# TWO INDUSTRY PRIORITIES FOR NEXT GENERATION E & ET STUDENTS

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Almost 50 years of practicing as a professional engineer have indicated to me a need for our young engineers 1) to be able to recognize the role and environment they are working in, and 2) to take a firm lead in securing a correct and appropriate solution for the assignment given.

In an academic paper submitted in 1982(1) I wrote "that nations and universities will need to decide whether they will fulfill a national or an international role. The professional colleges must consider the international role in light of their nation's national policies. A Canadian professional engineer of the year 2000, should be prepared [in 1982], to be capable of living his or her life goals as a world citizen." I suggested then, that an Administrator of higher education planning for the development of an engineering college to serve its nation's goals will need to consider 1) regional & national goals, 2) personal life goals, 3) professional practice goals and 4) international citizenship goals. Before the final submission of this hypothetical model I received a copy of a real model for the establishment of a Faculty of Engineering at the University of Victoria. It was interesting to note that goals 1 and 3 were considered, 2 and 4 were not.

The past two decades have focused on information technology and data management and not on the impact a project has on the quality and cost of living. Simultaneously people have shifted from rural areas to the overburdened infrastructure of cities. These infrastructures are aging and maintenance or replacement is not keeping pace with deterioration. (2)

There has always been talk since 1960 of adding extra years to the current 4 year program as indicated in an article in this September's issue of the American Society of Civil Engineers (ASCE) magazine.(3) The co-op universities have always used the co-op terms wisely as those extra years. Originally the draft "Civil Engineering Body of Knowledge for the 21 st Century" listed 15 desired outcomes; a review increased the list to 28 placed in 3 categories: "foundational, technical and professional". The outcome numbers 14 Contemporary Issues, 21 Globalization and 26 Leadership are similar to the themes of this paper.

## Possible Roles and Environments

The education of the next generation of Engineering & Engineering Technology (E & ET) students should continue to prepare such students for the possible role areas of: Investigations; research & development; design, construction/fabrication, inspection; and maintenance. These students from an Industry point of view should also be made aware of the possible environments to which they could be called upon to perform their E & ET roles. Such environments are the air, land (urban, rural), and waters of this world, space and other worlds.

## Firm Leadership to correct and appropriate solutions

Since the early nineties non-engineers want to control engineering or the leadership of engineering. Project managers want to manage projects, educators want to manage the A/E departments, MBA's want to manage water systems and lawyers want to write construction contracts. What has happened, engineers and engineering technologists at one time led the way in new and existing technology? A Contractor gave me his business card in the mid 70's, on the back was the slogan "Either you lead, follow or get the hell out of the way!" One could soften that to "or step aside!" which could be applied more today to those non-engineering professionals who have replaced experienced engineers in top management positions. One reason for this is that the Engineers have a *code of ethics* directly applicable to engineering processes & outcomes and the others do not. E & ET leaders are not easily manipulated politically. They need now more than ever, a program that lets them regain these lost leadership roles.

## Programs on Roles, Environments and Leadership (REL)

Having myself enjoyed a variety of engineering assignments in both academic and industry positions, and mentored many E & ET undergraduates, postgraduates and employees in seeing more options to any situation, I wrote this paper to encourage the incorporation of three programs; to give all E & ET students of all engineering disciplines the methodology and techniques to grow in REL on their own

## The Possible Roles:

Case studies should be the theme around which this program is developed. A program which would introduce them to all four possible roles: 1) investigations; 2) design, construction, fabrication, inspection; 3) research & development and finally 4) maintenance.

Let me give you a quick maintenance example. "The Pollution of Walkerton's drinking water". There was nothing in Ontario papers indicating that any penalty or reprimand was given to those who employed the less than competent operating and maintenance staff. The Ontario Water Resources Commission (OWRC) formed in the mid-50's and the forerunner of the Ministry of the Environment (MOE) set up many treatment plants and labs for Ontario municipalities and trained many competent E & ET staff. Why were trained people not hired?

The Lesson learned? "The public expects proper maintenance and inspection procedures to always be carried out."

