QUEENSBOROUGH COMMUNITY COLLEGE

Department of Engineering Technology

ET-821-5

Professional Skills Exercise

**Introduction**

Proficiency in professional skills is critical for success in 21st century engineering careers. A critical issue facing 21st century engineering is the global sourcing of complex services. Prior to 2000, outsourcing of routine engineering functions was commonplace. With growing demand and the improvement of off-shore engineering skills, engineering education must not only help students develop strong scientific, technical and mathematical foundations, but also an integrated approach to problem solving that moves beyond traditional engineering parameters.

In this performance task, small groups of students are presented with a complex, real-world scenario that contains multiple unresolved problems. They are then asked to discuss implications and propose some approaches to address the issues. Each group of students then collaborates to develop strategies they could use to address the given multifaceted problem, and their performance in response to that challenge is assessed by faculty in each program.

**Part 1**

**Discussion Instructions**

Imagine that you are a team of engineers working together on the issue(s) raised in the scenario below. Discuss what your team would need to consider to address the issue(s). You do not need to provide details on the implementation of specific solutions, but try to come to consensus on what is most important, and agree on one or more possible approaches. As you discuss, take into consideration the professional skills listed above. Your team lab report will need to include responses to the following prompts:

* What are the primary issues raised in the scenario? Rank them in order of importance (or severity) from the most important issue to the least important issue.
* Record questions that arise from the scenario.
* What are some possible approaches to address the issues you’ve identified as most important? Consider all of the factors that will be impacted by the approaches used to address the issue.
* Choose one or two approaches/possible solution paths that seem most feasible and state your rationale for choosing such approaches.

**Scenario 1**

Lithium Ion batteries are rapidly becoming the technology of choice for the next generation of electric vehicles. The automotive industry is increasingly committed to electrified vehicles to provide sustainable mobility in the next decade. LiIon is the preferred battery technology to power these vehicles.

To achieve required cuts in oil consumption, a significant percentage of the world automobile fleet of 1 billion vehicles will be electrified in the coming decade. Ultimately all production, currently 60 Million vehicles per year, will be replaced with highly electrified vehicles – PHEVs and BEVs.

Analysis of Lithium's geological resource base shows that there is insufficient, economically recoverable, Lithium available in the earth's crust to sustain electric vehicle manufacture in the volumes required, based solely on LiIon batteries. Depletion rates would exceed current oil depletion rates and switch dependency from one diminishing resource to another. Concentration of supply would create new geopolitical tensions, not reduce them.

The last and biggest untapped reserve of Lithium salt in the world is in the Salar de Uyuni salt pans of Bolivia, the remains of an ancient inland sea. Bolivia is estimated by the USGS to contain Lithium resources of 5,400,000 tons or nearly 50% of the global Lithium metal reserve base and an even higher percentage of the Lithium salt reserves. Another estimate has put the Bolivian resource as high as 9MT.

Bolivia has made a number of attempts in the past to use these Lithium resources, which have all foundered, primarily for political reasons. The current political situation in the country is acting as a strong disincentive for foreign mining companies to operate there. A social revolution is under way in Bolivia and many foreign mineral extraction companies are seeing their assets nationalized, notably in the oil and gas industries. The historical exploitation of mineral resources by foreign firms with what is considered to be insufficient benefit to Bolivian society in return is a major political issue in the country.

In Bolivia, the Lithium resources are considered to be a national asset. In the current climate, the Bolivian government may not permit the wholesale industrialization of the Uyuni salt flats, a unique and ancient ecosystem, just to provide more motive power to the world. They certainly will not do so without requiring a much greater financial return than previously. It would take at least 5 years for the first Lithium Carbonate product to reach the market after an agreement was concluded to develop it. Contract negotiations would add to this timescale.

