Development of a Web-Enhanced Live Interactive Television Course

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Abstract

A variety of social, economic and technological factors are converging to create increased demand for long distance education. This demand for distance education is in turn transforming how knowledge is delivered to students. New technologies are emerging to help address this need. From the instructor's perspective, this presents a challenge. Not only does the instructor need to learn how to use the new technologies, the nature and style of delivery of the course content itself has to be adapted to the new medium of delivery. This paper describes the process that was followed in transforming a traditional course in Engineering Economics, formerly delivered with the traditional chalk-and-blackboard method, for delivery as a web-enhanced live 2-way interactive television course. The issues discussed include the instructor's familiarization with the new technology, preparation of new course materials and visual aids, and incorporation of computer-based tools to enhance student understanding. The paper also discusses the administrative procedures that were put in place to ensure smooth running of the class and create a positive learning experience for both the on-campus and off-campus students.

1. Introduction

A variety of social, economic and technological factors are converging to transform the nature of higher education today. Some of the key symptoms of this change have been noted by leading academics and social commentators. James Duderstadt, President Emeritus of the University of Michigan - Ann Arbor, has this to say: "Today's undergraduate student body is composed also of increasing numbers of adults from diverse socioeconomic backgrounds, already in the workplace, perhaps with families, seeking the education and skills necessary for their careers" [1]. Sir John Daniel, Vice-Chancellor of Britain's Open University says, "Higher education is in crisis world-wide. The ingredients of the crisis are access, cost and flexibility and they blend differently around the globe [2]. Renowned management consultant Peter Drucker caused an uproar in academia when he said: "Thirty years from now the big university campuses will be relics… The college won't survive as a residential institution. Today's buildings are hopelessly unsuited and totally unneeded" [3].

The following questions raised by Daniel indeed reflect what institutions of higher education should be asking themselves today: Are universities teaching the knowledge and skills that

students need? Do our teaching methods match the habits of today's learners? Are universities confident about the quality of what they do? Bluntly, is the traditional campus model of the university appropriate in the era of lifelong learning? [4]

It is clear then that enormous challenges are facing today's institutions of higher education, with a need to reduce costs, improve access, and cater to a changing population demographic. This societal change promises to have a profound impact on the traditional university. The responses to this challenge have been quite varied, including a wide range of approaches to distance education. This paper is not an attempt to evaluate the relative merits or otherwise of the various approaches, but rather focuses on the instructor's role in implementing one particular approach - specifically, web-enhanced distance education using interactive two-way television.

2. Towards Distance Education

The traditional approach to higher education involves a cohort of students coming together at a specified time and location in a formal classroom setting to meet with an instructor. Knowledge is transferred from the instructor to the students in a lecture format in which the students are mostly passive recipients of knowledge from the master. In many cases today, time, location or cost constraints mean that this traditional approach is not viable and alternative methods have to be applied. To reach non-traditional students more conveniently, our university has established a number of extension centers around metropolitan Detroit where students can take a large number of classes without having to commute all the way to the downtown campus. This makes it more appealing to working adults because they can take classes close to their places of work or residence and minimize time lost to commuting. The university has also entered the field of distance education using interactive television (ITV). The course described in this paper was adapted from a traditional chalk-and-blackboard course to a web-enhanced ITV-based distance-learning course.

It is imperative that if distance education tools are going to be used, the instructor designing and delivering the course be completely comfortable with the new technology. To help accomplish this, Wayne State University makes creation of distance education courses voluntary. Each department decides what courses or sections of courses it would like to offer via distance learning. Incentives for faculty to participate are also left to the department to decide. The university offers training programs to help interested faculty understand the basic mechanics of preparing and delivering a distance-learning course.

