

# Why It Makes Sense to Give Stuff Away (The CANTEACH Project)

by

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## *Abstract:*

*There is a critical need for preserving CANDU® technical knowledge and for providing a means of disseminating that knowledge to the nuclear community in a convenient and cost effective manner. The CANTEACH project is aimed at fulfilling those needs. This paper describes the project model and how collecting information and then giving it away via a public domain web site is a worthwhile and essential strategy for the Canadian nuclear enterprise. Knowledge management has never been so clearly a superior investment as it is now in this economy.*

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## 1 Introduction

CANTEACH [1, 2] is a web-based resource library aimed at preserving knowledge of the CANDU® nuclear-electric generating system technology. It is open to the public domain for use by anyone interested in knowing more about CANDU including present and future members of the CANDU community. This paper briefly introduces CANTEACH and discusses the rationale behind 'giving stuff away'. It also serves as the primer for an on-line demonstration that will take place during the paper presentation.

CANDU is a remarkable achievement. But the rapid growth and hiring of the Canadian nuclear enterprise in the 1960's through to the late 1970's followed by two decades of low expansion and hiring stagnation has generated a significant demographic gap. Perhaps even more damaging is that the lack of new design and new construction permits have contributed to stagnation of new developments and interest in the technology. Impending retirements in the next 5 to 10 years

will further degrade the expertise gap that currently exists and will present significant challenges to the industry. This should be everybody's concern given the fact that there is no equivalent alternative to replace existing nuclear power stations and existing plants continue to age along with its workforce.

Furthermore, prior to CANTEACH, there existed almost no technical educational material that was available to colleges, universities and other agencies outside the Canadian utilities, AECL and the CNSC. Young people entering our field of study must make do with non-CANDU textbooks and diverse technical papers augmented by limited-scope education and training materials. University professors often have even more limited access to in-depth and up to date information. In fact, they often depend on literature published in other countries when preparing lectures, enhanced by material from industry guest lecturers. But now things are different, and it's time to re-examine CANTEACH and its role in the industry.

There is a large volume of existing documents that describe CANDU systems and operations. We need the ability to mesh this stored knowledge with human expertise. Much of the documentation is repetitious and contains less depth than is desirable. Very few of the documents detail why CANDU is designed the way it is. How can designs evolve appropriately and how can retrofits and design changes be implemented correctly if the 'whys' are not elucidated? How are the graying experts passing on their experiences, knowledge and wisdom? Addressing these issues will help give us the ability to share the knowledge. It is this need that the CANTEACH project is striving to fill.

## 2 Project Model

As described more fully in [1,2], figure 1 illustrates the information flow and products of the project. Donors (organizations and individuals) send contributions to CANTEACH staff. Staff then arrange the documents into a consistent format and vet the material to ensure a high level of quality. The main activities of staff to date relate to development and refinement of the information management system. Information is formatted and split into manageable chunks to enable large documents to be easily downloaded. Results may be judged by browsing the website. Current activities are focused on preparing and posting the more readily available technical documents and in developing the database interface to permit keyword based filtered searches and interlinking of the library. The two most challenging aspects of implementing a knowledge database is how best to collect the knowledge and how best to search what has been collected. Four functions make up the CANTEACH project — gathering, organizing, refining, and distributing knowledge.

The obvious dissemination media is the World Wide Web. It provides a convenient and easy access to a virtually unlimited volume of information which provides great value at negligible project and distribution cost.

We next look at the details of the CANTEACH website.

