Some comments for this online version: This talk was originally given at the CSPG CSEG CWLS annual convention (geoconvention.com), May 2011, Calgary, Canada. It was presented in the Economic Recovery session on Tuesday 10 May.

Format: I have removed most of the builds from this file to simplify it and reduce the number of slides. So some of the slides look harder to explain all at once than they actually are. In case you like to print things out, I apologise for the mostly dark backgrounds; it was too fiddly to remove them all.

Thanks everyone for coming to this talk.

I strongly believe that opennes—open ideas, open data, open teams—can help us build more competitive, higher performing, more sutainable organizations in this industry.

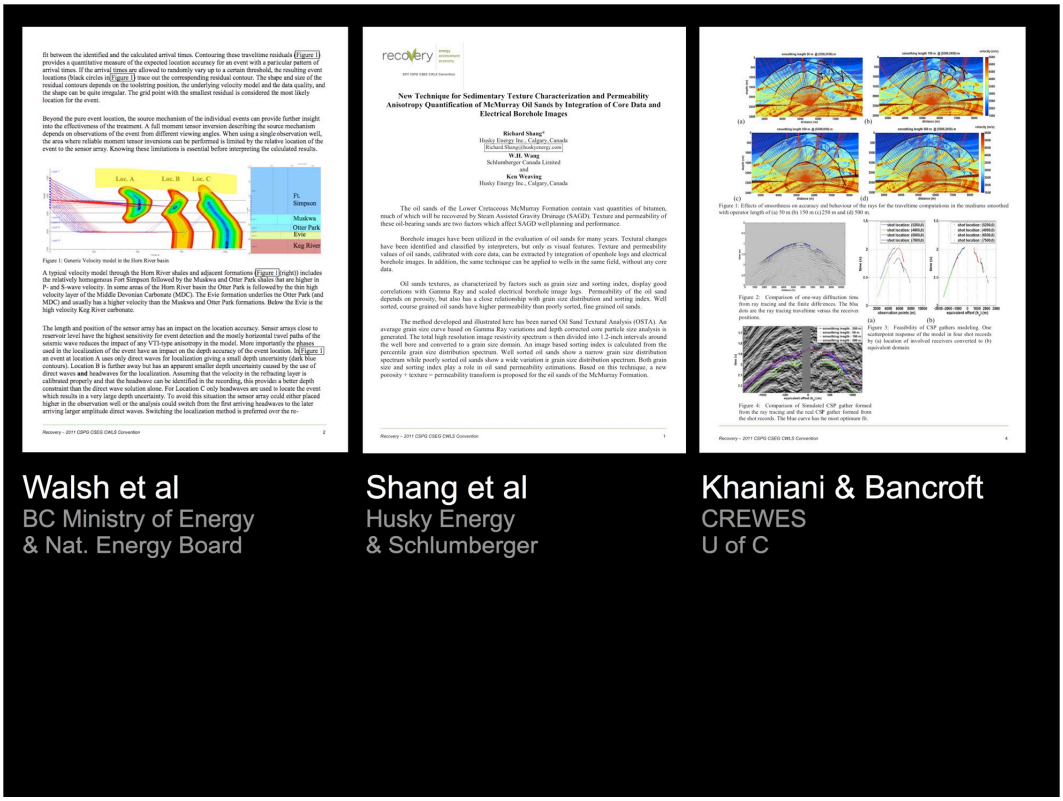
I want to share two ideas about openness, and address a couple of myths. Then tell you about two trends I see going on, and finish with two things I think we can actually do today in our organizations.

The first idea is simply that there already is openness in our industry...

...look at this conference. There are 47 sessions of talks, with something like 250 presentations. Eighty posters, and thirteen core displays. At least 4000 people, mostly earth scientists, will consume this information. And of course they'll go on to talk about it to other acquaintances.

So we do share already — especially in Calgary perhaps, where the geography of our professional networks is so compact.

But maybe there are some limits to this openness...



Walsh et al
BC Ministry of Energy
& Nat. Energy Board

Shang et al
Husky Energy
& Schlumberger

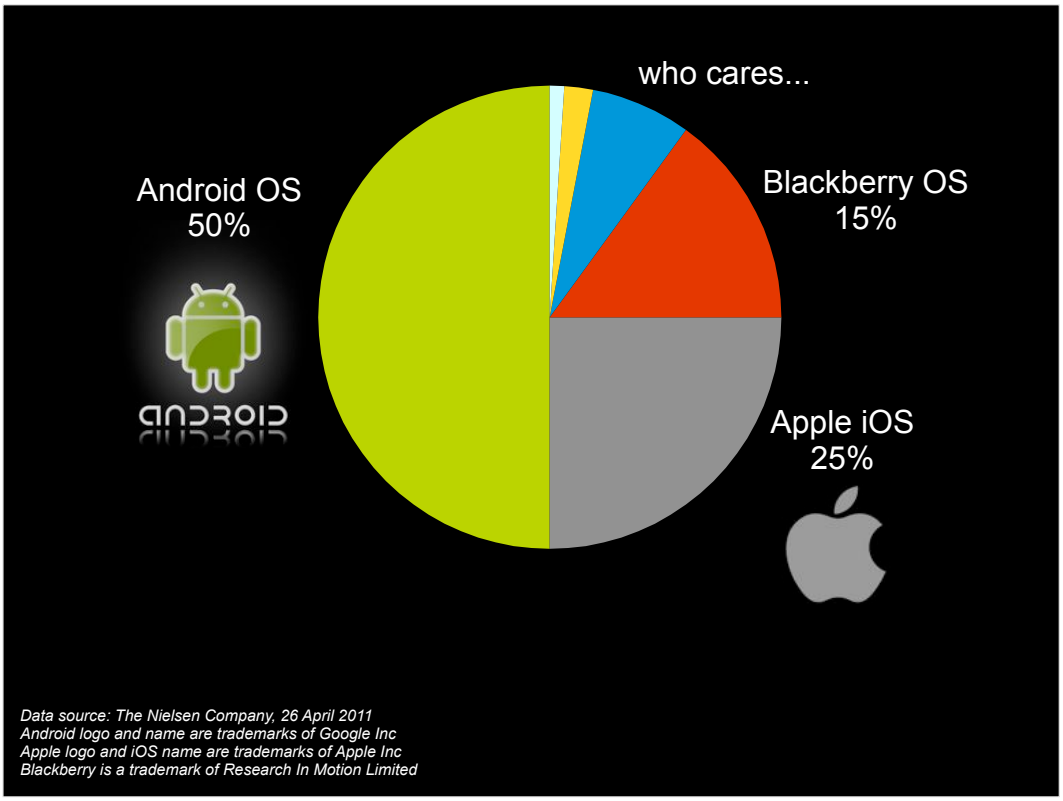
Khaniani & Bancroft
CREWES
U of C

... let's look at three more-or-less random abstracts from this conference. The first, by Walsh and others — this is a government paper — is a very nice abstract, but it obscires the well names with fake names: A, B, and C. This is common in our industry.

The second, by an old colleague of mine, Richard Shang, was a great presentation. But the abstract is the old, short, kind: it doesn't give much away.

This last one is also very nice and thorough, but it emanates from the CREWES consortium at the University of Calgary. While doing excellent science, CREWES is a closed system: to see the data or the code, you have to pay.

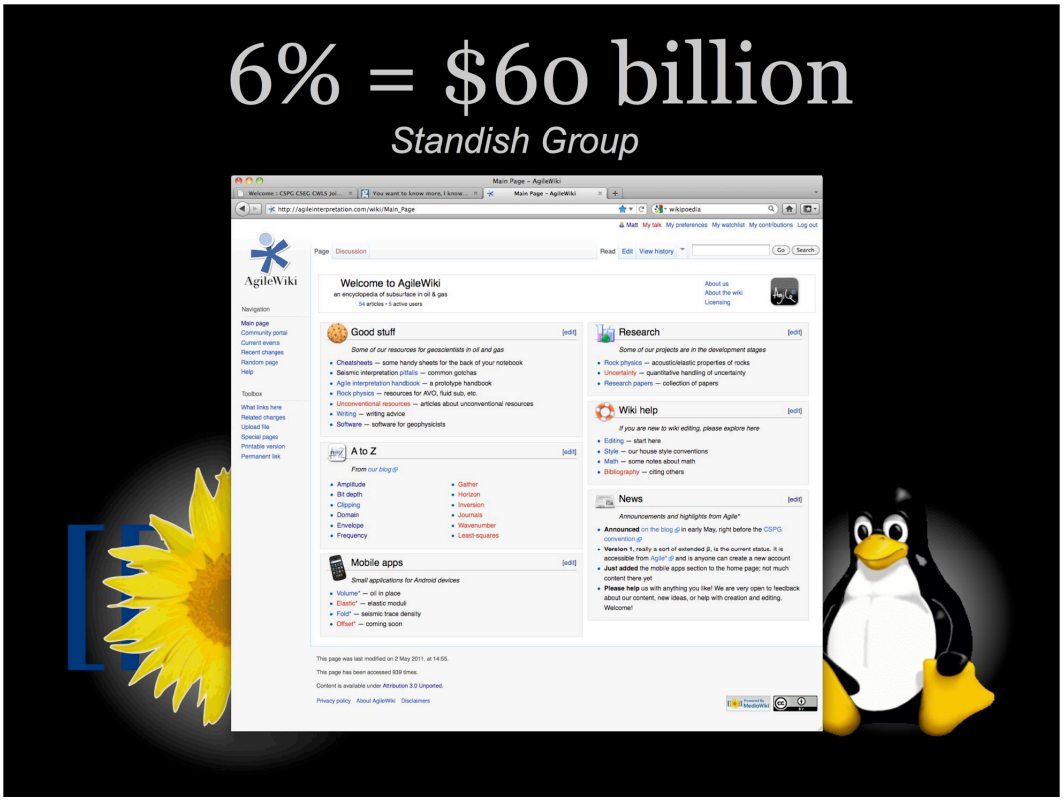
So clearly there are limits to our openness.