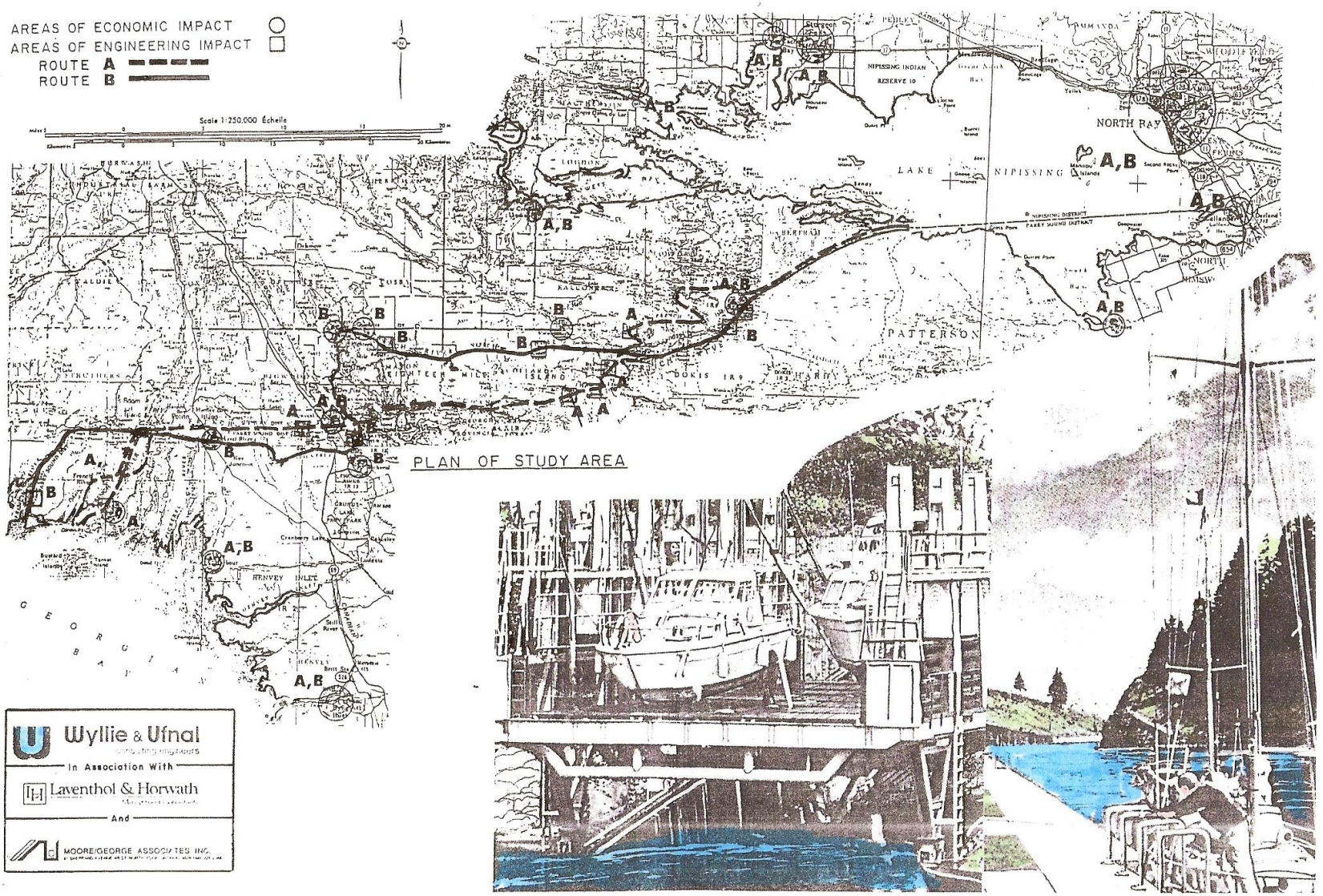
The Possible Performance Environments:

Case studies should be the theme again, around which this program is developed, however 'space and other worlds' may be beyond the reach of some universities and colleges but there may be an industrial manufacturer or supplier for such environments willing to link-up with an E & ET group. This program should allow the students to become aware of what work is like in the air, land (urban, rural) and waters of this world, space and other world situations.

Here's a more detailed Ontario example. "The French River Voyageur Recreational Waterway on Canada's first designated *Heritage River*". (4) The map on the following page comes from the back cover of the 1989 feasibility report. Samuel Champlain the French explorer canoed the Ottawa and French Rivers to reach Georgian Bay in 1615, a route used by Indians to travel from the St Lawrence River to the headwaters of Lake Superior and the prairies beyond. The aim of the Canadian Heritage River System is to protect the historical and recreational values of outstanding waterways in Canada. The key factor in the selection of an optimum route was the preservation of a scenic and historic canoe route separate from the sportsman/sailor/powerboat route. The map shows two routes: A the historic canoe route and B the proposed sail and powerboat route from Georgian Bay to Lake Nipissing. To find route B, I visited the Ontario Archives and uncovered plans and profiles for two ship canals on the French River one set dated 1898, the other 1908. One made use of the parallel Pickerel River this was the key to possible success. The firm allowed me to hire a pilot who had experience in oblique photos of engineering sites and with a navigator using our a map prepared with the possible six barriers to be crossed, flew the route upstream and gave us a set of colour slides to present at the interview. We had found the best solution prior to any other firm taking a look and won the contract to do the detail study by the default of others withdrawing. The project was 75% funded by the Ministry of Northern Development and Mines. The low volume of boat traffic made it an uneconomical project and the Study is now archived with the Ontario Northland Transportation Commission.