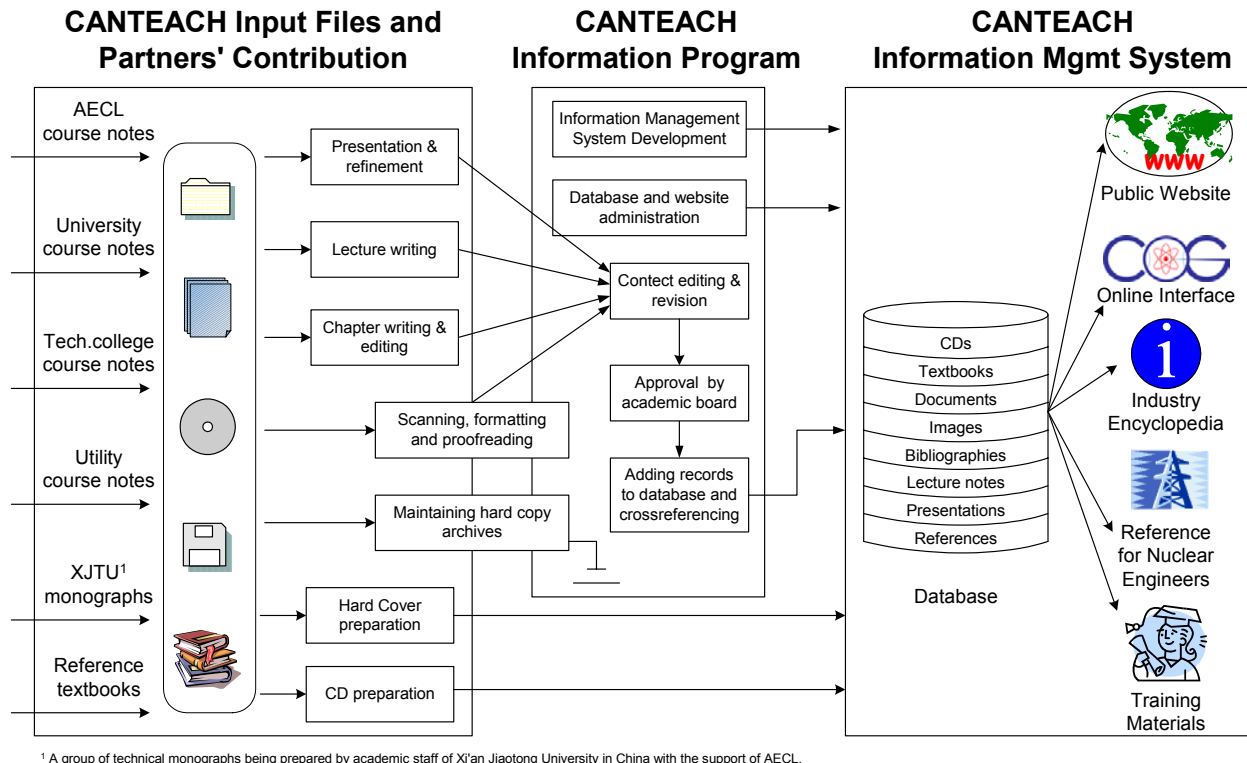


Figure 1. Information Flow and Content

### 3 Website Tour

Figure 2, copied from the website home page, serves as an introduction to the features of this site. The contents of the dedicated server containing this information are varied, and they change frequently as new materials are added. The easiest way to find out what information is available today is to access the website at <http://canteach.candu.org>.

If it is your first visit to the site, have a look at “Welcome to CANTEACH”. Entering a library can be a daunting experience so a quick tour is recommended to get a feel of what type of information is available and roughly where it is stored. Clicking on the central stack of books on the front page of the website takes you to the library stacks, analogous to a physical library. The documents are arranged by institution. You can see what is on the site, but you can also see what is not. Can you help?