**Sources**

*The Trouble with Lithium: Implications of Future PHEV Production for Lithium Demand*

(2007, Meridian International Research)

*Re-engineering Engineering Education for the Challenges of the 21st Century* (2006, JOM –

Journal of Minerals, Metals and Materials)

*Introduction to the Grand Challenges for Engineering* (2008, National Academy of

Engineering)

*Holistic Engineering* (2007, The Chronicle of Higher Education)

*Engineering for a Changing World* (2008, The Millennium Project)

Team Report

*The template below can be used as a guide for the team discussions and the final submission of your report. Use additional space as necessary.*

What are the primary issues raised in the scenario? Rank them in order of importance (or severity) from the most important issue to the least important issue.

Record questions that arise from the scenario.

What are some possible approaches to address the issues you’ve identified as **most important**? Consider all of the factors that will be impacted by the approaches used to address the issue.

Choose one or two approaches/possible solution paths that seem most feasible and state your rationale for choosing such approaches.

Identify several ethical considerations regarding this scenario and those which may arise while addressing the issues.

Who are the stakeholders and what concerns might they hold?

How might you, as the project leader, address the concerns of the stakeholders?

**Part 2**

Working on your own consider scenario 2. In a one page paper, discuss the primary issues raised, questions that arise, and some possible approaches to address the issues.

**Scenario 2**

Daily explosions and violence in Iraq mean thousands of people are losing limbs-usually their legs-every year, officials and aid workers say. But while some US soldiers have access to state-of-the-art technology, Iraqis are left scrambling for prosthetics which are 30 years out of date. The Red Crescent Society and the director general for health services in the northern city of Mosul said they estimate demand for as many as 3,000 additional replacement limbs annually in their region alone.

The limbs are usually lost as a result of amputations, and the severe shortage of prosthetics marks another looming healthcare crisis for the war-torn nation. Military figures show a rate of amputations carried out by US military surgeons which is double that of previous wars. It is believed that as many as 6% of wounded US troops serving in Iraq will require an amputation. The usual figure is 3%. Mosul-based US orthopedic military surgeon Lieutenant Colonel Wayne Mosley said around 80% of the injuries seen at the military hospital were to the extremities.

The Iraq conflict is characterized by a high proportion of car bombs and roadside explosions, as well as injuries to civilians during US air strikes. There are now five times as many air strikes today in Iraq as there were in the early part of 2006. It is estimated by the Ministry of Health in Iraq, that there are “approximately 80,000 amputees of whom some 75 to 85 percent reportedly were caused by mines or unexploded ordinance.” Many of the wounded are innocent children and women who are completely disconnected from the war. Recently, the leaders of the Basra, Iraq, Prosthetics Project hypothesized that, assuming no new cases, it would take 20 to 30 years to fully and adequately care medically for the current survivors in Iraq.

Being an amputee in Iraq has very different connotations than it has in developed areas of the world. Since it is not a “wheelchair friendly” country with paved roads and other necessities for wheelchair transportation and accessibility, becoming disabled in this nation is a serious setback; it means a total loss of independence for the survivor. Once you are an amputee in Iraq, “you’ve lost your mobility; you’ve lost your future,” according to Linda Smythe, head of the Prosthetics Project.  With no way to get around, the survivors cannot support themselves and their families. Also, since high numbers of these amputees are children, they lose access to education in addition to their mobility.

Iraq lacks enough medical centers to treat the disabled people of its nation. Due to the current conflict in Iraq, many health-care centers have been destroyed or damaged, and others have been forced to shut down. The medical centers that do exist throughout Iraq do not have sufficient orthopedic doctors or specialists trained in orthotics or prosthetics available to help the overwhelming number amputees regain their mobility. Additionally, these centers are under supplied.

Sources:

“Basra, Iraq Prosthetics Project” *Journal of Mine Action*, summer 2008.  <http://maic.jmu.edu/Journal/12.1/focus/young/young.htm>

*Iraq’s Prosthetics Crisis (7.29.07) hc2D.co.uk Virtually Comprehensive Healthcare News* <http://www.hc2d.co.uk/content.php?contentId=3589>

“Iraq.” *Landmine Monitor Report,* 2006. [http://www.icbl.org/lm/2006/iraq.html#fnB230](http://www.icbl.org/lm/2006/iraq.html#fnB230%2520)