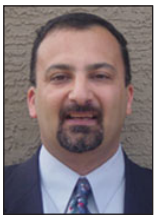


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# Enhancing Course Delivery in Operations Management: Integrating Web Technology and Face-to-Face Learning

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In the last few years, technology has allowed for more efficient and flexible delivery of course material. In parallel, the demand for online delivery of higher education courses continues to rise. Online courses provide more time and location flexibility for students and allow universities to expand their course offerings by expanding their virtual infrastructure. The challenge facing many instructors is in finding the right blend of technology and interpersonal teaching that meets students' need for flexibility and the university's need for rigorous coursework.

Operations management courses carry a mix of quantitative concepts and qualitative theories. For example, OM students can be exposed to methods for calculating economic order quantity (EOQ) in one week, the ramifications of the product process matrix on manufacturing strategy the next week (Hayes & Wheelwright, 1989), and case analyses on Total Quality Management the week after. Effective teaching in OM requires the ability to combine a broad base using a multitude of teaching techniques. Whereas detailing the key aspects of EOQ on the whiteboard may work better than showing a static PowerPoint, a video on practices at Toyota may be the most effective way to illustrate the key attributes of Toyota Production System. Seasoned OM instructors recognize the value of having a large "teaching toolbox" for delivering such an eclectic profile of concepts.

An increasing number of OM instructors are combining the tools provided through online course platforms such

as WebCT, Blackboard, and e-College with their face-to-face classroom settings. For many, the question is not whether online or face-to-face is the better format, but rather how both approaches can be combined to deliver a high quality OM course. In this article, we explore how some tools traditionally associated with face-to-face or web-based deliveries can be combined to enhance course delivery in OM.

Our insights come from several years of combined teaching experience. We have been fortunate to teach OM in online, face-to-face, and hybrid forms for over a dozen educational institutions during the past decade. Through the years, a handful of tools have become central in our "teaching toolboxes" when teaching OM courses. Some of these were initiated from face-to-face classes and were then incorporated to the online version. Others were initiated in online classes and subsequently integrated into face-to-face sessions. We explain each in a brief paragraph or two below, in hopes to provide our colleagues with new ways of enhancing their course delivery.

## From Face-to-Face to Online

### Lectures

A hard to replace element of face-to-face classrooms is the course lecture. As a time honored tradition, the course lecture allows the instructor to share their wisdom and understanding of the material in a format that is different and complementary to the textbook. Clearly, a well

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developed and delivered lecture moves beyond restating what the textbook covers. Good lectures help motivate students by stimulating critical thinking skills and can be the basis for further inquiries. Lectures in Operations Management are particularly useful, since much of the topic has to do with practical application of theory to manufacturing or service environments.

There are at least two key aspects of the traditional lecture that makes it a potent tool. First is the insight and perspective delivered by the lecturer. Thankfully, with today's communication technology, video and audio recordings are easy to share. More OM instructors are recording their face-to-face delivered lectures and posting them to the online course platform for students to revisit later. However, a downside to this approach is the loss of instant interaction. Students cannot ask questions during a recorded lecture. Nor can the instructor stop and request for the class to complete a short in-class exercise. So the second element of an effective lecture is feedback and involvement by the class. Communication technology allows for this to occur as well. Most web platforms now include a feature that allows for synchronous delivery of material. In many cases audio-enabled sharing of presentation slides and audio connection is becoming standard practice.

Some instructors combine the delivery and feedback steps using a "synchronized" lecture. We do not use synchronized methods for lecture delivery. Instead, our students are expected to make comments about the recorded lectures in an online discussion forum. Our lectures are purposefully designed to be engaging and typically include questions in the midst of the recorded presentation. Students are tasked with finding the answer and posting their reply in an online discussion forum. This is equivalent to having students reply to a question posed during a face-to-face lecture and provides an archive for students to use during their exam review.

Today's technology allows for various means to record animated presentations. One particular tool to help OM

instructors is screen recording software. Screen recording allows for uncomplicated combination of instructional material from different software sources. Screen recording programs allow for presentation slides, lecture notes, excel sheets, calculator results, and hand written notes to be strung together into video by recording them right on a desktop computer. Software packages including *Camtasia*, *Camstudio* and *Adobe Captivate 4* allow for easy recording of video and the addition of audio to the file with the help of a microphone. The multimedia files can then be imported into a course content management system as streaming video or podcasts. We believe screen recording programs can be helpful when teaching the quantitative aspects of OM courses. For example, when teaching linear programming in Excel, functions such as *Lookup tables* and analysis tools such as *Solver* can be taught more effectively by creating step-by-step how-to videos customized for the course.

