Enhancing Conferences and Symposia using Web Based Asynchronous Techniques[1]

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Abstract. This paper describes ways to enhance conferences using Web-Based asynchronous techniques and their advantages and disadvantages as compared to a traditional synchronous face-to-face conference. The paper also treats the development of the prototype WebConference as a Case Study, discusses the prototyping experiments using the world as a laboratory and provides several lessons about the requirements and systems engineering processes.

Keywords. Internet, Virtual Conference, Requirements Engineering, Case Study, Distance Learning.

INTRODUCTION

The Web Based Asynchronous Virtual Conference (WebConference) (Kasser 1999) provides a framework for using the World Wide Web (WWW) to free systems and software engineers from the constraints of attending conferences, continuing education classes and project reviews in real time. The WebConference can be used to compliment or even in some circumstances replace the traditional conference. The major innovation in a Web-Based asynchronous Virtual Conference is that the participants can view and discuss the presentations at their convenience from their desks by clicking on the appropriate title in a web page. The advantages of the Web-Based asynchronous Virtual Conference include:

- Participants no longer miss sessions because they are in another one.
- Travel time and costs are reduced to zero.
- The session is available for posterity long after the conference is over.
- There is no time limit on a presentation. Unlike in a traditional conference, in which the session is time limited, in the WebConference a presenter can take as much time as is needed to explain the topic. The audience is free to stop viewing the presentation at any time.
- Presentations can be updated after the conference based on the presentation discussions.

BACKGROUND

In 1997 INCOSE announced that the 2001 international symposium would take place in Sydney Australia. While holding the symposium outside the country is laudable for internationalizing the organization, it presented a high risk to the domestic US organization. Employers fund the attendance of most domestic members at the symposia, and it seemed likely that the employers would not:

- Be willing to fund the added expense of the overseas trip to Australia.
- Allow key employees to take time away from work to travel to Australia.

Consequently, the level of attendance by stateside members was expected to drop. In an attempt to mitigate this risk, (Kasser and Weiskopf, 1998) proposed to use technology to manufacture a real time multi-location tele-conference based on the INCOSE Sydney symposium in 2001. The teleconference was proposed as an event with simultaneous participation (presentations and audiences) in several locations around the world, i.e., Australia, USA (East and West Coasts), Canada, Europe, Africa, etc.

[1] This work was partially funded by the DSTO Centre of Expertise Contract

In the time interval between the submission of the paper and the presentation at the symposium, Dr. Kasser was pioneering asynchronous audio enhancement of on-line class lectures for distance education at the Graduate School of Management and Technology at University of Maryland University College (UMUC). Recognizing that conference presentations and classroom lectures are similar, Dr. Kasser prototyped an approach for delivering presentations asynchronously, by pre-recording the audio for a PowerPoint presentation, and then linking the audio to the presentation and storing the files onto a CD-ROM. The concept was first demonstrated at the INCOSE symposium in Vancouver by playing the recorded presentation to the conference session without notifying the audience of what was to happen[2]. The audience in fact did a double take when the presentation began, and the voice was uninterrupted as the speaker raised a soft drink can to his lips and drank deeply.

PROTOTYPING CHANGES IN REAL TIME

As with many projects resources were very limited for this project. Since INCOSE wasn't able to provide the opportunity for prototyping, other opportunities were taken as and when they occurred.

Dr. Kasser continued to use voice enhanced technology in his class on Software Maintenance (CSMN 648) to deliver the first class that used a full semester's worth of audio enhanced lectures in distance learning at UMUC in fall 1998 (Kasser and Kerby 1999). Having solved the problem of how the instructor delivered audio enhanced presentations in the distance learning environment; attention turned to how the students could:

- Communicate synchronously using voice over the Internet, and
- Deliver their audio enhanced classroom presentations in an asynchronous manner.

The voice over the internet problem was solved by the PhoneFree shareware software package which allows a group to communicate by typing, while simultaneously providing the capability for point to point voice communications.