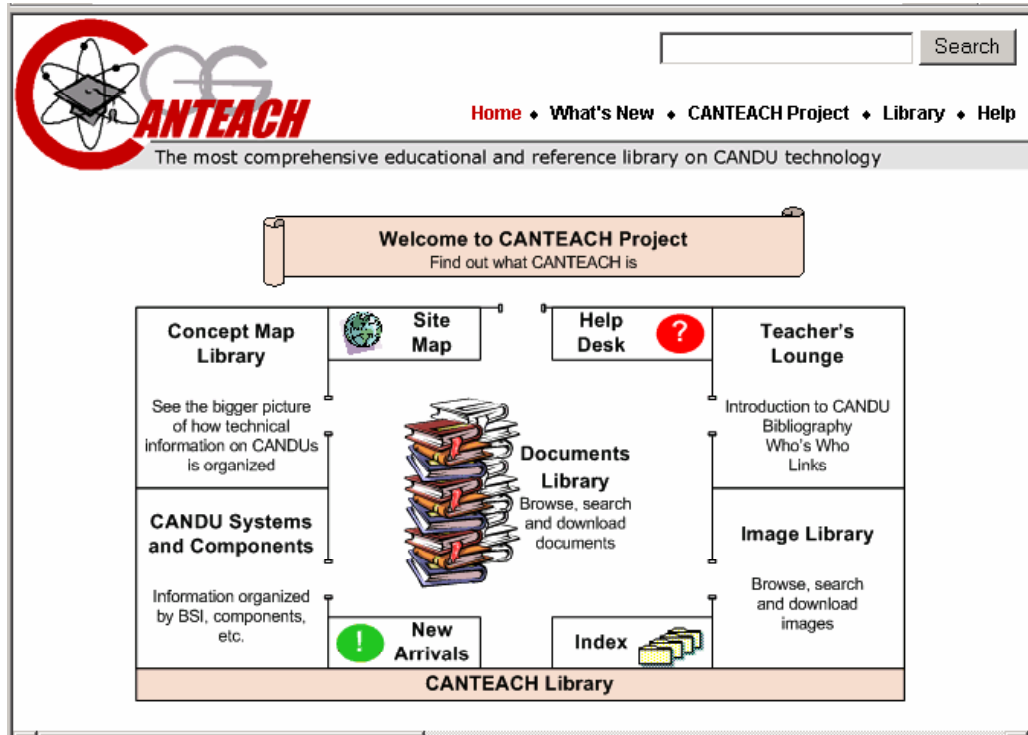


Figure 2 – Reference Library Home Page

## 4 Why Capture Knowledge and Why Give It Away?

In the CANDU industry, intellectual capital is our greatest asset. ‘Captured’ knowledge is only information stored as an imperfect record of the knowledge of the writer, and means nothing without knowledgeable people to understand and implement that information. Libraries are full of books. Books are static, i.e. ‘states’. Libraries do not earn degrees or other tags of competence. Knowledge describes an individual human condition. How do we best address the demographic problem? We need people, enabling institutions and information. So, at the very least, we need to open up the information so we can efficiently and effectively turn it into living knowledge. Many people worry about losing their competitive edge by this open process. But herein we are talking about fundamental training and education. At this level, we don’t have to give away any secrets in the process.

CANTEACH is not about education per se but it is about establishing a technical library that is open, free and available to all, and which thereby forms a base upon which educational activities can stand. Through education, people are empowered. Professionals are developed. And who knows what innovative science and engineering will emerge from that?

There is an interesting and relevant paper on empowerment by Edward Deci of U of Rochester on SDT (Self-Determination Theory) [4]. He suggests that there are 3 dimensions to motivation: competence, relatedness and autonomy (a person is motivated to do something if she is good at

it, if the activity is meaningful or matters in some way, and if she has decided this herself). This is not the answer to the meaning of life but it is something to consider when addressing education or, for that matter, dealing with a co-worker or a student or a child or sticking to a diet or ..... life in general. CANTEACH, by dint of being an enabling resource for competency and for the creation of a sense of a technical community, helps to give a person the tools and context so that the person can decide for herself the best path forward. Hence CANTEACH addresses all three dimensions of empowerment. This is not a trivial matter applicable only to worker-level skills training. It relates also to managers, CEOs, politicians and other key decision makers on all levels from local to international and on all sides of the decision to 'buy into' CANDU. CANDU is a solid product and a rational choice. Raising the general level of competence and awareness of the technology can only help. We generate an enthused and knowledgeable bunch of young engineers. We encourage them to criticize. We engage them. We empower them. And we trust that we have a valid product that will stand the test of scrutiny.