The City of North Bay administered the funding and our firm not being the 'favoured child' had information to the public and portions of our field surveys delayed. A member of the Provincial Parliament wrote an article about our firm in the daily paper. Upon returning from Cincinnati for a week in March 1988 my assistant asked me what I was going to do about this slander. My reply was "That's not slander that's the truth! I'm going to meet with him over breakfast and show him all of the information we have and can't get to the public. The MPP arranged and chaired the public meeting and we were able to complete our assignment.

The Lesson learned? Taking unique approaches to the environment in a proposal can scatter all competition and opposition into withdrawing.




PLAN OF STUDY AREA

The Leadership Potential:

Again case studies should be the theme around which this program is developed. Speakers and films from forensic investigation firms and entrepreneurial investors would be excellent. The review of failures and collapses were once available in textbooks. Team playing and respect is a key. The program needs to develop attitudes of solving not blaming; of prevention not repair.

Let me give you a more complex Texas-Ohio example. "Asked twice to and did become Department Head". This was a most challenging situation. A very capable Head with Tenure had stepped down and no other faculty would step forward in loyalty to him. Because of my creative capstone course in Construction methods at Texas A & M, I was interviewed in August of '85 by the Dean and the Department's Construction Council of faculty and contractors. I pointed out some gaps in their data that they should clarify then headed to Texas. They contacted me again late in '86 to inform what the objectives were: to prepare for ABET accreditation, to move to a more modern campus site that was being renovated for the college and to develop extension programs for the contractors in the Columbus-Cincinnati areas. What was not told was that the first class in Architectural Engineering would be completing their 4 years in August of '88, and no licensing authority had been worked into the program development plan. Politics from another group had gone to the Provost, who had gone to the Dean and both had gone to the former Department Head. So 3 months into the assignment when this became apparent from the AE students, I had to reassess what objectives were do-able, reset priorities, run and schedule it all as an engineering project. My contract had allowed me one week every three months to return to Ontario to review and check the work being done on the Voyageur Recreational Waterway. As I had not been asked to solve the licensing problem, I decided that I would encourage discretely someone in the Faculty who was an American Citizen or held a Green Card to become the next Department Head. All objectives were obtained plus some positive attitude changes for the Department. It was an interesting assignment in a very pleasant City. I was quite impressed with the College's co-op director, staff and program.

The Lesson learned? There is great value in mixing academic & industry leadership skills.

What then is a Career?

Looking back to when I graduated in Civil Engineering here at this University in the spring of 1960 and received my Iron Ring from the Ceremony held in an upper meeting room of Convocation Hall, I would say it is a journey of exploration of various roles in various environments in challenging leadership positions, not management. Most of us started out looking for that work job that was almost fascinating and paid fairly, the word "career" was not in the vocabulary of most fourth year students, but "work with pay and a chance to learn" was.

With a half century in Engineering I have found it to be a most fascinating journey. Three activities I would recommend to all E & ET people to do are: a course in Real Estate Law &

Practice, a course in Construction Law & Arbitration and most definitely a stint at teaching a class of some 40 students or more.

We all have a skill unique to each of us. My most exciting opportunities came because I can freehand sketch on blank sheets processes of solution that can be converted into contracts that can be tendered and built. On occasion I would sketch three dimensional views that would clarify a point and win a decision in a meeting and still do.

## Conclusion

From an Industry point of view future E & ET students need to see a larger overall view as to where they could fit in the engineering application world. Three programs that would enable them to achieve this are one which introduces all possible roles especially those in maintenance; another which gives an awareness of the unfolding work environments and thirdly one that prepares them to regain and keep those lost senior leadership roles.

## Reference Information


1. FOSTER, Richard Dennis, 1982 "An Engineering College to Serve Canadian Goals to the Year 2000"

2. "Civil Engineering" August 2007, Vol. 77 No. 8, pg 66 Magazine of the American Society of Civil Engineers (ASCE) " The Vision for Civil Engineering in 2025" The distillation of a report prepared in 2006 by the ASCE Steering Committee to plan a Summit on the Future of the Civil Engineering Profession in 2025.

3. "Civil Engineering" September 2007, Vol. 77 No. 9, pg 64 "Preparing the Civil Engineer of Tomorrow by 'Raising the Bar' Since 1998 ASCE's Board has aggressively advocated elevating educational standards for engineers. This distillation is of the draft of the revised Body of Knowledge for the 21st Century.

4. Ontario Northland Transportation Commission 1989 Feasibility Study: "Voyageur Recreational Waterway by Wyllie & Ufnal, Consulting Engineers in association with Laventhol & Horwath, Management Consultants and Moore George Associates Inc.


## Bibliographic Information

RICHARD DENNIS FOSTER, P.Eng. Born in Toronto, earned his engineering degrees of BASc and MASc at the University of Toronto and his PhD at Texas A& M University. '60s: saw varied consulting experience. '70s: saw the incorporation and 10 year operation "in the black" of a medium sized consulting firm, membership in ASEE and ASCE. '80s: taught and designed courses at Texas A&M University and was Head of Construction Science at the University of Cincinnati. '90s: Dennis enjoyed key roles on special projects in Canada and USA and still does today.