The second idea is about value.

There is massive value, business value, in open systems. The recent rise of Android OS, Google's mobile operating system, illustrates how an open platform can capture attention and market. Revenue from apps etc is shared with carriers and handset manufacturers, and Google's massive investment is justified by its end goal — getting more people on the web.

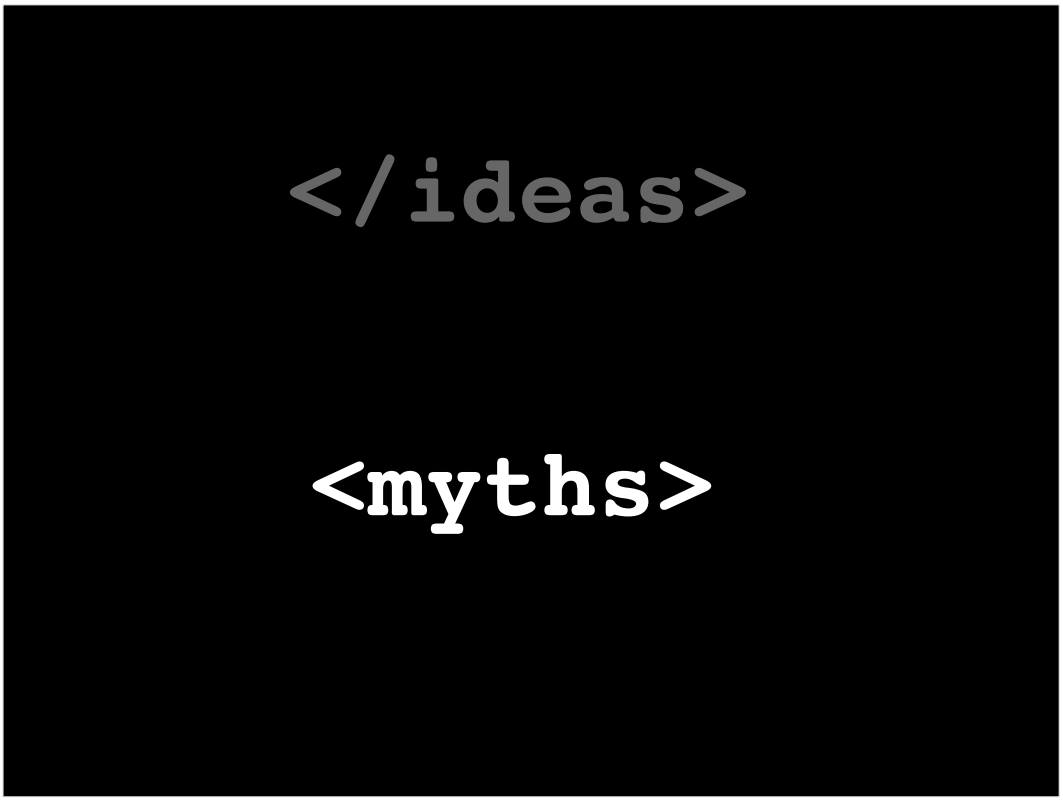
Understanding where your real value is — the web in Google's case, not operating systems – can free you from the idea that everything you do needs to be secret.



Last year, the Standish Group reserach firm estimated that open source software was capturing about 6% of the trillion dollar global IT budget. The rise of the GNU-Linux operating system clearly has a lot to do with this — the OS is even widespread in our own industry, having emerged in about 2003. Some companies are on their second hardware iteration already.

MediaWiki is the open source engine behind Wikipedia.

These open tools enable even small companies like mine to maintain inexpensive but professional-grade web services like our wiki site, which runs on Amazon's elastic compute web service.



So, there are two ideas:
Openness is not new in our industry
Openness has massive value in other industries

I want to talk about a couple of other things I've heard people say about openness, which I think are erroneous... We could call them myths.

The first is the idea that openness is not suited to business.

Believe it or not, people are using Wikipedia to do their reserach in your organization. Not only is Wikipedia based on open software and published under open licenses, the content itself is open — editable by anyone. It' as open as you can get.

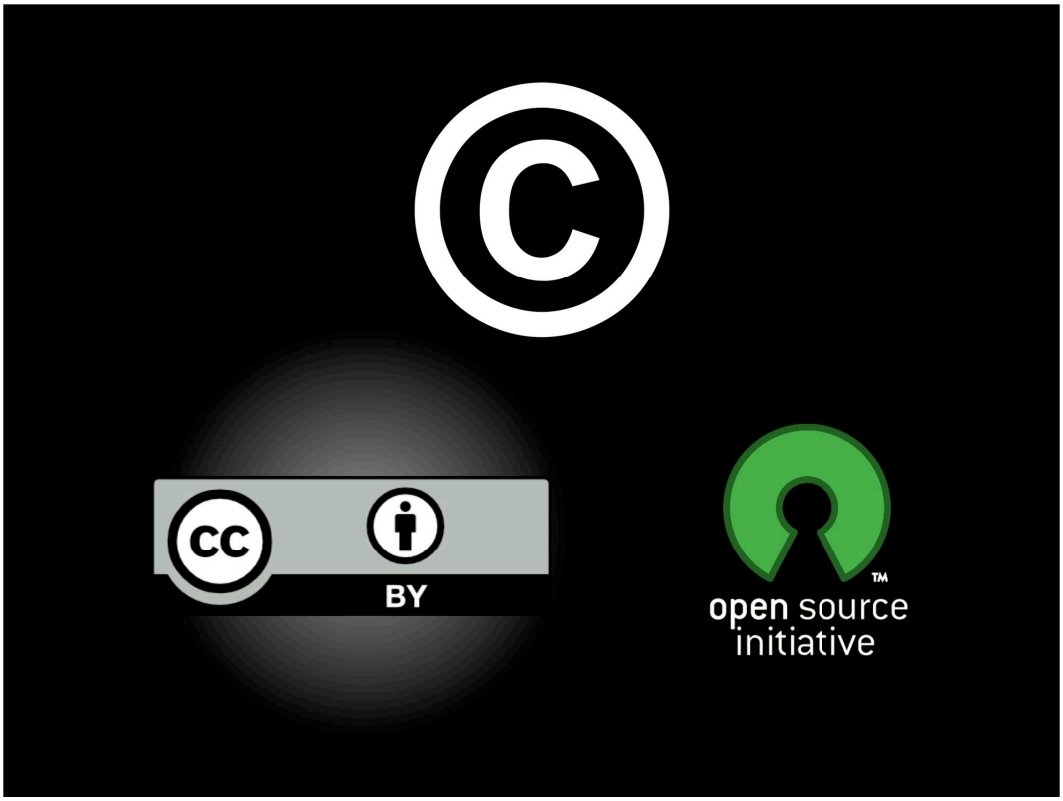
And it's fairly complete and reliable. It's a de facto authority on a very wide range of subjects. Partly because of this, it will continue to improve and eventually it will be accepted as a genuine authority.

Look at Oracle's free and open-source office productivity suite, OpenOffice.org. It's very big in goverment institutions — not only because it's free and they have a lot of users to service, but because it's open, and openness is a cornerstone of democracy. Not just of science and ethical business.

But there's also deep adoption in some traditional sectors like manufacturing and heavy industry.

There are even some large installations in the United States.

The other myth...



... is about copyright. Openness — open source, open access, etc — does not connote a free-for-all, a loss of ownership, credit, or control. Indeed, many open access models depend on copyright.

The Creative Commons Attribution (or CC-BY) license, for example, preserves copyright, and merely waives some of the exclusive rights that copyright confers. This sort of license is called 'permissive', because you can license a modified work in any way you like. Your only duty is to give the originator proper attribution.

OSI-approved open source software licenses, like the widespread BSD, MIT, and Apache licenses, work in a similar way. Some people think the permissiveness makes these licenses more business-friendly. It depends on your point of view.

Some of these types of license are also, rather confusingly, referred to as 'copyfree'. This does not mean they are copyright-free.

Copyleft is another interesting piece of jargon. It describes not the opposite of copyright, but a philosophical position. This position is often associated with the Software Freedom Foundation and Richard Stallman. The idea is that my free license must preserve the freedom of the things it protects — this is what is meant by 'share alike' or SA.