The students access the audio enhanced lectures from a web page. It was quite possible for the students to access their presentations in a similar manner. And, if they were using a web page, then other features could be added to create a web based conference. Now, Dr. Kasser was also the instructor for the Software Engineering Project class in the Master of Software Engineering (MSWE) degree in spring 1999 at UMUC[3]. He introduced the concept of the WebConference as a final project to the class and a group of students then built the prototype over the course of the spring 1999 semester[4]. Dr Kasser set up a website for an experimental conference in February 1999 and requested submissions of presentations on systems and software engineering that had been made at conferences within the previous three years. The response from INCOSE was somewhat less than enthusiastic[5].

The Fourth Annual Intelligence Community Desktop Collaboration Conference and Expo. in Virginia Beach, VA, in May 1999 used distance presentation technology in one session. The presentation was given via distance techniques in the synchronous mode. The presenter, Doug Vogel of City University of Hong Kong, was located in Hong Kong and made the synchronous presentation using Microsoft NetMeeting software. The screen in the conference room showed:

- A small talking head of the presenter which was updated about once a second. There didn't seem to be much value added in the slight movement, it was more distracting than additive.
- The PowerPoint slides for the presentation, which were controlled in the conference room.
- A text window for typing questions back to the presenter. However, only the session chair could type into the communications link.

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[2] A first at an INCOSE symposium if not elsewhere, although the CD-ROM presentation was tested at an INCOSE-WMA Chapter meeting before the conference.

[3] MSWE 617 is the capstone course in the program. It may be considered as a comprehensive examination covering the application of the tools, skills and techniques the students have acquired in the course of their studies. This course provides experience in applying software-engineering techniques by giving the students an opportunity to produce software working in teams under the schedule constraints commonly experienced in industry. The instructor emulates the vagueness shown by typical customers in describing requirements. The instructor serves as a guide and mentor, not as a traditional teacher. The students are expected to have acquired the knowledge of what to do and how to do it from the prerequisite classes. It is up to the students to form their own teams (organization) and schedule their work to meet the deadlines imposed by the contract (syllabus).

[4] As the programmers on the student team worked at UMUC and were involved with maintaining and upgrading the UMUC distance learning platform, WebTycho, the WebConference was built to seamlessly interface with WebTycho in a future release of WebTycho.

[5] One person submitted her PowerPoint presentations, but audio never followed.

While there were several noticeable hits on the presenter's voice during the presentation, the link was reasonable and there was little difference in audio quality between that technology-enhanced presentation and the conventional presentation that came next in the session room.

The Web Initiative in Teaching conference at UMUC in May 1999 provided an opportunity for (Kasser et al. 1999) to give a workshop on producing audio enhanced PowerPoint presentations. The workshop was presented (using the output of the process being demonstrated) by means of synchronous streaming technology over the Local Area Network (LAN) at UMUC. A few audio dropouts were also noted. Since the presenter was in the room with the audience he was able to provide a meta-commentary on the network effects on the presentation as well as partake in the discussions.

The INCOSE Brighton experiment. The asynchronous presentation technology was again used in the INCOSE symposium in Brighton. Dr. Kasser made a presentation in a panel forum from his desk at UMUC. The presentation, which described the capabilities of the WebConference (Kasser 1999) was played from a CR-ROM in the session room. While the presentation was in progress, Dr. Kasser connected to the session room via the Internet using Phonefree software. Dr. Kasser was able to hear the end of his asynchronous presentation then take part in the synchronous question and answer discussions. The quality of the audio, as measured by an ear, was as good as a telephone. Since Phonefree has a text mode link in parallel with the audio link, several of his students were able to monitor the text communications between Dr. Kasser and the session chair.

The first WebConference experiment. The first use of the Web Based Asynchronous Virtual Conference was in the summer 1999 Semester in two classes in the MSWE degree. Students in the -

- Two sections of the distance education class on Software Maintenance were allowed to make audio presentations to their peers as if they had been in the classroom.
- Face to face class Systems Engineering were offered the opportunity to use the audio enhancement technology and record their presentation instead of making it in front of the class. As a further experiment, one recorded presentation was mixed in with the live presentations on one of the evenings that the student presentations were made.

The Fifth International Conference on Asynchronous Learning Networks (ALN), held at UMUC in October 1999 provided another opportunity to use the technology to discuss the technology. The purpose of the experiment was to repeat the Brighton experiment, but over a link between UMUC and the University of South Australia (UniSA) in Adelaide. Thus the (Kasser and Cohen 1999) presentation was recorded to CD-ROM for asynchronous delivery, and the discussion would be synchronous (at 1 a.m. Adelaide time). The experiment failed because the synchronous discussion could not be held as the conference room at UMUC could not be connected to the Internet in a timely manner[6].