Figure 3 shows an analogy for the proper form of corporate organization. Its roots are grounded firmly in the soil of the society, from which it draws its raw materials - including, in our case, educated people. The trunk (a.k.a. CEO) must be strong enough to support the whole organization, and yet must be flexible within limits. The larger branches ('lower' management) are responsible for supporting the major parts of the company above them, and depend on the main stem for their own support. And so the analogy progresses upward to finer and finer divisions. Growth becomes a main goal near the top of this organization, where new opportunities for receiving light (a.k.a. business) are apparent. Flexibility and balance are essential to the health of the whole structure.

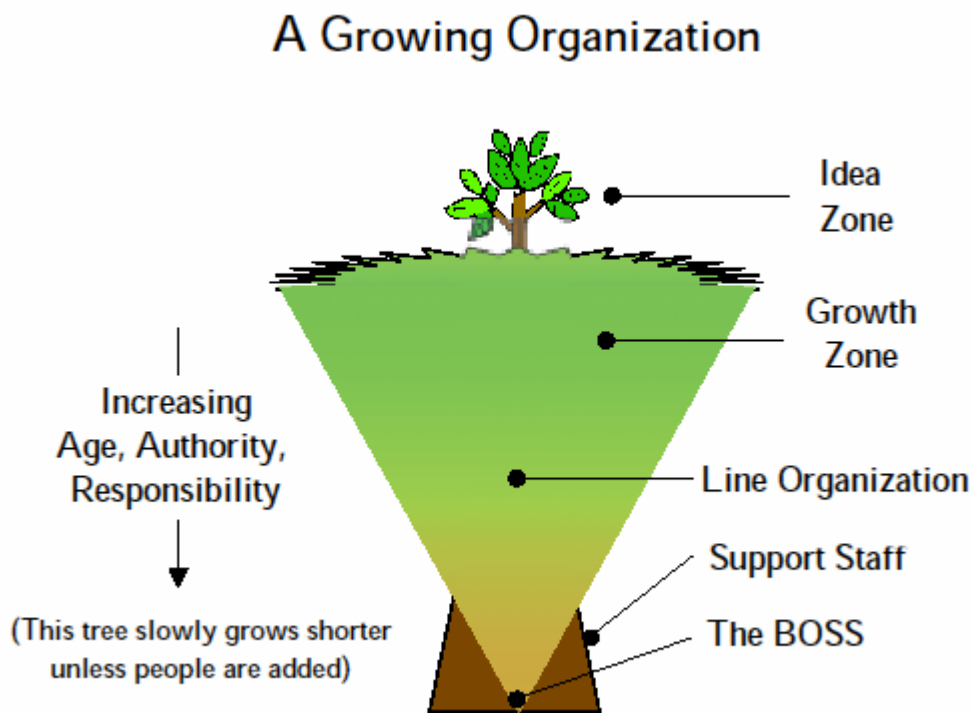


Figure 3 -A Growing Organization Chart

Creation of wealth happens only in the mantle, where new people arrive after being imbued with the principles and objectives of the organization. Our analogy indicates that flow of raw materials, stability of purpose, and the basic design principles of the organization flow upwards. Profits and knowledge flow in both directions.

A second product coming from the top of this tree is information collected in the course of business operations. The tree produces seeds; the analogous business produces formal records.

The fundamental purpose of these formal records is to enable the society to take advantage of information gained earlier in time – perhaps long after the original organization has died – to grow new and productive organizations. They are crucial in both space and time. Spatially, records are necessary to grow the original business around the world. In the time domain, records are necessary to ensure that the business and technical concepts successfully applied in the past do not have to be painfully relearned at some later time, when the society urgently needs them. Knowledgeable workers must be present in the ‘soil’ of society at every stage, in order to keep today’s ‘trees’ healthy and to be certain that new ‘trees’ will grow strong in the future.

But why give away this technical knowledge by making it public domain on the web? Let’s address this good question by drawing on a series of examples.