This propagating behaviour leads some people to call these 'viral' licenses. Some commercial open-source advocates, like dGB and Statoil for example, use these licenses to ensure their contributions stay out in the open.

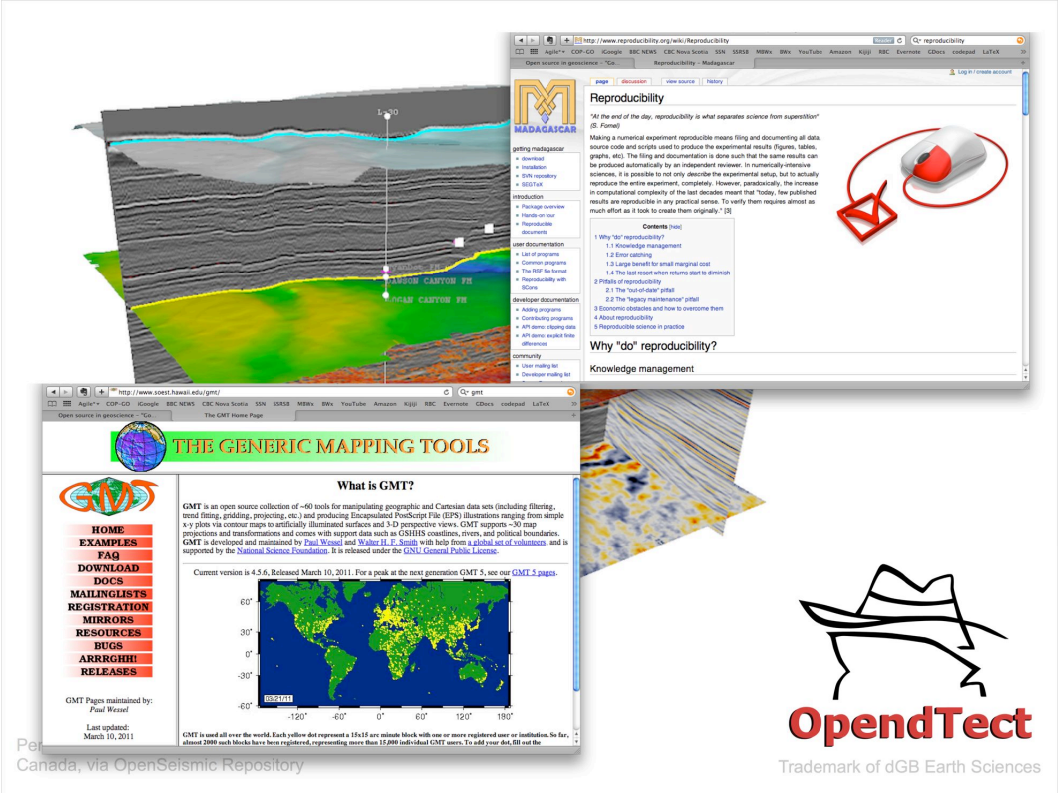
These non-permissive licenses are very widespread. The content of Wikipedia uses the CC-BY-SA license. Most open source geoscience applications use the GPL.

The only model for publishing work that is free of copyright restrictions or ownership is 'public domain' or copyright free.

Very old works generally fall into the public domain (though expressions of them, such as a photo of an old painting, for example, maybe copyright). So too does the work of many pulic bodies, such as NASA.

So there are two myths: that open thinking is not business-like, and that openness is a legal free-for-all, with no ownership or rights.

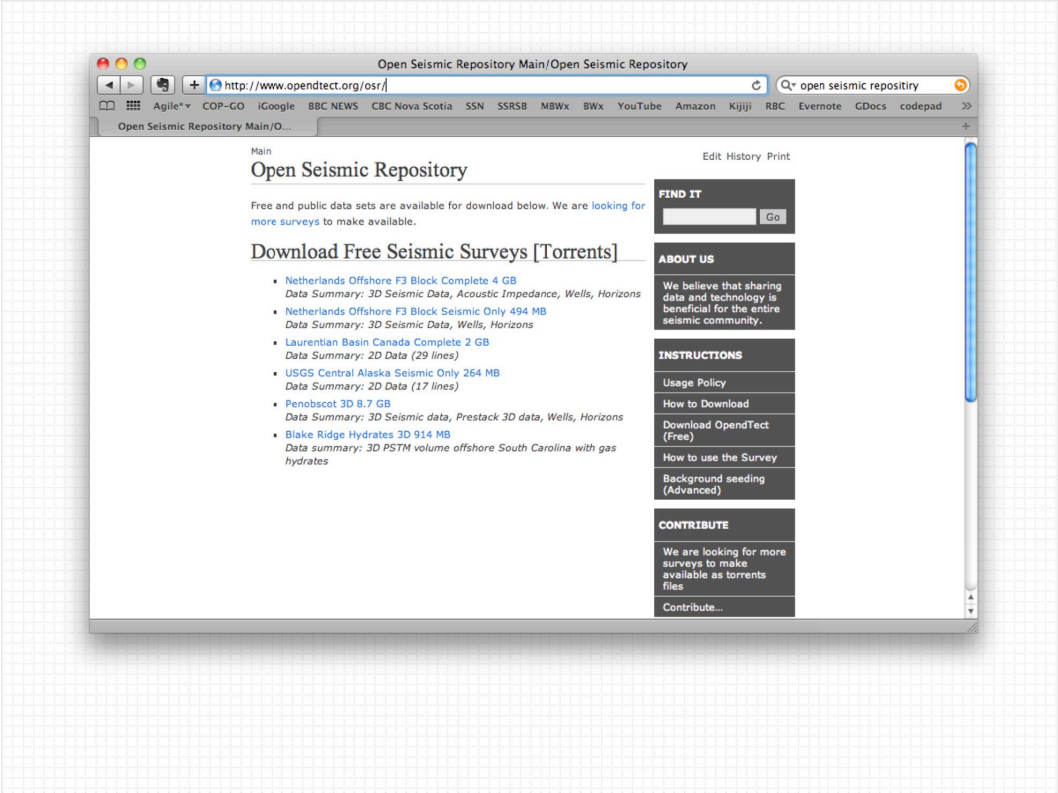
Let's look at a trend that is going on right now — the rise of open source software in geoscience.



My favourite example, because it breaks so many models of what open source software is like, is OpendTect (www.opendtect.org). Full-featured, robust, professional software, written and maintained by paid developers. How is this possible? Its creator, dGB Earth Sciences (www.dgbes.com) of the Netherlands, has the vision and courage to test the idea that a platform can be more powerful and valuable than a black box software program. They know that their real value is not in building generic 3D viz tools — it's in high-end applets (like the amazing Horizon Cube module for seismic strat) and boutique consulting.

What's really cool here is that this tool has dived into the open ecosystem, exploiting open source projects Madagascar for seismic processing and GMT for mapping extensions. This is where the real power is — modular, adaptive, open technology.

But that's not all — even this dataset is open...

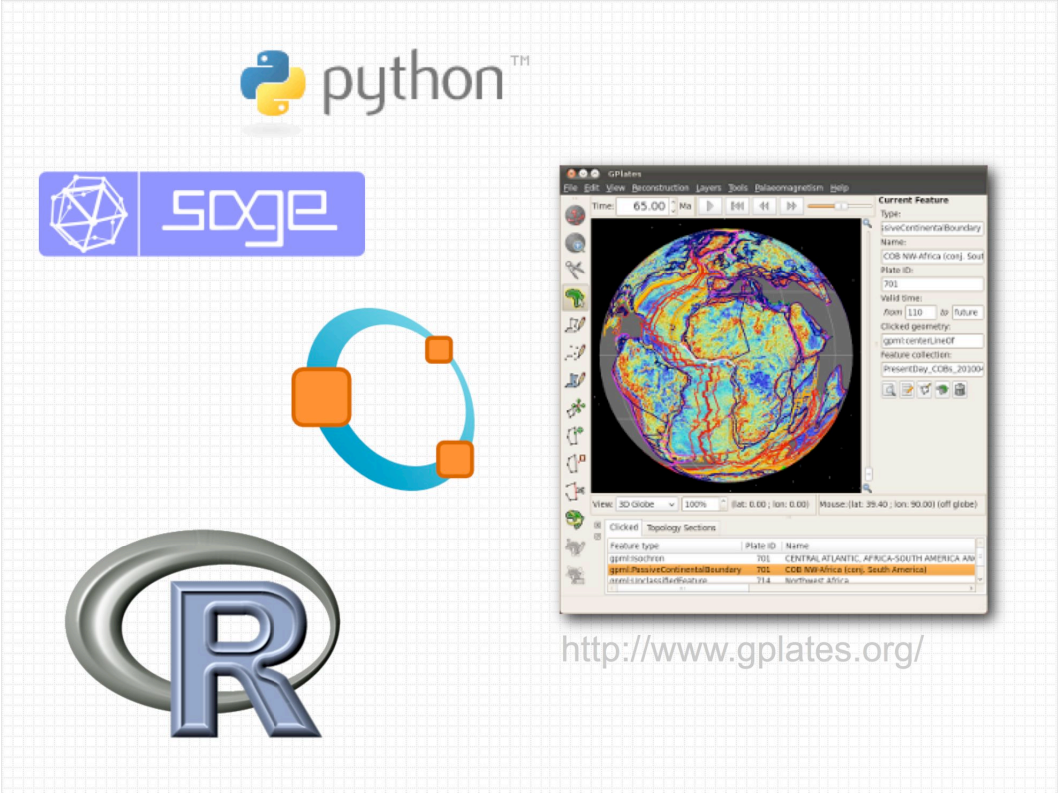


dGB, not content with disrupting the oil and gas software business, is also making a statement about open data. Their Open Seismic Repository (www.opendtect.org/osr/) is an important contribution to reproducibility in our science, as well as to improved collaboration and higher quality academic research.

