TIME ZONES AND GEOGRAPHY DON'T MATTER: REAL WORLD PROJECTS IN INTERNET GRADUATE CLASSES

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Graduate students from all over the world collaborate electronically using the internet to produce high quality action research. The School of Engineering Technology at Eastern Michigan University (EMU) offers two M.S. degrees via the internet: an M.S. in Engineering Management (EM) and the M.S. in Quality Management (QM). EMU is located in southeast Michigan 40 miles from Detroit and about half of the students are "local", that is, living within 50 miles of campus. The other half of the students live elsewhere in the U.S., and in many other regions of the world. Many of the internet classes have team projects and this paper will focus on two such classes taken by both EM and QM students: Lean Production and Total Quality Management (TQM).

Both the degree programs and these two classes are practitioner-oriented. That is to say we actively attempt to reflect current and near- future business practices in the courses as well as include timely and proven course content. This means that the pedagogy (including internet-specific practices) *and* the course topics are both designed to assist the student to prosper professionally. The recent survey of new organizational practices published in the *Economist* (2006) magazine suggests that 21st century organizations are still tied to inappropriate 20th century forms of work. New practices include "responsible autonomy, a form of organisation (sic) in which groups of workers decide for themselves what to do, but are accountable for the outcome." Furthermore, employees are increasingly mobile and linked electronically. Some 40% of current IBM employees do not report daily to an IBM site (Economist, 2006). To paraphrase Marshall McLuhan, the medium of instructional delivery should be as much the "message" as the course content.

There is significant literature suggesting that students, especially graduate students in technical and business areas, need to work collaboratively (Angelino, 2002; Bal and Teo, 2000; Yazici, 2005). Handy in *The Age of Paradox* (1994) states that "the ideal productive units are no longer bureaucratically regimented factories but ever-changing teams summoned together to master peculiar projects...". Yazici (2005) concludes that "graduate students showed to be collaborative and independent learners". Thus, the need for students to work together in these classes takes advantage of their propensity to collaborate and complete the work independently which will assist their work team to succeed in the class projects. Simultaneously, the shared responsibility reinforces what Handy posits is a behavior critical to their success in the current and future workplace. Requiring collective work products in these courses creates a pre-condition for effective team work (Katzenbach and Smith, 1993). Grading is done both on individual and

collective work. While controversial among the students, this practice fulfills another Katzenbach and Smith criterion for effective teams. The majority of the internet graduate students are employed as technical specialists; various types of engineering and technical management predominate as job titles (Tucker, 2006). Nearly all of these jobs require team work and more specifically, collaboration across time and space. Specific examples include supplier quality engineers whose job it is to link multi-tier and international supply chains to customers in the U.S. and elsewhere, product engineers involved in integrating components designed and made all over the world, and project managers coordinating complex efforts such as the construction of oil refineries involving many countries' cooperation. Again, the nature of the class assignments ought to reinforce the importance of working collaboratively and contribute to the skill set critical to the students' professional success.

Teamwork in a virtual context is different than "live" teams in a single physical location, (Holton, 2002). According to Baker (2002) "Due to an increase in corporate restructuring, competition, and globalization, virtual teams have become an integral part of many organizations." So what elements of effective virtual teamwork should be incorporated into these course assignments? Baker (2002) reports research concluding that "utilizes a task, which requires individuals to work together as members of a disbursed group and results in quantifiable decisions which can be compared across groups." His findings suggest that while his subjects expressed lower satisfaction with electronically-mediated collaboration when compared to face-to-face meetings, virtual collaboration did not result in lower quality of decisions. Also from the literature (Griffith, Sawyer, and Neale, 2003; Griffith and Neale, 2001) we learn that virtual teams are more likely to outperform face-to-face teams when explicit, not tacit knowledge is required to successfully complete the project. While this may well be a limitation in organization where values and insider knowledge give a "live" team an advantage, in the internet class all participants have equal access to the necessarily explicit knowledge. The advantage of mastering tacit organizational knowledge may mitigate the success of virtual teams elsewhere, but not in the cases studied here. The lessons from this literature suggest that virtual teams can work with open access to resources even though most of us would prefer to work face-to-face.