**From the Mouths of Babes:** A colleague of mine was telling me about his grandson. The grandson just idolized his grandfather. The feeling was obviously mutual. They often play a game of who can find the biggest number. The kid is 4. Grandad got him to go up into the millions, then tens of millions etc. Finally, Grandad had to resort to infinity...which caused the kid to go silent. Weeks later, the kid asked to play the game again and, to Grandad's surprise, did not start off with infinity. They played the usual one-upmanship until Grandad finally said "infinity". The kid fired back "outfinity". POW! Does it get any better than that? With a single word, a 4 year old burst through an existing constraint, defying the comfortable status quo. One cannot be anything but humbled and thus be left more receptive, more open, to novel schemes that on the surface seem counterintuitive. In the context of the current discussion, it just might make sense to give stuff away.

**The Linux analogy:** Open source computer code has been the rage in some circles for a decade or more. The Linux operating system is completely free, is gaining market share and surpasses Microsoft in some areas. How is that possible? Simple; you survive, and even thrive, by selling service. In an article [5] Robert Young states

“No one expects it to be easy to make money in free software. While making money with free software is a challenge, the challenge is not necessarily greater than with proprietary software. In fact you make money in free software exactly the same way you do it in proprietary software: by building a great product, marketing it with skill and imagination, looking after your customers, and thereby building a brand that stands for quality and customer service.”

**Apple vs IBM:** In the early days of personal computers, Apple chose to keep its architecture closed while IBM, in contrast, opened its architecture to the public domain. In effect, IBM got, in return a small percentage of a very large market. Apple, on the other hand, ended up with

100% of a very much smaller market. IBM profited more by far than Apple in the PC market.

**The Twisted Fork:** There is an interesting restaurant in Oakville, Ontario, called The Twisted Fork [6]. It holds cooking classes and releases its recipes. Apparently, they are a thriving business. Obviously, they realize that sometimes there is much more to be gained by giving away information, even key information. The truth is, the value of the restaurant lies not in the recipe itself, but in expertise that exists in the chefs and in the service that they provide. Giving away culinary secrets in classes only enlarges their client base.

**Happy Days:** In that TV sitcom, Howard Cunningham, the father, who ran a hardware store, was ill. His wife filled in for a week. When Howard went back to work he saw that his wife had sold paint at well below cost yet made a profit because of increased sales of paint brushes and other accessories. When questioned, she said, "You give away the potatoes and make your money on butter and sour cream."

**Auto Industry:** How do car makers survive given that a competitor can buy and disassemble your product? The answer is brand loyalty, reputation, service, quality, and cost effectiveness. True, automakers do not give away their knowledge willingly, but they are surviving quite well in spite of the unavoidable product transparency.

**Standing on the Shoulders of Giants:** Implicit in this discussion is the notion that we have not and do not learn and innovate in a void. Education is very much a social phenomenon. Sir Isaac Newton may indeed have said: "If I have seen further, it is by standing on the shoulders of giants.", but he apparently did not originate it. Ilkka Tuomi [7] traces the saying back to Bernard of Chartres in the 12th century AD in his article about knowledge sharing and the idea of the public domain. It contains a good discussion on the historical growth of notions of intellectual copyright.

But I cannot resist giving the last word to Hal Abelson [8], an EE professor at MIT:

"If I have not seen as far as others, it is because there were giants standing on my shoulders."

Insular thinking is a giant barrier to learning. We should do what we can to ensure that there are no such giants standing on the shoulders of the New Nuclear Generation.

## 5 Conclusion

The CANTEACH project exists to provide access to existing legacy education and training documents and images, to distill the essence of these documents and to prepare new documentation. The task of populating the CANTEACH library with seminal documents is underway. The underlying philosophy of an open and free, cooperative exchange of fundamental CANDU design and operation information has proven to be sound. There is much to be gained by following this line of thought. Do take the time to visit the CANTEACH library – it is always open! We look forward to hearing your comments and suggestions after you visit the CANTEACH web site. Contact email addresses can be found at <http://canteach.candu.org/>.

## 6 Acknowledgements

The authors wish to thank all those individuals who have kindly donated to CANTEACH and the Partner institutions for their continuing support.

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