excellence on the part of the instructor and on

the other there are deeper pleasures in being able to present to the world in a coherent form some piece of one's understanding. One realizes the non-tangible gains of seeing one's knowledge and understanding in an organized form from which other's can benefit and very often such attempts enhance the clarity of thinking of the writer too. Such efforts aren't possible if one remains confined to narrow pursuits but one has to "think big". Much of excellence in academic pursuits have to start with "thinking big" in terms of reflecting on its possible global positive consequences. Narrow, local street-smart and short-time scale thinking has little chance to survive in a free world.

On more tangible aspects, open access movement along with digitization of knowledge saves on real-estate which is becoming scarce and costlier. It eliminates the entire physical and economic effort of maintaining books,libraries and cupboards.

But just to reiterate the point digitization is not the end of the free knowledge movement but only a modest start since digitization alone doesn't ensure free accessibility. The later has to be ensured separately.

The Challenges

From the point of view of a citizen of a developing country the first road block that I see is the very limited reach of broadband in India. Having personally lived in fringe towns, I am aware that even Internet connection is like platinum in those places. This can probably be a potential region where private-public partnership can help spread the broadband to every corner of India. An extensive reach of broadband in India will take open source movement to the deep interiors and hence bridging the physical impossibility of setting up institutions in deep interiors. Free knowledge movement can reduce illiteracy by exponentially reducing the cost of education and also increasing its accessibility. There is much to be gained in terms of just literacy rates by getting computing powers to reach the interiors. The possibility is very real since not only is it possible to have knowledge free but also softwares for free thanks to the Linux revolution.

Further there are lot of copyright complications to be tackled with not only the older systems but also regarding compatibility between various open source models. At this the reader is requested to read further on the web about the major initiative called *Creative Commons*.

As one might easily notice that much of the quality open source knowledge available on the net as texts are mostly at a fairly advanced level and there is much less of such writings at the undergraduate level and rarer still at the school level. This is a strong indicator for the need of greater manpower to write on the net on more basic topics. This is probably where the student community can chip in efficiently. The stalwarts in the field are unlikely to write articles on say theory of matrices and hence the expository article on linear algebra that I have put up on my TIFR home-page `http://theory.tifr.res.in/~anirbit/` might find an use.

Further much of the online educational resources are in English and this considerably reduces their reach and the bias on one single language is detrimental to the spirit of humanity. It is needed that technological support be evolved which will facilitate people to write in whatever language they feel comfortable in. Gold mines of understanding stay locked up in regional languages and efforts should also be made to digitize, translate and free them.

What we can do?

Go Type! From inside a research institute probably the biggest resource we have is the ability to type out knowledge into the web through such amazing broadband facilities. Time spent on various not-so-fruitful activities on the web can be channelized into more productive work like typing your understanding on some subject to disseminate to the world for a greater cause. The task a priori may seem arduous as it did to me initially but then in small daily steps eventually it looks natural. Enhancing the culture of running student lectures and discussion sessions can go a long way towards bigger goals and as by products the speakers can regularly keep typing the technical content onto the web. Even personal blogs can crucially contribute to the cause going beyond just record of personal ramblings. Cues can be taken from how Fields Medalist Terence Tao is using his blog.

To enhance the impact of open access movement, it is necessary that institutes like TIFR start having some central database of lecture notes of courses and intra-student sessions along with an YouTube channel for itself for videos of courses in TIFR. More and more instructors be encouraged to type detailed lecture notes after every class or video-tape them. Sustenance of such work needs appropriate tangible institutional incentives being provided to students and professors for their efforts. Such incentives can finally start the process of looking for more reliable parameters of measurement for students beyond the highly debatable reputation of marks in finite-time exams. After all MIT OCW isn't a flawless idea and there is much room to improve and surpass such initiatives.

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