

*Part 3:*  
*Implementing Technology*

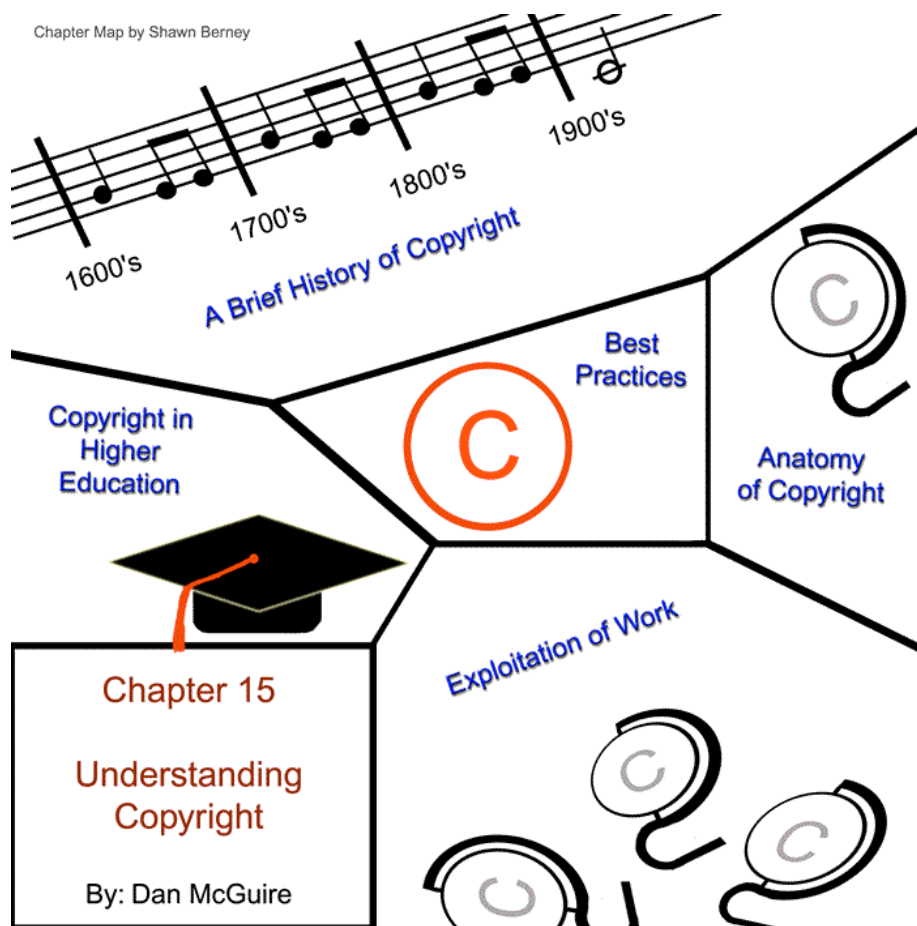


# 15

## *Understanding Copyright: Knowing Your Rights and Knowing When You're Right*

Dan McGuire

Chapter Map by Shawn Berney



## Learning outcomes

After completing this chapter, you will be able to:

- Define “ownership”, both as a concrete concept and as an abstraction, as a practical measure of property rights.
- Identify your rights as the owner of intellectual property
- Explain why seeking permission to use copyrighted material is preferable to using materials without permission.
- Identify some common instances of copyright infringement.

## Introduction

**Copyright** is a word that has developed its own mythology.

It is almost impossible to go through a day without coming into contact with something protected by copyright. Music on the radio as we commute into work, the architecture of the home we live in, or the buildings we drive by, articles in the newspaper—you could safely say that almost every item we touch or interact with has some ‘copyright’ factor associated with it. With such a proliferation throughout our economy it’s surprising just how often ‘copyright’ is misunderstood.

## A Brief History of Copyright

### EARLY HISTORY

The concepts underlying copyright protection have been around for at least 1500 years. The situation before the sixth century is a little unclear. Copyright has always been a response to technological change. The first such change was the advent of writing itself. Before writing, history was recorded through stories that were told and retold to succeeding generations. In the oral tradition it would not have occurred to anyone to restrict who could repeat the tales.

The first documented copyright dispute occurred in sixth-century Ireland. This isn’t a tale of high priced lawyers arguing over minute details of the law—rather it is a tale of religion, power and bloodshed. In the early part of the sixth century Columba of Iona, a priest, borrowed a psalter from Finnian, and then diligently copied it page by page, though without asking Finnian for permission to do this. Finnian demanded the return of the psalter, and appealed to the Irish king Dermot, who ordered the copy be handed over to Finnian. When Co-

lumba refused to comply, Dermot used military force to see his judgment through. In the end, as many as three thousand men may have died.

While this tale certainly has all the elements of modern day copyright piracy, with the addition of armed conflict, it was not until much later that copyright issues came to the fore. St. Columba had to copy the psalter by hand, a very slow laborious process. Since very few people were literate, copyright wasn’t much of an issue. It was not until the invention of the printing press that the idea of granting permission to make copies has any significance.

### First laws

With the printing press it became possible to make multiple copies of books efficiently. Books became a commodity. Printing and selling books was soon a lucrative venture. At first the system of controlling the right to make copies was ad hoc. Kings and other rulers would grant the privilege of printing books to one printer or another. Books that were not authorized were banned. Printers who produced unauthorized works were arrested. Printers held a monopoly on the titles they printed. This system was clearly aimed at aiding the printers, as opposed to the authors. It was also a system that was ripe for corruption. It has been argued that one of the causes of the English Civil War was the monopolies handed out to his friends by Charles I.

The Statute of Anne, enacted in 1710 by the British parliament, is regarded as the first copyright law. This law placed the right to authorize the reproduction of a book not in the King’s hands, but in the author’s. This exclusive right lasted for 21 years, after which time the book entered into the public domain, and anyone would be free to copy it. The state of affairs in copyright remained relatively calm for the next two centuries. Book publishing increased in importance, both in society and within the economies of the world’s nations. While printing technology improved, the process of publishing, and the state of trade in creative works remained largely the same.

Other nations took very different tacks in regard to copyright law. The United States of America, for example, entrenched the fundamental elements of their copyright law in their constitution.

### TWENTIETH-CENTURY DEVELOPMENTS

While the 18th and 19th centuries were relatively stable in terms of copyright law, the 20th century saw a torrent of challenges, changes, and adaptations to the law. Technological change became a constant. Many of the technologies we take for granted today represented major challenges to the copyright status quo.

The invention of the photograph created a new, previously unimagined method of creativity, and generated an intense debate over the difference between a painting and a photograph. Was a photograph even a creative work? Was it not just a reproduction of that which already existed in nature, or was it analogous to a painter creating an impression of the same scene?

The ability to record musical performances opened a fresh can of copyright worms. For the first time there was an ability to 'fix' the performance, to store it and repeat the performance indefinitely. This raised questions about the rights of the composer, the performer, the recorder, and the distributor. For the first time, the idea of everybody owning a tiny slice of rights surfaced.

The idea of derivative rights was brought to us via the motion picture industry. This new form of expression was ripe for exploitation. The law was clear that one could not reproduce a novel or story in print, but what about adapting it into a movie? There was no law in this area, and so naturally the movie studios quickly delved into the libraries, adapting popular books for film. Book publishers of the day quickly moved to have the laws amended to block this loophole!

Other innovations included radio, television, and the photocopier. These minor challenges were essentially dealt with without legislative change to copyright law, as was one much more significant innovation.. The anticipated introduction, by Sony, of the home video tape recorder caused a great deal of consternation for television broadcasters. The VCR would allow the public to retain copies of their broadcasts for later viewing, or even sharing with friends and neighbours. Universal Studios sued Sony in an attempt to block the introduction of the VCR, and thankfully for everyone who has ever taped a television program for later viewing, they lost. The courts ruled that Universal Studios could not block the introduction of the VCR, which they acknowledged could be used to infringe copyright, because the device had significant non-copyright infringing uses. Had the VCR been intended only to reproduce copyright works it never would have seen the light of day as a consumer product. Today the sale or rental of movies for home viewing represents a major source of revenue for companies like Universal Studios.

All of these technological developments and adaptations of copyright law, either through the judiciary or through legislative change, were little more than a prelude to the challenges that arose in the late 20th century.

## CONTEMPORARY SITUATION

At the beginning of the 21st century technological change has reached an amazing pace. New methods of communication, creation and transmission of ideas or works are introduced every day. New methods of exploiting creative works appear almost daily. Until recently, the technologies available to copy a work would not allow a perfect copy. A photocopy of a textbook is a poor substitute for the original, a tape made from a record is never as clear as one from the publisher. Now digital technologies allow for perfect (or near-perfect) copies—as many as are needed—to be transmitted around the world.

These technological innovations have re-opened the debates surrounding copyright protection. Given the ease of reproduction, some people have wondered about the relevance of copyright laws—proposing movement from a monetary economy to a gift economy, from competitive production to collaborative models. The open-source movement is a prime example of this debate. As a response to closed, proprietary software many software developers have moved to a model where the sharing is a requirement of distribution. Open source software licences permit the modification, distribution, and reproduction of the software without further permission or payment. The only requirement of these licences is that the same terms must be offered to any recipient of the code, and that the original source must be publicly accessible. Often described as an 'anti-copyright' movement, the open-source licences are entirely reliant on the existing copyright laws.

## Anatomy of copyright

### PROPERTY AND OWNERSHIP

Most people are familiar with the idea of ownership. We have all felt the pride of that first bicycle, or other prized childhood possession. But what exactly is ownership? This question has an easy answer: Ownership is the possession of property. This, of course, leads to the next question: What exactly is property? Again an easy answer comes to mind: Property is the stuff I own. There is no fundamental aspect that makes one object property, while another is not.

There is of course the idea of 'property' as a portion of land (real estate) which one person controls or possesses, probably the most important property we own. But of course the owner does not have complete control over his real estate. It is impossible to pick it up and

move it to another location, and there are limits as to how the land may be used within any municipality.

Another form of property includes those items that can be moved, such as cars, computers, books, and pens. Ownership of a car is normally evidenced by registration of the title with some government agency, but what about the ownership of a pen? That form of ownership relies entirely on the mutual recognition of property rights. A pen is mine only because the other people in the room recognize it as my pen. Possession is 15/10ths of the law.

One of the key features of our modern society is the legal structure built up around the idea of property. Real estate is defined by law; my possession of a portion of land is granted by the government. Theft, fraud, trespass, vandalism are acts against property that have been forbidden by law. We accept these laws, largely without question, even when there may be valid reasons to refute them. Is someone who takes a loaf of bread from a store to keep from starving really a criminal? How about the person who paints anti-nuclear slogans on the side of a warship?

The laws relating to property have not been decreed by some dictator; rather, they have evolved to meet the needs of our society. Modern society has progressed from the time when possession of land was necessary for survival to a time when possessing tools for a trade could provide the income with which to buy the sustenance that land alone used to provide. Now we are in an age where most economic activity is cerebral—service and creative industries now dominate our economies. Similarly, laws have evolved that mirror this transition. During the last few centuries the concept of 'intellectual property' has been defined and developed.

## A SIMPLE VIEW OF COPYRIGHT

Copyright is the right to copy, period. Such a simple statement could lead you to believe that any time you copy anything, even a small part of something you are infringing copyright. If it is impossible to do anything without infringing copyright then how relevant is the law?

## WHAT COPYRIGHT PROTECTS

Copyright applies to, and protects, creative works. This includes the written word in literature, artistic endeavours such as painting or photography, the performing arts, and the combinations of these works in areas such as film or television.

Under international treaty, there is no requirement that a work carry any notice of copyright to be pro-

tected. This was the case for American copyright up until the 11576 Copyright Act. Today copyright protection is automatic, and applies from the moment an idea is 'fixed' into a tangible medium.

## MORAL RIGHTS

For an artist or author, reputation is everything. In most countries copyright law includes provisions to protect the reputation of the author or artist. Nothing may be done to a work that reduces the reputation of the creator. This could include actions such as editing a work to give it a different character, altering a work of art to change its meaning, or including a work in a context that harms the reputation of the author. Moral rights may be waived, but they cannot be sold or transferred. In some nations moral rights are perpetual. In other nations they match the term of copyright protection. In some places they cease to exist when the author dies. In the US, there is no formal recognition of moral rights.

## ECONOMIC RIGHTS

The main feature of copyright law is the commoditization of creative works. This is to say the creation of property-like rights in regard to creative works. Property is an often-misunderstood concept. Usually property refers to some physical, tangible object, which someone is said to own. My car, my pen—anything that begins with 'my' is usually considered a piece of property; that is, things that belong to me. John Locke stated that people have natural right to own the fruits of their labours. Taking this further, who else could own the thoughts of an individual? Copyright law makes it possible for artists and authors to record their creative thoughts and sell, rent, or lend them. This is clearly an economic issue—how are creative people within society rewarded for their labour?

## INTERNATIONAL RIGHTS

Trade in cultural goods presents many interesting dilemmas. When a tangible product, such as a car, is traded between two nations, it is a simple matter. When a book is traded, it can become a very complicated transaction. Consider a situation where two nations do not recognize each other's copyright laws. In such a case if a single book is traded, it can then be reproduced by a publisher in the receiving nation and resold many thousands of times (assuming it is a good book). Of course the copyright owners may demand that no copies be traded with nations that do not recognize their rights, but enforcement of such a decree is next to impossible.

This situation was rectified in the late 19th century with the creation of the Berne Convention for the Protection of Literary and Artistic Works. This international treaty sets out basic conditions required in each member nation’s copyright laws, as well as creating a system of international copyright law. The key concept under Berne is the idea of “national treatment”. Under this term, a work is protected by the copyright laws of a given nation regardless of the nationality of its author. This means that an Australian author’s works are protected by US copyright law in the US, just as an American author’s works are protected by Australian copyright laws in Australia. This also means that a consumer of copyright works within a country need only understand the laws of their country. It is only when a project will be multi-national that the variations between copyright laws need to be examined.

Under the Berne convention, copyright protection must last for at least the life of the author plus fifty years. Copyright must apply to “every production in the literary, scientific, and artistic domain, whatever may be the mode or form of its expression” (Berne Convention 1886, Art. 2(1)). There must not be a formal process required for copyright protection, such as a requirement for a copyright notice. Currently 163 countries are members of the Berne convention, making it a near-universal treaty.

## What copyright does not protect

Copyright is not absolute. There are many situations where copyright protection is either nonexistent or limited. The exceptions and exclusions to copyright law are critical tenets of the law.

Copyright is not a system of censorship. It is not intended as a tool to suppress debate or criticism. Unfortunately this principle has not always been adhered to. Copyright is not intended as a system to confine or restrain culture, although certain groups have attempted to do just that. Copyright law attempts to grant rights to the authors and artists, while balancing the rights of readers, art lovers, and other creators.

To be protected by copyright a work must be significant, not in terms of its impact on society, but in proportion to the entire work. A small quotation is not likely to be protected by copyright, unless of course it is the kingpin in an entire work. There is a story circulating regarding a request for clarification on what constitutes a significant portion of a work made to a major

publisher. The response came back that every word copied from one of the publisher’s books should be cleared before being re-used. The question then is, what about the word “the”?

### FACTS

Copyright protects creative works; that is, it enables an author or artist to collect an income from their ideas. Facts have no author, or if they did, the author exercised no creativity. Facts are clearly not protected by copyright. But what if there is some form of creativity involved in the collection or presentation of those facts? In such a case the work in its entirety would be protected, but each underlying fact would still be unprotected.

### IDEAS

Copyright protects the expression of an idea, not the idea itself. For a work to be protected it must be “fixed”, that is, recorded in some physical form. Many of Disney’s movies have been based on public domain fairy tales. From *Cinderella* to *Aladdin*, Disney has used these public domain tales as the basis for feature length animated films. If copyright law protected both the expression and the idea underlying the expression, then Disney would now hold rights to these tales. While Disney does hold certain rights to their creations, those rights are limited only to the exact expression fixed in their movies. Without this critical aspect it would be impossible to maintain any balance between creators and the public.

### USES FOR THE “PUBLIC GOOD”

Most copyright legislation recognizes that certain uses of copyright material benefit society as a whole. Education is a classic example. The better educated a society is, the more well off its members can expect to be.

Criticism of a work or body is considered to be in the public good. It is considered beneficial to debate important issues; as well, it is often necessary to infringe the copyright of a person or persons to reveal their intentions to the public in general. The courts in many jurisdictions have recognized this and created jurisprudence that protects such uses. There are clauses in many copyright laws specifically stating that copying for the purpose of criticism is not a copyright infringement. Consider the difficulty in gaining permission from a copyright owner to use their work in a manner which will portray them in a negative manner. There have been cases where entire works have been reproduced, and the courts declared that no infringement occurred.

## CHALLENGES

It is unfortunate that most of these exemptions are not stated as a positive right; rather they are defensive in nature. The best legal arguments may protect you in court, but they do very little to protect you from being brought to court in the first place. Many times a person has copied protected work in a manner that is fair, and in the public good, however when faced with a lawsuit from the rights holder they are forced to concede, and cease their use of the material. It’s not the person with the legal right who wins, it’s the person with the deepest pockets.

## Exploitation of a work

One of the best ways of understanding copyright protection is to know how copyright works can be exploited; that is, used for financial gain by the copyright owner. Here’s a list of all the ways to use a work:

- **Copying:** This is the oldest form of exploitation of a work protected by copyright! This is the arena of book publishers, music distributors and film houses. The issue is fairly clear if we are talking about an entire work. The grey areas appear when we start talking about copying part of a work. If the law states that no part of a work may be copied, then what happens to cliché’s? What about small quotations needed to make a point? What is the line between acceptable copying and copyright infringement?
- **Adaptation or derivatives:** This is a right that emerged in the late 19th and early 20th centuries. This is the right to take a work and create a new work based on it. This is the home of ‘film rights’ and the like. Examples would include making a movie from a book, or a sculpture from a painting.
- **Translation:** At times foreign markets demand a book or other work, when the artist has no intention of supplying it in the chosen language. It is often difficult to directly translate a work into a new language. This can lead to moral rights issues, if the translator is unable to properly relay the author’s original intent.
- **Performance:** In music, the choice of orchestra, the choice of arrangement even the choice of instruments can greatly affect the resulting performance. Consider the plethora of cover tunes—some good, some bad, some horrid. It is clearly in the composer’s interest to be able to control how their works are performed. In many cases it is the only way a composer can gain an income from their work.

- **Broadcast:** The advent of radio created a challenge to copyright laws of the day, not unlike the challenge brought by Napster and online file sharing. There is a tendency to believe that when one hears a song on the radio, it is being heard for ‘free’. This is not the case, as radio broadcasters carefully record each song played and remit payment to the copyright owners for each broadcast. Of course radio broadcasters cover this fee through the sale of advertising.

## Copyright in higher education

### UNIQUE POSITION OF EDUCATIONAL INSTITUTIONS

The university is unique as both a creator and a consumer of copyright works. Most people are unaware of the many fees and licences that exist for the use of copyright works.

Issues relating to the use of copyright materials in teaching and learning are not new, in fact most materials have been used for so long we simply forget the underlying scheme that exists to pay the copyright fees. Many forms of copyrighted works—books, music, video, and sculpture are used in the modern university. These works are brought in for a range of purposes—for the entire student body, for specific faculties and schools, or for a specific course offering. Fees for the use of these materials are paid for by university departments, including the library, the faculties and schools, and by individual students. Table 15.1 demonstrates the matrix that describes this situation.

Table 15.1

	Individual Student	University Department	Faculty or School
Books	Bookstore—assigned texts  For a given class. Brought in by the bookstore and resold to students. Goal is cost recovery.	Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school.  While these books are available to the entire student body, they are of primary interest to that one school



	<b>Individual Student</b>	<b>University Department</b>	<b>Faculty or School</b>
Journal subscriptions		Library—the library selects titles appropriate for the entire student body.	Library—certain library purchases may be made at the request of a specific school  While these books are available to the entire student body, they are of primary interest to that one school
Photocopies	Purchased by individual students, at self serve copiers. Paid for via cost recovery (machines) and Access copyright licence.  Also supplied by the university bookstore/ reprographics on cost recovery basis.		Distributed to students in class, cost borne by department. Covered by Access copyright licence
Digital Assets	Included on CD/companion website, Cost borne by the student		

## EXEMPTIONS AND THEIR IMPACT

Fair use, fair dealing and other exemptions are defenses in court, nothing more. This means that even with a solid argument for fair use, the copyright owner is still able to sue the user. Often the initial press regarding the case represents the greatest cost to the right’s user, damaging their reputation and setting other rights holders’ guards up against them. Add to this the cost of mounting a defense against such claims of infringement, and it is easy to see why most claims of copyright infringement are dealt with quickly and quietly.

## STUDENT RIGHTS

Often students are unaware of their rights. They produce essays and term papers for submission to their

instructors and then forget about them. The question of copyright is never considered. Most teachers know that examples of past work, both good and bad, can be an excellent aid to the learning process for current students. Presenting past student work is only legal if permission has been secured. This is easily done with a simple submission form where the submitting student can tick off what rights they are willing to grant the instructor or the school.

## Best practices

### KNOW THE LAW

There are two problems that occur when instructors are not familiar with copyright law. The first, and most worrisome for administrators is the infringement of copyright. When third-party materials are used without proper regard to copyright law, the institution is exposed to a serious liability. The damage from a copyright infringement case would not only be economic, as the institution would have to pay for a defense, but also the reputation of the institution would be damaged. The second problem occurs when instructors fail to use materials that would enrich the learning experience of their students simply because they believe copyright law prohibits such use, or that obtaining permission would be too onerous. This does a disservice to the students as well as to the authors and artists of our society.

### PLAN FOR THE UNEXPECTED

Even in the best of circumstances things can go wrong. It is possible that a copyright owner may be unavailable to grant permission for some reason, or there may be reasons that prevent the author from granting permission, or you may run into a copyright owner who is simply not going to grant permission. Having a back-up to replace any work will be a huge benefit.