There are offshore 3D seismic datasets here from the Netherlands and Canada, and the datasets include wells and even some prestack data.

Unless I'm mistaken, this – is – awesome.

We need this. We need more of this. More of this will improve our industry and eventually benefit society as we get better at extracting hydrocarbons in a responsible way.

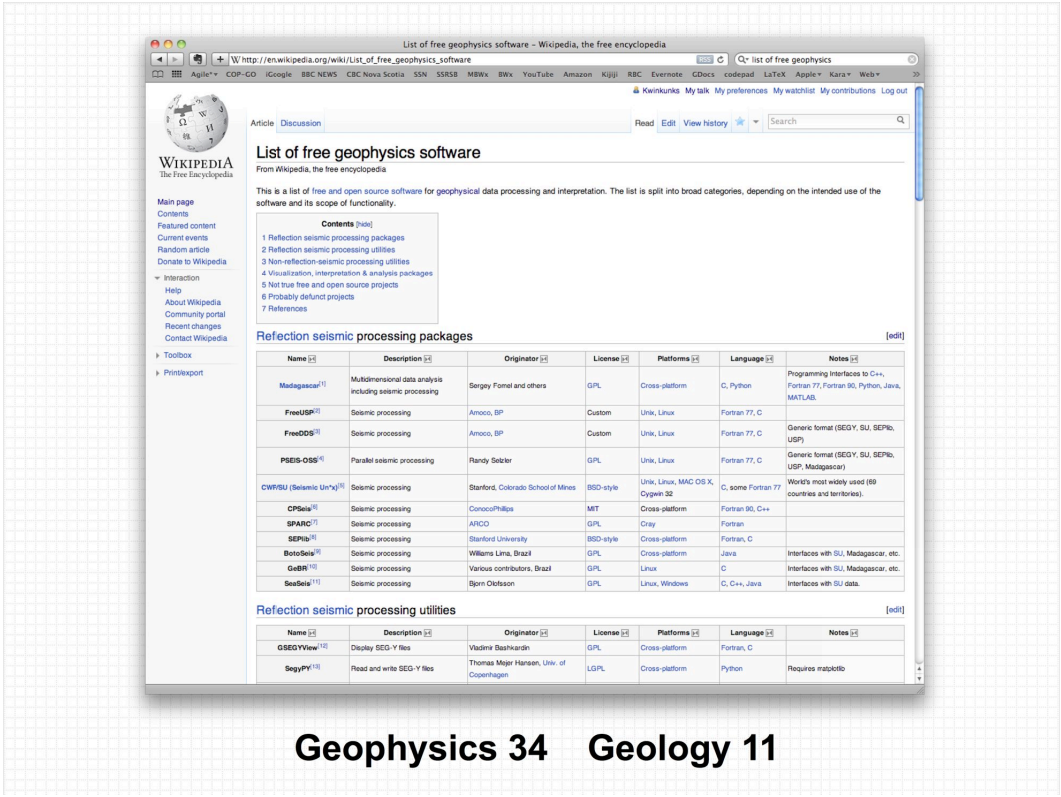


There is a vast array of other open tools... Python.org for scientific computing and scripts. Sage (sagemath.org) for solving equations. GNU Octave (octave.org) for mathematics. R (r-project.org) for statistics.

There are even awesome, fun tools for doing geoscience — check out this plate tectonic virtual globe from gplates.org.

Remember, these tools are not just free. You can download and inspect the source code. It is not possible to build a black box with these ideas.

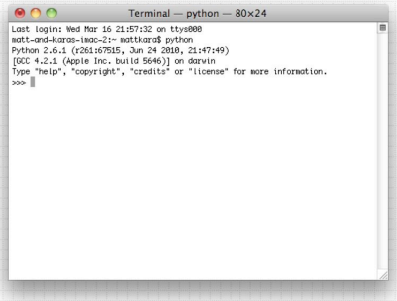
Think about that for a second: do you know what your software does?



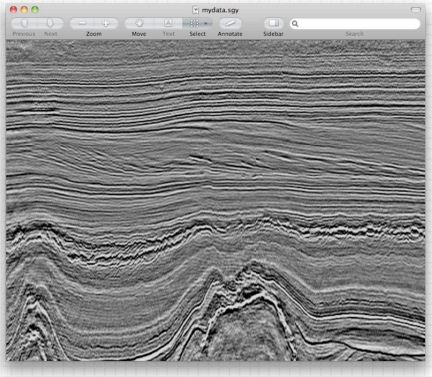
Geophysics 34 Geology 11

There's a list of lots of free geology software in Wikipedia, and another on geophysics. Google *free geophysics software* and you'll find it. If you know of, or find, others, please add them!

Software is not just technology. Software embodies someone's ideas, workflows, and methods...

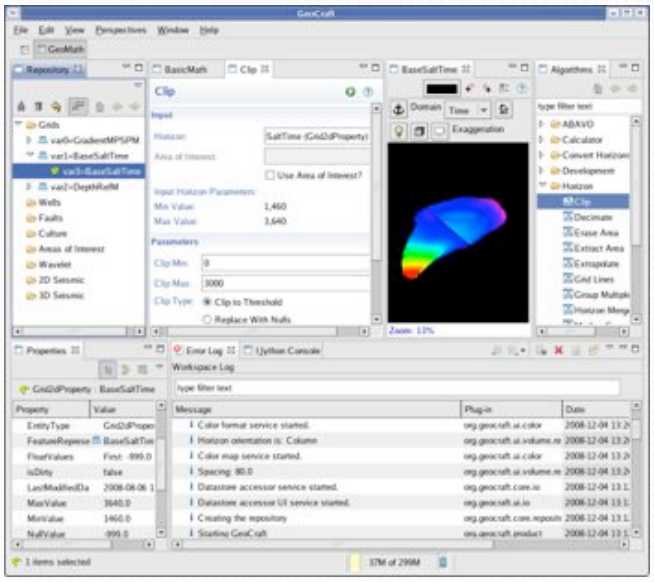



```
import segypy
data, header, traceheader = segypy.readSegy ('mydata.sgy')
segpy.wiggle(data,header)
```



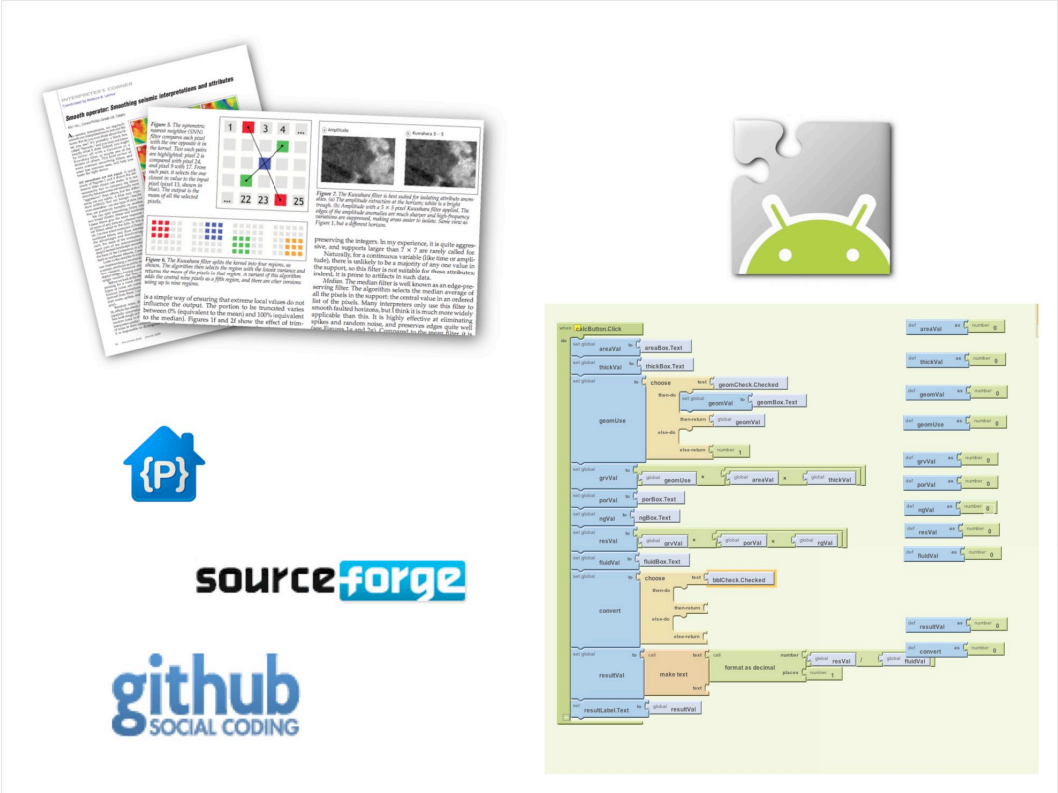
...so software can be the door to open workflows and ideas.