To get myself ready for delivering distance courses, I participated in a two-day workshop for WSU faculty that was taught by Virginia Ostendorf [5,6]. This workshop orients instructors to the demands of the video classroom. The prospective instructor gains familiarity with the layout of the classroom, and the various pieces of equipment available in the classroom and their effective use. Our particular classroom incorporates multiple cameras in the originating room and the remote site(s), computers, and a VCR; all integrated to work as a single system under the instructor's control. The workshop offered hands-on training in operating all components of the system, and important guidelines for preparing instructional materials for delivery using the system. The workshop proved to be very helpful. It was particularly eye-opening to realize that the experience of a student taking a televised distance class needs to be deliberately designed to

be different from that of a person watching a scheduled television broadcast. In particular, the following common perceptions about watching regular television need to be kept in mind when developing a televised course, and deliberately countered during the development of course materials:

- TV is entertainment
- TV requires no action on the viewer's part
- TV is something we can 'tune out' at will
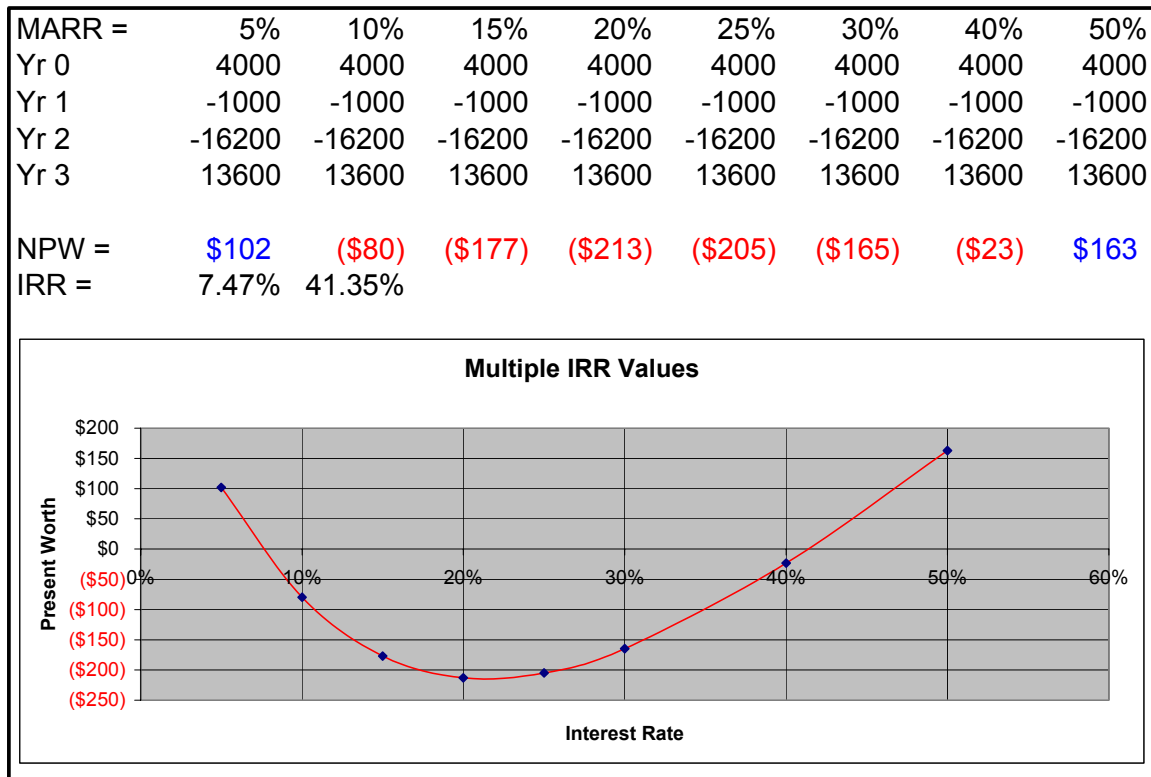- TV abhors silence

3. Design of Instructional Materials

Most students and instructors are used to the lecture format, which introduces important principles along with examples of applications, with the textbook serving to provide the details and reference material. An instructor can answer questions on the spot and change course if he senses the students are not grasping a particular point. For a televised course, the danger is that the instructor can become an entertainer as he attempts to capture and keep the attention of students. If not carefully thought out and designed, everything that happens in the course would revolve around the instructor as the star of the show. However, if the student is to learn effectively in a televised course, it had better provide at least a comparable experience to what students are used to in the traditional classroom. For courses delivered simultaneously to multiple locations, students at both the originating site and the remote site(s) must be purposely catered for. In particular, learning materials should be designed to capture and retain the attention of students at both locations. In any case, the students at both sites must remain actively engaged. The successful televised course should not be like a commercial television broadcast, but rather a multimedia presentation including a mix of the following characteristics:

- Active involvement by students at all participating sites
- Multiple presentation media with planned change elements to help retain student interest
- Planned silences are especially important to allow students to think
- Animations and simulations where appropriate
- Actual physical models of reasonable size if possible
- Examples of practical applications

These principles were implemented in our Statics course as reported elsewhere [5]. In this paper, we discuss how these ideas have been implemented in our course in Engineering Economic Analysis. In this course, computer-based instructional tools were used heavily. These allow the instructor to plan out the main points of a lecture presentation so that less time is spent in writing and more on explanation. In this case, presentation slides were prepared in Acrobat and PowerPoint. PowerPoint's animation capabilities proved to be of great value as they allowed the instructor to present procedural steps in problem solving in a succinct yet fully engaging manner. Another tool that proved very helpful was Excel, which was used to illustrate important issues in cash flow analysis and problem solution procedures. Advantage was also taken of Excel's built-in functions for financial analysis. Consider for example the question of determining the internal rate of return (IRR) on an investment. The definition of IRR is that it is the interest rate for which the Net Present Worth (NPW) of a project is zero. When done by hand, determining the IRR

value is a tedious task requiring an iterative computation of NPW values at different interest rates until an interest rate is found for which the NPW value is zero. Excel can be easily set up to do the relevant calculations internally and simply show the result. Convenient as this is however, it is not an effective approach to teaching the concept since the students would not see the underlying iterative computations. This is where Excel's versatility can be exploited by displaying the results from intermediate steps in the solution, instead of just giving the final answer. Excel's graphical capabilities can make the point even more dramatically by helping the student to visualize the variation in NPW values as the interest rate used for analysis is changed. Eventually, an interest rate resulting in a zero value for NPW is determined. Figure 1 shows how Excel was used to demonstrate this process for a problem resulting in multiple solutions.

MARR =	5%	10%	15%	20%	25%	30%	40%	50%
Yr 0	4000	4000	4000	4000	4000	4000	4000	4000
Yr 1	-1000	-1000	-1000	-1000	-1000	-1000	-1000	-1000
Yr 2	-16200	-16200	-16200	-16200	-16200	-16200	-16200	-16200
Yr 3	13600	13600	13600	13600	13600	13600	13600	13600
NPW =	$102	($80)	($177)	($213)	($205)	($165)	($23)	$163
IRR =	7.47%	41.35%						

Figure 1: Demonstrating Multiple IRR Values Using Excel

As the above figure shows, Excel allowed the instructor to modify parameters on the fly during teaching, to demonstrate how answers are affected when pertinent problem parameters are changed. This use of Excel was easily integrated into the medium of a televised course because the classroom had all the required technology built-in. The computer output could be projected onto a screen in the classroom as well as being simultaneously transmitted to the remote receiving sites. Examples of the Excel spreadsheets used in classroom instruction were stored on a course web site for students to review later at their leisure.

Using computer animations and simulations is very helpful in making important concepts easily understandable to the students. One disadvantage of this however is that the students find it more

difficult to take notes as the pace of the class tends to be faster. If the concept being demonstrated is fairly straightforward, this may not be a major problem. However, I have adopted the technique of providing the students with a stripped down version of the presentation as a classroom handout. They can annotate the handout as the class progresses to keep track of the key points of he lecture. This is important in reducing the student anxiety because they do not have to worry about copying complicated notes off the screen and they can pay more attention to the points being made in the lecture. This has the additional advantage of keeping the student actively involved in the class while saving on the time required to cover the material.