### DOCUMENTATION

When using third-party material, keep careful records of where content came from, what steps have been taken to obtain permission and under what terms permission was granted. At a minimum, any correspondence with copyright owners, including any final licences, should be retained for as long as a work is used. It is also good idea to retain a record of research undertaken while trying to determine who owns the copyright.

## CONSIDER THE BENEFITS

One of the side effects of seeking permission to use materials is the creation of a dialogue between creator and consumer of a work. Often, academic authors are only interested in how their works are used. By seeking permission you may also obtain access to unpublished materials, or higher quality copies. If there are any difficulties regarding the use of materials, if you have permission to use them you can go back to the rights holder for assistance. Imagine trying to do this for a 'bootleg' copy.

## Glossary

**Author.** The original creator of a creative work.

**Berne Convention.**

**Compilation.** A collection of creative works, with a variety of rights holders.

**Copyright owner.** The person with the legal authority to authorize reproduction or other actions covered by copyright.

**Derivative work.** A new work based on a pre-existing one.

**Fixation.** Recording an idea or form of creativity in some tangible form.

**Idea.** The concept underlying a work

**Infringement.** Doing any of the actions under the control of the copyright owner without their authorization.

**Licence:** A document granting permission to perform one of the exclusive rights of the copyright owner in some limited form.

**Medium.** The format in which a work is fixed.

**Moral rights.** Those rights that relate to the reputation, or character of the author.

**Permission.** The positive response from a copyright owner. In most jurisdictions permission must be in writing.

**Private.** A family or close circle of individuals all known to each other, a location that is accessible only by a limited number of people.

**Public.** Any group of people who do not necessarily have any preexisting relationships in a location which any individual in society, or a large segment of individuals in that society may access.

**Term.** The length of time under which a work is protected OR the time span during which a permission or licence is valid.

**Work.** A fixed expression of a creative idea in some medium.

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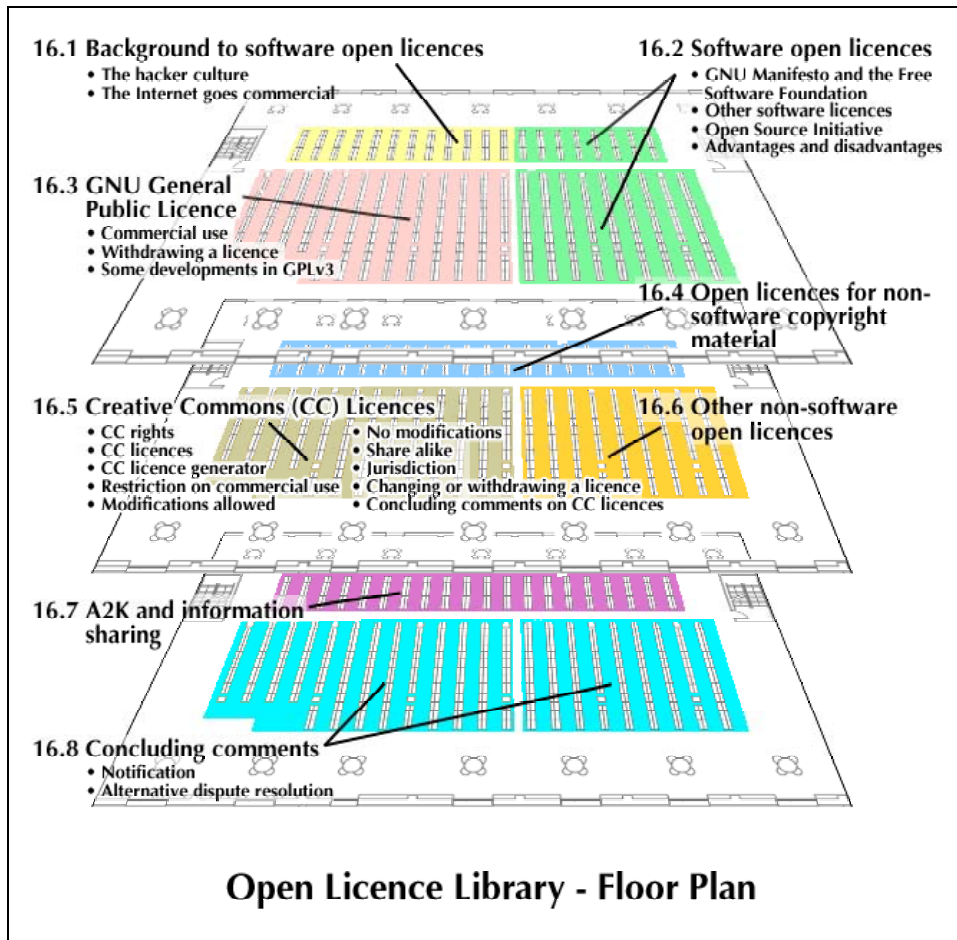
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# 16

## 'Open Licences' of Copyright for Authors, Educators, and Librarians

Julien Hofman and Paul West

Free software is a matter of liberty, not price. To understand the concept, you should think of free as in free speech, not as in free beer. – The Free Software Definition (<http://www.gnu.org/philosophy/free-sw.html>)



## Learning outcomes

After completing this chapter, you will be able to:

- Understand what open licence software is about and start looking for an appropriate licence for software you are developing;
- Appreciate the advantages and disadvantages of using open licence software;
- Understand how open licensing for non-software educational material works;
- Appreciate the access to knowledge movement and what it aims to achieve.

## Introduction

An open licence, as used in this chapter, is a neutral expression for a licence granted by someone who holds copyright in material allowing anyone to use the material subject to the conditions in the licence but without having to pay a royalty or licence fee.

There are many different open licences, some for computer software and some for other forms of material. Each has its own terms, conditions and vocabulary. This chapter is an introduction to open licence language and to the open licences that are important for authors and educators. It is not legal advice. Individuals or institutions thinking of committing themselves to open licensing should get professional legal advice about the implications of the licences they are considering using.

Supporters of the different licences do not always agree with one another. There are even extremists who, disliking the business practices of some commercial software suppliers and publishing houses, want to use open licences to do away with restrictions on using copyright material. Despite the understandable wish of some open licence supporters to reform copyright law, open licences are legal tools that use the existing copyright law. They rely, in particular, on the exclusive right copyright law gives a copyright holder to licence material with an open licence or any other form of licence.

The chapter starts by looking at software open licences. Software developers working on open licence software will need a more detailed explanation of the different open licences than they will find in this chapter. But even authors and educators with no pretensions to ICT expertise depend on operating systems, word processors, communication packages and online learning software. This part of the chapter aims at providing such users with an introduction to open licence software and its advantages and disadvantages.

Understanding software open licences is also a good introduction to the open licences that apply to other materials and, in particular to Open Educational Resources (OERs). The second part of the chapter looks at these open licences and, in particular, at the Creative Commons licences. The chapter ends by looking briefly at the Access to Knowledge (A2K) movement that aims at making all forms of information more freely available.

## Software open licences

### THE HACKER CULTURE

Open software licences had their origins in what Eric Raymond calls the hacker culture. (Eric Steven Raymond *How to Become a Hacker* 2001, latest revision 2007, <http://www.catb.org/~esr/faqs/hacker-howto.html>). For Raymond and those who work with open licence software “hacker” has its original meaning of a committed software developer. It does not refer to a criminal who breaches computer security. Hackers share their discoveries and feel free to use the work of other hackers. This leaves hackers free to work on unsolved problems rather than waste creative energy repeating what others have done. Hackers who publish their work, either on the Internet or in other ways, have copyright in it. At first, however, few hackers bothered with copyright. Some were not even concerned with their moral rights, the right to be recognised as the author of original material.

It is not clear how to understand this in terms of copyright law. It could have been argued that this behaviour reflected or created a trade custom among hackers. Or, because hackers often used the Internet to share work, it could have been taken as evidence of an implied licence that allowed members of the Internet community to use material on the Internet without permission. Certainly, many early Internet users assumed that they were free to use anything they found on the Internet. But it is doubtful that these arguments would have served as a defence if an author had sued for breach of copyright. The second argument reverses the usual legal position in which a copyright holder has to licence another to use the copyright holder’s work. And with both arguments it would have been difficult to establish the terms of the licence or custom and who qualified as a member of the community to which it applied. But whatever the exact legal position, this was how it was when software developers were mostly academics or researchers who often used the Internet to share scientific or technical information.

Some developers did claim copyright in software they developed. They did this by making their products available as freeware or shareware. Freeware is copyright material which the copyright holder allows others to use without charge. Shareware is copyright material which the copyright holder allows others to use subject to a small charge or condition. Freeware and shareware are not the same as open licence software because they do not envisage users continuing to develop and distribute the material.

## GROWTH OF COMMERCIAL SOFTWARE

Some of the lack of interest in ownership in computer software may have been because, in the early days of computers, the software was not seen as distinct from the computers on which it ran. But as computers for ordinary users became popular, particularly after the launch of the IBM PC in 1981, it became clear there was a separate market for software for these computers. This market grew as personal computers became more powerful and able to run more complex software. And it received another boost when, towards the end of the 1990s, ordinary users began to access the Internet through the World Wide Web. From the 1970s onwards most countries recognised copyright in software and in 1996 the WIPO Copyright Treaty made it clear that software fell under copyright law. Some commercial software developers became very wealthy from licensing the software they had developed. Some countries have even taken the controversial step of giving software added protection by allowing software patents.

Today businesses are always looking out for new and useful software. If they can acquire rights over the software they will invest in marketing it. When they do this they usually allow only those who pay their licence fee to use the software. And they do not usually allow users access to the software’s source code. Source code is the human-readable version of the software used to create the computer program. Restricting access to the source code means that in practice only the software owners can develop the software. Software of this sort is known as “closed software” or “proprietary software”.

## SOFTWARE OPEN LICENCES

The hacker community and those who sympathised with their ideals saw the possibility that all software would become closed or proprietary. To stop this happening they developed open licences of which the following are some of the more important.

### BSD licences

The Berkeley Software Distribution (BSD) licence was developed by the University of California, Berkeley and first published in 1989. But some of the BSD software goes back to 1977 and the BSD licence is said to embody the conditions under which this software was released. This means the BSD licence may have been the earliest open licence. Some important software is available under BSD licences including the software that runs many domain name servers and a Unix-like operating system.

Different versions of the BSD licence have developed. BSD licences have few restrictions on how the software may be used. They differ from the GPL, discussed below, in not insisting that developments of BSD software be distributed on the same terms and in not insisting that source code be made available to those to whom the object code is distributed.

### GNU licences

Richard Stallman is a prophetic figure who campaigns for free alternatives to commercial software and, in particular, for a free alternative to the Unix operating system that AT&T, the US telecommunications giant, developed. In 1985 Stallman published the GNU Manifesto (GNU standing for Gnu’s Not Unix) setting out his ideals and established the Free Software Foundation (FSF) to support this work.

In 1989 Stallman published the first version of the GNU General Public Licence (the GPL). There is also a GNU Lesser General Public Licence (LGPL) that allows for linking GPL software and software not published with the GPL and a GNU Free Documentation Licence (FDL) for software development documentation and manuals. The GPL is now in its third version and, about three-quarters of the world’s open licence software uses the GPL. This software includes the Linux operating system, an alternative to Unix, that Linus Torvald released under the GPL in 1991. The following are some of the main features of this important licence.

A powerful (and contentious) feature of the GPL is what Stallman calls “copyleft”. Copyleft, shown by a reversed © symbol, means that others are free to develop a GPL work on the condition that any work derived from a copyleft work is distributed subject to a similar condition. This means the GPL licence is what some call “viral”, it tends to take over software originally published under other open licences.

Another feature of the GPL is that GPL software must be conveyed with its source code. This is to make it easier to develop the software. Not every open licence requires this.

To those who think of software open licences as anti-commercial, a striking feature of the GPL is the absence of restrictions on using GPL software to make money. As the preamble to the GPL puts it: “Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for them if you wish) ...” In the past few years this has begun to happen. Red Hat, for example, is a company listed on the New York Stock Exchange. It develops and distributes a version of Linux, Red Hat Enterprise Linux. Since 2002 IBM has been offering this as an operating system for IBM computers. Dell, a major supplier of personal computers, has previously offered its computers with Linux operating systems and is now selling some computers with Ubuntu Linux. Even a corporation like Novell that sells software rather than computers, is using a version of Linux, SUSE Linux, as an operating system.

The advantage to these and other corporations of using open licence software is that they do not have to develop this software themselves or pay licence fees for software others have developed. They get the benefit of the work independent developers put into open licence software and can concentrate on improving the products or applications that are their speciality. In return, independent developers get access to the work these corporations put into adapting open licence software. Open licence developers are also well qualified to work for the corporations and provide support to the corporations’ clients. They are even free to market the software on their own account.

The growth of the commercial use of open-licence software has not stopped individuals and groups supported by not-for-profit organizations from continuing to develop GPL software. The Shuttleworth Foundation, for example, has sponsored Ubuntu Linux. Ubuntu Linux is meant to be easy for non-technical people to use and, in particular, supports other languages than English. It is this version of Linux that Dell is offering on its personal computers. Ubuntu also has a commercial sponsor, Canonical Ltd, that provides training and support for Ubuntu users.

As already mentioned, anyone who acquires GPL software and develops it may only distribute the developed software under the GPL. But someone who develops original software, meaning here software that is not a development of other software, is free to decide how to licence it. Such a developer is free to use more than one licence. So software may be distributed under the GPL and another open or proprietary licence. This raises the question whether someone who develops original software and distributes it with a GPL licence may withdraw

the GPL licence? Because the GPL is perpetual anyone who acquires a copy of original software from the developer under the GPL is free to continue to use the software. It is not entirely clear whether the developer can prevent those who have already acquired the software from passing it on to others. But it is clear that the GPL does not require a developer to continue to distribute software and this may make it difficult for others to acquire the software. In addition, the GPL does not require the developer of original software to offer further developments of the original software under the GPL. By not offering further developments under the GPL the developer of the original software will lessen the attractiveness of the earlier GPL version.

The GPL came out in 1989. A second version, GPL version 2, came out in June 1991 and GPL version 3 in June 2007. Version 3 has two interesting new provisions. The first is in clause 11 dealing with the GPL and patent rights. The other is in clause 3: “No covered work shall be deemed part of an effective technological measure under any applicable law fulfilling obligations under article 11 of the WIPO copyright treaty adopted on 20 December 1996, or similar laws prohibiting or restricting circumvention of such measures”. This means a person is free to remove coding of this sort if it appears in GPL software.

### Other software licences

Some software developers use other open source licences. They may do this because they want to avoid the copyleft restrictions in the GPL that make it difficult to use the software commercially or because they do not want to require licencees to distribute the source code. Or they may have to use another licence because the software on which they are working began with a different licence. The following are some examples of other software open licences and how they came about.

Sendmail is a widely used program for managing email that was first published under a BSD licence. In 1999, following difficulties in developing and supporting the software as an open licence product, a company was formed to do this commercially while leaving the software available under an open licence. This called for changes to the BSD licence that resulted in the sendmail licence. The sendmail licence, it has been pointed out, is not listed as an open source licence at the Open Source Initiative website discussed below.

Netscape, on the other hand, was a commercial software developer that produced the influential Navigator web browser and Communicator email software. Following competition from Microsoft’s Internet Explorer, Netscape decided to release the source code for these products under an open licence while continuing to

develop the software commercially. To enable them to do this they produced the Mozilla Public Licence. The successors to Navigator and Communicator, Firefox and Thunderbird, use this licence. Other developers, particularly by those who want to have both commercial and open licence versions of their software, also use this licence.

The Apache Software Foundation has its own model for software development that has resulted in non-GPL licences. The Foundation grew out of a community of developers who, around 1995, were working on projects that included the important Apache HTTP Internet server. According to the Apache Foundation website: “All software developed within the Foundation belongs to the ASF, and therefore the members”.

### OPEN SOURCE INITIATIVE

As the number of open licences has grown so it has become difficult for non-specialists to understand the differences between them. In 1998 the Open Source Initiative (OSI) was founded to be “the stewards of the Open Source Definition (OSD) and the community-recognized body for reviewing and approving licences as OSD-conformant” (<http://www.opensource.org/about>). The OSD is a list of 10 requirements that software must meet to qualify as open source.

The Open Source Initiative keeps a list of licences it considers comply with its definition of open source. It has a trademarked logo that those whose licences comply with the definition can use. It might seem it should be possible to use any OSD-compliant software with any other OSD-compliant software. This, however, is not always the case as some of the licences contain incompatible terms.

### ADVANTAGES AND DISADVANTAGES OF OPEN LICENCE SOFTWARE

Traditionally open licence software users were technically sophisticated. They probably shared the ideals of organizations like the Free Software Foundation and may even have helped develop the software they used.

Increasingly, however, open licence software users have little or no technical expertise. They simply want to save money by switching to open licence software rather than pay for commercial software from suppliers like Microsoft. Stand-alone products like open licence products like Firefox and Thunderbird should present these users with few difficulties. But non-technical users are likely to resent having to learn how to use the more complex products that are an alternative to Microsoft Windows and Office. In addition, some of the proprietary software on which an individual or institution de-

pends may not be easy to run with open licence software or be available in an open licence version. Open licence software is also likely to need as much support as the equivalent commercial software. Support here means help with installing the software, manuals, training for users and access to experts. Before committing themselves to open source software, users with little technical expertise should check these points and, in particular, be sure adequate support will be available and know what it will cost. Businesses using open licence software should also bear in mind that most open licences disclaim liability for any damage resulting from the software. They may need to consult their insurers.

It is worth noting that some software managers working in higher education institutions have reservations about using open licence software for sensitive data. Their concern is that if the source code is available it is easier to attack the software and publish, change, or destroy the data.

Open licences are popular among educators. But individuals and institutions that distribute their original software with an open licence may be giving up the possibility of royalty revenue from those who use their software. They need to weigh this against the advantages of open licensing and the possibility of exploiting their software in other ways. They should also be aware, as has been mentioned, that they have the option of licensing the software with an open and a proprietary licence.

## Open licences for non-software material

The success of open licence software led to an interest in using open licences for non-software material and especially for educational and scientific material. The list of individual and institutional signatories to the Cape Town Open Education Declaration of 2007 (<http://www.cape-towndeclaration.org/>) shows how much support there is for open licence educational resources (OERs).

### EARLY OPEN LICENCES

Open licences for non-software material came some time after open licences for software. The earliest such non-software open licence may have been the Open Content Licence that David Wiley of Open Content published in July 1998. The following year, in June 1999, the Open Content Project published the Open Publication Licence.

## GNU FDL

In March 2000 the Free Software Foundation released version 1 of the GNU Free Documentation Licence (the FDL). The FDL was meant for software developers writing manuals and documenting their work but it can be used for other forms of material. Wikipedia, for example, uses the FDL. A revised version, FDL version 1.2, appeared in November 2002 and the Free Software Foundation is working on version 2. The FDL, like the GPL, allows for commercial publishing. If, however, the GNU website list of 30 or so commercially published FDL books is complete (<http://gnu.paradoxical.co.uk/doc/other-free-books.html>), FDL material is not yet as attractive to commercial publishers as the GPL software is to commercial software developers.

## CREATIVE COMMONS LICENCES

Open licences for non-software material began to attract serious attention in 2001 when Lawrence Lessig and others started Creative Commons (CC). The CC licences are now the most important open licences for non-software material.

### CC rights

The CC licences are based on the CC analysis of copyright rights. This distinguishes between four rights of a copyright holder. The CC website lists and explains these rights:

“Attribution. You let others copy, distribute, display, and perform your copyrighted work—and derivative works based upon it—but only if they give credit the way you request.”

“Noncommercial. You let others copy, distribute, display, and perform your work—and derivative works based upon it—but for noncommercial purposes only.”

“No Derivative Works. You let others copy, distribute, display, and perform only verbatim copies of your work, not derivative works based upon it.”

“Share Alike. You allow others to distribute derivative works only under a license identical to the license that governs your work.”

All the CC licences include what CC calls the “Baseline Rights”. These are the rights to copy, distribute, display, perform publicly or by digital performance and to change the format of material.

## CC licences

In theory the four CC rights, used singly or combined, allow for eleven different possible licences. In practice CC offers only six licences. These licences allow copyright holders to grant users different combinations of the CC rights. This flexibility makes the CC licences more attractive to authors than the all-or-nothing open licences that are usual for software. As the CC website says:

Creative Commons defines the spectrum of possibilities between full copyright—all rights reserved—and the public domain—no rights reserved. Our licenses help you keep your copyright while inviting certain uses of your work—a “some rights reserved” copyright.

The CC website has a diagram that shows the spectrum from copyright to public domain with CC licences occupying the space between these two:



CC also takes into account that copyright law differs from country to country. As well as a generic or unported version of each licence CC aims at providing a version, in the appropriate language, adapted to the law of each country where the CC licences are used. This means there is no one CC licence in the way there is one GNU GPL. With CC licences it is always necessary to specify which national version of the CC licence is being used, and, in some cases, the language version of the licence.

In addition to the CC licences, CC provides a form for an author to place a work in the public domain. This is only legally possible in some countries. CC also has a procedure for recreating the original US copyright term of 14 years.

CC uses symbols and abbreviations to represent the four rights of a copyright holder and combines these symbols and abbreviations to represent the different licences. The names, abbreviations, and symbols of the six CC licences give some idea of the complexity of the CC licence system:

- Attribution Non-commercial No Derivatives (by-nc-nd)
- Attribution Non-commercial Share Alike (by-nc-sa)
- Attribution Non-commercial (by-nc)
- Attribution No Derivatives (by-nd)
- Attribution Share Alike (by-sa)
- Attribution (by)



### CC licence generator

The text of the CC licences and their different language versions is on the CC website. The CC website does not, however, expect users to study every licence before choosing one. Instead, there is a licence generator that suggests the appropriate CC licence based on the answers to following three questions:

- Will an author allow commercial use of the work?
- Will an author allow users to modify the work? (Included under this question is the possibility of allowing users to modify the work if they share alike.)
- In which jurisdiction does an author want to license the work?

The questions are a convenient starting point for commenting on the six CC licences.