Many of these tools are very high-level. By that, I mean that a geologist can use them (joke). They abstract complex ideas into simple operations. So, for example, Thomas Mejer Hansen's SEGYPY (http://segymat.sourceforge.net/segypy/) lets me read and display a SEG-Y file with a very, very small program.



Other tools, like ConocoPhillips' brilliant GeoCraft project (geocraft.org) have user interfaces like most software. And its openness is not necessarily that useful to me, as a non-programmer. But what I do like is its Jython command line — so I can input my own commands, operating on objects I loaded with the GUI.

Think of what you could do with your tools if you weren't constrained by the ideas some random computer scientist had 20 years ago (tongue-in-cheek).



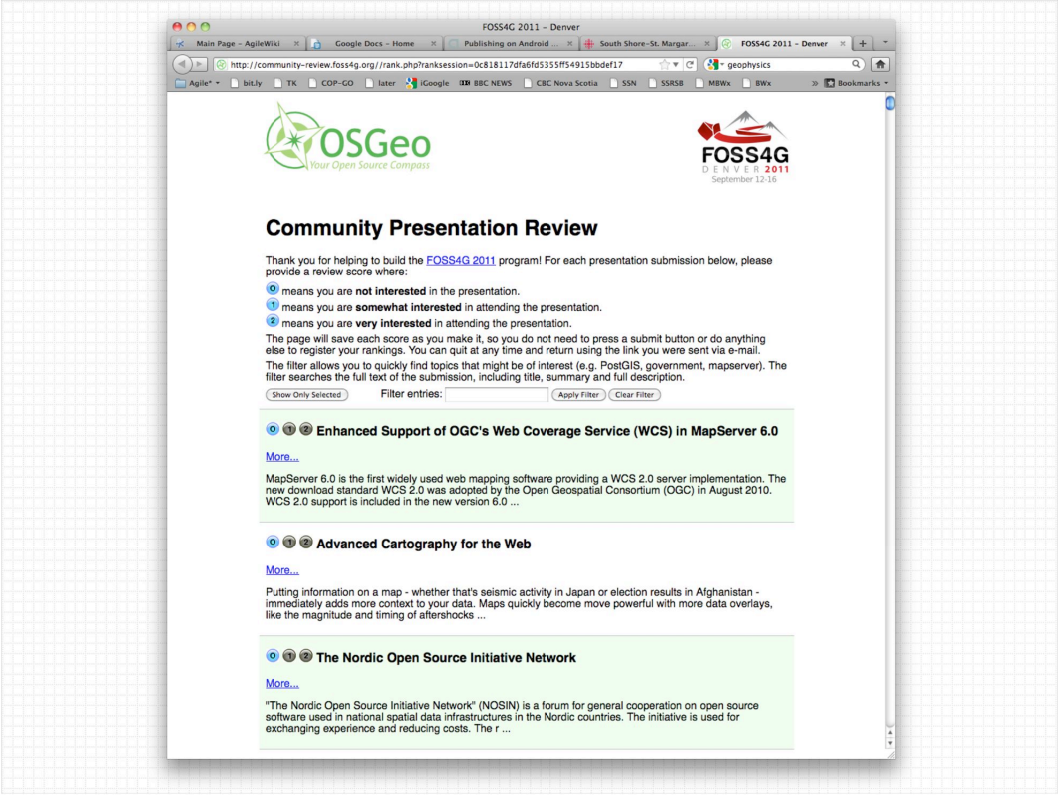
Here's my dream. One of them anyway.

I want to be able to read a paper in The Leading Edge (or whatever), and then, instead of thinking, 'hey, that's cool, I wonder when I'll be able to do that in my software' and forgetting about it, I want to be able to try it, today.

My colleague Evan Bianco and I just released our first mobile app, for doing volumetrics in exploration. It's just a toy really, but the remarkable thing is how we built it: in this graphical programming environment called App Inventor. It took less than a week. Less than a day, actually. This was the first thing I'd ever tried to build, and the first working version took about an hour to build.

Imagine tools like this for doing geoscience. Imagine libraries of widgets and routines for seismic processing, like the open online libraries software developers use.

Imagine the creativity and innovation this would catalyse.

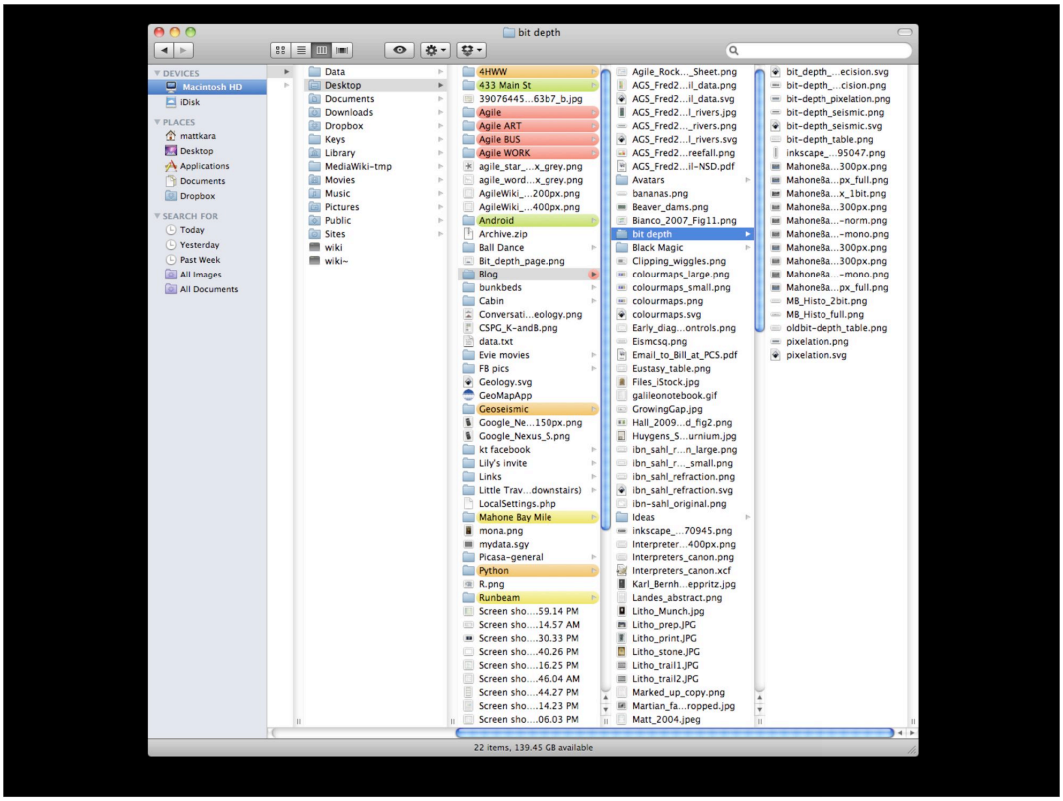


One final note on this open idea trend... I was recently invited to this conference, FOSS4G, which is about open software in the geospatial arena. Instead of reviewing abstracts by committee, they simply put them on the web and added a voting system.

I guess we'll never know if this will make for a better conference, but I like the idea that it might make for a stronger, more engaged community.

So I think these two trends, the steady growth of open source tools in our industry, and the emergence of tools that cross the boundary from mere technology to workflows and ideas, will help shape the coming years.