Incorporating best practices of online education *and* collaborative virtual work makes these classes particularly germane to working professionals. Virtual teamwork done in the class should mirror new and accelerating demands in the workplace. Complex technical activities like those suggested by student job titles are not new. However, instant communication via cell phones and the internet as well as the ease of rapid international travel and shipping accelerates these trends to make new demands on education relevant to this clientele. The use of online teaching and learning should augment students' understanding of the virtual world. This is not simple and developing online education is fraught with pitfalls. Wallace (2002) warns that online education, like all education must be "informed by research, rather than markets" A corollary caveat from Volery and Lord (2000) is to use technology (which is inherent in the course platform) in pedagogically sound ways. For instructors, it is tempting to focus the class and associated student assignments on the technology itself. One can spend endless hours

making each webpage colorful and dynamic with images, video and audio clips, animation, and a multiplicity of potentially distracting and irrelevant hyperlinks. This may mean that the mastery of course content is shunted to a secondary role while the course appears to focus on entertainment. Another potential problem pointed out by Volery and Lord (2000) is the lack of technical expertise by the instructor. Some academics, experts in their chosen field, may find it potentially humiliating to seek help in effective internet course construction and pedagogy. The instructor must play a central role becoming a "learning catalyst and knowledge navigator" (Volery and Lord, 2000). If these courses are to meet the needs of our target clientele, they must appropriately use (but not overuse) both available technology and current research on internet course pedagogy.

It is a truism to state that virtual work across cultures, languages, and international boundaries is fraught with difficulty. Consistent with a study by Tucker (2005), the number and nature of business contacts across international divisions of language and culture are expanding rapidly but bring the potential for ethical conflict. Both authors are fluent in languages other than English and have considerable international experience. The course instructors have made every effort to eliminate any cultural or national bias. Of course, these courses are all done in English and our assumption is that all students are considered equal, but otherwise we believe that there is no particular bias with regard to time zone, country of origin, or other factor. Drago and Wagner (2005) address the issue of learning styles in online courses. They conclude that online students may be dissatisfied if they are primarily aural and kinesthetic learners but are likely to be satisfied if they are primarily read-write learners. The authors do not feel that these distinctions impinge on the relative value of online education across national and language barriers.

How do we achieve these goals while valuing mastery of the course content? Early in the course, the instructor randomly assigns 3-5 students to project teams. Randomization tends to negate geography as an organizing principle. The online course is set up to accommodate file sharing, real-time chat, and contains information for e-mail and telephone contact. Student's location may facilitate real-time chat and conference calls. If, however, they are separated by many time zones, only asynchronous communication is required. In both classes students are assigned a project that requires at least one team member to physically visit a work site. In Lean Production, this may be a factory, warehouse, fast food outlet, or any other site where there is repetitive work flow that may be evaluated using lean principles. Aside from the more prosaic factories and fast food franchises, sites have included a shipyard in Asia, a winery in Canada, and a goat dairy in Israel. For TQM, any company or franchise/retail outlet could be the focus of a study. The TQM project requires that the student teams compare the organizations "Mission" or "Vision" statements with the real quality practices of their everyday operations. For both types of projects, permission from the organization's management is required.

Students begin the project early in the term. No leader is assigned by the instructor. The instructor must approve the proposed project. Over a period of about ten weeks, students must develop a work plan with schedules and deadlines, assign tasks to the various team

members, do the background research from legitimate academic and trade sources using electronic databases made available through the university library, execute physical visits at the appropriate locations, integrate their work fulfilling the assignment, and finally post their presentations as PowerPoint files for all the other students to see and evaluate. There are some practical considerations: photographs and video content must be limited to yield a file size of 2 megabytes or less. Bigger files may not download properly with dial-up connections. This mandatory electronic and frequently asynchronous communication forces the students to solve problems of the global, virtual work environment. The quality and sophistication of the final products is very good. In a few cases, the instructor has had to intervene to help in conflict resolution. In general, these self-directed teams work very effectively together without intervention.

To assess the value of online group projects to instructors and to students, five questions were posed to experienced online instructors in the School of Engineering Technology at Eastern Michigan University. Six faculty responded who had an average of three years teaching graduate online engineering management and quality courses. The total number of online classes which required group projects taught (over the last 5 years) by an individual faculty member ranged from 2 to 25. What follows is the questions with answers. These answers are representative but not specifically identified with any particular faculty member.