### Jurisdiction

It is useful to start with the third question on the jurisdiction of the licence. If a work will be used mainly in one country an author should select that country. If an author is publishing a work internationally or if there is no licence for the country in which the author is publishing, the author should answer ‘unported’. The unported version of a licence is a generic, international licence. The following discussion of the other questions will refer to the unported versions of the licences.

### Restriction on commercial use

The first question the licence generator asks is: “Allow commercial use of your work?” If the copyright holder does not want to allow commercial use of the work the licence generator suggests a non-commercial (NC) licence. What this means is that a copyright holder who finds individuals or institutions making commercial use of the work can take legal steps to stop them doing this. But what does non-commercial mean? Section 4b of the unported CC Attribution-NonCommercial 3.0 licence says:

You may not exercise any of the rights granted to You in Section 3 above in any manner that is primarily intended for or directed toward commercial advantage or private monetary compensation. The exchange of the Work for other copyrighted works by means of digital file-sharing or otherwise shall not be considered to be intended for or directed toward commercial advantage or private monetary compensation, provided there is no payment of any monetary compensation in connection with the exchange of copyrighted works.

One view of what this means, often forcefully expressed in workshops and discussion groups, is that non-commercial means that no money should change hands. This is not, however, the usual meaning of non-commercial. It is not a commercial transaction, for example, to refund someone for buying me a loaf of bread or even to pay that person’s travelling expenses. It only becomes commercial if that person wants to make a profit out of providing this service. It follows that someone who distributes an NC work should be able to charge to recover expenses incurred in distributing the work. These expenses, typically, would include copy charges, salaries and overhead expenses. The only restriction is that anyone doing this does not intend to make a profit out of distributing the work. This is the view of the Draft Guidelines that CC published to try to clarify the meaning of non-commercial. (“Proposed best practice guidelines to clarify the meaning of ‘noncommercial’ in the Creative Commons licenses” available at [http://wiki.creativecommons.org/DiscussionDraftNonCommercial\\_Guidelines](http://wiki.creativecommons.org/DiscussionDraftNonCommercial_Guidelines))

There is still some uncertainty, however, about what “primarily intended for or directed toward commercial advantage or private monetary compensation” in section 4b means. It could be argued that even if a project does make a profit, the use is still non-commercial if the project was *not primarily intended* to make a profit. According to this view, an organization that is run for profit may use NC material and may recover its expenses for distributing NC material provided the *project* using the NC licensed material does not aim at making a profit.

This raises questions such as whether private schools run for profit or public broadcasters that accept advertising revenue may use NC-licensed material for teaching or informing their viewers? (See Mikael Pawlo, “What is the meaning of non-commercial” in Danièle Boucier & Mélanie Dulong de Rosnay, *International Commons at the Digital Age: La création en partage 2004* Romillat, Paris 69 at 78–82. Available at <http://fr.creativecommons.org/iCommonsAtTheDigitalAge.pdf>) Another question is whether a business whose profits support a non profit body such as a university may use NC material. The Draft Guidelines appear to prohibit using NC material in these ways. Section C(2) of the Draft Guidelines, for example, says that it is not non-commercial if money changes hands to, for example, a for-profit copy shop. Section A(1)(b) insists that an educational institution or library using NC material must be nonprofit. And section B appears to classify as commercial any use of NC material in connection with advertising.

What the Draft Guidelines say, however, does not settle the matter. The Draft Guidelines are not part of the NC licence. As section 8e of the NC licence says: “This License constitutes the entire agreement between the parties with respect to the Work licensed here.” And a notice at the end of the licence says “Creative Commons is not a party to this License, and makes no warranty whatsoever in connection with the Work.” The Draft Guidelines themselves do not claim to be an authoritative. CC published them to “elicit feedback about whether these guidelines accurately reflect the community’s (including both licensors and licencees) understanding of the term”. This means that what the Draft Guidelines say should be treated with respect but any dispute between a copyright holder and a user can only be settled on the basis of what the licence says. This raises the question whether any ambiguities in the wording of the licence should be interpreted strictly, to limit the use of NC material, or generously, to allow the widest use of a work.

CC plans to return to the question of the meaning of non-commercial. It would be helpful to know what authors who use the NC licence really want to achieve. They do not want royalties for their work but they do, presumably, want the work to be made widely available. If these authors object to associating their work with commerce in any way, the Draft Guidelines should be followed. If, on the other hand, these authors want only to avoid commercial interests taking over and restricting access to their work, the authors may be prepared to allow their work to be used by organizations or individuals working for their own profit provided they do not limit further distribution of the CC work. And this could be achieved by using a SA ShareAlike licence.

As with all the CC licences, it is always possible for a commercial user to approach the author of a work directly and ask for permission to use CC licensed work in a way the CC licence does not cover.

### Modifications allowed

Once a user has decided whether to allow commercial use, the licence generator’s second question is: “**Allow modifications of your work?**” There are three possible answers to this question: “Yes”, “No”, and “Yes as long as others share alike”.

Particularly where the licensed material is educational material, users are likely to want to modify it by adding examples and other material, by translating it into another language or adapting it in some other way. The licence generator will suggest that those who want to allow users to modify their material use either a simple attribution (BY) licence or an attribution non-commercial (BY-

NC) licence. Which it suggests will depend on the answer to the first question: “Allow commercial use of your work?”

The simple attribution licence, not combined with a NC restriction, allows a user to do anything with the material except claim copyright in it or authorship of it. A user may modify the material or leave it as it is and market the modified or original material commercially and keep any profit.

### No modifications

If the answer to the licence generator’s second question “**Allow modifications of your work?**” is “no”, the licence generator will suggest an ND (no derivative works) licence. The human readable summary of version 3 of the unported Attribution-NoDerivs licence says: “You may not alter, transform, or build upon this work.”. The legal code prefers to speak of not adapting a work. Section 1a defines adaptation as:

a work based upon the Work, or upon the Work and other pre-existing works, such as a translation, adaptation, derivative work, arrangement of music or other alterations of a literary or artistic work, or phonogram or performance and includes cinematographic adaptations or any other form in which the Work may be recast, transformed, or adapted including in any form recognizably derived from the original, except that a work that constitutes a Collection will not be considered an Adaptation for the purpose of this License. For the avoidance of doubt, where the Work is a musical work, performance or phonogram, the synchronization of the Work in timed-relation with a moving image (“synching”) will be considered an Adaptation for the purpose of this License.

This means that a ND licence allows users to use, reuse and distribute a work but not adapt it.

There are situations where an ND restriction is necessary. If a work is a report or set of standards, it makes sense to insist that it is only used in its original form. Changes to a work of this sort destroy its value. Even valid corrections can be harmful because they give readers a false impression of the accuracy of the original report.

The ND restriction is also necessary if an author wants to distribute a work for comment while reserving the right to publish the final version of the work.

Some educators dislike the ND restriction and say it makes it difficult for them to use material most effectively. But the ND licence does allow for an ND work to be used in a collection. (Some versions of the ND licence

call this a collective work.) Section 1b of the legal code defines a collection as:

a collection of literary or artistic works, such as encyclopedias and anthologies, or performances, phonograms or broadcasts, or other works or subject matter other than works listed in Section 1(f) below, which, by reason of the selection and arrangement of their contents, constitute intellectual creations, in which the Work is included in its entirety in unmodified form along with one or more other contributions, each constituting separate and independent works in themselves, which together are assembled into a collective whole. A work that constitutes a Collection will not be considered an Adaptation (as defined above) for the purposes of this License.

This means that provided the ND work is reproduced whole and unmodified it can be published in a collection with a commentary or other relevant material. It is not clear whether it would be permissible to use hyperlinks to take a user directly to parts of an ND work or to connect an ND work to a commentary or other material.

Section 4 of the legal code goes into detail about how an ND work can be incorporated into a collection and how the work must be credited. It is possible to assemble a collective work consisting of materials carrying different licences. A collection may also, if it is sufficiently original, qualify for copyright protection and for its own licence which does not have to be an ND licence. When this happens the collective work’s licence will not change the licences attaching to the components in the collective work.

### Share Alike

If the answer to the licence generator’s second question “**Allow modifications of your work?**” is “Yes, as long as others share alike” the licence generator suggests a share alike (SA) licence. This ensures that modified works based on the licensed material are available to others under the same conditions as the original work. The share alike licence offers authors the possibility of making their work “viral” in a way that is similar to the GPL. Version 3 of the unported of the Attribution-ShareAlike licence says:

You may Distribute or Publicly Perform an Adaptation only under the terms of: (i) this License; (ii) a later version of this License with the same License Elements as this License; (iii) a Creative Commons jurisdiction license (either this or a later license ver-

sion) that contains the same License Elements as this License (e.g., Attribution-ShareAlike 3.0 US); (iv) a Creative Commons Compatible License.

The CC’s symbol for share alike is almost exactly but not quite the same as the FSF’s symbol for copyleft.

### Attribution

All the CC licences require what CC calls attribution. The human readable summary of version 3 of the unported Attribution licence explains what attribution means:

You must attribute the work in the manner specified by the author or licensor (but not in any way that suggests that they endorse you or your use of the work)

### Changing or withdrawing a licence

The CC licences all say the licence is for the duration of copyright and only ends if the person holding the licence breaks the terms of the licence. Section 7b of version 3 of the unported Attribution licence, for example, says:

Subject to the above terms and conditions, the licence granted here is perpetual (for the duration of the applicable copyright in the Work).

Whether an author can stop those who have not begun using the material, from acquiring rights in terms of the original licence is an awkward question. Section 8a of the licence suggests that an author cannot do this:

Each time You Distribute or Publicly Perform the Work or a Collection, the Licensor offers to the recipient a license to the Work on the same terms and conditions as the license granted to You under this License.

There is a problem with this clause in that the identity of the “relevant third party” is unknown until someone begins to use the work. This means that an author is bound to an uncertain person. Not every legal system accepts that this is possible. If an author does withdraw a licence this will not affect the rights of those who had previously begun to use the material.

### Concluding comments on CC licences

There was no CC equivalent to the GNU Manifesto although there is now a “*Free Content and Expression Definition*” that may serve as a manifesto. It seems, however, that what the founders of the CC movement had in mind was a community producing material that it would

make available under the CC licences in the same way as there are communities of software developers. making software available under different licences. There two features of the CC licences that might hinder this.

First, the system of CC licences is complex and, as has been shown, the meaning of the licences is not always clear. A pre-publication review of this chapter advised against publishing some of the comments for fear that they might weaken confidence in the CC licences. It seems, however, that long-term confidence in the CC licences will only be possible when difficulties of the sort this chapter raises have been resolved.

Second, and possibly more importantly, authors and educators ‘need to eat’. Those in regular employment and those supported by public or private grants may be happy to use the CC licences. But authors earn their living from their work might be reluctant to use the CC or any other open licence. Commercial publishers, whether they publish traditionally or online, are unlikely to want to pay authors for the rights to publish a work that is already freely available. And it is difficult to see how there could be a commercial use for non-software open-licence material in the way there is for open licence software.

## OTHER NON-SOFTWARE OPEN LICENCES

Some authors draft what are, in effect, their own open licences. This can be done quite simply. So, for example, the copyright notice on the Antiquarian Horological Society’s Website (<http://www.ahsoc.demon.co.uk/>) reads:

The material in these pages is copyright.  
© AHS and Authors. 1996 – 2007.

The information may be downloaded for personal use only. The information may be passed on to another party for their private use provided that the source and this copyright information is acknowledged. The material may not be reproduced in quantity, or for commercial purposes.

Open licence drafting, however, is not always a simple matter and not every home-grown licence is free of problems. The United Nations Disaster Management Training Programme, for example, has the following licence on some of its training material:

The first edition of this module was printed in 1991. Utilization and duplication of the material in this module is permissible; however, source attribution to the Disaster Management Training Programme (DMTP) is required.

In this licence it is not clear whether ‘utilization and duplication’ includes making derivative works and using the material commercially for profit.

The African Medical Research Foundation, to take another example, has licensed some of its educational material with CC Attribution-Share Alike licence. The Foundation then goes on to explain that copying, reproducing and adapting the material is “to meet the needs of local health workers or for teaching purposes”. It is not clear if this limits the CC licence. The Foundation also asks, although not as a term of the licence, for feedback on how the material is being used:

This course is distributed under the Creative Commons Attribution-Share Alike 3.0 License. Any part of this unit including the illustrations, may be copied, reproduced or adapted to meet the needs of local health workers or for teaching purposes, provided proper citation is accorded AMREF. If this work is altered, transformed or built upon, the resulting work may be distributed only under a license identical to this one. AMREF would be grateful to learn how you are using this course, and welcomes constructive comments and suggestions.

## Access to knowledge and information sharing

There is a growing awareness of the importance of access to knowledge and information and of the need to prevent commercial exploitation from making important knowledge the preserve of relatively few. An example of this was President Clinton’s decision to increase funding for the Human Genome Project to ensure that the sequences were not patented and limited to commercial use. When discussing access to knowledge it is useful to distinguish different kinds of knowledge or information.

Governments have detailed information about matters such as the health, safety and education of the population, trade figures, economic performance, spatial information and geodata. They collect this information for their own purposes and, in terms of the law of most countries, they have copyright in it. Such information, of course, is often also useful to researchers and commentators and to those thinking about investing in the country either to make a profit or to help development. There is, however, no single approach about whether and on what terms this information should be available.

In 2005 Brazil and Argentina proposed to the World Intellectual Property Organisation that the organization’s development agenda should discuss the possibility of a Treaty on Access to Knowledge (A2K). Much of the draft of the treaty deals with widening the scope of the exceptions to and limitations on the copyright holders’ rights. Part 5 is entitled “Expanding and enhancing the knowledge commons” and includes articles providing for access to publicly funded research and government information and a provision that government works should be in the public domain.

A category of government information to which some countries already allow access is material of a legal, judicial or political nature: legislation, case law, and parliamentary proceedings. In 2002 delegates from some Commonwealth countries produced a ‘Declaration on Free Access to Law’ that asserts, among other things that “(p)ublic legal information is digital common property and should be accessible to all on a non-profit basis and free of charge; ...” Anyone who has followed the discussion in this chapter and reads the full declaration will realize that the declaration needs to go into more detail about creating derivative works and using the material commercially.

Tax exempt foundations and not-for-profit educational and research institutions also fund research that produces important information. According to the law in most countries, funders and employers can decide on what terms to release this information. It is understandable that researchers looking for funding may want to include a profit line from intellectual property in their research proposals. Educational institutions also like the idea of using the research done by their staff to produce what some call “third stream” income. It could also be seen as part of academic freedom that academics who work in educational and research institutions are entitled to a say in how their research is released. Access to knowledge advocates could argue that governments should consider whether institutions and funders that do this are really entitled to their tax-free status.

Creative Commons works through Science Commons to encourage the free flow of scientific information. One of the Science Commons projects has drafted model contracts for the transfer of biological material. Another project aims at publishing material that is important for biological research with an open licence. A third project aims at getting peer reviewed journals to publish with open licences and enlisting academics to publish only in journals that do this.

## Concluding comments

In conclusion it seems worth mentioning two features that most open licences lack: provision for notifying the copyright holder about how material is being used and provision for alternative dispute resolution.

### NOTIFICATION

It is surprising that open licences do not allow an author to require a user, in return for being free to use the author’s material, to keep the author informed about what a user does with the material. The African Medical Research Foundation’s licence requests this information but it is not a condition of using the material. Drafting such a condition, of course, would have to be done so as not to impose too much of a burden on users. But if it could be done the information would help assess the value of open licence material.

### ALTERNATIVE DISPUTE RESOLUTION

We have seen the different opinions about what some of the clauses in the CC licences mean. And there has been litigation about the meaning of the GPL. As things stand only a court, possibly even a whole series of courts in different countries, can settle differences of opinion. Given the cost of litigation, it is unlikely that the courts will ever have an opportunity to do this. In 1999 ICANN adopted a Uniform Domain-Name Dispute-Resolution Policy for settling disputes about domain names. There is no reason why there should not be a similar dispute resolution procedure for settling disputes between copyright holders and users about the meaning of open licences.

## References

Much of the material used in this chapter comes from the websites of the organizations responsible for the different licences and initiatives where readers will easily find it. The Creative Commons website, in particular, has a helpful index of academic commentary. The following may also be helpful:

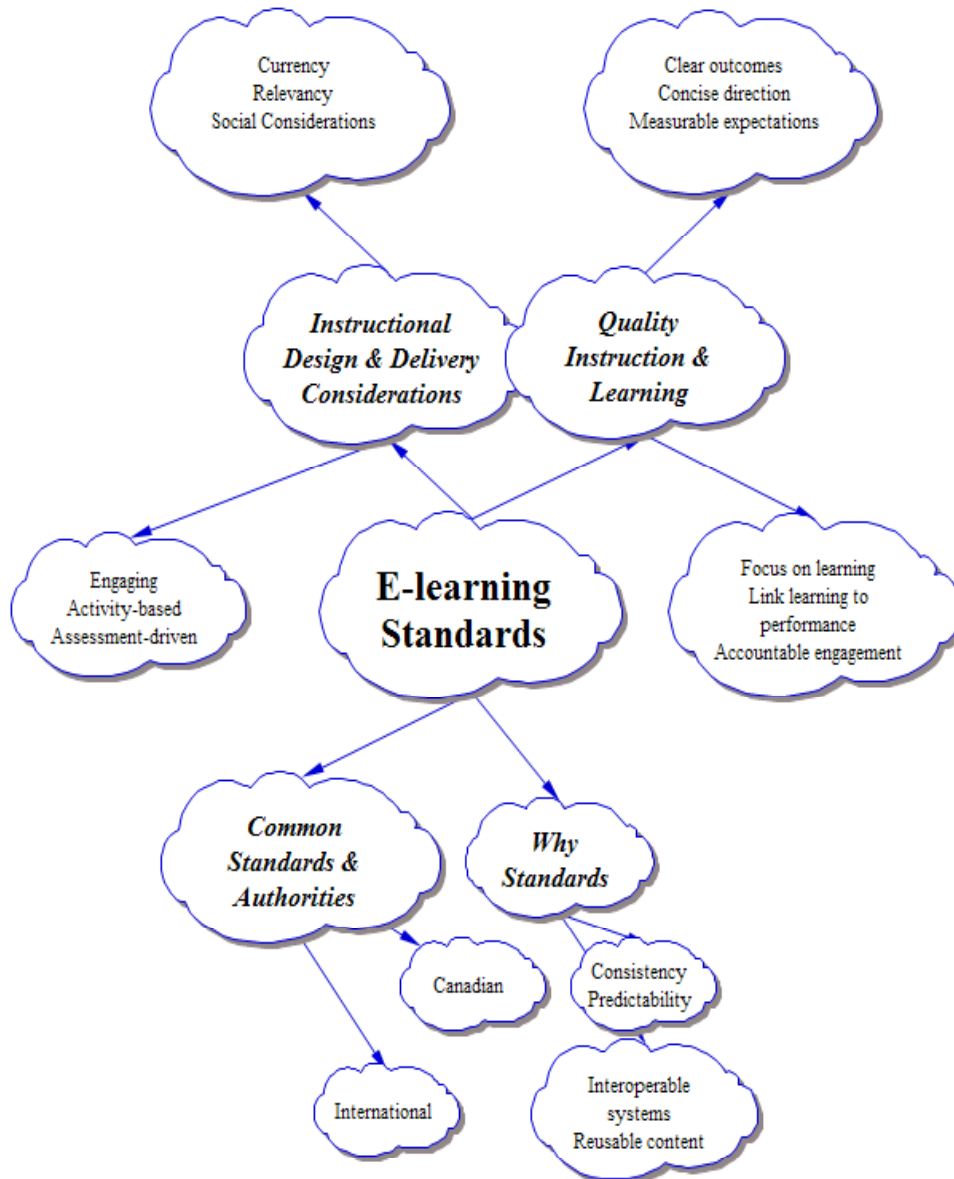
- Lawrence Liang *Guide to Open Content Licenses* version 1.2 2004 Piet Zwart Institute Willem de Kooning Academy Hogeschool Rotterdam. Available at <http://pzwart.wdka.hro.nl/mdr/pubsfolder/opencontentpdf>.
- Andrew M. St. Laurent *Understanding Open Source and Free Software Licensing*, 2004 O’Reilly. Reviewed by **Mike Fraser** in issue 42, January 2005 *Ariadne*.



# 17

## *E-learning Standards*

Randy LaBonte



## Learning outcomes

After completing this chapter, you should be able to:

- Identify the most prominent e-learning standards, bodies and organizations.
- Determine e-learning standards that could apply to your own e-learning situation.
- Apply standards in your organization.
- Look for more detailed information about standards for e-learning.

## Introduction

**Standards** exist for many things, from safety standards in home construction and manufactured goods to standards of professional practice. Implementing e-learning requires that you adopt standards and specifications for both the development and delivery of content. Standards allow e-learning content, technological infrastructures, educational technologies and learning systems to be interoperable.

Because the gauge of railroad track was standardized, locomotives led the way for the industrial economy. Similarly, the Internet was born from the standardization of **TCP/IP**, **HTTP**, and **HTML** protocols for the World Wide Web. Historically, standards emerge when proprietary technology does not integrate with other technologies. Users of the technology demand changes that allow new products to work with existing ones (for example, the Blue Ray—High Definition DVD battle recently). This convergence provides the basis for a set of standards that ensures the consumer of longevity and consistency.

For the purposes of this chapter, the term standard refers to document descriptions containing technical specifications and criteria to be used as rules and guidelines to ensure content materials, delivery processes, and services meet their intended purpose.

Establishing e-learning standards began as part of a shift away from local, site-only content or programs to web-accessible ones. The migration away from proprietary systems and methods to common, shared ones, built the foundation for the development of standards. Today those standards form the basis on which e-learning can continue to develop and evolve. The standards enable the exchange of **learning objects** (content) and the technical integration of content, learning systems, and delivery platforms.