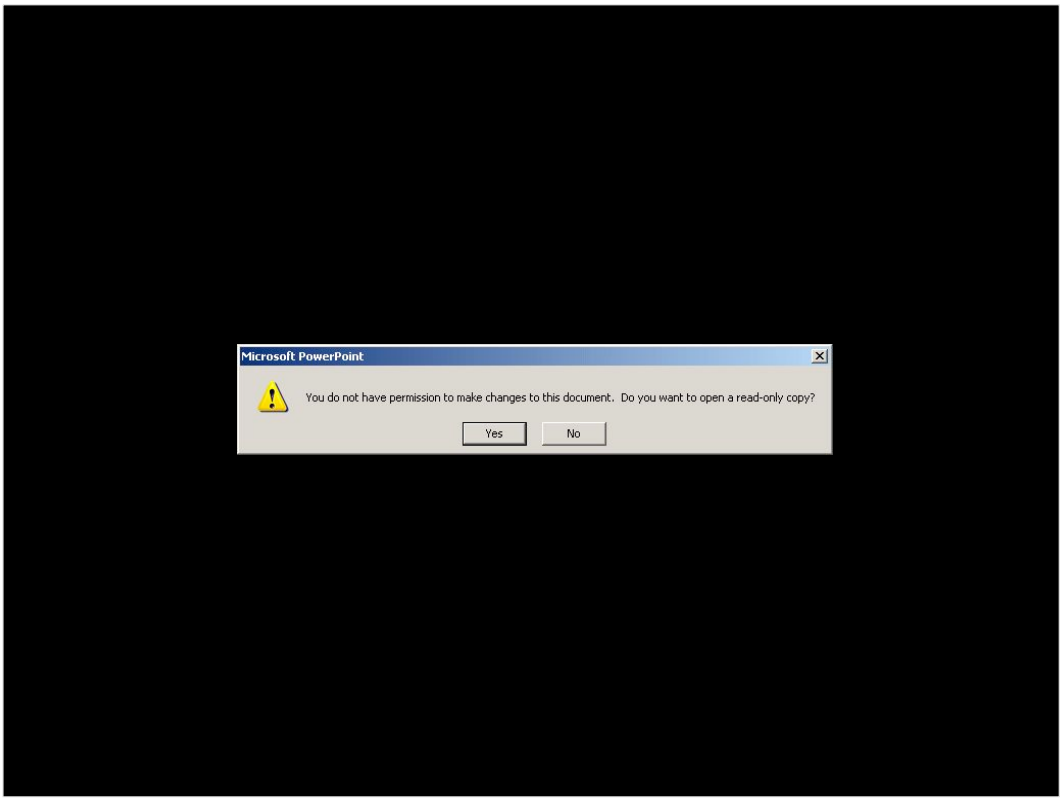
But, given the constraints of working in a company or other closed or semi-closed organization, what can we actually do?



Does this look familiar?

My directories tend to be a jumble of related and unrelated, drafts & final versions, images and text, current and obsolete. It's ok, because I'm the only one that has to put up with it. I also have great indexing and search tools on my network. But I bet you and your team don't.

This is a mess, and if your own directories don't look like this, I bet your shared directories do.



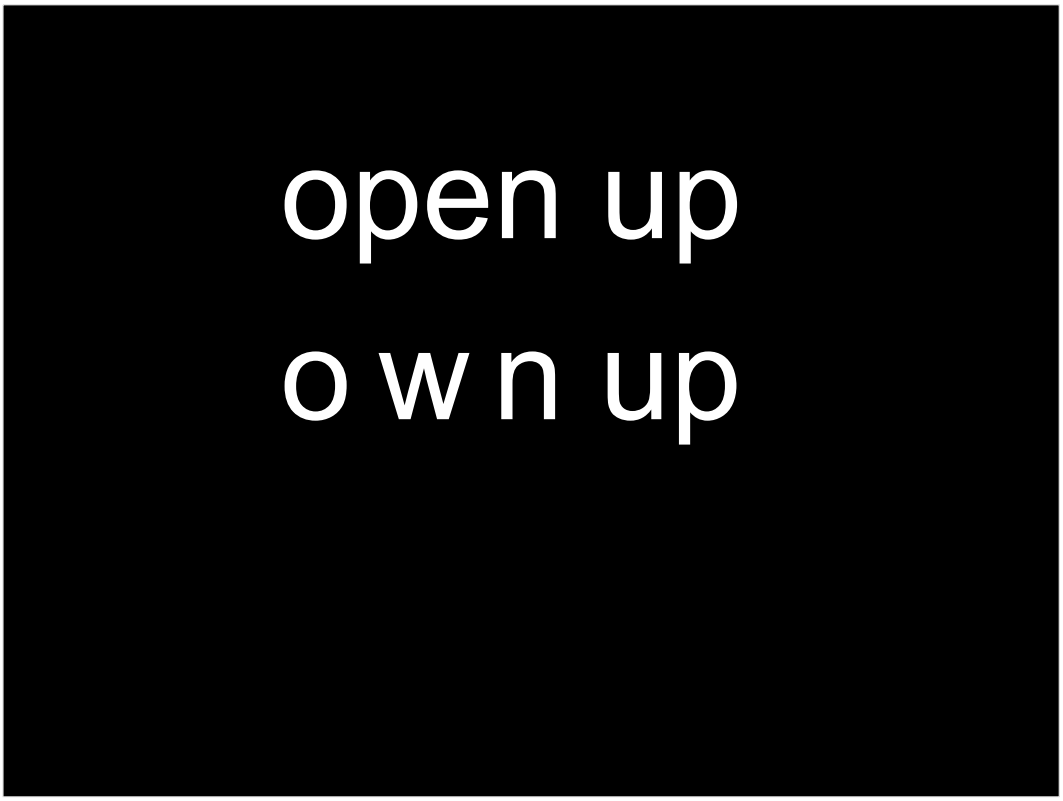
Ever seen this before?

No permission. Someone in my own company, someone that hired me maybe, doesn't trust me to change some company file.

Of course I want to open it... then maybe I change something. Then I want to save it... so now I have File_x and File_x_Matt. Then there's File_x_final, _final2, etc, etc.

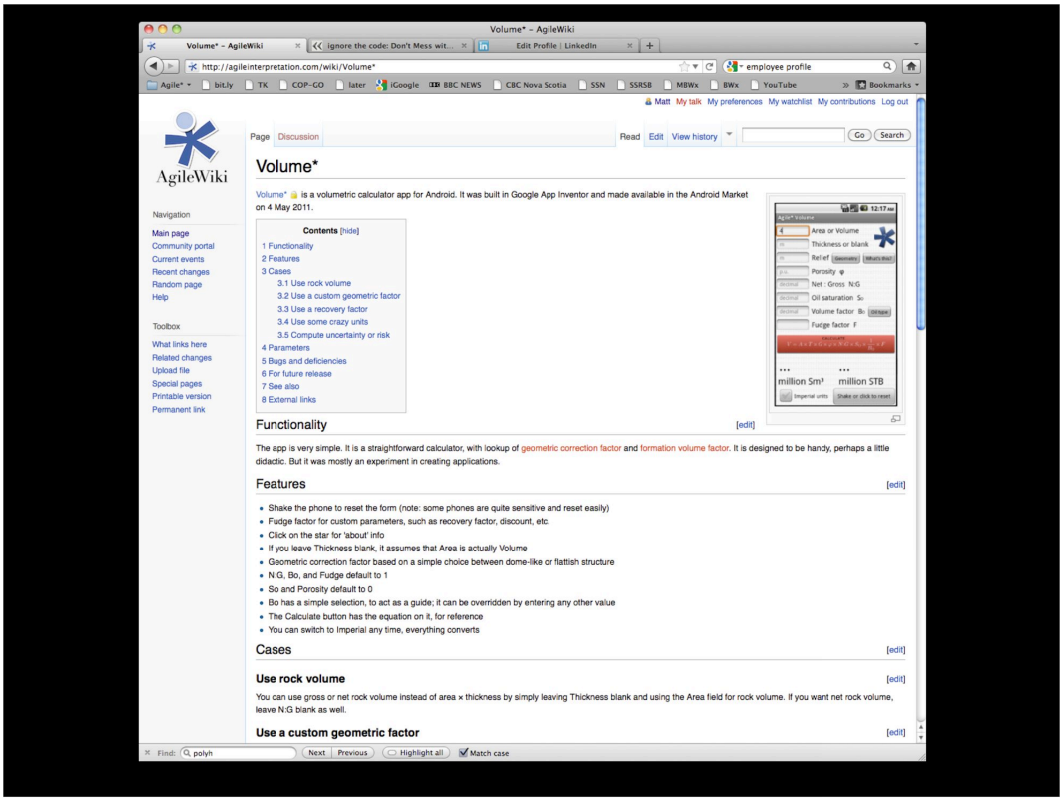
I guess the idea was to control and protect content. Closed sytems are mistrustful, annoying for users and they create mess, leaving a wake (in every sense of the word) of obsolete files behind them.

So instead of the futility of protection, embrace the fact that people migt want to change a file for the better...



...and open up. Stop being so afraid. You have back-ups don't you? Let your employees help you and keep dynamic documentation up to date.

