

# ENTERPRISE COMPUTING: OPEN-SOURCE IDEAS

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## 1. OPEN-SOURCE IDEAS

First, some context: you need to know that the Enterprise Computing course is punctuated in the middle by Innovative Learning Week (ILW). We all know ILW as the week in which no student at the University of Edinburgh has ever gone skiing.

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Innovative Learning Week is great fun for the students, but this ILW I thought to myself “Why should the students have all the fun?”

I then began reading some teaching materials and lecture notes of the famous Stanford professor of Computer Science, Donald Knuth, who is regarded world-wide as an excellent and inspiring mathematician and educator.

I’ve wanted to read these for years.

Now I have a precious bit of spare time in ILW, I thought, so here is my chance. Also, gosh, “*Why isn’t every week as much fun as Innovative Learning Week?*”

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After I had finished reading some of Don Knuth’s excellent writing I thought, “Innovative *Learning* Week was great. I feel refreshed and inspired by Donald Knuth’s energetic and funny writing style. OK, in that case now, how about some Innovative *Teaching?*”

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Genuine innovation in teaching is extremely difficult to achieve. Pretty much very good idea that you can think of has been already thought of has already been thought of previously by a really good head before you.

However, why not at least try?

After all, it doesn’t have to be *absolutely and uniquely innovative since the beginning of human education*.

It would even be enough for me if it was just *innovative to me personally, at this point in my career, so long as it seemed that it helped me to better communicate my ideas about Enterprise Computing to the students in the class which I began teaching in January 2015*.

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So, I tried lifting my hands from the keyboards (as I had previously instructed my students to do at the end of our first in-class hackathon) and used my computer keyboard as little as possible during Innovative Learning Week.

And read Knuth.

And the end result was ... ?

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The end result was the most interesting week that I have enjoyed at the University of Edinburgh since I entered the Department of Computer Science (now incorporated into the School of Informatics) on 1st October 1990.

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Now, from the perspective of 23rd February 2015, bear in mind that 1st October 1990 was quite a long time ago. I found out during the lecture that one young man in the class that I was delivering the lecture to was not even *born* in 1990, and maybe not even *conceived* of!

Well, good things can be conceived anytime. People are good. Ideas are good. Let's experiment and see if I can try to conceive of a few good ideas under headings such as "Innovative Teaching" and "Open-source Ideas".

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The lectures before Innovative Learning Week were all about *the coursework and teamwork and team-building* and contained content which was *non-examinable*.

In contrast, the lectures which come after Innovative Learning Week are all about *the examination, and the most important ideas of the course*<sup>1</sup> and contain content which *is* examinable, and *will be tested in the examination*.

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Best stern Professor voice: *It's time to sit up and pay attention, class!*

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Now, a lecture is several different experiences. One is sitting down in an unnecessarily handsome lecture theatre such as the one in the Hugh Robson Building in George Square and listening to someone talk with or without a set of overhead projector slides.

The other is sitting, standing or lying anywhere you like and reading things like overhead projector slides, or listening to an audio recording, or *some other way of communicating the ideas*. (Because the *ideas* are the important thing, not the words, the voice, or the Northern Ireland accent.)

You can do either, or just one, or neither of those things. (*By the way, I would seriously caution against doing neither! How are you going to answer the questions on the exam paper?*)

If you really want to think deeply about the ideas, and be able to stride into the examination hall with confidence and pride then I would suggest that *you absorb the content in as many possible ways as you can*.

Whether you can hear the sound of my voice matters not at all.

Whether you see me matters not at all.

No-one forces you to attend lectures at the University of Edinburgh, and no-one forces you to stride into an examination hall with confidence and pride.

You have to just *want to do it*. (Even if the course lectures are at 09:00 on Monday and Thursday morning in the Hugh Robson Building on George Square in the University of Edinburgh's Central Area.)

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Anyway, what matters is that you *absorb the ideas of the course as best you can — in preparation for the examination — in every possible way that suits you individually, best, in your own current careful considered judgement*.

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<sup>1</sup>Well, most important *to me*, anyway.

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Am I encouraging laziness and *non-attendance at lectures*? Goodness, no! But neither am I trying to force anyone to attend lectures. Perhaps they can't.

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Suppose, for example, that during Innovative Learning Week some student in the Enterprise Computing class went skiing<sup>2</sup> in Austria, managed to get a concussion and break both bones in his forearm. Say, for the sake of argument, that that particular male student was scheduled to get a recast this coming Monday, and so, for a good medical reason, he probably shouldn't have been in class.

