Living online: Any time, anywhere, any device [1]

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1. Background

I was extremely honored to stand before the NFAIS audience as the Miles Conrad Lecturer at their 54th Annual Conference. When Bonnie Lawlor (Executive Director of NFAIS) called me about the award, I was floored. Me, really? Lifetime achievement. I haven't even cracked 50 yet. My god, look at who has won this before me! So I asked her what she would like me to speak about and she said, "Anything". Wow. Anything... I struggled with this for quite a while. I knew I wanted to share with you how I have seen my slice of the information industry transform over the last two to three decades.

So there are three representations of me. One I use when I want to be more professional (read Linked In), one for more casual things (read Facebook), and the last for my more techie friends who chat and Skype with me. No matter what guise though, I am always a tech geek, a pragmatist and at heart a publisher. I make no apologies for any of these.

As I walk you through this journey, it is important for you to understand where I come from. I went to high school as the 1970s turned into the 1980s. I went to college right in the middle of the 1980s. I have been in publishing ever since – first social sciences then science, technical and medical publishing.

2. Centralized computing

So any talk about computing of course has to start out with the famous TJ Watson of IBM quote. "I think there is a world market for about five computers". Who could blame him? Look at the tremendous size of the things he was seeing. Look at the ENIAC (Fig. 1). I especially like this picture. My grandmother used to be a telephone switchboard operator. Who knew that a switchboard girl and computer scientist were so alike? No seriously look at the size of this thing and how the blinking lights and plugs compare to the old-fashioned telephone switchboards.

So well into the 1970s the prevailing form of computing was centralized. Usually in the form of some kind of mainframe. These big expensive pieces of equipment were only in specific locations and users had to hook into them via terminals. Not exactly mobile or personal. During this time telephones were
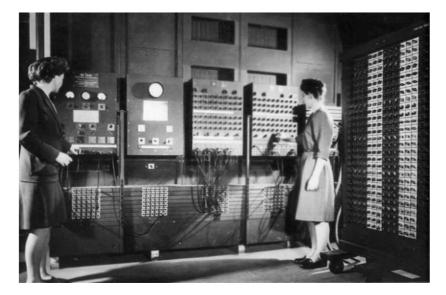

Fig. 1. ENIAC computer. This image is a work of a US Army soldier or employee, taken or made during the course of the person's official duties. As a work of the US federal government, the image is in the public domain. Image found at Wikimedia Commons (commons.wikimedia.org).

wired in, fax machines were a predominant form of communication and your music was either on $33\frac{1}{3}$ LPs or on tapes. You remember those round vinyl things with a hole in the middle or those new-fangled cassette tapes?

The 1980s arrive and we have the dawn of the Personal Computer Age. Bill Gates set out his vision. "A computer on every desktop in every home". A vision that would dominate the next twenty years. By the time I was in college (mid 1980s), things were really starting to change. My main tool was my good old typewriter but all around me new devices were springing up. I got to write my thesis on a DEC Rainbow. Yeah, that data is lost forever. The guys across the hall had a Commodore 64 and an Apple II. A friend's parent was one of the guys working on the Apple Lisa. Most people never got to see this one. And of course this was when the IBM PC was birthed. Computing is now decentralizing. Mainframes are still around but they are now being connected to by personal computers. DOS was the operating system du jour. Phones have just started to become more mobile.

3. Mobility

In the late 1980s, a real focus is being made on portable PCs. Many brands and styles emerged: Radioshack TRS-80, IBM Portable, NEC Ultralight running Windows 1.0, Macintosh Plus, Macintosh Portable. Back then portable meant lugging it into a car until you could find somewhere with an electrical outlet to plug it in. No concept of running on batteries here.

Fast forward to the 1990s and we have some real advances in technology. PDAs are out there: Apple Newton in 1992 and later the US Robotics Palm Pilot and even later the Sony Cleo. PDAs could only communicate after being hooked to a cradle. Some serious laptops are now being used: IBM Thinkpad 700, Apple Powerbook and Toshiba Tecra.