#### **Guest Speakers**

Local guest speakers allow for students to become acquainted to the local industries and recognize possible opportunities for jobs, internships or class projects. Guest speakers provide practical validation and reinforcement to what the students learn in an OM course. In a recent class, students were asked to submit questions to be posed to a Director of Operations about his company and their manufacturing and supply management practices. Top questions were rewarded with extra points. The speaker was impressed with the level of preparedness of the class and gave a generous sample of his company's product to each of the students in the class.

Guest speakers can be used in an online class as well. Simultaneous webcasts are one option but these are more difficult to do and require more preparation and planning. We have been more successful in posting video recordings of a speaker's talks to the course content management system. Recorded videos are also reusable. To make sure there is feedback and participation, students are required to

prepare questions before the talk and the guest speaker replies to select questions. This approach is well-received by both students and guest speakers.

#### **Group Presentations**

Presenting findings in front of a group of peers can be stressful, but it can also be a great motivator. Aside from grades and scoring, there is peer pressure involved, which forces many students to work more diligently on a presentation. Since the presentations are related to a topic of interest, there is enhanced intrinsic motivation as well. Presentations are required to be made in groups of two or more which requires team effort and collaboration.

One of the authors is offering his face-to-face students the option to submit video recordings instead of physically presenting their report to the class. We believe these recorded video presentations have several benefits. First, they provide viewing flexibility. They can be viewed as part of the classroom time or outside of the class. Face-to-face classroom sessions dedicated to student presentations are bound to be a race against time to make sure all of the scheduled presentations are covered. Instead, the recorded presentations can be reviewed and evaluated with less concern for classroom time limits. Using video recordings also allows us to better focus on assessing the presentation rather than maintaining schedule in the classroom. Third, in many cases we note that the quality of the recorded videos is better than what students deliver physically. Most indicate that they spend more time preparing for a video than a face-to-face presentation. Recorded presentations are quite useful in an online classroom as well. In online classes, the presentations are posted to the class web platform so that other teams can review and comment on the contents. In general, we believe video presentations encourage students to be creative and enable them to find new ways to share information with their classmates.

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## From Online to Face-to-Face

### *Enhanced Material Delivery*

These days there is a wealth of material that can be shared to enhance a typical OM class. There are case studies, magazine articles, web links, blogs, podcasts, and other recorded media to fill in megabytes of memory. The real difficulty for OM instructors is in properly filtering, summarizing and organizing the material so that students are not overwhelmed. Course content management systems (WebCT, Blackboard, eCollege) are quite useful for this type of effort. For example, Internet-based videos such as YouTubes, podcasts and other similar links can be categorized in one section. Links to professional sites, (APICS, ISM, etc.) can be placed in another. Recent event articles and other matters of interest can be placed in yet another organizer page. These specialized areas can then be integrated through the use of hyperlinks.

The benefit of using enhanced material delivery is in the ease of distribution and access of information. It is seldom necessary to create a large bundle of handouts for class and worry about shortages or excess copies for the students. Using an online course content management system, class hand-outs are carried in their own section and are linked to the appropriate week's material. Students are then free to download and print as they wish. This approach saves both time for the instructor and money for the university by avoiding unnecessary printing and copying expenses.

### *Discussion Questions*

Good OM instructors are well aware of the need to engage students in their lectures by asking for comments and input. Nevertheless, involving a face-to-face classroom in course related discussions can be difficult, time consuming, and distracting if the discussion does not lead to much learning. Unlike some MBA cohorts, most undergraduate students have minimal basis for a deep enough opinion to share with the rest of the class. However, we find that students in online classrooms are more engaged and have

more to say about the course topics. Unlike face-to-face students, online students do not have time limitations and can therefore contemplate and better develop their thoughts. Online discussion boards allow students to post their impressions, opinions, and experiences on the weekly material in discussion threads specialized by topics. Furthermore, online discussions are maintained on the course website, allowing for other students to read and respond to one another. Implemented properly, a great thread of discussions can occur without the need for the instructor to continually redirect and motivate student responses.