## Instructional design and delivery considerations

Selecting content for use in any learning program, whether online or face-to-face, is complex, and varies according to learning environment, instructional approach, learner's needs and learning style, not to mention user and institutional preference. Section 1 discusses some of the more common issues and approaches in **instructional design**. General considerations include how content is presented to the learner, how interactivity is created, how learning is measured, and how social context is reflected. The following points are particularly relevant to an e-learning program, although they can be applied to any learning program. The list is not intended to be comprehensive, rather is included here to stimulate reflection on key elements for a learning program.

### CONTENT/FORMAT

Learning materials should:

- Be relevant to the philosophy, goals, and learning outcomes of the curriculum.
- Make use of a variety of media presentation modes.
- Be accurate, current, and where appropriate reflect a diversity of learning approaches.
- Be suitable for online environments and accessible from commonly used hardware and software.
- Be designed for ease of use, simplicity of layout, durability, and accessibility.

### INSTRUCTIONAL DESIGN

Learning materials should:

- Favour activity over text or lecture.
- Support group and individual learning.
- Promote an applied approach to learning.
- Activate the learner's prior knowledge.
- Encourage learners to develop critical-thinking skills.
- Offer choice and flexibility as appropriate to meet individual learning styles and interests.
- Promote attention and engage the learner.
- Provide adequate instructor direction and support.

### EVALUATION/ASSESSMENT

Learning materials should:

- Provide continuous feedback to the learner
- Use formative and summative evaluation as appropriate.



- Track achievements for both the learner and instructor.

## SOCIAL CONSIDERATIONS

Learning materials should:

- Reflect sensitivity to culture, gender and sexual orientation.
- Promote equality.
- Reflect sensitivity to the diversity of ethnic backgrounds, configurations, and values.
- Portray positive role models.
- Use language appropriate to the intended audience.

## Quality first

Responsibility for e-learning often falls under an organization's human resources department or education authority, and typically personnel in these departments are responsible for, and most comfortable with, traditional classroom-based learning approaches. An e-learning environment's characteristics are different from those of a face-to-face classroom. Online instructors typically do not have visual feedback about learner engagement and must devise new strategies to encourage and measure learner engagement and achievement. Traditional classroom strategies do not necessarily transfer into an e-learning environment.

Whether online or onsite, good instruction is driven by a focus on quality to ensure continuous improvement and organizational performance. Standards for quality in academic settings typically centre on goals for achievement in numeracy, literacy, and critical thinking. In corporate training, standards describe goal achievement of specific skills and knowledge. In both settings, the drive for quality provides a framework for improving retention and raising achievement. Standards for quality learning set reasonable targets and expectations for instructors and students. Quality standards do not prescribe how instruction should be delivered, or how learning should occur. Rather, they set clear, concise, and measurable expectations that assist in selecting instructional strategies, assessment methods, and learning materials that support improved learning and achievement.

The drive for quality in e-learning is highlighted by the development of quality measures described by several organizations. For example, the British Learning Association's (BLA) (<http://www.british-learning.com/qualitymark/index.htm>) and QualitE-Learning Assurance's eQCheck (<http://www.eqcheck.com/eq/home.html>) both set quality measures and approve e-learning

content meeting them. The BLA's "Quality Mark" is designed to improve the impact of learning interventions on performance across multiple sectors by setting quality indicators for all aspects of learning materials production and delivery. The focus of the eQCheck is quality assurance through assessment and evaluation of e-learning products and services for both consumers and providers. The BLA and eQcheck quality marks are used to give confidence to providers and consumers much like a vintners' "VQA" (vintners' quality assurance) mark does for the selection of wine.

A quality-driven approach invites debate about what constitutes effective learning, no matter the learning environment, instructional approach, or technological sophistication. However, a quality-driven approach can ensure:

- focus on learning, rather than instructional delivery;
- learning solutions that meet both organizational and learner needs;
- learning policies consistent with organizational objectives;
- a relationship between learning and organizational benefits;
- a process for establishing continuous quality improvement;
- a recognized institutional commitment to quality.

## Why standards for e-learning?

"The nicest thing about standards is that there are so many of them to choose from". – Andres S. Tannenbaum (ThinkExist.com, 2007a)

Standards clarify roles and responsibilities for instructors, learners, and others responsible for the outcomes of the learning. Standards also provide a framework to assist in the selection of a course or program. For governments, educational institutions and corporate authorities, standards inform policy and the allocation of resources or funding. The development of standards reduces risk for organizations making investments in technologies and e-learning content. Standards compliance assures data systems will be able to work together and that investment in intellectual capital is not lost.

At a minimum e-learning standards should ensure content is interoperable on any learning system. Standards should make life simpler by building consistency and predictability. Some would argue that in the world of e-learning the opposite is true, as the drive for standards has increased complexity and created more confu-

sion. There are standards and specifications for learning objects, metadata, learning architecture, and instructional design, which most end-users find far too technical for their needs. What e-learning standards do have in common is the intention to assist both the development and delivery of online learning that, in the end, supports the end-user's learning needs and the organization's requirement to account for that learning.

Standards seem to come in two flavours: complex technical standards and specifications that define everything from minute details for multiple contingencies, to more user-driven general standards that enable content to be adapted for local consumption and use. Standards should fit within current practice and support learning—not promote a particular technical point of view or approach. Adoption of SCORM (shareable courseware object reference model) as a standard for online courses could be counterproductive for some organizations as it may conflict with instructional delivery methodology and approaches, whereas adoption of a subset of SCORM might prove more appropriate. For example, an institution or corporation may have invested in an HR database or learning system that does not meet all of the SCORM specifications for managing online content. Does this mean that new systems are required? To make matters more complex, SCORM is constantly undergoing update. So which level of SCORM compliance should be the standard? Should the standard of accessibility for all be required? If so, the adoption of this standard could limit the use of engaging media that would enhance learning for the majority of online learners.

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#### Tip

The development of accredited standards reduces risk for organizations making investments in e-learning technologies and content. At a minimum the adoption of a set of standards should ensure that data systems work together and that investment in time and intellectual capital in existing content is not lost. The standards any organization adopts should ensure that content is interoperable on any learning system, enabling its reuse and re-purposing.

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No matter the motivation, the reasons for adopting standards must be made clear to all, or the risk is to sign up to someone else's agenda. Standards that reflect current and emerging practice encourage development of engaging online learning. Standards that limit or constrain creative use of technologies and media can stifle effective e-learning. The best advice is to focus on learning, involve those responsible for development and

delivery of content, and engage instructors and learners in the process. (See Chapters 10 to 13.) With the establishment of a clear set of goals and outcomes for developing an e-learning program, selecting content and technology while applying standards becomes a less daunting task.

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#### Example from the field

In British Columbia standards for e-learning were developed in the context of existing practice and through the direct involvement of online practitioners (see the BC Ministry of Education's "Standards for K–12 Distributed Learning in British Columbia" available at [http://www.bced.gov.bc.ca/dist\\_learning/documents/dl\\_standards.pdf](http://www.bced.gov.bc.ca/dist_learning/documents/dl_standards.pdf)). Standards from existing bodies were adopted and adapted to reflect existing, sound practice as well as to create a standards document that supported and guided the evolution of improved practice in the K–12 system for BC.

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## Common standards for e-learning

"Standards are always out of date. That's what makes them standards". – Alan Bennett (Corliss, 2004)

While standards will vary from organization to organization, generally they address core aspects of e-learning including data specification, format, security, and exchange between systems, as well as content structure, cataloguing, and retrieval. Other standards attempt to address accessibility, engagement with the learner, instructional design, etc.

The key to understanding standards is to determine which apply to your instructional practice and support learning. The point of having a standard is to support and enhance practice, not to limit it. This is best captured by a policy of the International Open Forum. (2004, p. 3) which states:

Standardization is one of the essential building blocks of the Information Society ... The development and use of open, interoperable, non-discriminatory and demand-driven standards that take into account needs of users and consumers is a basic element for the development and greater diffusion of ICTs and more affordable access to them, particularly in developing countries. International standards aim to create an environment

where consumers can access services worldwide regardless of underlying technology.

Standards have been applied to the architecture of learning management systems (LMS) and learning content management systems (LCMS), as well as the development and metadata tagging of learning objects for presentation on these systems. Learning architecture standards set specifications for exchanging data with other learning systems and database programs (library resources, demographic or records information systems), and providing an environment to locate, manage, and deliver learning objects. Learning object standards set specifications for metadata tagging (how to make information about the learning object such as name, publisher, learning objectives, description of the content, visible), and how to integrate with a learning system (track learning, set mastery level, assess, and report on the learning that occurs using the learning objects).

The benefits of learning architecture and learning object standards and specifications to date have been:

- the ability to use learning objects from any compliant publisher or developer on multiple technological delivery platforms;
- data interoperability among different learning systems and database platforms; and
- the ability to use and manage learning objects as resources.

Common standards for e-learning include:

- (1) Data specification
  - What data must be available for exchange with another system (items such as learner information, learner demographics, learning assignments, performance).
  - What each data item is to be called and what format it should be in (text, integer, decimal number, etc.).
- (2) Data format
  - How data is packaged for exchange (comma-separated data, spreadsheet data, XML).
  - XML (a structured text format where every piece of data is preceded by its name) is the format most widely used.
- (3) Message packaging
  - Details the protocol for sending the data from one system to another. (HTTP has become the standard).
  - Transaction management
  - Details the protocol for what the receiving system is to do with the data (such as creating a new

learner, updating a learner record, creating a new performance record).

- (4) Security management
  - Details how data is to be secured, and how to authenticate the sender of the data to make sure the sender has rights to send data and perform the transaction indicated.
- (5) Content container specification
  - Details the environment that the learning management system will provide for the content it launches. (The least complicated and least capable container is a new browser window. More capable containers are browser windows that get data such as user identification information from the learning management system, bookmarks and sends data such as score and performance data).
- (6) Cataloguing and metadata creation
  - Refers to the process of creating structured descriptions that provide information about any aspect of a digital resource (the information may include technical information about the digital entity or describe the process of digitization).
  - Types of specific process metadata may be administrative metadata, technical metadata and preservation metadata.

## Standards regulatory bodies

“Standards are industry’s way of codifying obsolescence”. – Anonymous

Technology changes rapidly. Accordingly, the development of standards for e-learning is like a moving target. Many institutions and organizations first laid claim to “the standard” for online content and delivery. Several organizations have gained prominence in developing e-learning standards including:

- Aviation Industry CBT Committee (AICC)
- Sharable Courseware Object Reference Model (SCORM)
- IMS Global Learning Consortium (IMS)
- Institute of Electrical and Electronic Engineers Learning Technology Standards Committee (IEEE—LTSC)
- Canadian Core Learning Resource Metadata Application Profile (CanCore).

While compliance to standards and membership in any organization is voluntary, most major content developers and technology providers conform to some or

all of the standards recommended by these organizations. In many cases regulatory bodies reference a set or sub-set of each other's standards. Others list only specifications and guidelines rather than standards, as the development and/or adoption of what will become a standard will continue. The following provides a brief background on each organization. The References section at the end of the chapter lists additional organizations and websites that may be of interest.

### **AVIATION INDUSTRY CBT COMMITTEE (AICC)**

The Aviation Industry CBT Committee (AICC) is an international association of technology-based training professionals. The AICC develops guidelines for the aviation industry in the development, delivery, and evaluation of CBT and related training technologies. The AICC has developed methods that allow learning management systems to exchange information and track the results of contents.

Although AICC primarily attends to the aviation industry, their focus has led to very well developed specifications for learning, and particularly for computer-managed instruction. As a result, a wide range of learning consortiums and accredited standards groups adapt the AICC guidelines to their suit their own industries. The main link for the AICC is <http://www.aicc.org/index.html>.

### **SHAREABLE COURSEWARE OBJECT REFERENCE MODEL (SCORM)**

The Department of Defense and the White House Office of Science and Technology Policy launched the Advanced Distributed Learning (ADL) initiative in 1997 to develop an open architecture for online learning. Its purpose was to support access to quality education and training resources tailored to individual learner needs and available as required.

The ADL Shareable Courseware Object Reference Model (SCORM) specification provides a common technical framework for computer and web-based learning that attempts to foster the creation of reusable learning content as "instructional objects". SCORM is based on AICC and the IMS Global Learning Consortium specifications. The ADL provides interoperability testing laboratories and intends to establish a certification program. The main website for SCORM is: <http://www.adlnet.org/>.

### **IMS GLOBAL LEARNING CONSORTIUM**

The IMS Global Learning Consortium represents a number of large and small educational institutions, training organizations, government and software vendors interested in incorporating learning resource meta-data into their software products. IMS is developing and promoting open specifications for facilitating online distributed learning activities such as locating and using educational content, tracking learner progress, reporting learner performance, and exchanging learner records between administrative systems. The IMS Project is funded solely by membership (the highest level of participation is the contributing member, with an annual fee of \$50,000). The main link for IMS is <http://www.imsproject.org/>.

### **INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS LEARNING TECHNOLOGY STANDARDS COMMITTEE (IEEE—LTSC)**

The Learning Technology Standards Committee (LTSC), part of IEEE, is a formal standards body that produces standards with legal standing. The formal standardization process is generally based on existing process; in the case of the LTSC, the other organizations listed here provide input. The LTSC itself comprises several working groups that are developing technical standards, recommended practices, and guidelines for software components, tools, and technologies. They also design methods that facilitate the development, deployment, maintenance, and interoperation of computer implementations of education and training components and systems. The URL for the LTSC is <http://ieeeltsc.org/>.

### **CANADIAN CORE LEARNING RESOURCE METADATA APPLICATION RESOURCE (CANCORE)**

CanCore interprets and simplifies the IMS metadata specification, which is a subset of the SCORM specifications. SCORM has been developed in the context of military and training applications, whereas CanCore's authors and audience have been the public and educators. CanCore enhances the ability of educators, researchers, and students in Canada and around the world to search and locate material from online collections of educational resources. CanCore is based on, and fully compatible with, the IEEE Learning Object Metadata standard and the IMS Learning Resource Meta-data specification. However, the IMS and IEEE are global consortia of educational, industry, and government bodies and the standards they produce are cumbersome and complicated. (Some standards require support of a

set of metadata with more than 80 single elements). CanCore was developed to identify a minimum baseline of elements that end-users and institutions could agree were essential, simplifying complexity and providing guidance on general details related to the use of content..

Successful implementation of e-learning requires consistent interpretation of a standard's purpose and CanCore was devised to realize economies of scale in this process. Since its inception, CanCore has:

- conducted research into the field of learning object metadata;
- devised a workable, consensual sub-set of the IMS learning Object Meta-data Information Model, known as the CanCore Element Set (<http://www.cancore.ca/guidelines/drd/>);
- become a participant in IMS through the sponsorship of Industry Canada;
- developed informal ties with Dublin Core;
- written and presented numerous papers in the field of learning object metadata;
- created an XML-record bank showcasing sample CanCore records; and
- written the CanCore Learning Resource Metadata Profile Guidelines.

The key documents on which the CanCore Guidelines were based are:

- IMS Learning Resource Metadata Information Model ([http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd\\_infv1p2p1.html](http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_infv1p2p1.html));
- IMS Learning Resource Metadata Binding Specification ([http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd\\_bindv1p2p1.html](http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_bindv1p2p1.html));
- IMS Learning Resource Metadata Best Practices and Implementation Guide ([http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd\\_bestv1p2p1.html](http://www.imsproject.org/metadata/imsmdv1p2p1/imsmd_bestv1p2p1.html)).
- The IMS Learning Resource Information Model is itself based on the IEEE LOM.

The guidelines were also developed with consideration of the Dublin Core Initiative (<http://www.dublincore.org/>), particularly its element descriptions (<http://www.dublincore.org/documents/dces/>), qualifier descriptions (<http://www.dublincore.org/documents/dcmes-qualifiers/>), and usage guide (<http://www.dublincore.org/documents/usageguide/>).

## E-LEARNING STANDARDS ADVISORY COUNCIL OF CANADA

The E-learning Standards Advisory Council of Canada enables different provinces to work together to identify common requirements of their respective educational systems and to communicate requirements to those who develop standards. As there are multiple standards in development, eLSACC was intended to ensure standards being developed meet Canadian needs. eLSAAC was initially supported by the Minister of Education of Quebec and Council of Ministers of Education of Canada. Five provinces, including British Columbia, have agreed to fund eLSAAC for a five-year period. The eLSAAC can be found at <http://elsacc.ca>.

## Summary

“Consistency is the last refuge of the unimaginative”. – Oscar Wilde (ThinkExist.com, 2007b)

Standards anchor practice. If you are in the process of building an online program amidst shifting sands they can be the foundation you need. Consistency in and of itself is dull and predictable—and that may accurately describe some of the education and training programs available in classrooms and online—but contrary to Mr. Wilde from consistency creativity can be fostered. Standards do not need to be anchors that hold; rather they can be the base for consistency, predictability, and from which to build new and creative learning approaches. Understanding standards is one thing; applying them is another. The question remains, which standards apply, and how can you use them to build, not stifle, engaging learning?

Until recently standards conflicted with each other, with debate about which protocol, or set of protocols, should become a standard for development and/or delivery of content and which governing body should set those standards. The IMS Global Learning Consortium is emerging as a superset of all of the differing standards, and SCORM, based on the AICC and the IMS specifications, is emerging as the leading standard for e-learning content. However, SCORM compliance is a moving target, as specifications are set for multiple contingencies and circumstances. A far more practical subset of the complex SCORM standards and specifications are the CanCore regulations, which are intended to simplify and provide a minimum baseline for end-users and institutions to reference.

Finally, for the end-user and educator, simple and general standards statements are often used to both re-

flect and guide practice. For example, the Masie Center ([www.masie.com](http://www.masie.com)) has described seven simple standards by which to support the development and sustainability of e-learning investment. Masie standards for e-learning are:

- interoperability of content between multiple systems,
- re-usability of content and code,
- manageability of content and systems,
- accessibility of content materials to learners,
- durability of investment,
- scalability of learning,
- affordability.

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#### Tip

The Masie Center core standards can be used as founding principles for any e-learning program. The CanCore guidelines, based on the IMS and IEEE LOM standards and specifications (<http://www.cancore.ca/guidelines/drd/>), can be used to situate your selection of standards within the context of your overall goals and outcomes for your program.

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## Glossary

**DVD.** Short for "Digital Versatile Disc" or "Digital Video Disc", DVD is an optical disc storage media format used for data storage, including movies with high video and sound quality.

**HTTP.** Short for Hypertext Transfer Protocol, HTTP is a communications protocol used to transfer or convey information on the World Wide Web.

**HTML.** Short for Hypertext Markup Language, HTML is the predominant markup language for the creation of web pages, describing structure of text and how it is displayed on the World Wide Web.

**Instructional design.** Systematic method of planning, developing, evaluating and managing instruction to ensure competent performance by the learner.

**Learning architecture.** The technical structure of a learning system that enables the exchange of data with other data systems (interoperability).

**Learning object.** Any learning content such as an activity, resource or assessment item. In e-learning it is generally, but not always, an electronic or digital object such as URL, CD ROM, electronic file or software program.

**Metadata.** A set of words or phrases that summarizes the 'who, what, where, when and why' of a learning object (content). Metadata keywords label the ideas that are implicit in the learning object, much like a library

classification system. Metadata information is not visible to a person looking at the learning object, but is to an LMS or LCMS.

**Standard.** Document descriptions containing technical specifications and criteria to be used as rules and guidelines to ensure that content materials, delivery processes, and services meet the purpose for which they were intended.

**TCP/IP.** The Internet protocol set of communications protocols that the Internet and many commercial networks run on, composed of the Transmission Control Protocol (TCP) and the Internet Protocol (IP), the first two networking protocols defined.

## Resources

The following resource sites were not included in the chapter, and may be of use for further interest to the reader:

- **Centre for Educational Technology Interoperability Standards**—UK higher-education technology standards initiative <http://www.cetis.ac.uk/>.
- **International Open Forum**—Standards in e-learning: Towards enriching and sharing our educational heritage: Summary background & discussion paper. <http://www.educational-heritage.uqam.ca/normes2004/WSIS-Paper-Final-E.pdf>.
- **Merlot**—MERLOT is a free and open resource designed primarily for faculty and learners in higher education with links to online learning materials with annotations such as peer reviews and assignments <http://www.merlot.org/>.
- **National Institute of Standards and Technology**—A non-regulatory federal agency within the US Commerce Department's Technology Administration whose mission is to promote US innovation and industrial competitiveness by advancing measurement science, standards, and technology <http://www.nist.gov/>.
- **The eLearning Guild**—A community of practice for e-learning design, development, and management professionals—a member driven community for high-quality learning opportunities, networking services, resources, and publications <http://www.elearningguild.com/>.
- **www.StandardsLearn.org**—An online resource to raise awareness of standards and conformity of assessment programs by highlighting participation in the national and international standards development process <http://www.standardslearn.org/>.

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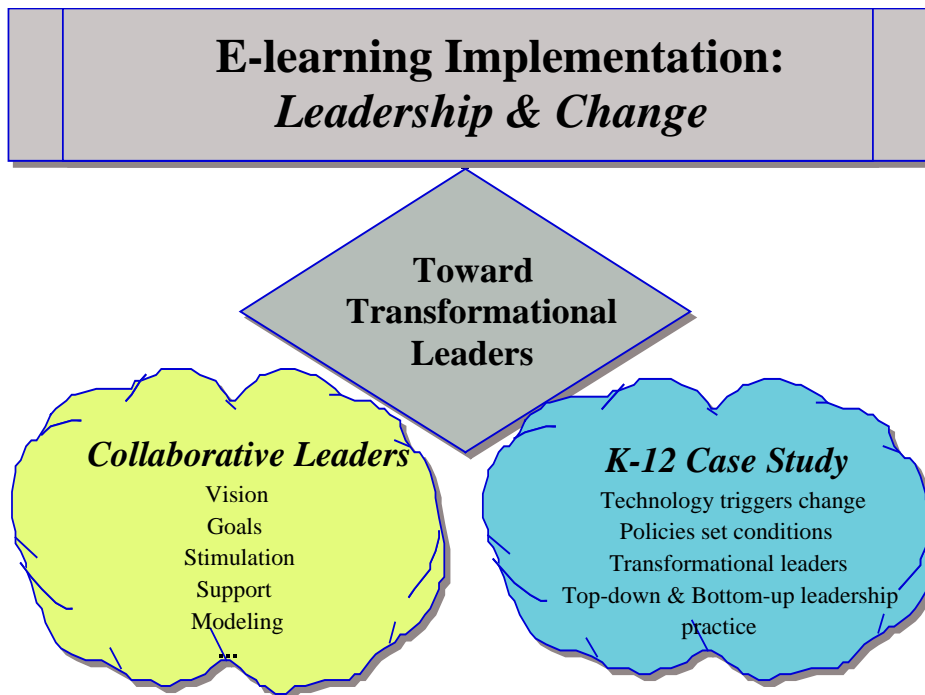




18

# *Leadership and E-learning: Change Processes for Implementing Educational Technologies*

Randy LaBonte



## Learning outcomes

After completing this chapter, you should be able to:

- Describe approaches for leading change and the development and implementation of educational technologies in your organization.
- Identify key leadership attributes and processes that support change management.
- Describe the critical processes that support and manage change for the implementation of e-learning programs.