Although he had had a medical appointment scheduled then perhaps that male student would then actually be able to make it anyway, and come in just as I had started delivering the *payload* of my lecture content on Monday the 23rd of February at approximately 09:15.<sup>3</sup>

Well, not to worry, make it to the lecture or make it not, for whatever reason<sup>4</sup>, students who miss a lecture can at least read these notes and absorb the ideas in any other ways and hopefully get along just fine.

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Ok, everybody ready? Seat-belts fastened? Off we go!

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So, good morning! Monday morning, 9:15-ish. It's a great, great pleasure to see you all here, as it always is.

Last week in the University was *Innovative Learning Week*!

It is a very, very interesting thing to *try a new thing*; whatever it is. Whether it is a burger that you might eat in a restaurant, or something else. If you *try a new thing*, you might like the new thing better than the old thing.

You might usually buy a beef-burger, and then if you try a veggie-burger you might find that you like the veggie-burger better than the beef-burger. You might sometimes go back to the beef-burger but *you won't know how delicious a veggie-burger is until you try one!*

It's good to try a new thing.

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During Innovative Learning Week I thought, "Why should the students have all the fun? Why don't *I* try doing something a bit innovative?"

So, I like doing lots of things, including teaching, scientific research, and administration.

I like doing administration. It's pleasing if you are in a well-run school, as I consider the School of Informatics to be.

For the scientific part of my work, I like doing numerical things such as *optimisation*. Optimisation is about doing things *better*.

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<sup>2</sup>It should go without saying that this is a fictional scenario. No student in the history of Innovative Learning Week has ever gone skiing in Innovative Learning Week.

<sup>3</sup>Re-emphasis: this is a *fictional* scenario. Also, lecture structure: header, *payload*, footer. (Packet network-ish.)

<sup>4</sup>Data point: as of 23rd February 2015 when I delivered this lecture, the student lecture attendance at 09:00 on that Monday morning was approximately around 50% of the class size of 65 students.

Doing things better is starting from the presumption that things are not currently *optimal*.<sup>5</sup>

Even if it is a bit unusual and unconventional, you don't know until you try.

In the spirit of ILW, research, and optimisation theory,<sup>6</sup> I can try something a bit different and do a straw poll at the end to see if the students on my course thought that my different style of teaching was better, the same, or "I'm not sure yet".

One topic that I want to talk about is *privacy*. Privacy is a very important concern, but it is often confused with *secrecy*.

Secrecy is a different thing. Encryption, public key crypto-systems, the Rivest-Shamir-Adleman (RSA) algorithm<sup>7</sup>, and so on, are concerned with secrecy. I think that privacy is the more valuable idea because privacy is about *humans*, and secrecy is about *computers and data*.

Things like privacy and security are often quite subtle topics and it would be good to talk about them. Through talking one can get better *bandwidth* with more communication of ideas.

Now, the title: *open-source ideas*.

When I was a younger man, I always produced *open-source software*<sup>8</sup>. If I managed to produce a piece of software that I thought was useful to me (and perhaps someone else) then my second thought was, "If it is useful *to me* then it *may*<sup>9</sup> be useful to someone else. Let's give it away at the lowest practical cost."

That's the *open-source spirit*, at least to me.

The Internet is a distribution medium which allows ideas to be communicated *at very low cost*. Before the Internet, even open-source software distribution incurred material costs in terms of a magnetic tape, a padded envelope, stamps, and so forth.

The Internet is a fantastically efficient tool for distributing ideas of whatever kind, at very low cost.<sup>10</sup>

So if you have an idea, whatever it is, having a very efficient low-cost distribution mechanism is helpful for spreading *open-source ideas*.

Computer Scientists practice the rigorous discipline of *inclusive Or* and *exclusive Or*. These are one-or-the-other-or-both (that's *inclusive Or*) versus one-or-the-other-but-not-both (that's *exclusive Or*, also called Xor, but the X is silent).

An example of exclusive Or is "Would you like ice cream, or candy floss?" (Not OK, to say "Both!") Another is "bright Xor early". (Ashok can be available bright-eyed and bushy-tailed, or he can be available early in the morning, but he can't do both simultaneously!)

<sup>5</sup>That is, the absolute best that they can be. The best of all possible worlds, if you like to think of it that way.