The main communication mode was very slow over telephone lines through modems connected into the wall. Remember those modem handshaking sounds? I remember them kind of sounding like a digi-

tized donkey. Perhaps it was because they were as slow as a donkey. We are more computer savvy. We are mobile but tethered. We are not very social.

4. Discoverability

Search engines changed the way people interact with their devices and information. Without services like these information would just be a tangled glob unusable by almost everyone. This is near and dear to the members of NFAIS as many offer services in this space. In the early 2000s, people began expecting information to be presented in new forms. First audio and then video. Nature did a bit of work in this area. I am pleased to say that is still going gangbusters today. This involved some serious investment in staff training and equipment, but we think it has been worthwhile.

5. Social media

It was just a few years ago that we saw the rise of Web 2.0 or Social Media (as some people call it). As content providers we experienced a shift from where we controlled everything to the user being in charge. One-way streets became two. Much of content management became a commodity. Anyone could now publish but were not necessarily publishers. Blogs found a place as more informal rapid communications became more common. The role of the journal editor had to adapt. Interactions directly between editors/journalists with readers became the norm. Ground rarely touched in formal publication (e.g., a peer review discussion) was now being aired. Every Nature-branded journal had a blog but our most successful by far has been the blog connected to Nature News.

Social Networks! Users gathered together by the millions to share information about themselves and things they found interesting. They interacted! This started on PCs but then quickly became a dominant part of their mobile experience too. User behavior changed. We are now social.

6. What happened?

So I started to think about what made all of this change happen? It is a few things. First, wireless became easy. I mean really easy! In most cases users who never connected an Ethernet cable to their PC were all of sudden connected wirelessly. Cell towers sprung up all over the world. Coverage, while still far from perfect, is still pretty amazing when you think about the progress made in the last few years. You can stand just about anywhere in a big city and check Facebook. The dominant days of connecting over a wire are over. The backbone infrastructure itself got faster and they made it simpler for people to connect. Cable, fiber, satellite. This is so important that Google is making investments in this space too.

One often-overlooked fact is that batteries got significantly better and processors started consuming less energy. Remember the early laptops with no batteries. Over the last ten years I have seen incredible progress in this area. The norm is now 7–10 h. The latest iPod Touch can play music for 24 h on one charge. Lithium Ion and Lithium Polymer batteries now make train, plane, and bus rides realistic places to wirelessly work untethered from a power source. We and our devices are untethered.

In the late 1990s Steve Jobs returns to Apple. Reinvents the phone – music, web, phone, data, apps. It is a perfect time for this convergence. His Apple created iOS – a new operating system for the iPhone and the iPad. Lightweight, less power hungry, and EASY to use! Design for simplicity was a key!

Fig. 2. Mobility. Product photos from vendor sites. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-2012-0664.)

This opened up a new world for content providers. New experiments began and more are coming. New explorations are being made into user experiences. New business models are being explored. Boom! There is an explosion (Fig. 2). Devices are everywhere. Now there are many, many mobile devices. Ultra light laptops, super small ones called netbooks, new Blackberries, iPhones, Android and Microsoft devices by the dozens. We own many devices. Computing travels with us.

7. Platform in the cloud

Somewhere along the way users discovered cloud services. They had no real idea they were working and playing in the cloud. They just used their apps and it all pretty much worked. Here are three examples of apps that I have on every one of the devices I use: my Blackberry, my iPhone, my iPad, my Macbook Air, and my home PC and even a Kindle Fire.

A device is carried along with me to every meeting. A quick jot or even a long memo into Evernote and I have something that is automatically synced to the Evernote cloud. I can recall and edit it on every other device I own. It's seamless and instantaneous. The best part is I don't think about it. It just works.

DropBox does a similar thing for files. Especially Powerpoints and PDF files for meetings. At Nature we have seen a significant drop in print outs of Powerpoints. We rolled out a good number of iPads. Files are loaded into DropBox for meeting attendees to share and then called up on the iPads during the meeting. Paper waste drops through the floor.