4. Logistical Support

If a live televised course is to progress smoothly, it is essential to have good logistical support. For example handouts are only helpful to the students if they can have them in hand during the classroom discussion of the pertinent concepts. For the course discussed here, we have used various levels of logistical and technical support to ensure smooth running of the course. The key elements of this are the internet, the telephone, and the fax machine. WSU has adopted Blackboard as its standard web-based course delivery system. In the course under discussion, Blackboard is utilized to disseminate a variety of course information such as the syllabus, class notes, handouts, and homework assignments. Students can then review these at their leisure. I typically post notes and handouts on Blackboard for students to download prior to the start of class. All students (local and remote) pick up and submit their homework online, and the graded homework is returned online as well, using Blackboard's Digital Drop Box function. Students are also able to carry out online discussions outside of regular classroom time. This creates a sense of community among students in diverse locations.

Special provisions are made when it comes to exams since these are done in the traditional pen and paper format. The administrator of the remote site is responsible for providing proctors for all examinations and faxing the finished exams in to the main campus. Graded examinations are also returned to the students via fax. The phone is handy for verifying receipt of the materials.

Additional technical support is available at both the originating site and the remote site to take care of equipment related issues. In our experience, the equipment has been reliable for the most part. On one occasion however, equipment failure meant that we could not establish connection with the remote site. We have tried two different approaches to handle this type of situation. One was to continue with the class at the originating site but have the lecture recorded. The videotape was then made available to the students at the remote site. Another approach was to just cancel the class at both sites and simply reschedule the missed lecture within other time slots available on the schedule. We had the flexibility to do the latter because of the class scheduling format followed by the school. This approach was more acceptable to the students because it treated all students equally. However, we were fortunate to have a flexible schedule that also happened to work for all the students involved. This would be an atypical situation and it is the author's opinion that the videotape backup should always be considered. Things indeed do go wrong from time to time.

In the same vein, when a presentation relies heavily on the use of a computer, backup materials that can be used with the simple overhead camera should always be available. It is not unknown

for a computer to malfunction and, as happened to us on one occasion, for the technician to be absent on just the day that the malfunction happens to occur. The advice here is to be prepared for the unexpected.

5. Evaluation

Developing and delivering this long distance course was indeed an interesting challenge. It was therefore with some equanimity at the end of the semester that the usual course evaluation was carried out. I was particularly interested to see how the students in the on-campus section would compare with those in the off-campus section. Table 1 shows results for selected questions from the university's Student Evaluation of Teaching (SET) instrument. The rating scale used is 1 - 5, with 5 being the best possible score. A rating of 3 or higher on any question is considered good and 4 or higher is very good.

Table 1: Student Evaluation of Course

Evaluation Factor	Median Rating	
	Local Section	Remote Section
How much have you learnt in this course?	4.5	4.0
How would you rate this course overall?	4.0	3.0
The course was well organized	4.4	3.7
Instructor presentations were clear	4.0	3.4
Illustrations and examples were helpful	4.4	3.4
Instructor was a motivator	4.6	3.8
Instructor encouraged questions	4.6	3.7
Instructor was respectful	4.8	3.7
Overall instructor rating	4.0	3.3

The first broad observation is that the students at both locations were generally happy with both the course and the instructor. Although they were generally happy, it is clear nevertheless that the students at the remote site were somewhat less satisfied in all the rating categories – in some instances, by quite a significant amount. This result was quite intriguing since the instruction at both sites was identical. More so, results from prior courses over several semesters taught using this format did not have the same degree of variation [6]. It is not yet clear if there was something peculiar to this course, to the specific cohort of students, or some other unknown factor. For this reason, the evaluations in this course will be monitored closely in the future to see if this trend continues and if so to try and figure why this is so.

6. Conclusion

The experience gained in adapting the course for delivery using distance education was quite valuable. The nature of the materials used in the classroom had to be changed to meet the needs of distance education. It turns out that the changes necessitated by the move to distance education were actually beneficial for the on-campus students as well. The move to a largely computer based delivery made possible the use of slides, handouts and animations in a manner that had not been tried before in this class and students were able to learn more effectively as a

result. In particular, the use of the Blackboard web-based course delivery system to support this course proved beneficial for both the instructor and the students. The end-of-semester course evaluations indicated that both the on-campus and off-campus students liked the course but with the on-campus section showing higher levels of satisfaction than the remote section.

7. References

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Biographical Sketch
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