## Introduction

From cell phone, text, and instant messaging to podcasting, wikis, and blogs, the ability to connect and communicate with anyone in the world at any time is at our fingertips. When it comes to learning, technology is changing traditional notions about how instruction is delivered, and how learning is organized. Educational technologies are being used to create and present digital media, simulations, and environments that enhance, and in many cases replace, traditional textbooks, chalkboards, worksheets, and classrooms. Computers and the Internet connect instructors and learners in remote locations, and computer-mediated learning materials enable users to engage in learning when they choose, rather than according to a classroom schedule. This use of educational technologies to support teaching and learning can be described as e-learning, and it is transforming the business of education and training.

It is one thing to have innovative technology, and preach about its ability to transform and revolutionize learning; it is another to actually make this happen within traditional, structured education and training environments. Sound leadership and change management skills are key to implementing the use of new educational technologies to support e-learning programs and foster transformation. While leadership, reform and change management have been well studied and documented, little has been written about the role leaders play in the success or failure of e-learning program design, development, and implementation. Traditional theoretical and practical constructs do not adequately reflect emerging e-learning environments, yet **transformational leadership** theory provides insight into fundamental assumptions about change, control, order, organizations, people, and leadership in implementing e-learning programs. Promising research affirms the critical role of leadership in systemic change for e-learning design, development, and delivery, and con-

firms that without a clear vision combined with collaborative leadership, organizations could end up committing precious resources to the development and deployment of courses for e-learning without much success.

## Why technology?

If technology is the answer, what is the question? The paradox of technology-enhanced education is that technology changes very rapidly and human beings very slowly. It would seem to make sense for proponents of e-learning to begin with the learners. (Bates & Poole, 2003, p. xiii)

Many institutions and organizations are embracing technology in an effort to support the transformation of how, when, and where instruction is provided, and how learning is organized within a digital environment. Educational technologies connect learners and instructors in different geographic locations, transforming the learning environment and traditional notions about instructor-led education and training. In e-learning programs learners now choose when to engage in the lesson, and from what location—home, school, work, or abroad. Digital technologies deliver lessons to learners, replacing the traditional instructor in front of a classroom. E-learning programs are used to provide self-paced, online environments that change learning from delivery of information to facilitated coaching, mentoring, and peer learning. Learning is being transformed from the “sage on the stage” model to a learner centred “guide on the side” model.

Research on the use of educational technologies indicates they can be a powerful means of transforming teaching and learning, particularly in how both are organized (Crichton & Kinsel, 2000; Dexter, Anderson & Becker, 1999) and the use of new technologies has the potential to affect teaching and learning positively (Bennett, McMillan-Culp, Honey, Tally & Spielvogel, 2000). However, the integration and use of technologies in today’s complex organizational environments demand significant change, and the literature is clear about the central role of leadership (Fullan, 1993, 2001, 2003; Leithwood & Duke, 1999; Sergiovanni, 1994, 2001; Creighton, 2003). While leadership and the management of change have been well studied and documented, little has been written about the role leaders play in the success or failure of adopting educational technologies and implementing e-learning programs.

Transformational leadership theory, first described by Burns (1978) and Bass (1985), and later elaborated on

by Leithwood and colleagues (Leithwood & Riel, 2003; Leithwood & Jantzi, 2005; Silins & Mulford, 2002), lends itself to describing and understanding the processes involved in the implementation of educational technologies in e-learning environments. Leadership is a central factor in the successful use of education technologies (Creighton, 2003; Coleman, 2003; Davidson, 2003; Foster & St. Hilaire, 2003; Hughes & Zachariah, 2001; National Center for Education Statistics, 2000). Transformational leadership in this context is about deploying technologies to accomplish core organizational goals in attaining a shared vision compelling enough to transform practice. Stated another way, implementing educational technologies requires us to resolve significant instructional, pedagogical, and technological issues, all of which need to be balanced against the purposes of learning. This kind of change management requires leadership. Transformational leadership theory can offer insight into fundamental assumptions about change, control, order, organizations, and people, and provide a more useful base from which to examine leadership and e-learning program adoption.

## What is leadership?

The essence of leadership is to be found in relationships between motives, resources, leaders, and followers. (Leithwood & Duke, 1999, p. 49)

Leadership is generally defined as the ability to influence and persuade others to agree on purpose (Gardner, 1990; Bennis & Nanus, 1985; Bolman & Deal, 1995; Sergiovanni, 2001). Early descriptions of leadership focused on personal qualities of a leader, the “great man” approach. These traditional views of leadership emphasized a leader’s charisma and personal conviction, however fell short intellectually, as they served only to describe leaders as displaying leadership, no more compelling than arguing that athletes display athleticism. A list of personal characteristics was not sufficient to adequately describe leadership as a practice. Situational leadership began to capture the notion of leadership in context, but still emphasized managerial and operational functions. However in the past two decades literature has emphasized data-driven results focusing on the behaviours of leaders as they engage in activities affecting growth and learning (Leithwood & Duke, 1999). Recent models of leadership focus on relationships within **community** (Sergiovanni, 2001) and the ability of the leader to cope with complex change (Fullan, 2003) and **organizational learning** (Leithwood & Riehl, 2003;

Mulford, Silins & Leithwood, 2004; Silins & Mulford, 2002).

If leadership is the art of getting things done with others, then it is also a shift from a “paradigm based on power and control to one based on the ability to empower others” (Silins & Mulford, 2002, p. 5), and this empowerment occurs within a learning community. Gardner (1990) emphasizes that “skill in the building and rebuilding of community is not just another of the innumerable requirements of contemporary leadership, [it] is one of the highest and most essential skills a leader can command” (p. 118). Sergiovanni (2001) describes leadership as both cognitive and moral—having more to do with values and purpose than bureaucratic need, less about position, personality and mandate and more about ideas. According to Bennis (1989, 1999), leadership is for the benefit of followers, not the enrichment of leaders, and is the capacity to translate vision into reality.

Leadership is “the process of persuasion or example by which an individual (or leadership team) induces a group to pursue objectives held by the leader or shared by the leader and his or her followers” (Gardner (1990, p. 1), or, as Leithwood (2003) puts it:

At the core of most definitions of leadership are two functions: providing direction and exercising influence. Thus, it may be said that leaders mobilize and work with others to articulate and achieve shared intentions (p. 7).

Leaders, then, pursue agreed purposes, shared vision, and serve others in achieving those purposes (Sergiovanni, 2001; Shields, 2003; Leithwood & Jantzi, 2005), and this pursuit is done in community. Leadership involves social relations and ends, purpose, direction, and influence. It is contextual and contingent on the setting, and educational technologies have changed the landscape of those settings.

## Leadership and change

The differences between leaders and managers: those who master the context and those who surrender to it (Bennis, 1989, p. 44).

If leadership is about shared vision in action, then that action is about change. The speed and complexity of change is increasing rapidly. What was once considered a linear and straightforward event (implementing change) is now more open-ended and complex. It is not enough to *manage* change, it is now important to *lead*

change: “change is a *requirement* [italics original] for continued success, and competent change leadership is a most coveted skill” (Anderson & Ackerman-Anderson, 2001, p. 1). Change involves working with others—not simply mandating new actions or behaviours. Lambert (2002) describes the notion of leadership as the professional work of everyone in the organization, with the development of shared leadership dependent on participation, vision, inquiry, collaboration, and reflection on success.

When change is considered in the context of educational technologies, the Consortium for School Networking (2004) found that the quality of leadership was a primary indicator of whether technology funding was spent wisely or wasted, and that without meaningful leadership backed by supportive communities of practice, disparities in technology budgets increased. If building the leadership capacity of an organization is key to influencing change and adopting new educational technologies, then success will depend on the ability to build a community of leadership and organizational learning (Leithwood, 2005) centred on e-learning. Leadership “influences ... the way instructors organise and conduct their instruction” (Mulford, Silins & Leithwood, 2004, p. 9) and is driven by the alignment of values and vision, and ability to “reflect in, on, and about action in each context” (Silins & Mulford, 2002, p. 5). That context is the digital learning environment created through the use of educational technologies, a place where traditional constraints and assumptions about learning and delivery of instruction shift.

Research on change describes how successful change takes place within a supportive community of practice that embraces pedagogical review (Fullan, 2001 & 2003), and that leadership is a key factor in the successful use of educational technologies (Creighton, 2003; Coleman, 2003; Hughes & Zachariah, 2001). Stated another way, to adopt educational technologies and implement e-learning programs, significant pedagogical and technological issues need to be considered and balanced against the purpose of education and training. Papert (1998) argues that if we confine our views of change to that which we already know or are familiar with, we could deprive ourselves of a new future. In other words, if we keep doing what we already know, we will keep getting what we already have. As technology continues to support rapid change in how information is processed, stored, and disseminated, Papert contends that the future could take us by surprise. As long as leaders confine the use of educational technologies to simply improving what is, little of significance can occur. Cuban (1996) describes this dilemma clearly as it relates to the implementation of educational technologies:

Techno-reformers, mostly public officials, corporate leaders, and other noneducators far removed from classrooms, deeply believe in the power of technology to transform schools into productive workplaces. This persistent dream of technology driving school and classroom changes has continually foundered in transforming teaching practices. (para. 2)

## Leadership, technology, and pedagogy

Technology is powerful, but only in the service of a powerful conception. (Fullan, 2003, p. 86)

Bracewell et al. (1998) conducted an extensive review of literature on educational technologies and found that successful e-learning programs combined technology with effective pedagogy and instruction. This integration was found to increase learner interest and motivation in learning, creating learner-centric environments, and increasing the number of learning opportunities. A meta-analysis of the research on educational technologies conducted by Ungerleider and Burns (2003) found that the effectiveness of technology use was correlated to the level of interactivity provided by the technology. Both sets of research reinforce the notion that successful learning is measured by the engagement of the learner. The creation of interactive learning through the use of educational technologies at a minimum requires an investment in review of instruction and learning. Research suggests that educational technologies can have a positive impact on teaching and learning, but only if leadership and vision bring focus to using technology to support core learning goals (Bennett et al, 2000). While technology is often viewed as pedagogically neutral, it can either enable or inhibit learning (Moll, 2001). The organization of learning and engagement of learners through educational technologies is essential to pedagogy (Bednar, Cunningham, Duffy & Perry, 1992; Gayol & Schied, 1997), and this organization of learning for an e-learning program is an essential part of the role that leaders influence.

While the introduction of educational technologies has the potential to transform learning (Crichton & Kinsel, 2000; Dexter, Anderson & Becker, 1999; Bennett et al., 2000), such transformation involves changing pedagogy and how learning is organized. Zhao (2002) found that educational technologies were effectively used in instruction when educators developed detailed plans for their integration and use. Creating the conditions for

successful implementation, including required hardware, and availability of Internet and network connections, are the domain of decision makers and leaders. Managing new educational technologies requires the ability to make choices and changes, particularly as the introduction of new educational technologies affects pedagogy, which in turn can influence the organization and structure of learning. Implementing e-learning programs is new ground for most leaders. Instructional design and delivery is different in an online environment, and traditional notions about how learning is organized do not necessarily apply.

Implementing an e-learning program, therefore, requires a review of pedagogy, instructional design, and delivery. Creighton (2003) believes that effective integration of educational technologies has more to do with pedagogy than it does technology. His views capture the essence of the issue of change, whether through adoption of educational technologies or not; any change involves pedagogy, and a fundamental examination of instructor-held beliefs about instruction. This type of change requires time and effort, and unfortunately, far too often innovation simply recreates or attempts to improve what is already taking place, with little change in pedagogy. Change demands meaningful and thoughtful leadership. While little has been written about how conventional leadership theories apply in new e-learning environments, emerging transformational leadership theory can be used to provide insights into how change processes can be understood and managed when implementing an e-learning program.

## Transformational leadership

To cope with a changing world any entity must develop the capability of shifting and changing, of developing new skills and attitudes: in short the capability of learning (De Gues, 1997, p. 20).

Transformational leadership provides a useful and relevant perspective from which to examine change processes involved in adoption and use of educational technologies. Research into factors affecting technology use for teaching and learning by Byrom and Bingham (2001) found that leadership was a key ingredient in the adoption and use of educational technologies. Leadership practice started with vision, leading through example, included support for followers, and shared leadership that maintained focus through evaluation of the change implemented. The International Society for Technology in Education (2001), through its National Educational Technology Standards Project, found that the core cur-

riculum and content area skills required for school technology leaders were leadership and vision; learning and teaching; productivity and professional practice; support, management and operations; assessment and evaluation; and social, legal and ethical issues.

These characteristics of leadership are clearly described in the literature on transformational leadership, hence its applicability to understanding change in the context of implementing educational technologies. Substantial research conducted by Burns (1978), Leithwood & Jantzi (2000, 2005) indicates that complex and dynamic change, such as the implementation of educational technologies, is more likely to occur through transformational leadership. Transformational leadership “can be thought of as a set of behaviors of individuals who accomplish change” (Valdez, 2004, para. 12), and “is about change, innovation, and entrepreneurship” (Tichy & Devanna, 1990, p. xii). Transformational leadership is dynamic. It is building motivation and purpose in followers where the greater good of the organization is placed ahead of personal interests. For Burns (2003), “a leader not only speaks to immediate wants, but elevates people by vesting in them a sense of possibility, a belief that changes can be made and that they can make them” (p. 239).

Bennis and Nanus (1985) describe transformational leaders as using knowledge and engendering trust to build commitment through communication to a shared vision to support change and transformation. Transformational leadership is the development of vision within a supportive culture, and the articulation of goals to achieve a collective vision (Silins & Mulford, 2002). Transformational leadership invokes change, and is more about innovativeness than innovation, less about strategy and more about strategizing. It is shared leadership, where everyone involved in the organization are leaders. This requires participation, vision, collaboration, and reflection—all of which require a sense of community and a direct link between leading and learning (Lambert, 2002). Leithwood and Duke (1999) describe seven dimensions of transformational leadership:

- creating a shared vision
- setting goals
- providing intellectual stimulation
- supplying individual support
- modelling effective practice
- meeting high expectations
- developing a positive culture, and creating structures that support active involvement in decision-making.

Developing shared vision and setting goals is a process that engages leaders and followers to achieve some-

thing greater than if left to their own self-interests. The process helps to create new structures to support active involvement. Transformational leaders engage process, and then promote change by valuing individual difference and supporting followers. They model the practice they wish others to emulate, and keep true to the vision and goals. They instill feelings of confidence, admiration and commitment in followers. Each follower is coached, advised, and delegated some authority within the organization. The transformational leader stimulates followers intellectually, arousing them to develop new ways to think about problems, and in the case of e-learning, new ways to think about the organization of learning and delivery of instruction.

Leithwood and Jantzi (2005) shaped a set of transformational leadership behaviours (TLBs) derived from their meta-analysis of the literature in school settings (see Table 18.1, Transformational Leadership Behaviours for details). Three of the groups of behaviours—setting directions, helping people, and redesigning the organization—are based on transformational leadership theory, while the last, an aggregate of transactional and managerial leadership, is based on Bass’s (1985) transactional model and attempts to fill gaps in transformational leadership theory. In setting directions, transformational leaders identify and articulate a vision, foster acceptance of group goals, and ensure high performance expectations. The vision may be one that is developed in a community collectively, or one that the leader espouses and articulates to followers for their endorsement and engagement.

In helping people, transformational leaders motivate by modelling high expectations, or “idealized influence” as described by Bass (1985), and they encourage and support followers to do the same. Knowing your followers is key to this dimension. In the case of adoption of educational technologies, leaders embrace and use technology as part of their professional work, and encourage followers to do the same for their own professional needs as well as part of their professional practice with learners. Transformational leaders create formal structures for dialogue and discussion that build collaboration, and expand those structures to include opportunities to engage all constituents.

Transformational leadership, then, is a model that describes how to build capacity for change that can support implementation of an e-learning program. Previous models of leadership stressed centralized control within hierarchical organizational structures, leading to a “top down” approach. A decentralized model based on flatter organizational structures leads to a “bottom up” approach associated with a transformational model of

leadership (see Bass, 1985, 1997; Silins & Mulford, 2002; Leithwood, 2005). For example, in a three year study of high schools in two Australia states, Silins & Mulford (2002) found that transformational leaders demonstrated active interest in teaching and learning, but more importantly they “help establish the systems and structures that support ‘bottom up’ approaches and allow ‘top down’ approaches to succeed [and] are effective because they are, above all, people-centred” (p. 31).

Table 18.1. Transformational Leadership Behaviours (TLBs) (Leithwood & Jantzi, 2005, p. 8)

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#### Transformational aggregate

1. Setting Directions
    - 1.1. Vision (Charisma inspirational motivation) [italics original]
    - 1.2. Group goals
    - 1.3. High Performance Expectations
  2. Helping People
    - 2.1. Individualized consideration/support
    - 2.2. Intellectual stimulation
    - 2.3. Modeling (idealized influence—attributed and behaviour)
  3. Redesigning the Organization
    - 3.1. Collaborative cultures
    - 3.2. Structures to foster collaboration
    - 3.3. Building productive relations with parents and the community
  4. Transactional and Managerial Aggregate
    - 4.1. Contingent reward
    - 4.2. Management by expectation: active, passive
    - 4.3. Management
      - Staffing
      - Instructional support
      - Monitoring school activity
      - Buffering
- 

Transformational leaders focus on those involved in the change, their relationships, and seek to transform feelings, attitudes and beliefs in support of organizational direction, established through a clear, shared vision. In his meta-analysis of the research on transformational leadership, Leithwood (2005) concluded that “as an image of ideal practice, transformational leadership currently is challenged only by instructional leadership in both practitioner and scholarly communities” (p. 2). Leithwood cautions, however, that most research on transformational leadership in non-school contexts has been restricted to the work of

Bass (1985), while he and his colleagues have done the majority of the research in school contexts.

Theory is one thing, practice yet another. Transformational leadership theory is relatively new. While more research will substantiate its usefulness, particularly as it applies to adoption and use of educational technologies, it has limitations. While the literature describes how vision, goal orientation, and progress is communicated, it does not describe how that communication is received. Too often superficial dialogue is created when transformational leadership processes are used, and while communication occurs, understanding does not. Transformational leadership theory also claims to explore equality and justice issues, yet studies reflect organizational change, not issues of equity, social justice—the “digital divide” for any e-learning program. Further research into the effects on pedagogy of the adoption of educational technologies, particularly with a view to equity issues in e-learning programs, is worth consideration.

## Case study: developing e-learning programs in K–12

A case study of K–12 educators in British Columbia conducted by the author as part of doctoral research (LaBonte, 2005) provides insight into how leaders in the BC e-learning community supported implementation of educational technologies. Educators in BC were attempting to create flexibility and innovation within the public education system through the use of educational technologies and were challenged to create conditions for adaptation and change. The study focused on identifying decision-makers and leaders in the BC e-learning community and describing characteristics of these leaders. These leaders were found to have a desire to learn, seek challenges, take risks, and to improve learning. BC e-learning leaders had a clear vision, were highly motivated and hard working, finding it difficult to say “no”. They were focused on learning, exhibited clear and consistent communications, were passionate about what they did, and had a clear focus on strategic goals. These leaders within the evolving BC e-learning community exhibited characteristics attributed to transformational leaders.

E-learning programs flourished in British Columbia in part to accommodate Tapscott’s (1998) “net generation,” but more importantly because of policy changes initiated by the Ministry of Education under the stewardship of a new government. Change was precipitated from both ‘top down’ and ‘bottom up’ approaches. The Ministry of Education was spearheading a “choice”

agenda, whereby parents and students would have different options for required schooling. Technology was seen as a key part of the choice agenda. In an effort to foster change and innovation, policy was changed to release a cap that restricted the number of distance learning (e-learning) programs in the province. Policy changes were made that reduced restrictions and created conditions that stimulated new ways of providing learning opportunities for learners. At the same time, despite a critical lack of resources to support these new and emerging learning approaches and structures, a shared vision, collective goals, and passionate belief in the ability of educational technology to support change held by these leaders was compelling enough to continue to drive the change and implementation of e-learning in BC K–12 schools.

A summary of core findings of the study determined four distinct insights:

- Leaders within the BC e-learning community believed educational technologies were a catalyst for changing how learning is organized and supported.
- Policy was a key influence in development of e-learning in the K–12 sector, and was found to precede change and reform.
- Features of transformational leadership were evident in leadership practice within the BC e-learning community at both provincial and school levels.
- There was a tension between top-down and bottom-up leadership approaches that could be attributed to a lack of resources provided to support program implementation.

The case study reaffirmed the key role leaders play in change, and confirmed that without a clear vision, collaborative leadership, and an adequately resourced system-wide approach, organizations could commit precious funding to e-learning without much success. In short, the study affirmed the importance of transformational leadership as a process to encourage change and implementation of new e-learning technologies while ensuring fiscal responsibility.