<sup>6</sup>And, because the students on my course are all doing so well already!

<sup>7</sup><http://en.wikipedia.org/wiki/RSA>

<sup>8</sup>In a programming language you may never even have heard of called Standard ML. (The Wikipedia page is a great place to start reading about Standard ML.)

<sup>9</sup>Or, it may not.

<sup>10</sup>And in whatever kind of media. YouTube: "Broadcast yourself!" used to be their slogan.

An example of inclusive Or is “Intelligent or funny”. (Oscar Wilde, Albert Einstein, Lewis Carroll, Donald Knuth<sup>11</sup>, . . . , Jane Austen, Marie Curie, Geena Davis, Grace Hopper<sup>12</sup>!!!)

With privacy or secrecy we usually want both, and often seem to settle for secrecy, which is the less valuable of the two.

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During ILW I could take my hands off the keyboard and wander around the building at 10 Crichton Street talking to my colleagues.

I had a difficult matter to discuss with two colleagues. I wanted a face-to-face confidential meeting<sup>13</sup> so just wandered along to their office to see if they were free. We had a quiet chat, because one of the administrative staff had been worried about a troubling and sensitive matter.

This seemed to be a lot better than writing emails about this subject. In person, you get better bandwidth with a face-to-face meeting, and can assess the emotional responses of colleagues on-the-fly during the conversation. You may back away from saying something later on when you see how the first part of the message is received.

Email in contrast is a megaton conversation bomb. You can drop several paragraphs of content payload before getting anything back from the recipient.<sup>14</sup>

In addition to having better bandwidth in the communication, I noticed that something else had been achieved.

A one-to-one email *seems* like a private communication but in reality **email is a postcard**. Most emails are not encrypted and pass through numerous servers along the way from the sender’s computer to the receiver’s computer. All along the way, potentially, it *could* be read by other people.<sup>15</sup>

So email communications are not as private as you might think that they would be, even if they are from one person to another directly.

A conversation in an office with a door closed (using indoor voices<sup>16</sup>) can be *more private* than a regular email. It just seems like a better form of communication than an email, and yet email is the default means of communication between colleagues in a working (enterprise) computing environment.

In a well-designed building, such as the one at 10 Crichton Street, offices have glass doors (or a glass panel by the door) so anyone walking by in that building can see that a conversation is happening, but they cannot hear the private content which is being exchanged.

That seems like a good balance to me for a certain level of sensitive content, and it is one which is unachievable using email, IM, VOIP, Skype, and other familiar methods of computer-based communication.

<sup>11</sup>Wikipedia has a great page on Donald Knuth.

<sup>12</sup>Wikipedia has a great page on Grace Hopper, but Wikimedia has a better one. Also, and this is unbelievable, <https://www.youtube.com/watch?v=1-vcEr0PofQ>

<sup>13</sup>Doodle poll, anyone? That would seem overkill for three people in the same building, indeed even on the same floor.

<sup>14</sup>Indeed, you may never get anything back from the recipient. Wouldn’t it have seemed to be a waste of time writing that long email in that case?

<sup>15</sup>It is unlikely that that *will* happen, because content such as “You’re doing a cracking job leading your team!” might be pleasing for the recipient to receive, but it would seem to have zero commercial value.

<sup>16</sup>Think, “These walls are *paper-thin!*”

How helpful it is, I think, if instead of doing paperwork you can do *wordwork*.<sup>17</sup>

Skype<sup>18</sup> is a well-known peer-to-peer video-and-audio-based communication platform. It can be a useful substitute for email.

It is also a low-cost distribution mechanism for ideas. Instead of a PhD student flying from America to Scotland to meet my colleague Jane Hillston and I, we can have a technical talk about mathematical research of the kind where you (for some reason) need to wave your hands about when you are talking. And with Skype we can see each other waving our hands about!

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Thank you all very much for your time and your attention, for your eyes and your ears. It was really interesting for me to try Innovative Teaching. It's a wonderful experience to teach the Enterprise Computing course.<sup>19</sup>

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*Live long, and prosper!*

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<sup>17</sup>“Wordwork” is not even a word, as far as I know, but I use it to mean work done using *words* instead of using *pieces of paper*.

<sup>18</sup>A contraction of “Sky peer-to-peer” apparently.

<sup>19</sup>Enterprise computing is “Computing in a social context” or “Software as a social process”.