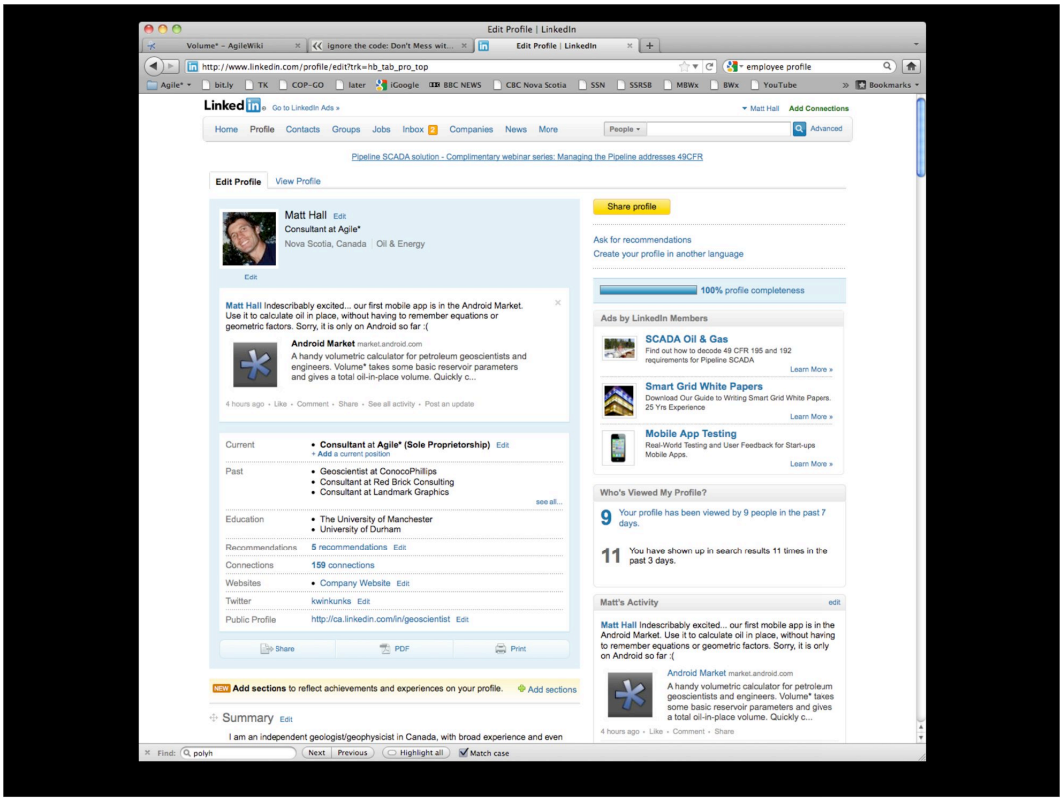
An important aspect here is to own up. Make it clear who did what. This engenders responsibility and lets people build reputation.



Wikis are a wonderful way to do this. Essentially a content management system, wikis store every change by every user, satisfying the control freaks. But the real beauty is that documents in wikis never die, at least not if they're useful and used.

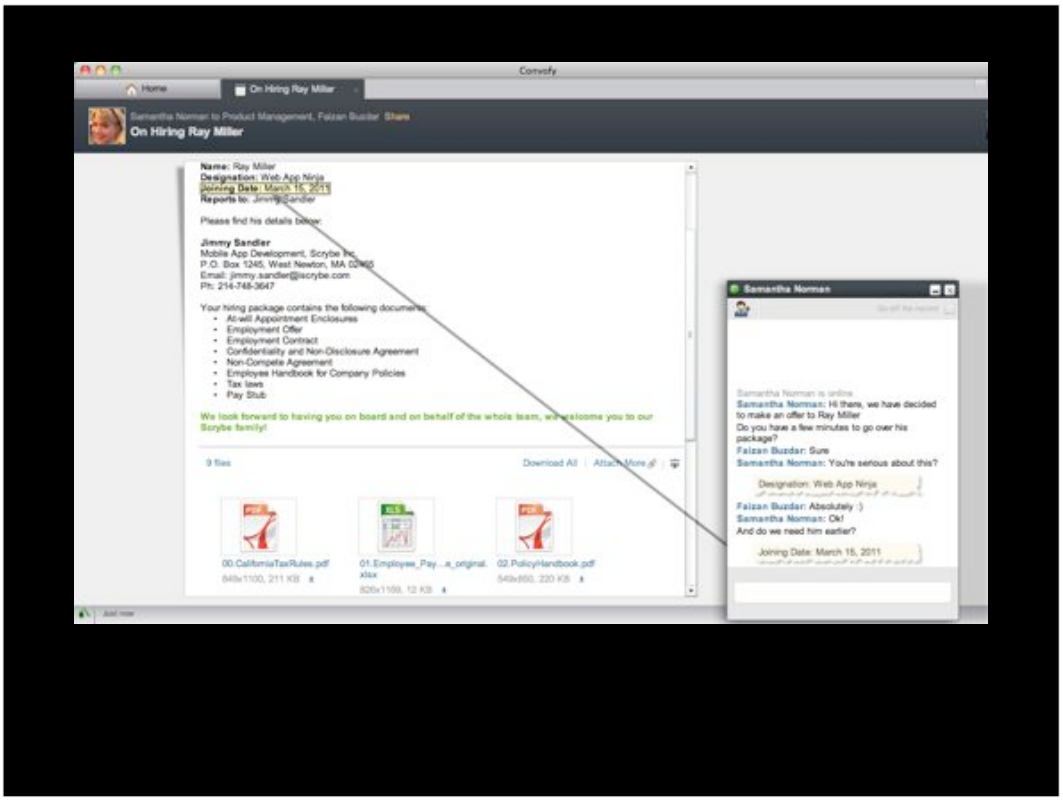
They are free and easy to try in a corporate, closed environment. Grab a spare PC, download MediaWiki, and off you go.

You will be surprised how well people repsond to the trust you extend to them.



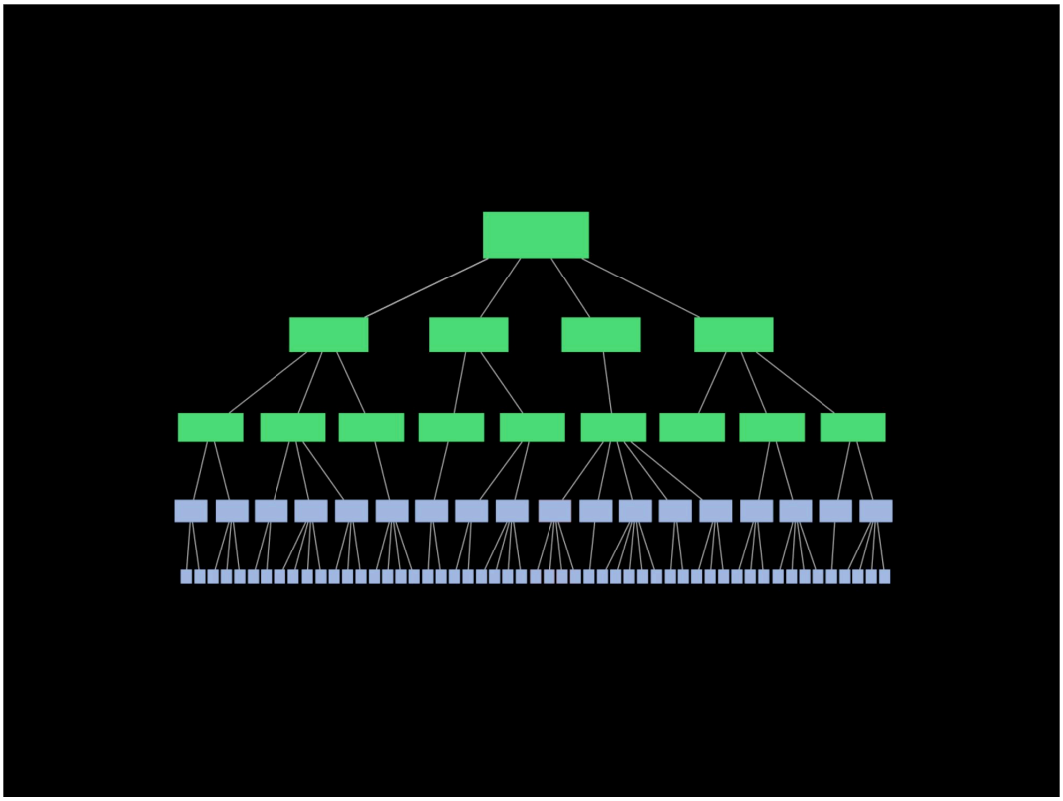
There are plenty of tools for managing user profiles too. This is LinkedIn, a popular online community tool... but there are ways to experiment with this concept in lots of other places, even SharePoint.

Make it easier for people to get to know each other, and share things. Help them create their own networks of mutual trust and interest. And, by the way, it's fun.



Tools like Convofy (convofy.com) are emerging that are going to change this landscape very quickly. Thin, instant, social layers are coming to email, documents, and even subsurface interpretation tools — LMKR recently announced they will be teaming up with Convofy to bring this technology to GeoGraphix.

To get a peak at this sort of thing, have a look at Google Docs (docs.google.com), which has group editing and chat built in.