## Summary

What is exciting and encouraging [is that] with appropriate instructional leadership by principals, technology can be an effective catalyst for educational reform. (Creighton, 2003, p. 46)

The above quote from Creighton highlights the relation between leadership, technology and pedagogical change. The implementation of educational technologies can transform learning, but not without significant investment in reviewing how instruction is delivered and how learning is organized. Transformational leadership theory provides insight into how to manage the change processes required for this to happen.

Sound leadership and change management skills are central to implementing the use of new educational technologies to support e-learning programs and foster transformation. Traditional theoretical and practical constructs do not adequately reflect emerging e-learning environments, and transformational leadership behaviours can be used by those leading e-learning programs to guide and support change in their organizations. By providing individualized support and consideration, encouraging followers to aspire to organizational interests and move beyond self-interest, transformational leaders provide intellectual stimulation, and challenge followers to question the status quo. Through their actions, these leaders model expectations, challenge others to question, and inspire followers.

In the case of implementing e-learning programs, transformational leaders model the use of technology, create collaborative cultures, restructure conditions to provide time for planning and problem-solving for redesigning how learning is organized. Transformational leaders build productive relationships that foster creative uses of educational technologies to engage learners and support new learning environments that alter how learning is organized. Promising research affirms the critical role of leadership in e-learning design, development, and delivery, and confirms that without a clear vision combined with collaborative leadership, organizations could end up committing precious resources to the development and deployment of courses for e-learning without much success.

## Glossary

**Community.** An organization's constituents and the environment within which these constituents interact.

**E-learning.** The use of educational technologies to support online learning. E-learning programs are generally delivered through educational technologies using computer-based, online, or web-enabled course material and instruction.

**Educational technologies.** Communication tools that support the process of teaching and learning—chalk and blackboard, video machine, computer hardware and software, and the Internet. Bates and Poole (2003) de-

scribe educational technologies as including “any means of communicating with learners other than through direct, face-to-face, or personal contact” (p. 5).

**Leadership.** The ability to influence others and provide direction for change in organizations.

**Organizational learning.** The process of improving actions through better knowledge and understanding.

**Transformational leadership.** A model of leadership that describes how to build capacity for, and support of, change.

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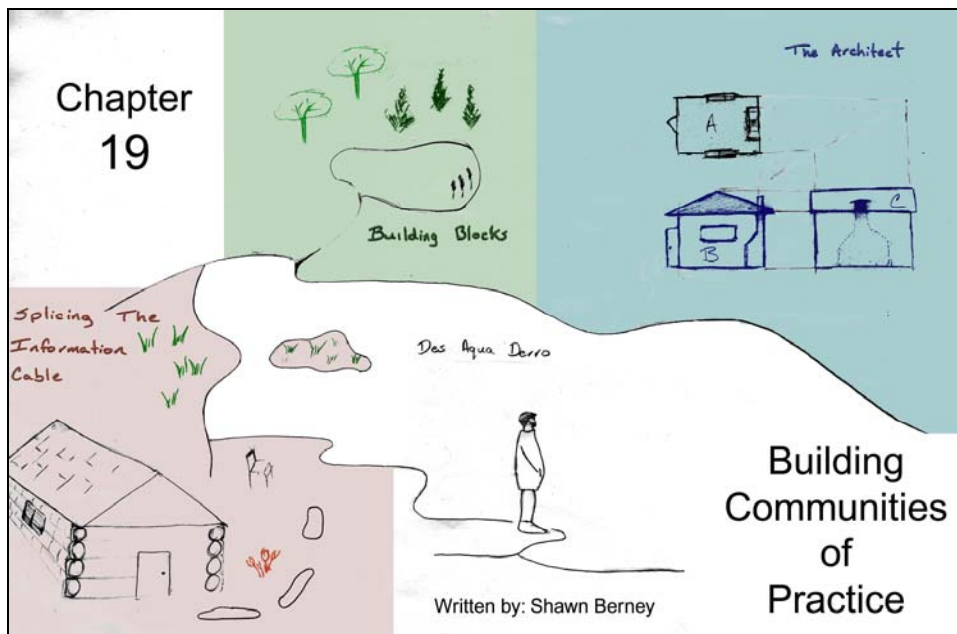
# 19

## *Building Communities of Practice*

Shawn Berney

The reason that Linux hackers do something is that they find it to be very interesting, and they like to share this interesting thing with others. Suddenly, you get both entertainment from the fact that you are doing something interesting, and you also get the social part. This is how you have this fundamental Linux networking effect where you have a lot of hackers working together because they enjoy what they do.

Hackers believe that there is no higher stage of motivation than that. And *that* belief has a powerful effect on realms far beyond that of Linux. – Linus Torvalds, *The Hacker Ethic*, Prologue, p. xvii



## Learning outcomes

After completing this chapter, you should be able to do the following:

- Discuss technology’s effect on social practices within a community.
- Identify resources that rationalize the design theory for developing information and communication technologies (ICTs).
- Define and apply the following technical terms as they apply to computer interactions:
  - platforms
  - applications
  - services
- Explain the relevance of technical standardization to interpersonal communication tools such as email.
- Describe underlying processes (recording, referencing, and publishing data) that occur in mainstream commercial applications such as Microsoft Outlook®.
- Identify facilitation and sequencing techniques that may enhance digital community interactions.
- Describe how modelling tools can support community involvement in the development of digital community infrastructure.

## Introduction: the turkey boat problem

*The Power to Edit*

Each spring an excited group of athletic individuals filter into the small and close-knit whitewater rafting community. Upon arriving at the river community these trainees are given a place to camp, and an opportunity to ride along with the senior guiding staff. Although the senior guides are tolerant of the new arrivals, they recognize that, in an average training year, only one third of them will eventually become guides.

Over several months, the new arrivals will be asked to practise rescue techniques, learn to read complex whitewater hydraulics and develop sound decision-making abilities within highly stressful and quickly changing conditions.

Only after these hard skills have been attained can trainees begin to comprehend the immense responsibility they hold for the safety of others. In an effort to manage the risks inherent in rafting, guides need to develop their problem-solving techniques before they progress into dangerous situations. Whitewater guides must understand that each

participant plays an important role in an interdependent team, which must coordinate efforts in order to successfully navigate treacherous and complex whitewater rapids.

Often people who want to become a professional guide see the role of guiding as a burden to be shouldered through physical strength and expertise. Indeed, physical competence is an important component however, the importance of the other team members within the boat is often underestimated. This lack of recognition can quickly lead to failures in communication—creating an environment where accidents can occur.

The turkey boat is used in raft guide training to address the importance of teamwork and communication. A team of guide hopefuls (around eight, total) with little or no direct advice, are given a whitewater raft, paddles, life jackets and helmets and told to navigate difficult whitewater rapids.

Much like learning to drive a car, the kinetics of whitewater rafting are not overly complex. Your paddle works as the steering wheel, gas pedal and brake. And as with driving a car, once the basic kinetics have been learned, confidence quickly follows. Unlike a car, however, a raft can be controlled by any of the individuals holding a paddle—and to complicate matters, each individual is viewing the river from a different location. So the turkey boat consists of eight individuals, armed with minimal technical knowledge and growing (sometimes inflated) confidence, eagerly striving to prove their leadership ability.

Leadership development schools such as Outward Bound have taught basic sports psychology for years. The idea behind these schools is that group development progresses through stages. Further, these stages can be used to develop tools that facilitate highly dynamic group interactions. Although raft guiding activities can be classified as adventure recreation, or perhaps even educational, the focus of guide training programs are to build physical and social competencies, including guiding technique, communication, respect, and problem-solving. Because of this focus, guide training programs can be described as a developmental adventure education.

Developmental adventure education contains a strong process-based component. This process can be used to assess the goals of the group and attempt to facilitate a trajectory of learning for the participants. These trajectories work to place engagement in activities in the context of a valued future within the group. In this way, learning can be experienced as a form of identity.<sup>20</sup>

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<sup>20</sup> A detailed review of this process can be seen in many written works, but most notably, the recent works of Etienne Wenger who has developed a persuasive and detailed analysis of this position.

The adaptation of personal behaviour is the foundation of developmental adventure education. Facilitating the process of adaptation guides the participant in developing an understanding of group expectations, norms and behaviours.<sup>21</sup>

## Building blocks

The leadership concepts and lessons of the turkey boat also apply to community interactions.

In this section we look at theories of community development, balanced with an understanding of how digital communities, and technology generally, have pervaded daily lives.

## Conceptual investigations

The emerging nature of cyberspace has caught the imagination of writers for decades. Prolific science fiction writers in the mid-1980s introduced what were then radical ideas about how the Internet would create a space for perfect regulation.<sup>22</sup> Today, this question of regulation has become more relevant than ever before. Increasingly society is using the Internet for commercial enterprise. As a result, control is coded by commercial interests, and backed by government legislation.<sup>23</sup> Yet resistance to this control is spreading throughout many digital communities that perceive themselves as being oppressed.<sup>24</sup>

For some founders of the digital era such as Linus Torvalds<sup>25</sup>, the ability to communicate and share infor-

mation has always been fundamental to both personal and professional development. These technological pioneers have attempted to provide the tools for individuals to contribute to a community. These contributions allow individuals to create, adapt and adopt the rules that govern the digital community's very social fabric—its code.

## INFORMATION WITHIN CYBERSPACE

It is the ability for individuals to contribute to the community that provides the context for information to be applied to practices.<sup>26</sup> More generally stated, our participation within the digital world allows individuals to build relationships with others. These relationships form the foundation for our collective social interactions within the online space.

It is only recently that researchers have begun addressing the social consequences of new technologies.<sup>27</sup> Our optimistic perception that technology will radically transform our business processes have been somewhat tempered in recent years. Researchers are beginning to realize that “technology does not have any impact per se, it is all a matter of choices, power and situated change—the digital economy is not evolving by itself; it is all about choices at the societal, company and individual level” (Anderson, Fogelgren-Pedersen & Varshney, 2003, p. 211). The management of the technology that controls information is becoming increasingly important.<sup>28</sup>

This chapter assumes that the important choices regarding the very design of digital communication must be based on the values of the community using the technology. As technology continues to shape society's material structure,<sup>29</sup> individuals and organizations must

the public to access and modify its fundamental operations through altering computer code.

<sup>26</sup> For a detailed review of how individuals contribute to practices in the development of a community see Etienne Wenger's book entitled “Communities of Practice” (1998).

<sup>27</sup> Of particular note is the new research group at the University of Surrey, UK—the Incubator for the Critical Inquiry into Technology and Ethnography (INCITE). Established in 2001, this group focuses on research at the intersection of qualitative sociology, design and new technology.

<sup>28</sup> A persuasive argument outlining how changing technological resources are affecting organizations can be found in the Journal of Information, Communication & Society entitled ‘Mobile Organizing using Information Technology (MOBIT)’ (Kim Viborg Andersen et al., 2003, pp. 211–228).

<sup>29</sup> This is an argument put forth by Manuel Castells as an epilogue to Pekka Himanen's book *The Hacker Ethic*

<sup>21</sup> This is reinforced by Fabrisio and Neill who state “adaptation is necessary for individuals to achieve a sense of belonging which... must be obtained before individuals can experience personal growth” (n.d., p. 5).

<sup>22</sup> William Gibson's influential book *Neuromancer*, released in 1984, is one example of the deep uncertainties many people felt when envisioning the future role technology would play within society. (Lessig, 1999, p. 5).

<sup>23</sup> The ability for commercial enterprises to influence government legislation for increased control can be seen within the recent Digital Millennium Copyright Act within the US.

<sup>24</sup> John Perry Barlow (1996) describes the perceptions and resentments of many within cyberspace through his persuasive essay entitled ‘A Declaration of the Independence of Cyberspace’.

<sup>25</sup> Linus Torvalds was the developer who released the Linux operating system (OS)—a computer OS that competes with Microsoft Windows. This OS has the advantage of allowing

work to regulate<sup>30</sup> these technological developments by supporting initiatives that represent the values of the community.

## THE ROLE OF ICTS IN COMMUNITY PRACTICES

The need to support community practices<sup>31</sup> through information and communication technologies (ICTs) is not a new idea. The evolution of document retrieval systems—historically used to store publications, and searched through keyword indexes—has changed into something substantially more sophisticated.<sup>32</sup> A similar evolution has occurred in software applications once designed as contact databases that now offer fully featured customer relationship management (CRM) applications.<sup>33</sup> These similar forms of information and communication technologies (ICTs) have been met with mixed success. Horwitch and Armacost of Bain & Company suggest that the cause of this mixed success stems from poor deployment.<sup>34</sup>

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(2001). My arguments have been greatly influenced by the book's proposition that a fundamental shift in the social perspective will be required to adapt to, and excel within, the newly forming information age.

<sup>30</sup> Regulation within this context is synonymous with 'constrain' and can include limitations imposed by market demands, social norms, legal consequences and architectural designs. This definition has been taken from Lawrence Lessig, a constitutional lawyer, who addresses the regulation of cyberspace in his 1999 book *Code and Other Laws of Cyberspace*.

<sup>31</sup> Community practices as described here has been defined by Etienne Wenger as "groups of people who share a passion for something that they know how to do, and who interact regularly in order to learn how to do it better" (Wenger, 2004, p. 2)

<sup>32</sup> Accenture Consulting (previously Anderson Consulting) has an article entitled "In Search of A New Generation of Knowledge Management Applications" (Liongosari, Dempksi & Swaminathan, 1999). This article describes in detail how document retrieval systems can be enhanced to allow for greater efficiency in searching and evaluating information providing tools such as biography generators and rate of absorption statistics.

<sup>33</sup> Interface Software offers a fully featured CRM application designed to incorporate customer list management with client management and relationship analysis (<http://www.interfacesoftware.com>).

<sup>34</sup> Horwitch and Armacost present an article published in the *Journal of Business Strategy* entitled "Helping knowledge management be all it can be" (2002). This article attempts to persuade the reader that despite poor performance in

Critics will point out that consulting companies have a vested interest in advancing high-tech solutions (Oshea & Madigan, 1997, p. 92). Furthermore, despite the fact that many clients will face similar issues, these consulting companies sell themselves on their ability to develop unique solutions (Oshea & Madigan, 1997, p. X). Given this information, it becomes reasonable to view the advice of consulting companies on this matter skeptically.

To address the tough questions on efficiency and effectiveness of ICTs, researchers are exploring how technological developments interact with communities and organizations from sociological and ethnographic perspectives (see Pinkett & O'Bryant 2003, Wakeford 2003, Wenger 2004a and Wenger 2004b). These researchers are working to address how to evaluate and develop ICTs that add value for the individuals within the community. Although each of the researchers approach the issue of value creation in different ways,<sup>35</sup> all situate the application of information at the individual as apposed to the organizational level. This is a fundamental shift in context from researchers such as Kaplan and Norton<sup>36</sup> (2004) who suggest that knowledge is a commodity that is made available to community members (rather than being created by them).

Perhaps one of the greatest difficulties in approaching the question of what role ICTs should play within community practices involves developing an understanding of different ways in which a community can be supported.<sup>37</sup> In this chapter we assume that the application of information to relevant situations results in the creation of knowledge. As this information influences others through their participation in the process of learning, the community develops a more or less unified view of

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past years of KMSs, competitive advantage using these systems can be achieved if deployment is carefully managed.

<sup>35</sup> Pinkett & O'Bryant (2003) address how to increase value through technological adoption as an urban studies and planning issue. Wenger (2004) addresses the issue of value from a social learning perspective. Wakeford (2003) addresses value creation by discussing methods for interpretation by individual community members.

<sup>36</sup> Kaplan and Norton authored the book *Strategy Maps* (2004). This book suggests ways to measure organizational performance and manage knowledge-based assets.

<sup>37</sup> For a detailed review on how information can be managed based on theoretical assumptions about knowledge within the community see Shultze and Leidner's article published in the journal *MIS Quarterly* in September 2002 entitled "Studying Knowledge Management in Information Systems Research: Discourses and Theoretical Assumptions".

the world.<sup>38</sup> This perspective is incompatible with Kaplan and Norton’s perspective of knowledge as an organizational asset (although knowledge is not viewed as an asset, that does not mean that information is necessarily openly shared or unprotected from outside access<sup>39</sup>). Knowledge that emerges from the application of information through the daily practices of a group needs to be supported by technology differently than information that is to be applied for control and management of future actions.<sup>40</sup>

“Through BCcampus educators receive development funds for creating online learning resources, access to a shareable online learning resources (SOL\*R) repository, training and dissemination of best practices, and support for communities of interest.” (Paul Stacey, 2007)

If we are to accept that knowledge is what communities have accumulated over time to understand the world and act effectively in it, then those who form the community membership must also actively manage<sup>41</sup>

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<sup>38</sup> This perspective has been described by Deetz’s taxonomy of organizational inquiry as an interpretive discourse (Shultze & Leidner, 2004).

<sup>39</sup> This perspective can be seen in practice by examining the Info-X, a professional group of avalanche forecasters who collectively gather data for analysis to create information. That information is compiled and released through park service bulletins of avalanche conditions. Although this information is protected due to both liability concerns and the difficulty associated with appropriate interpretation, the resultant information is not selectively manipulated or distributed as mandatory rules in an effort to create a particularly desirable result (a situation associated with asset management). The information is merely provided to the public who are responsible for incorporating this information into personal decisions about avalanche conditions.

<sup>40</sup> My arguments here have been greatly influenced by Brown and Duguid (1991) who present a persuasive argument for organizational transformation in their article entitled “Organizational Learning and Communities of Practice”. This article outlines how organizations need to restructure to replace directive workplace documentation with systems designed to support communication and learning that emerges in the process of activities.

<sup>41</sup> There is some debate whether knowledge can be managed or merely supported—it is my view that KMSs are more accurately defined as those systems that manage information used to produce knowledge through computer applications or services. Hereafter, the term ‘knowledge

knowledge that is created (Wenger, 2004(a), p. 230). Knowledge management systems (KMSs) can be viewed as nothing more than a set of tools used to aid individuals in communication, supplying information that may be used by others when considering problems that seem similar in nature. In other words, KMSs provide an alternative medium for individuals to view and contribute to the practices of a community.

## DESIGN CONSIDERATIONS

If ICTs are to support individuals and their contributions to the organizational learning process, then community members should become active participants in the design of these new technologies; individuals must begin asking questions about technical system designs and the way in which our communities are located within their production and use (Wakeford, 2003, p. 230). The involvement of individuals to guide the use of technological resources becomes more than just a question of matching business processes to system design and implementation principles,<sup>42</sup> individuals within the community where these systems are being applied must accept the constraints and limitations that are used to regulate behaviour within this digital space.<sup>43</sup>

The regulation of our behaviour, however, is only viewed negatively as a form of oppression when this regulation violates our social values. In fact, our fierce desire to protect and defend our national values provides a source of strength that we should use to create a digital environment that reflects our interests as independent organizations and Canadian citizens.<sup>44</sup> As such,

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management’ or its equivalences will refer to the management of that information which helps to produce knowledge for individuals within the community.

<sup>42</sup> Matching business process with design and implementation principles has been suggested by Horwitch and Armacost of Bain & Company consulting in their 2002 article “Helping knowledge management be all it can be” as the primary reason for lack of system effectiveness. This tactic places the blame for product inefficiency squarely on the implementation team and away from those who have actually designed the system—an interesting tactic from a company who is well known for charging vast amounts of money for the design of software applications and integration tools.

<sup>43</sup> For a comprehensive analysis on how behaviour is regulated within digital spaces, see Lawrence Lessig’s book *Code and Other Laws of Cyberspace* (1999).

<sup>44</sup> Michael Ignatieff presents a persuasive stance within his OD Skelton Lecture given at the Department of Foreign Affairs and International Trade. This speech, entitled

fundamental design criteria should address questions of intellectual property, free speech, privacy and security, in a manner that reflects the values of the collective digital community—and perhaps the Canadian society generally.

## Technical investigations

### PLATFORMS, APPLICATIONS AND SERVICES

Addressing the role of information within cyberspace provides understanding for the rationale behind the design of ICTs such as knowledge management systems. To transition between the design of ICTs as a concept and the implementation of ICTs within the world of digital technology, we must establish a foundational understanding of the processes that occur in computer-to-computer interactions.

To begin this discussion, we must start with a computer. We tend to think about computers as those appliances that sit below our desk at home or office where we can check email or perhaps create a CV. In fact, the definition of a computer can encompass a huge variety of technology from Internet enabled cell phones to massive PBX (private branch eXchange) systems capable of supplying telephone service to over 20,000 users.<sup>45</sup> The ability for computers to interact is based on the open system interconnection (OSI) model (or in a simplistic version referred to as the TCP / IP protocol stack<sup>46</sup>).

An understanding of how computers interact does not necessarily require a detailed technical understanding of the underlying technology. It is important to understand, however, some basic terminology. First, the platform refers to the collective ability of software and hardware to provide general lower level and non-

specific functions<sup>47</sup> for the user. One function of a platform is to allow for outputting data. On home computer systems, for example, the Microsoft Windows operating system enables the user to print information, or save it on disc. This functionality is provided by a combination of hardware and software that together is referred to as your (computer) platform.

Applications are directly tied to your platform. These applications provide the platform with the ability to provide task-specific functions by structuring the way the platform processes and presents data. Internet applications are designed to access information from the Internet in a defined manner. Microsoft Outlook, for example, is an application that is designed to send and receive digital mail. This application can access the functionality of the platform to display, store, or print the mail that has been received.

Web-based services provide data to applications in a format that is not dependent on the platform of the individual user. The ability to communicate between two computers is based on: the standardization that has occurred within the transportation of data across the physical network infrastructure, and the establishment of a common language (HTML<sup>48</sup> for example). That is to say that standardization has created the ability to establish communication (through standardized packets sent by the TCP / IP protocol stack over network cabling) and communicate coherently (through sending and receiving HTML, XML, or other data).

Once computers have established communication, web-based services provide data for a specific application (the Skype Internet telephone service provides communication packaging through the voice over Internet protocol). The application is responsible for interpreting this data and sending it to the platform for processing. The platform then presents this information to the user in the appropriate format (based on the computer's configuration). The Skype application, for example, would send and receive data from your Internet service provider and your computer platform, providing voice communication over the Internet through a headset and microphone.