Pandora is the main way I listen to music these days. A streaming service that works on all of my devices. It stores my stations in the cloud and lets me enjoy music by streaming it to me wherever I am, whatever time I want it, and on whatever device I happen to have at hand.

Computing is becoming ubiquitous.

Mark Weiser is one of my idols. During the 1990s he did some fascinating research into exactly what I have been talking to you about today. He coined the term "ubiquitous computing". My favorite line here

is: "age of calm technology, when technology recedes into the background of our lives". Mark passed away before he ever got to see many of the devices we have today. I am certain he would be amazed about how right on the money he was.

Here is a summary of his principles:

- The purpose of a computer is to help you do something else.
- The best computer is a quiet, invisible servant.
- The more you can do by intuition the smarter you are; the computer should extend your unconscious.
- Technology should create calm.

Professor Andy Hunt took Mark's research and is teaching classes at York University. His teachings on Pervasive Computing appear to corroborate nicely with my own theories:

- Decentralization.
- Diversification.
- Connectivity.
- Simplicity.

In just the last few weeks we have had some big announcements from the largest tech companies of the world. Microsoft announced that Windows 8 will have much of the look and feel of Windows Phone OS. Apple announced Mountain Lion, which will take OSX even closer to the functionality of iOS than the previous Lion release. And of course Google is still pushing its browser OS Chrome to work on PCs. It is all really converging.

As I was doing a bit of research for this talk, I came across this 4 min video which gives a high level overview of a few of the points that I have focused on. It is from a company called Crowd-sauce.com. They are similar to GroupOn. Their service allows you to ask for a deal from any business. They then negotiate with the business to deliver deals that are personal, relevant, and most importantly save you money. See http://www.youtube.com/watch?v=lUljrP6ILN0&feature=related (Credit: Crowd-sauce.com, Uploaded April 30, 2011).

8. What should the publishing community do?

Many years ago I think I coined a phrase... Article Particles. I admit it. I was too early. It was all about breaking the article down into its component pieces and using standard identifiers like CrossRef, Datacite, ORCID to identify them. Then provide a way for developers to access them. But now our readers are consuming and using information in new ways. They want it anywhere, any time, and on any device. They want to do new things with information. They want to reuse things, the want to redo things. They want information easily surfaced so they can get to it. So is now the right time? Maybe.

Here is one idea: *Linked Open Data* (Fig. 3) refers to a set of best practices for publishing and connecting structured data on the web:

- You need URIs to identify identities or concepts.
- You need HTTP to send/retrieve the info.
- You need RDF to structure and link the data.

There are hundreds of nodes in the Linked Open Data cloud. Some of you are represented here. Should we do more?
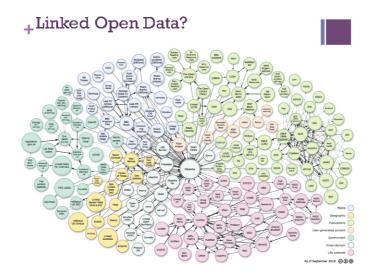
Fig. 3. Linked Open Data cloud. Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch; http://lod-cloud.net/. (Colors are visible in the online version of the article; http://dx.doi.org/10.3233/ISU-2012-0664.)

Triples: <Subject> <predicate> <object> <John Smith> <works as> <professor>

Here is another idea: *Research Objects*. They bundle together essential information relating to experiments and investigations. They include not only the data used and methods employed but also the people involved in the investigation. Associations between a paper and a dataset can now be deep and meaningful. This is very much in its infancy, should we embrace it?

And finally, I really believe we need to *allow developers and users to interact with our stuff*. We will never have enough developers to do all of the experiments. Let them teach us interesting new ways to interact with your content and metadata. Elsevier is leading the way here and others are here too. Could we standardize on APIs in some fashion?

My last words:

- Divide it up!
- Mark it up!
- Share and shake it up!

Here are a few references in case you want to dive in more.

References

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