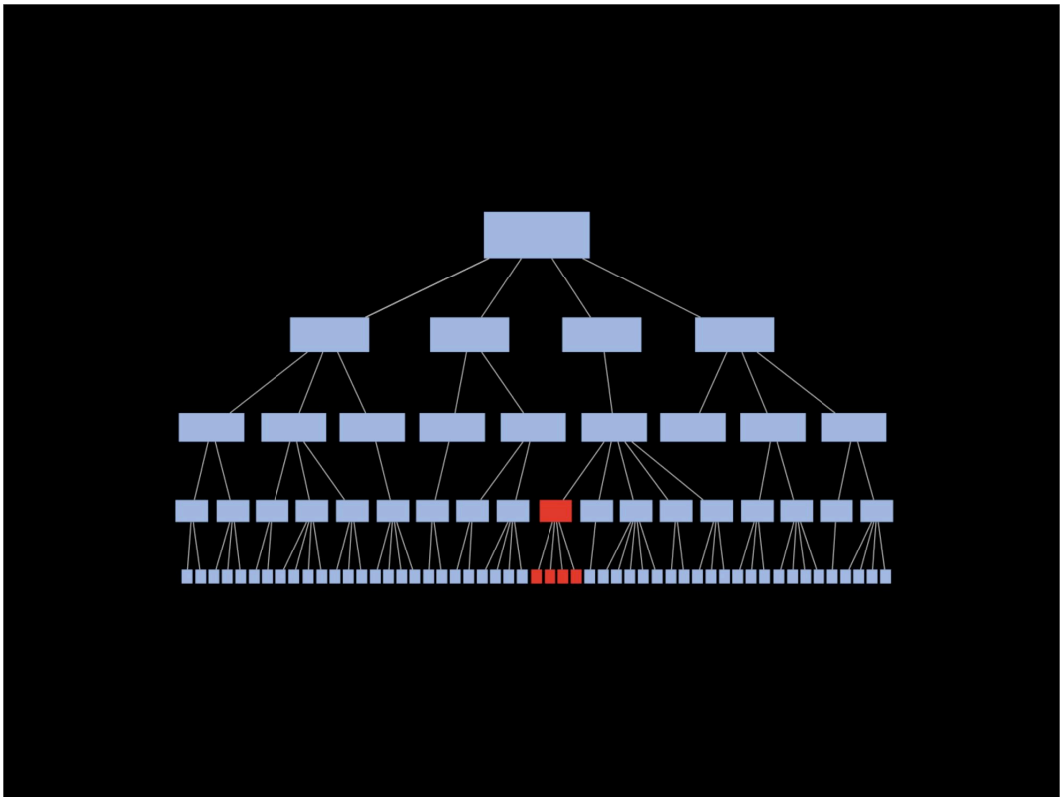


By the way, this constant change means you cannot drive this cultural shift tactically. It has to be strategic, driven by principles of openness, transparency, and a more social workplace.

This means that, while the energy for the change has to come from the grass roots, management have to be fully behind it, and their behaviour has to reflect the philosophy.

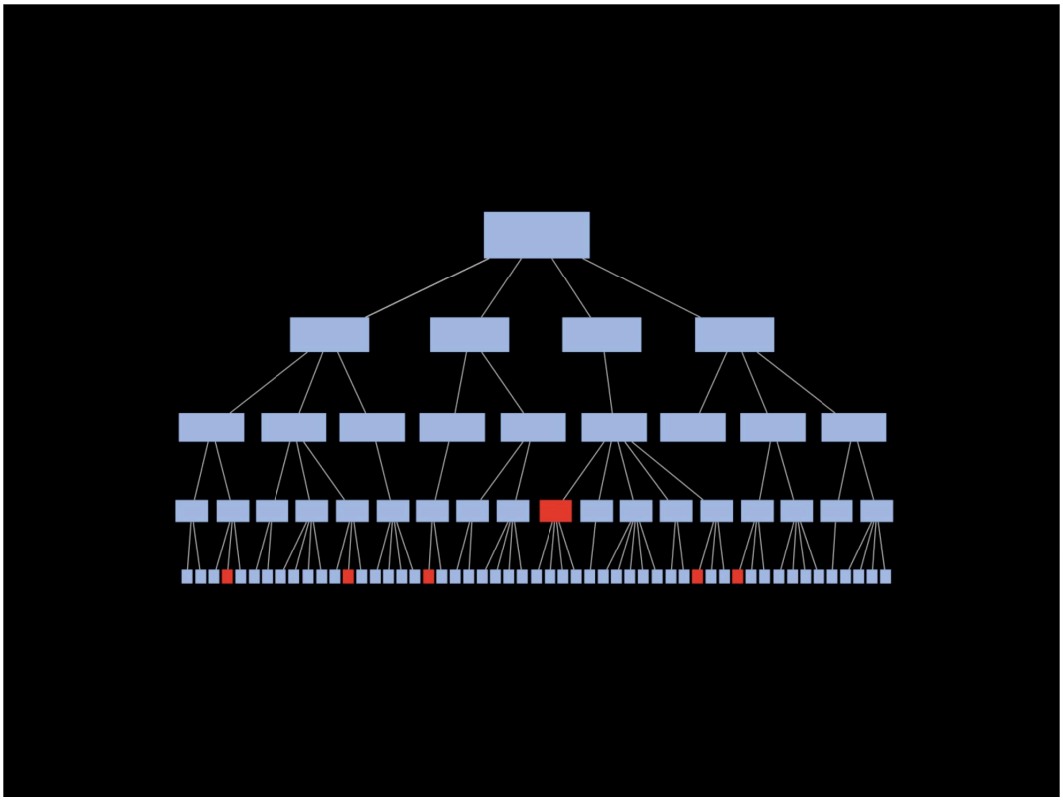
This, by the way, is the flaky, MBA-style part of the talk. It's very short, don't worry.

Notice this org chart. Though I made it up to make a point, it's familiar and at least approximates many large organizations.



The structure is designed to make it easy to set goals for a team, then have them execute those goals with regular meetings with their manager, who keeps timelines and budgets on track.

The trouble is, there's a lot of voerhead with changing the structure, so it can only happen relatively infrequently, perhaps every 18-36 months. So if the best team for a small project happens to...



...look like this, you're stuffed. There's no easy way for these people to work together: where will they sit? Who will they report to? Whose budget will pay?

Organizations have a hard time forming ad hoc teams like this, even though there are lots of small, 3, 6, or 9 month projects that would benefit from this type of agility.

I admit this is a bit of a cop-out, because I don't know exactly how to fix this, but I think it's time to at least experiment with non-linear management structures (or non-structures), that are adaptive like this. And it's not really about technology, though there will be a role for it of course, it's about embracing this mindset of openness, so that organizations and managers stop thinking of people as 'theirs' for example, but instead as a common pool of talent and experience — rather like Sourceforge and Github are pools of code and ideas.

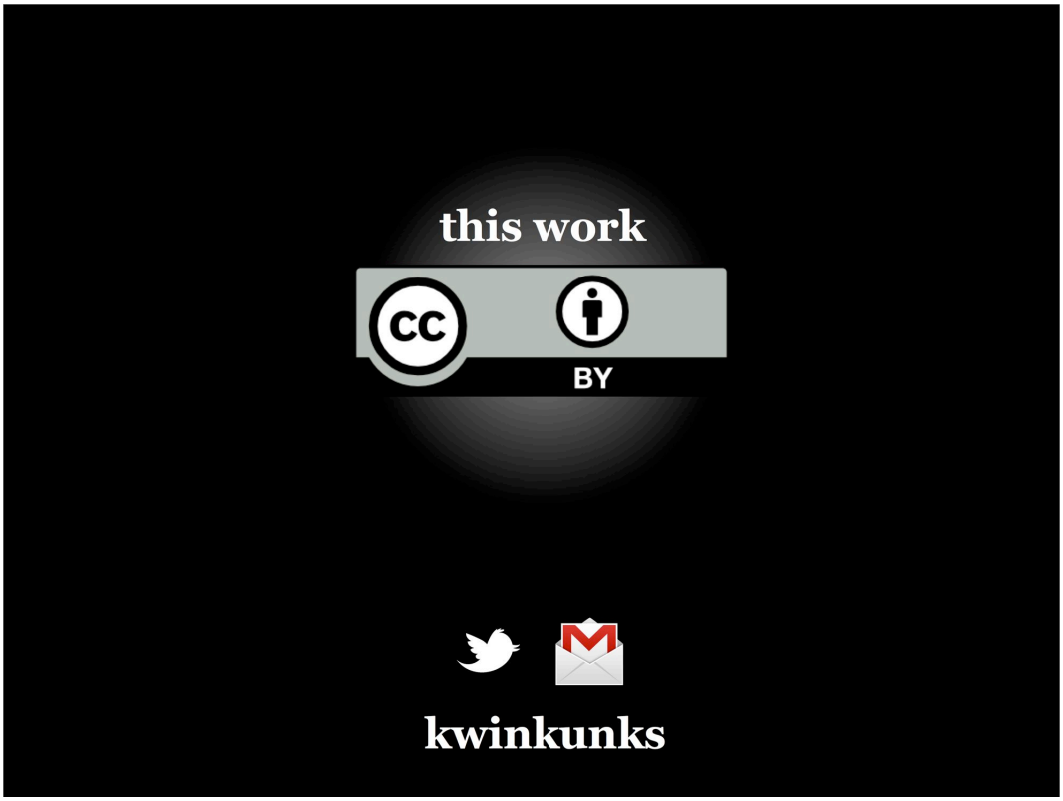
There are two things I think we can do in our industry. Contrary to popular opinion, you don't need permission to try these things — your job is to be awesome.

Just keep it inside your firewall, for now.

So there are two ideas: that openness is not a revolution in our industry, and that openness has massive value.

I talked about two myths: that openness is unbusinesslike, and that openness is a free-for-all.

The two trends — the growing stable of open tools in our business, and the emergence of open workflows and ideas — support my belief that there are some things we can do today to tap into the massive value. Explore some open tools in-house, and experiment with more adaptive ways to structure teams. And have fun doing it!



That's everything I wanted to say. Thanks very much for your attention.