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“Peace, Order and Good Government: A foreign policy agenda for Canada” (2004), suggest that national values are supported by a responsible government that reflects these values in appropriate legislation and policy statements.

<sup>45</sup> PBX systems are specialized computers that provide connection to the public telephone system. Size and scalability of these systems vary.

<sup>46</sup> The TCP / IP or Transmission Control Protocol / Internet Protocol establishes communication through various levels of digital processing. The bottom level of the TCP / IP protocol stack of four layers, termed the network layer, converts signals transmitted over networking cables to data packets. These packets are then received by the Internet layer, recompiled by the transport layer and displayed by the application layer.

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<sup>47</sup> ‘Functions’ used within the context provided here are generally referred to as services. Functionality has been chosen in order to avoid confusion between the provision of (platform) services and web services.

<sup>48</sup> HTML refers to Hypertext Markup Language and is a way of describing how data should be presented and interpreted by local computers. Web browsers are programs that translate HTML syntax to platform-specific instructions used to display, print or save information.



## REFERENCING AND RECORDING INFORMATION

The independence of web services from platform-specific architecture can provide the ability to connect inherently different technologies.<sup>49</sup> This ability to cross boundaries within system architecture, however, is not inherent in the technology. The technology has no inherent nature at all. The use of standardized communication packaging in no way requires the use of standardized languages. In fact, the ability to alter the way in which the computer interprets data is now a fundamental part of web services.<sup>50</sup>

Altering how computers interpret data provides value by giving the application a structural context from which to view data that is received. By allowing the computer to maintain a specific and individual perspective, exploring complex relationships can be accomplished with greater efficiency. In the computer world, this individual perspective is based on a set of defined rules that allow the user to structure and reference information (much like colour-coded file folders and tabs are used to organize business information within a filing cabinet).

The explosion of new technology over the past twenty years has provided software developers with an overwhelming variety of tools for technological development. A quick tour of the computer section of the local book store will reveal volumes of books on C, C++, C#, Perl, Python, and PHP for programming; HTML, XML, XSL, and CSS for presentation / mark-up; and Flash, Illustrator, and Photoshop for graphic manipulation just to name a few. Each programming language has been used to create applications that store, retrieve and/or present information. Although a detailed review of these concepts is beyond the scope of this chapter, the information that follows will provide a valuable resource in this endeavour.

The technology infrastructure and management processes can provide information on the current state of

organizational knowledge. Although measures for evaluating organizational knowledge would be imperfect at best,<sup>51</sup> it would provide system administrators with the information to make system design decisions based on behavioural patterns. (Integrating process management tools with design models will be covered in greater detail later in the chapter). Once patterns are recognized, system functionality can be developed based on these patterns. From this perspective, internal referencing not only determines how individuals navigate through a computer application, if designed correctly, referencing can provide continuous feedback for identifying changing patterns of behaviour.

### Referencing

While referencing, applied within an organization, can provide insight into managerial practices, sharing this information externally can be accomplished by creating policies regarding access to this information (and enforcing these policies through system design). The creation of policies can ensure that direct and indirect stakeholder interests have been addressed when distributing organizational information. Aside from the policies related to the management and use of information externally, the technical process that makes this communication feasible must also be considered.

Referencing and exchanging electronic data effectively requires locating and describing data efficiently. Describing data helps the user or program determine relevance, while structuring the data allows the user or program to locate the data quickly. Once located, relevant data can be recorded (saved to disk or printed), linked (bookmarked for direct access to web pages for example), or distributed (data can be published within web pages, through subscription news feeds, or printed and given away). Efficient access to data through referencing provides extraordinary power and potential within a networked environment.

Because of the large amounts of data available, accessing it efficiently has become increasingly important. Several types of structural formatting rules have been established and are publicly available to developers for review. Examples of these structural formatting rules include document type definitions (or **schemas**) and

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<sup>49</sup> The technology used within a mobile cell phone that allows for Internet access is substantially different than that required by a server computer running a large electronic commerce operation, yet these two systems can communicate using the HTML language.

<sup>50</sup> Alterations of web-based languages are now common and developed under the framework of XML (eXtensible markup language), OWL (ontology web language), RDF, and other metalanguages. Metalanguages are used to define specialized terms and are standardized using document type definitions (DTDs). In turn, these DTDs allow industry work groups to create communication tools tailored to their needs.

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<sup>51</sup> One such measure applied to communication technologies, suggested by Hoekman et al. (2004), is to measure the total interaction by monitoring the volume of voice telecommunication traffic and infer levels of both movement of people and trade / FDI flows (2004, p. 6).

older electronic data interchange (EDI) formats. These formatting rules are evolving and refining standards as developers build new features and capabilities into communication frameworks such as the eXtensible markup language<sup>52</sup> (XML).

One reason that the XML framework has been enthusiastically adopted stems from its ability to structure information in a flexible manner, allowing information to be grouped into related sub-topics. This grouping is especially useful when relating complex information between various computer applications. Unlike hypertext markup language (which formats data), XML can be used for situating data within a hierarchical structure.

For example, the data “Jenn Arden Brown” would use HTML markup syntax (<strong><em> ... Jenn Arden Brown</em></strong>) to present the data in bold and italics: ***Jenn Arden Brown***. XML markup would provide the semantic information (or field name in database terminology) used for adding context to the data using the following syntax:

```
<name>
  <first>Jenn</first>
  <middle>Arden</middle>
  <last>Brown</last>
</name>
```

In this case, the data can be integrated into both internal and external applications (assuming the data structures exist). For example, Microsoft Outlook may recognize XML structured data from a cellular phone application and automatically offer to store the data located within the <name> node (and subsequent <first>, <middle>, and <last> nodes) into your list of personal contacts.

## Recording

Referencing locates and describes data for computer applications. Recording is used to store data between references. Perhaps the simplest way to record data is through printing the data onto paper, creating a physical copy that can be filed away, faxed to outside offices, or published on information boards. In the age of digital information, however, the amount of data available

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<sup>52</sup> “Extensible Markup Language (XML) is a simple, very flexible text format derived from SGML (ISO 8879). Originally designed to meet the challenges of large-scale electronic publishing, XML is also playing an increasingly important role in the exchange of a wide variety of data on the Web and elsewhere.” (W3C, 2005)

makes printing impractical for storing large amounts of information.

Printing was used historically for the storage of all data required by physical machines during the infancy of the computer industry.<sup>53</sup> Printing, as the predominant form of data storage, became outdated with the ability to reliably store information onto tape and disk technology. These three technologies are not completely dissimilar. Each requires information to be packaged and stored in a linear format. In fact, linear packaging of information (or serialization) is still the predominant method for recording information today. Image files (such as JPEG, BMP and MPEG), office documents (such as Word documents) and static HTML web pages all store information in a linear format. It is the responsibility of the application (web browser, photo editor, word processor) to read these files from start to finish, process the data, and present the information in a manner that can be understood by the user.

Although at a fundamental level all information within a computer is stored in a linear format,<sup>54</sup> advances in computer applications have provided greater flexibility in the packing and unpacking process. The ability for applications to process data is determined by their ability to apply specific rules during this process. Photo editors, for example, can usually interpret JPEG, BMP, and GIF images. These file types use standardized rules for presenting images. These rules can be incorporated into applications that are designed for the Microsoft, Linux, or Macintosh operating systems. Applications such as Internet Explorer, Photoshop, and GIMP (Gnu Image Manipulation Program) read the files from start to finish, apply rules for interpreting the data, and display the result to the user. This process works fine for relatively small packages of data.<sup>55</sup> Read-

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<sup>53</sup> Machines using a punch card operating system made their debut in 1965 and stored information as a series of physical holes in index cards. This technology formed “the first of three operating systems developed... It controlled the connected card readers, card punchers and high speed printers, and supported the classic card applications like reading, sorting, duplicating as well as the counting of the cards.” (IBM, 2005)

<sup>54</sup> “By combining bits [0s and 1s] into a sequence, we can form binary representations that are equivalent to other representations of numbers.” (Hyde, 2004, p. 22)

<sup>55</sup> Many photo editors, for example, can only interpret files that do not exceed 20 MB in an uncompressed format. This occurs because the program has only allocated 20 MB of computer memory for storing temporary versions of the

ing the entire contents within a file, however, quickly becomes impractical when searching large amounts of data (for example, you would not want to read a complete dictionary each time you needed to define a single word).

Because of these limitations, the ability to structure data began to evolve. One method used to structure information into manageable subgroups is to organize the data into horizontal rows (records) and vertical columns (fields). Using this structural format, it becomes possible to search through data that meets certain characteristics (such as all individuals with the first.name<sup>56</sup> value of Jenn). This technique for structuring data is referred to as a database.

Previously, the XML framework was used to describe how information can be referenced between computers. Although XML does not store data, which is physically stored in a linear text file, XML is a data model that can provide hierarchical structure. To clarify this, we revisit the previous XML example:

```
<name>
  <first>Jenn</first>
  <middle>Arden</middle>
  <last>Brown</last>
</name>
```

The data within this example is encapsulated within the tags `<name>` and `</name>`. In XML syntax, these tags can be described as opening and closing tags. In this case, the XML syntax references the node `<name>`, references the child node `<first>`, and inputs the data: Jenn. To externally reference (or exchange) this XML syntax with a database, we merely need to redefine how the computer application interprets the information. A database would interpret the XML syntax as follows:

Table 19.1

First	Middle	Last
Jenn	Arden	Brown

file. If the program cannot completely load the file into memory, the image cannot be displayed.

<sup>56</sup> Programming syntax often uses the ‘.’ to show relationships between, or to concatenate, variables. In this case, information stored in rows and columns is referred to as a table and is represented by ‘.name’. A field (information that describes a record) is given the name ‘first’, and is used to describe the record (the total information about one or more items), in this case, Jenn Arden Brown.

Within a database, additional rows (termed records) can be used to describe a long list of people. When reading this database, the application can search only the ‘last’ field within the ‘name’ table and present only records with the data ‘Brown’ within this field. Searching within a single field reduces the amount of data that requires processing by applications. A relational data model, such as a database, requires that all records contain the same number of fields. Conversely, the XML data model is hierarchical, allowing unused nodes to be omitted. This differentiation will be explored in greater detail when technology development is discussed later in the chapter.

## Organizing

We live in a hexi-deminal world, a reality where meaning is conveyed through characters (written and spoken) and numbers (pure and applied).

General numeric expressions like  $(3 \times 2)$  or  $(3 + 2)$  can be used to help organize content [(6 people in 2 groups of 3) for example]. XML and related technologies (XSLT, XPath, XPointer) do not validate and/or execute more complex exponentiated functions. However, exponentiated functions [(2 to the power of 8) or the (square root of 64)] are generally excessive for organizing information into a coherent and flexible format easily read by humans.

In short, XML technology provides a fast and flexible data framework / model with an ability to transport complex and deeply encoded files for additional processing (like streaming video). This technology can be seen in practice in the virtual world Second Life where XML—Remote Procedure Calls provide complex social and visual interactions (like dancing, talking and flirting).

Although database standards like ODBC lack certain flexibilities, they are adept at defining strict relationships between data sources. These often complex relations are valuable when referencing and processing a large number of records. New initiatives (by QD Technology in particular) have shown that queries can be sent and processed (using standardized ODBC compliant instructions) with compiled database sources. Although there are still graphical limitations, this marks a significant development in the organization and portable distribution of content.

# Splicing the information cable

## *Bridging the Gap Between Technology and Sociology*

Just as raft guide trainees are faced with both social and technical challenges that must be addressed before guiding difficult whitewater rapids, so too must members of digital communities overcome social and technical barriers when contributing to online practices. Given these challenges, proper sequencing of content becomes an important component of facilitating community interactions. The following section addresses issues associated with the sequencing and facilitation of community interactions, the publication of community information, and the development of technological infrastructure that supports these ongoing processes.

### DEVELOPING TECHNOLOGY

With the Palm, PocketPC, and Blackberry handheld computers struggling for market share against both notebook computers and cell phones enhanced with text messaging and digital photography, the push to provide consumers with better information management tools and applications is not surprising. Manufacturers are competing fiercely to guide, or perhaps monopolize and control, the adoption of technology created by exponential growth rates in processing and data transmission capabilities over the past four decades (Technotopian Delusions, 2005[54]).

Although these applications are often designed around the commercial interests of private firms, technological standards are working to integrate these disparate information sources. The eXtensible markup language (XML) is one such standard, playing an increasingly important role in this ability to exchange and integrate application data. Through the development of industry-specific document type definitions (DTDs), system developers can clearly define how information is extracted from structured XML documents and used in new software applications.

As the complexity of information systems increase, system architects and information technology professionals have begun to develop sophisticated tools for modelling and communicating these intricate system designs (termed unified modelling language [UML] notation). Although practical examples of UML notation will be given in the following section, it is important to note that development of this notation closely follows the growth of object oriented programming practices that encourage code reuse through clearly defined and independent program modules.

The technical advancements that allow for the distribution of information over the past decade—accomplished through standardized referencing and recording practices—are often highly structured and inflexible. These information systems have largely modelled organizational structures found within small companies that benefit from centralized control, usually associated with niche expertise. As a result of these referencing and recording practices, many organizations suffer from hierarchical communication channels and myopic management, and are usually not able to respond to rapid changes in business conditions (Bieberstein et al., 2005, p. 696). For this reason IBM researchers have adopted a new form of organizational structure termed the “On Demand Workplace”.<sup>57</sup> This new organizational structure provides the framework for redefining our increasingly “organic organizations”<sup>58</sup> and strive to optimize the efficient exchange of information.

One method for efficiently exchanging information is by transporting data files using the hypertext transfer protocol (HTTP)—reliable message patterns (RMP). RMP is ideal in a networked environment. RMP provides transport of serialized content where distributed services can use XML-specific mid-tier processing.

### Service oriented architecture

Frank Cohen suggests that service oriented architecture (SOA) is ideally suited to the loosely structured and decentralized communities emerging on the Web (Fast-SOA, p. 5). One tool available to the implementation of the service oriented architecture (SOA) implementation is the XML data model. Effective sharing between groups can be accomplished through policy enforcement regimes that use XML schema repositories (XSRs). Through XML referencing and recording of data, and

<sup>57</sup> The ‘On-demand Workplace’ is based upon the concept of a service oriented architecture (SOA). This “new organizational structure that optimizes the workforce and streamlines cross-unit processes to leverage the new IT systems” (Bieberstein et al., 2005[4], p. 696) is designed around the perception of core tasks and activities as ‘units of service’. These units of service can be defined as differentiated, flexible, and team-based services that can be orchestrated (Bieberstein et al., 2005[4], p. 696).

<sup>58</sup> Bieberstein et al. state that; “IT systems have evolved from mere tools and accelerators to an organic organizational entity. This new entity needs to be factored into the proposed structural design” (2005, p. 697) that has been created to orchestrate a chain of services from various teams in order to execute higher level tasks and business objectives (Bieberstein et al., 2005[4], p. 697).

effective sharing of information between groups, SOA can help define the relationship between the user and the software application.<sup>59</sup>

Flexibility, rapid development, and good scalability can be encouraged with the adoption of: a common notation (UML), and a defined data model (XML). In its most basic form, SOA is a technique for component software reuse (FastSOA, p. 84). The SOA design pattern is well suited to update data aggregation services and perform complex federated service requests (Fast SOA, p. 65). This task is not easily achieved in more structured languages such as **SQL**.

### Simple object access protocol

Mid-tier processing is used to address the difficulties that arise when flexible XML technology is merged with a relational database management system (**RDBMS**). Common techniques for mapping data from XML files to database storage systems use the simple object access protocol (SOAP), which “allows us to pass structured, typed data in a decentralized, distributed environment” (Lecky-Thompson et al., 2005).

The SOAP—remote procedure call (RPC) uses exponentiated encoding to map XML data structures to **data objects** located within trusted memory resources allocated to programming languages. As a result, “SOAP-RPC bindings instantiate up to 15,000 Java objects to deserialize the SOAP request that contain 500 elements in the SOAP message body.” (Perkins et al., p. 274).

The complex auto-binding ability that maps XML content to database storage (XML-RPC) should be used sparingly as files over 96kbs can have a dramatic impact on CPU and network bandwidth (FastSOA, p. 69). Alternatively, XML documents can be encoded literally, using SOAP-document-literal-encoding. SOAP-document-literal-encoding, however, does not allow you fine-grained control over the data source from Java.

### Java and the Enterprise Java Bean

EJB stands for “Enterprise JavaBeans” which are distributed network-aware components for developing secure, scalable, transactional and multi-user components in a J2EE environment. (Sun Microsystems, 2007)

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<sup>59</sup> This relationship between the user interface and software application is defined by Bieberstein et al., as the Human Service Bus; an optimized organizational structure designed to meet the needs of the on-demand business environment (p. 698).

Java and PHP are both programming languages. Languages have advantages over document parsers when supplying complex mathematical and functional routine libraries. These libraries send requests for computer processing resources. For Java languages, this request is created within a Java container. The container often used for Java server page content is Project Catalina (Tomcat). Tomcat runs these libraries by establishing a trusted set of memory resources on the computer platform.

Trust is established within Java by using defined functional components as described by the Technology compatibility kits (TCK) developed through the Java community process (Dmitry A. Fazunenko, JDJ, p. 26). These technology compatibility kits (TCK) are distributed using the XML data model. TCKs ensure that vital information is distributed for the conformance testing of components such as the Enterprise JavaBeans (EJB), and are available upon subscription from Sun Microsystems.

The trusted memory resources restrict Java from accessing external resources. EJBs provide access to those restricted resources. This access is secured through highly defined relationships that coordinate and facilitate the transmission of information between the programming language and networking infrastructure. In other words, Enterprise JavaBeans can be described as a set of components that help to define a collection of properties (classes) and access points (interfaces) used to enhance interaction between the system and user.

LearningTimes, a web application, is one such example of a Java based community application. This application is built on open source (CommunityZero) technology and uses highly structured database technology distributed across multiple servers and multiple locations to offer secure, scalable, and reliable services.

### XML document parsers

Data can be referenced, recorded, and organized using less complex and more flexible tools available in native-XML document parsers such as the document object model (DOM), streaming API for XML (StAX), or Java architecture for XML Binding (JAXB) to name just a few. XML document parsers work alongside your web-server (Apache, IIS, Lighttpd [Lighty], Cherokee) to organize data using arithmetic operators (addition/subtraction and multiplication/division) without the processor-intensive mathematical libraries available to Java, Perl, Ruby, or Python.

Although a detailed explanation of document parsers is beyond the scope of this chapter, the above document parsers provide access to objects from within program-

ming languages. Each of these processing models offers alternative design patterns. Design patterns provide structure to application program logic. As such, “the structure of a program should mirror the structure of the data that it processes” (Kroenke, 1992, p. 274). Stated another way, XML document parsers should be selected based upon; 1) the data structure within the XML data model, and 2) how that data will be used by the programming language. Table 19.2 provides a brief description of where the XML parsers mentioned above offer performance advantages:

Table 19.2

XML Parsers	Description
Document Object Model	Suited to situations where all elements within the data structure need to be evaluated.
Streaming API for XML	Suited to situations where skipping unwanted sections of the data structure provides performance advantages.
Java Architecture for XML Binding	Suited for referencing large elements within the data structure where both control over the serialization process and validation as a set of properties (classes) by the Java Language are required.

Once formed, XML documents can be filtered and displayed. One tool for altering the style of XML content distributed online is the “XSL Specification, which lets you translate XML tags into other XML tags” (Sun Microsystems, 2007). These transformations can occur as a result of the native-XML parser’s ability to ‘close’ the data model; ensuring the algebraic constructions are created in a logical manner.

One advantage of using XML document parsers is their ability to distribute data collection processes to mid-tier application servers. By transferring data collection processes to community led groups, complete authority over what data is created and how data is organized can encourage new and creative forms of contribution, greater coordination and alignment of efforts, and broader engagement in community discussions and initiatives. Community groups often use a variety of methods to publish content, including **wikis**, blogs and **RSS** feeds.

This authority to manage information within the community is critical in supporting the production of knowledge. When knowledge has been created through the application of information to relevant situations, a unique community perspective emerges.

At this point, the knowledge obtained by the community can be transformed and given structure by de-

fining a document type definition (DTD). This DTD is the foundation for sharing community practices between various groups and sub-groups. Policies for sharing this information are then enforced through a validation process that is applied through XML schema technology. As the community develops these DTD and broader engagement in community initiatives occur, a variety of policies can be created and enforced using an XML schema repository.