For group/team class projects in your online courses:

1. What lessons have you learned? What have you tried that works?
A. Very prescribed assignments.
B. Signed contracts from students faxed in to commit to team project.
C. A provision so that students can contest poor evaluations from peers.
D. A high level of student choice in selecting project but always subject to instructor approval.
E. I need to assess the project and what skills are required to make up teams and maybe "tweak" assignment.
F. I assign a group leader.
G. I use projects from external clients who are given access to the class. Students have a term long relationship with their client.
H. I set up a chat room for each group. I use synchronous chat rooms in the class even though it creates time zone problems.
I. I make sure each group has an "out-of-town" member when the class make-up is heavily local.
J. Making sure that the assignment and how it will be graded is totally clearly defined very early in the course. Also, deadlines must be set and enforced.
K. Interim deadlines so the instructor knows the project is moving along.

2. What have you tried that didn't work?
A. Open-ended assignments.
B. Too much freedom given to students.
C. Not monitoring progress of team project and intervening if necessary.

D. Real time chat rooms are difficult because of time zones.
E. Allowing students who work together to make up the group.
F. Making a group assignment early in the term and then having it due at the end with no monitoring of progress.
G. Making up groups right at the beginning of the term. I now wait fro the (almost) inevitable students dropping the class after a week or two.

3. What forms of grading/assessment have you employed in group projects?
A. 50% of course grade comprised of peer evaluation factor multiplied by instructor's evaluation
B. 30% of grade broken down as 5% peer, 10% student evaluation of others' presentations, and 15% instructor evaluation.
C. I use a combination of peer and group leader evaluation. I have not yet found a really fair group evaluation method.
D. I would like to integrate Webex or other system for real-time presentation and asses that.
E. 30% of the total grade divided evenly between peer and instructor evaluation.
F. I use a specific grading rubric integrating student and instructor evaluation

4. What have students said about these projects?
A. At first, I though this was going to be impossible. It turned out to be one of the best learning experiences I have ever had.
B. Group work for class credit always ends up with some doing more work than others. I don't want my grade jeopardized by lazy classmates.
C. I had not realized that such a virtual, electronic project was possible. I learned a lot and now feel prepared to similar projects at work.
D. First, we learned about how effective teams work as part of our class work. Then, we did the team project trying to apply the course material. To my surprise, it worked!
E. Students generally like the projects but often complain about grading fairness
F. Students like it when it is properly structured and performance expectations are clear.

5. What advice would you give to someone considering requiring group/team projects in online courses?

A. Make sure you define as much as possible beforehand. Prescribe everything possible.
B. Don't try something online that you have not tried in other venues.
C. Make sure it is actually doable.
D. Try to include doing real work for organizations e.g. DOE, Lean Audit, Customer Satisfaction Study
E. Provide options for students to do actual work for non-profits/community organizations. I give bonus points for such work.
F. Do not allow students to do field studies in their own place or work
G. Randomize students into groups to simulate actual work situations.
H. Give students the option of working alone if they request it.
I. Make sure you have other forms of evaluation to compare with student achievement in group projects.

J. Do not hesitate to intervene when groups run into trouble. It will happen! The trouble may be with the assignment or with the group process.
K. Group projects are great but hard to manage. Online group projects are much harder to pull off than live classes.
L. The instructor must be readily available via telephone and e-mail throughout the project. Issues which may seem small and may be dealt with easily at the beginning grow to disastrous proportions if not resolved. Some groups must be disbanded and reformed. Do not try to do this unless you are willing to monitor and intervene,

As you can determine from these comments, there are many pitfalls and many rewards possible with online group projects. In general, when students have clear and objective criteria for their class performance they find the experience both challenging and beneficial. Instructors must think through the assignment and carry out meticulous planning to properly execute these online group projects. Also, faculty must not shy away from intervention and guidance. Not monitoring these projects and failure to act may condemn the students' project to failure. Most of the students in these classes are mature, mid-career professionals in technical fields. They are accustomed to solving their own problems and communicating with a wide range of fellow employees. As such, they are ideal participants in these class projects and usually require little intervention. If these projects were to be required at the undergraduate or even in lower division classes, the authors believe that the assignment would have to be dramatically re-structured.

The team-based internet projects required in these classes meet the student needs with regard to content but also with respect to methods of work. The workplace demands expertise in collaborative work with collective work products and some form of (at least partial) collective performance review. Rapid changes in technology and the compression of work time frames stemming from globally instantaneous communication require virtual teams to be connected electronically. The continuing globalization of business means that we must work across times zones, languages, cultures and regions. The rate of change in the technical and business world necessitates constant updating through training and education. Students can learn about all of these timely and critical issues through both the course content and the medium of instruction.

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