There are other benefits to having online discussion threads. From a student's perspective – be they online or face-to-face – having a well administered area for discussion threads reduces feelings of isolation and helplessness. Reading other students' questions and responses helps enhance the feeling of group-belonging. For the instructor, benefits of threaded discussions include decreased repetition as students can see when a question has already been posed. Without a discussion thread, the same question may be asked a few dozen times. Having a record of the conversation means an answer need only be posted once. Also, many simple questions are answered by other students. This leaves the instructor to deal with fewer administrative minutiae and allows more time to create innovative course content.

### *Virtual Office Hours*

We all know how rare it is to get students to drop by during office hours. Except for a select few, most students prefer to ask their questions just before or after class or by sending an email at odd hours of the day (or night). The downside of email is that it does not allow for instant interaction. When teaching material requiring significant interactions (mathematical concepts, programming, trouble shooting of spreadsheets), sending emails back and forth can actually create more confusion.

We have found that virtual office hours where students can drop by (using

a Messenger system such as Yahoo or AIM or Skype) and discuss their questions via voice chat or text message have been quite helpful. When necessary, a shared whiteboard (available in WebCT and Blackboard programs) to draw and explain a concept can help students understand concepts more easily. A hybrid office hour for our face-to-face classroom gives students an opportunity to send an instant message to ask their question and get an instant reply instead of stopping by the office. This not only saves travel time, but also helps increase traffic to our office hours. Some instructors include instant messenger IDs, Skype and web page information on their syllabi to improve their accessibility. Students sincerely appreciate this and, in our experience, rarely abuse the privilege.

### *Group Assignments*

Group projects play an important role in enhancing student learning. Research has shown that groups are more creative than individuals in developing novel solutions to non-linear and complex tasks. Group projects not only help develop better results, but also help enhance collaboration, a key attribute that hiring organizations request from new recruits. However, group projects are not without challenges. Inevitably there are difficulties in arranging meetings and in dealing with free-loaders. Also, for many students, meeting in person is a luxury of time not readily available.

Group presentations are a required aspect of most of our online OM courses. Students are not obligated to be physically present for these. Instead, students are required to video record their work and submit it to me via the course website. Students have commented that even though "video submittals" require more work, they are happier with the end result. We have found that compared to in-person presentations, video recorded student presentations are of better quality and generally include more creativity in the use of the presentation software.

Student groups are encouraged to meet through electronic means as often as possible. Most of the groups meet via

online conference, phone conference, and video conferences using a variety of instant messaging and Voice over Internet Protocol tools (such as Skype) freely available online along with group workspaces within the course content management system. It seems that even when there is a possibility of physically meeting, students prefer to virtually collaborate. An additional benefit of virtual collaboration is that this approach familiarizes students with methods they will use in the workforce.

With any group project, there is the possibility of free riders who do not contribute their share to the work. We have minimized this by requesting frequent peer-evaluations. An online survey tool included in the course content management system or a standalone tool such as Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)) allows each team member to provide candid feedback for their team members at every milestone in their group project.

### Concluding Remarks

In this article, we focused on the positive attributes of both online and face-to-face classrooms and how they can enhance one another. We believe neither approach is perfect. For example, face-to-face classrooms can be a scheduling burden for working students. In contrast, the weakness of online education is in its inability to efficiently verify learning. As of yet, technology does not allow practical means of assuring that every student is taking their own examinations and doing so without help from other sources. However, technology is improving and perhaps we will see answers to the issue. A recent article by Heizer, Render and Watson on the topic introduced some means that can help in that regards. Nevertheless, until there are means to reliably evaluate online students, we believe the use of a purely online course will not carry the same level of quality as face-to-face classes.

However, shortcomings of either delivery method should not prohibit us from leveraging the clear benefits they can provide in enhancing teaching. As noted, there are distinct advantages to

online and to face-to-face delivery of instruction. At the root of these is the richness of delivery provided in a face-to-face environment and the removal of temporal and geographic constraints by the online environment. When merged properly, the two can provide a winning recipe for delivering courses in Operations Management. Clearly, as advocates of continuous improvement OM instructors should be the first to recognize, test, and incorporate tools that can help improve our course deliveries.

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