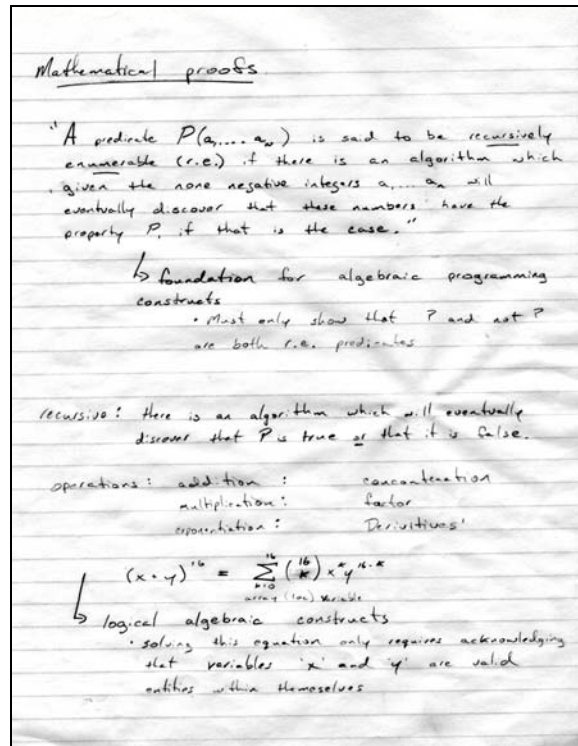
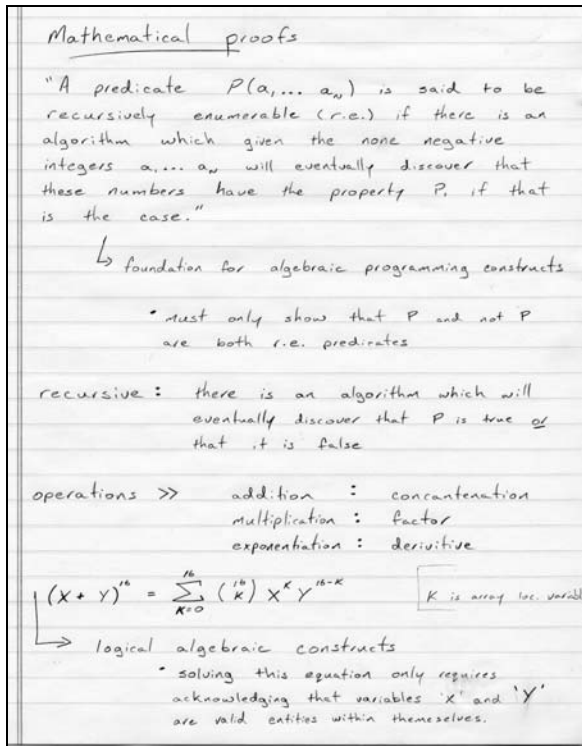
## INTERACTING WITH TECHNOLOGY

So far we have tried to explain how the computer references and records information, using logical arguments and examples. Though these concepts are important to understanding technologies implementation, communication frameworks such as XML are rarely described as intuitive.

Perhaps it is this lack of intuitive understanding that constrains the adoption of technology within society, manifesting itself as a growing digital divide<sup>60</sup> between demographic and social groups within communities. This division has concerned industry leading experts in ICTs for over a half century,<sup>61</sup> but only recently have these concerns emerged as urgent and worthy of careful study. Today, with technology imposing on every aspect of daily lives, new initiatives, studies, and research have undergone explosive growth, resulting in the plethora of tools and applications designed to support the adoption and adaptation of technology and information.

<sup>60</sup> This term has been recently made popular by the initiatives such as the Premier’s Technology Council of British Columbia [Canada] who have dedicated financial resources for the creation of NetWork BC; assisting communities and other government organizations to integrate technology into the everyday lives of BC residents (PTC, April 15, 2005).

<sup>61</sup> Vannevar Bush published an article in 1945 in *Atlantic Monthly* where he envisioned the personal computer (then termed the memex) as an integral part of communication (Freeman, 2005). He continues, however, by warning of the impacts of relying on computer indexing over free and transitory association of ideas between disciplines. Bush suggested that this transition could create such narrow specialization that “the effort to bridge between disciplines is correspondingly superficial” (Freeman, 2005, p. 337).



Notes on Algorithmic Information Theory by Chaitin (1987). Written by Shawn Berney (2005).

**Publication**

With the emergence of Internet in the home a mere decade ago, its presence has transformed communication, entertainment, and research.

Although economic and business principles have adapted to accommodate electronic commerce, perhaps the greatest impacts associated with the Internet occurred when "technology had collided so violently with journalism" (Gillmore, 2004, para. 19). This collision forever altered how individuals contribute to the community consciousness, creating "a conversation in which the grassroots are absolutely essential" (Gillmore, 2005, p. 50).

From the humble roots of hobbyist bulletin board systems that supported text-based games, electronic messaging, and file sharing, conversations began to develop into communities. These communities, frequented primarily by local individuals (due to the high cost of long distance phone service), began to thrive. Today the need for community planning initiatives is more important than ever before. "Aggregation is the name of the game, driving users away from search engines with a flat and bulky model of the net into the arms of specialist groupings and community-led sub-nets" (Howse, 2005). As the expectation of individuals to both access

and publish information grows, greater demands have been placed onto administrators for features that allow sites to quickly and easily update site content. Today a wide variety of applications are available for publication, providing everything from photo galleries to real-time collaboration of complex documents and projects.<sup>62</sup>

"However, inasmuch as a monthly newsletter contributes to a community rhythm, a ScoPE community blog (in the works!) would provide more timely updates. A blog does not reach the same audience as a community newsletter, so we are investigating ways to produce and manage both." SCoPe Case Study, written by Sylvia Currie

"The Small City site allows for daily/weekly/monthly email notices of content updates and more re-

<sup>62</sup> Real-time collaboration software takes many forms and varies greatly in complexity. Microsoft uses a proprietary Sharepoint server, while the developer behind Lotus Notes has released a product called Groove Networks, which synchronizes individual computers. Within the academic world, services such as the LearningTimes platform provide interactive spaces for discussions, audience polls, and whiteboards.

cently a RSS feed has been added to help push communication about these activities out so that those interested in participation are made aware and can choose to participate if they want. All these are ways in which we are attempting to foster participation.” Small Cities Case Study, written by Dan O'Reilly

### Enhancing community

The abundance of technology has changed the lives of Canadians. Some researchers suggest that through open trade policies and the reduction of the barriers associated with adopting new technology, efficient distribution of information can be encouraged (Hoekman et al, 2004). Other researchers argue that, through targeted intervention, this information can be used to create new forms of learning and community practices. Though the analysis of trade policies may provide valuable insight into economic development of digital communities, we will focus here instead on the development of community learning. From this perspective, facilitating the integration of new information may provide insight into the manner in which individuals contribute to community practices, leaving the issues of personal and community economic development issues aside. If you are interested in this topic, there are several articles within the References section worth reading.

### Facilitating the learning experience

Researchers have been increasingly addressing the complex issue of learning within a technologically diverse and complex social environment. Wenger (2004b) suggests that:

“The challenges that we face today can be understood as learning challenges ... [and] all these challenges require accelerated learning at multiple levels of scales at once, from individuals, to communities, to regions, to the whole world. But such deep and multi-scale learning is not simply a cognitive challenge; it entails a transformation of our very identities”.

Provoking reflection and interpretation of new information supported by technological infrastructure can transform the way we engage with the world. Wenger suggests that these “complex situations where everyone belongs to very large numbers of different communities over the course of their lives and at any given time ... [shows that] each person is a unique intersection of multi-membership” (Wenger, 2004b, p. 5). By leveraging this multi-membership and reifying the relationships

between individuals,<sup>63</sup> IBM researchers suggest that contributions to information management practices can reflect the dynamic and flexible nature of human interaction.

Conceptually, Wenger suggests that the reason human interaction is dynamic and flexible is founded in our ability to negotiate new meaning and incorporate that meaning into our community involvement and identity (2004b, p. 5). Through facilitation, it may become possible for individuals to benefit from key factors that researchers such as Wenger suggest are critical within all communities of practices—providing stimulation to the learners’ imaginations, aligning and coordinating of efforts between individuals, and engaging individuals in new practices (1998).

As technology continues to develop towards supporting newly created and dynamic teams, perhaps the facilitation of technology could benefit from group leadership and development skills. Techniques for developing these skills have been ingrained into the operational practices of leadership development and training centres such as Outward Bound and certification programs such as the Association of Canadian Mountain Guides. The following sections highlight selected techniques for developing these group leadership skills.

### Facilitation techniques

Although group facilitation techniques are varied, adventure guiding researchers have identified several structural features that encourage behaviour that meets group expectations. These structural features include the group focus of activities, the use of metaphoric processing, and exposure to unfamiliar environmental conditions (Newes, n.d.). By manipulating these structural features facilitators can alter the amount of cognitive load required by participants, thus reducing stress and mental fatigue (Fabrizio & Niell, n.d., p. 6). While discomfort can initiate personal growth and development, substantial time and interaction must be provided. The proper sequencing of events and content can provide participants a natural progression towards full commu-

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<sup>63</sup> Wenger’s extensive research within the field of community development describes the situated nature of learning and provides the foundation for understanding how individuals develop meaning and identity within the community of practice (and the larger organization). Brown and Duguid’s article, entitled “Organizational Learning and Communities of Practice”, presents Lave and Wenger’s social learning theory of legitimate peripheral participation, which suggests that the formation of knowledge occurs through collective learning and renegotiated meaning of past and future events, constructing a community practice.



nity participation and help individuals avoid potentially severe negative reactions that can result in social withdrawal.

If the individual adapts to the stressful new conditions the discomfort is temporary, and increases self-esteem and perceived competence.<sup>64</sup> To expedite this process, expectations should be realistic. Facilitated discussions can create an atmosphere of trust, cooperation, tolerance and integrity.

Within digital communities of practice, unfamiliar environmental conditions often challenge new participants of group oriented activities. These participants can easily become overwhelmed by new terminology and technological processes. Facilitating new information through techniques such as **debriefing** exercises, **front-loading** community activities, and metaphoric examples framed within a similar context (termed **isomorphic framing**) may help participants adopt, and adapt to, community information.

The use of facilitated debriefing provides the participants with the opportunity for active reflection and open communication following group activities. These debriefing exercises may address specific behaviour or, more generally, provide direction and help prioritize future initiatives. Debriefing is commonly used to facilitate a greater understanding of complex or stressful events to ensure that individuals comprehend and recognize a broad community perspective.

Alternatively, activities and events can be addressed in advance by highlighting common perceptions or actions and suggesting alternative behaviours. Front-loading community activities can be advantageous when attempting to avoid specific recurring and undesirable behaviours within community interactions. Front-loading community interactions can also be combined with isomorphic framing to provide subtle guidance relating to community expectations.

### Sequencing

Developing strong interpersonal communication can also be supported through carefully designed and sequenced interactions. Just as facilitation requires specific and well timed intervention, participant development can be aided by well structured and implemented opportunities to engage community participants in the accomplishment of broad based group goals and objec-

tives. These opportunities can be presented as valued components that require attention within the digital community. Using this methodology, participants have the freedom to specialize in areas of personal interest defined within the community, while community facilitators and educators support these contributions by integrating this information into community practice and conceptual understanding.

Carefully designing and planning alternative / candidate activities for community participants can also create sub-groups based upon experience and expertise. These sub-groups can provide valuable support as individuals experience discomfort, stress, and frustration related to new and unfamiliar practices. In turn, these unfamiliar practices will become more routine and individuals will begin to participate more fully in community practices.

## The architect . . .

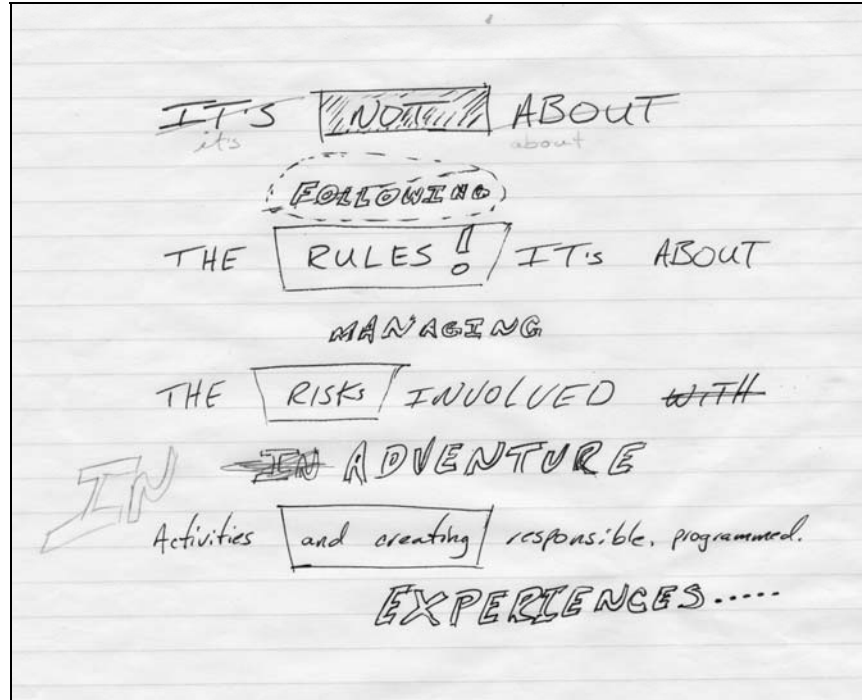
“I have come to the conclusion that software architecture is very difficult to define. It is a range of artifacts that are used to specify the strategic decisions about the structure and behavior of the system, the collaborations among the system elements, and the physical deployment of the system” (Quatrani, 2003).

While the previous sections focused on the sociological and technical foundations for building digital communities, this section works to address how these ideas can be integrated into a digital community’s social fabric—its code. This section is dedicated to exploring tools used by software developers to communicate the complex relationships within digital communities. A basic understanding of these tools can increase the value and functionality of these emerging collaborative spaces. The tools can provide powerful working documents that encourage input from the diverse community members who populate these digital communities.

The system architect collects and analyzes software requirements then documents the required functionality for both the end user and the application. In an effort to standardize the communication of these complex relationships, system architects have begun to adopt notation techniques based on the unified modelling language (UML).

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<sup>64</sup> This is reinforced by Newes who states, “[appropriate] sequencing also provides initial successes, or ‘mastery tasks’, fostering feeling of capability while counteracting internal negative self-evaluations, learned helplessness, and dependency” (Newes, n.d., Chapter 2: Sequencing of Activities).



*It's Not About ... Created by Shawn Berney (2005)*

UML provides an abstract representation of complex relationships. This notation can be used to extend the efforts of social and technical investigations by providing a flexible and powerful communication framework. UML is a compilation of primarily three common, yet distinct notations (including OMT [Rumbaugh], Booch & OOSE [Jacobson]), and is now a fully recognized and published standard (ISO/IEC 19501:2005) within the International Organization for Standardization (ISO).

## SYSTEM MODELLING

Structuring information is critical in facilitating highly dynamic and complex interactions. For raft guide trainees, structure is provided continuously through direct supervision. This instruction and supervision provides guide trainees with valuable feedback and insight into community practices and expectations. This feedback allows guide hopefuls to develop and contribute to the completion of a safe and enjoyable rafting experience. By clearly communicating how raft guide trainees can contribute to the professional rafting community, trainees can offer valued contributions without imposing on the guests' experiences.

Rafting companies provide much more than professional guides; they provide a carefully choreographed series of experiences designed to educate and entertain.

The services must work to attain the highest quality guest experience.

The experience attained within a digital community can also be viewed as a series of choreographed and sequenced interactions. These interactions are influenced by both the architectural design of the digital community and the services provided by information managers during the implementation of the system architecture. The development of modelling tools have been successfully used to mediate these complex relationships, allowing individuals to communicate important system design information, system implementation processes, and the sequences and activities available for facilitating participation.

## Use case diagrams

“The most important role of a use case model is one of communication. It provides a vehicle used by the customer or end users and the developers to discuss the system's functionality and behavior.” (Quatrani, 2003).

Describing how users will interface with highly structured computer information systems is an important and complex task. Developing technological infrastructure that efficiently models community practices re-

quires a detailed understanding of how community members interact. Individuals with this knowledge are often referred to as domain experts. These experts are frequently charged with attempting to explain complex and informal information management practices. Use case diagrams are designed to visually represent these practices, capturing information that allows system architects and software engineers to ensure new technological solutions record and reference valued information only.

### Activity diagrams

“These diagrams represent the dynamics of the system. They are flow charts that are used to show the workflow of a system; that is, they show the flow of control from activity to activity in the system, what activities can be done in parallel, and any alternate paths through the flow ... activity diagrams may be created to represent the flow across use cases or they may be created to represent the flow within a particular use case ... Activity diagrams may [also] be created to show the workflow for an operation”. (Quatrani, 2003).

Once the required information has been identified, system architects begin to evaluate the process for collecting and publishing the information for community access. Once again, domain experts—those individuals familiar with community practices—play a vital role in explaining the information requirements of community members. In this stage of system development, documentation provides insight into community participation by identifying the actions of community members. Ideally, these actions will be developed using a series of modular and reusable components.

### Sequence diagrams

“A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams typically are associated with use case realizations in the Logical View of the system under development”. (Quatrani, 2003).

Once the program activities have been identified, software developers work to sequence the completion of these activities. Sequencing activities facilitates community participation by defining opportunities to engage in group goals and objectives. By carefully selecting how information system architecture imposes constraints

upon community member interactions, digital communities can create carefully choreographed experiences.

### Class diagrams

A class is an abstract representation of an idea (an approval class for example). Class diagrams are commonly used by software engineers to provide an abstract representation of programming logic (the connections between ideas, for example, ensuring approval status is obtained before allowing publication to occur). Programming logic is used to implement a technological solution that reflects the process of storing (recording and referencing) and retrieving (publishing and facilitating) digital information. Class diagrams also allow programmers to communicate the technical ability for software to integrate additional features or third-party modular extensions, an important component of implementing a SOA strategy.

## THE APPLICATION OF UML

By sharing the process used to integrate new technological infrastructure, digital community practitioners can begin to selectively evaluate architecture found within various software packages. When this evaluation process is combined with community consultation, development initiatives can be prioritized and system integration requirements can be clearly defined.

### The implementation process

These communication tools can be combined to create a solid process for managing the information lifecycle<sup>65</sup> and provide insight into the design and development of community infrastructure. The ability to derive processes from the business information model (such as UML diagrams) can be used to map information interaction patterns and facilitate the adoption of content (Hinkelman, Buddenbaum & Zhang, 2006, p. 375).<sup>66</sup> Existing data structures can be mapped and information transformed to enable data exchange between disparate information systems—a process “strategically important

<sup>65</sup> A recent article entitled ‘Lifetime Value’ by Karen S. Henrie offers a persuasive introduction to Lifecycle Information Management and published by Ziff Davis in CIOInsight (June 2006[69]).

<sup>66</sup> For a complete review of emerging standards for implementing design patterns that integrate information with process indicators see the complete article written by Hinkelman et al. published in Volum 45[2] of the IBM Systems Journal entitled ‘Emerging patterns in the use of XML for information modeling in vertical industries’.

for enterprises to increase information technology efficiency by reusing and integrating existing [data]” (Roth et al, 2006, p. 393).

## Summary

The development of technological infrastructure that supports community interactions has seen explosive growth with the emergence of high speed and wireless Internet access. As these tools continue to develop, and tools for integrating disparate information sources become increasingly sophisticated, digital communities have the opportunity to expand and grow. To enhance this growth, greater community involvement in the planning and design of community infrastructure can be used to evaluate the barriers associated with participation. Visual modelling tools are merely one tool that can support this ongoing process of community consultation and development.

Visual models such as the UML notation techniques can help to educate community participants on how information is managed. These tools can also provide important insight into community design initiatives; allowing productive discussions about issues such as privacy, security, intellectual property, and architectural design to occur.

For the greatest community value, it is important to understand how society is being altered by digital technology. Working to inform community discussions can aid participants in understanding digital community design alternatives. These discussions should strive to include real world economic and financial considerations; allowing individuals to invest greater amounts of time and energy into digital communities.

Once individuals begin to invest time and effort into community initiatives, information managers must work to facilitate contributions to community initiatives and develop sequenced candidate plans that support community priorities. The ability to plan and structure digital community development using modelling techniques will allow new ideas to emerge and encourage the coordination and integration of new technological initiatives continually over time.

“The first guiding value in hacker life is *passion*, that is, some intrinsically interesting pursuit that energizes the hacker and contains joy in its realization”. – Pekka Himanen, *The Hacker Ethic*, p. 139

## Glossary

**Data Objects.** A specific instance of a class (idea) used by computer programmers, for example, storing the data object ‘Corvette’ in the sports car class.

**Debriefing.** Also termed: processing, reviewing or reflecting. Debriefing is a deliberate process for drawing learning from experiences (Hirsch, 1999).

**Des Aqua Derro.** A phrase used almost exclusively in Patagonia region of South America. Des Aqua Derro can be literally translated from Spanish to ‘Where Water Runs’. It describes the spot where the headwater pond becomes a river before descending from the high Andean plateau.

**DTD.** “Document Type Definitions are written in a formal syntax that explains precisely which elements may appear where in the document and what the elements’ contents and attributes are” (Harold & Means, 2004, p. 28)

**EDI.** Electronic data interchange is a computer-to-computer transfer of business information. The American National Standards Institute (ANSI) helped to develop and maintain EDI standards in the late 1970s (Schneider, 2004).

**Front-loading.** Front-loading is based on the belief that the client may benefit from direction prior to participation in group activities. This direction should include specific objectives based on the facilitator’s current assessment of group needs.

**Hexi-decimal.** Hexi-decimal representation is a 16 digit numbering system. This system uses the decimals 0 – 9 and characters A – F. The decimal number 200 or  $(200)_{10}$ —the subscript specifically defines the numbering system) is equal to  $11001000_2$  in binary form, and  $C8_{16}$  in hexi-decimal form.  $C8_{16}$  can be stated in expanded representation as  $8+[C \times 16]$  just as the number 23 within the decimal system can be represented as  $3+(2 \times 10)$ .

**ICTs .** Information and communication technologies is a broad term used to describe electronic systems which transmit and receive data for human consumption.

**Isomorphic framing.** Priest and Gass (1997) define isomorphism as “similar structures”, going on to state that “an isomorph is an idea, object, or description that is identical in form or structure—but not necessarily composition or function—to another idea, object, or description ... **Isomorphic framing** focuses on matching a client’s needs, mind-set, and objectives with an ... experience in such a way that successful completion of the ... experience mirrors successful resolution of the client’s issue” (p. 210).

**RDBMS.** A relational database management system is a method of storing related data in columns and rows. RDBMSs are searched using SQL syntax.

**RSS.** Really simple syndication is a publication format used to distribute aggregated data such as news feeds. RSS uses the XML data model.

**Schema.** “An XML schema is an XML document containing a formal description of what comprises a valid XML document” (Harold & Means, 2004, p. 278). XML schemas are used to enforce system policies through automated comparison and validation of content prior data aggregation.

**SQL.** Structured query language. “A language for defining the structure and processing of a relational database. Used as a stand alone query language and also embedded in application programs” (Kroenke, 1992, p. 642)

**Wiki.** A wiki is a web page which can be modified by viewers.

**XSR.** XML schema repositories are collections of schema documents.

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