SETE 99. Two weeks later a preplanned opportunity arose to test the links the other way round. The Systems Engineering, Test & Evaluation Conference (SETE-99) Conceiving, Producing and Guaranteeing Quality Systems was held in Adelaide. The (Kasser Goff and MacKenzie 1999) panel was a full-scale panel forum using a mixture of techniques -

- Kasser gave his presentation by playing the CD-ROM recording in the session. The discussion was synchronous. This was a repeat of the INCOSE Vancouver 1998 experiment with identical results.
- MacKenzie's presentation was made in an asynchronous manner from a CD-ROM. There was no discussion.
- Goff's presentation was made via real-time streaming technology from the UMUC server. The link, which stretched half way around the world, was as good if not better, than the one on UMUC's LAN in May[7]. Dr. Goff was also on-line for the synchronous post presentation discussion.

There were technical difficulties during the SETE 99 panel. While the Phonefree text link worked very well, the audio portion could not be made to work. The modem in the laptop computer also did not work and a spare laptop had to be utilized[8]. However, by changing the order of the speakers, and using the time taken by the asynchronous presentations for some judicious real-time troubleshooting the show was completed. This had been a live link and it had (sort of) worked. Only the session chair knew how close it had come to being a failure.

The DCNet99 conference in November and December 1999 was a fully online conference on the future of design computing sponsored by The International Journal of Design Computing and hosted at the University

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[6] The rooms are configured for Internet connections, but the sockets have to be connected to the LAN each time an Internet link is needed.

[7] Murphy must have been in the audience.

[8] The author gratefully acknowledges the help of David Harris of the Systems Engineering and Evaluation Centre at the UniSA for the loan of his laptop computer.

of Sydney in Australia. The Conference began with a two-week period, starting on November 16, 1999, in which the accepted presentations were available for comment and threaded discussion. This was followed by four days of synchronous discussion, November 30, to December 3, in a Virtual Conference Room using a MOO enviroment[9] with slides a whiteboard, and communicating by typing.

The Innovations in Higher Education 2000 conference was a traditional conference in Helsinki in August/September 2000. Dr Kasser presented using a prerecorded asynchronous presentation to demonstrate the topic (Kasser and David-Chung 2000). One major use for the technique noted at the conference is for preparing and presenting a presentation in a foreign language. It frees the presenter from

- Having to think in the foreign language in real-time during the presentation.
- Reading the paper in a monotone to the chagrin of the audience.

The 'Distance Education: An Open Question?' conference hosted by UniSA in September 2000 allowed participants to post their asynchronous presentations on the Web site. Instructions were provided for the creation of the presentations via the conference web site. However, not one single presenter made use of the feature. The creation of the presentations was seen as being too difficult, and the majority of the presenters did not have a technical background.

The SETE 2000 conference provided an opportunity for a distance mode session of three presentations. None of the presenters were in the session room in person; two were in the USA and one was Interstate. Each of the presentations was shown asynchronously using Realmedia. The session chair initiated the presentation. Each presenter then telephoned into the session room about 5 minutes before their presentation was scheduled to finish, waited while the presentation finished and then took part in the question and answer session in a synchronous manner. The responses to audience questions were relayed to the room by simply placing a radio microphone next to the telephone earpiece.

OBSERVATIONS ON THE CASE STUDY

When the (Kasser and Weiskopf, 1998) paper was written, the concept was for a totally synchronous multi-site conference with bi-directional audio-video links. However, a totally synchronous conference is prone to a number of disadvantages including, but not limited to:

- **Communications dropouts** - The communications links have to work perfectly all the time at all site locations.
- **Cost of communications links** - Given that communications costs were falling and costs in 2001 were expected to be much lower than costs in 1997, the costs could still be prohibitive if two way video were to be used. However, the need for two way video was uncertain.
- **Requirement to see the presenter is not firm** - While there are several different approaches to synchronous video over the Internet, they are all technology driven, not application driven. These experiments showed that when the lights are down in the conference room, there is little non-verbal communication from the presenter since most people are watching the presentation graphics. If the presenter chooses to take questions at the end of the talk, there is no difference between her delivering the presentation synchronously or asynchronously. There thus seems to be no requirement to see the presenter during the presentation, just the presentation graphics.
- **The perception of the difficulty of producing asynchronous presentations** - There seems to be a perception that producing asynchronous presentations is difficult. This has been seen in the failure of the faculty at UMUC to adopt the technology and the lack of participation at the Distance Learning: An Open Question conference. The reality is otherwise as noted by those who actually tried the process. A survey of post-graduate students at UMUC (Kasser and David-Chung 2000) showed that when the students are required to do it, they do it. When it is not required, the perception of the difficulty drives the reality.
- **Synchronous or asynchronous, that is the question** - Students' comments on the difference between the recorded and live presentations were that they couldn't interrupt the recorded presentation with a question. This was the same response to the question posed to the audience in the first demonstration/experiment at INCOSE in Vancouver and in subsequent conferences. Thus, **since conference sessions generally comprise a presentation then a discussion, there is no requirement for the presentation to be synchronous.** Comparing the session in Virginia Beach to the (Kasser and Weiskopf, 1998) presentation, and the SETE-99 Panel, there didn't seem to be any real advantage in

[9] "MOO" is a complex acronym for MUD, Object Oriented, where MUD is itself the acronym for multi-user Dimensions/Dungeons, a text-based virtual reality originally used for the type of computer games known as Dungeons and Dragons.

the synchronous presentation over the asynchronous one. In fact the asynchronous presentation is more robust than the synchronous presentation as shown in SETE-99. This observation reinforced the perception that asynchronous presentations are better even in a synchronous conference[10]. Prerecorded asynchronous presentations also overcome the "no show" problem faced by the conference organizers that results in last minute schedule changes.

- In the DCNet99 conference, the asynchronous discussions suffered from the same problem as the UMUC student WebConference. The presenters did not always return to the thread to answer posted questions. The synchronous presentation and discussion had several disadvantages, the most notable being:
  - The times were equally inconvenient for everybody. For example, the third session of DCNet99 was held at a time that was 8 a.m. in Sydney, 4 p.m. in New York and 10 p.m. in Zurich.
  - Routine activities preempted this author's attendance at the scheduled times for all sessions. As the synchronous discussions were recorded they could be viewed after the sessions had terminated which made the real-time session unnecessary.
- The MOO environment had to be learned to find one's way around the conference. The MOO environment also showed the actions of the participants. So it was distracting to read that Fred had left the room in the middle of the speaker's session text.
- The presentations were displayed at the SETE 2000 conference using Realmedia compressed files. There was a small but noticeable difference in the quality of the PowerPoint slides and the audio when compared to playing a non compressed PowerPoint presentation with WAV format audio. The presentations were scheduled in the afternoon in Brisbane, which happened to be in the middle of the night in the Eastern USA.
- Due to the varying topics and presenter styles if was difficult to identify issues that were technology related.
- After experiencing asynchronous audio enhanced presentations at the INCOSE and SETE conferences, the DCNet99 was a disappointment.

[10] They can be edited to firm up the presentation by deleting "ums", and "errs", etc. They can also be set to an exact time so the session does not overrun.

THE MOVING TARGET

While this research was in progress, the world did not stand still and wait. The state of the art in distance education was advancing, as was the availability of conference papers on the WWW. The organizers of the AusWeb99 conference actively sought to change the discourse within their conference. The papers were available on the Web a month before the conference, and were to be couriered to participants a week or two before the conference (Debreceny and Ellis 1999). The objective was for participants to have worked out which papers they're going to attend and, at worst, skimmed or, at best, read the papers before they arrive at the conference.

During the course of this research, people have repeatedly stated that the WebConference will never replace a live conference. If a paradigm shift is permitted, and as (Kuhn 1970) stated they hardly ever are, the situation can be seen differently. Instead of thinking of live, web assisted and web-based conferences, think of a continuum with synchronous at one end, and asynchronous conferences at the other. It can then be perceived that conferences held for different purposes might use a different mix of synchronous and asynchronous techniques and there is a place for a totally asynchronous conference.

THE EVOLUTION OF THE CONCEPT

Like any other system engineering project, this project is an example of the concept evolving as the project progressed. The concept changed as follows:

1997 - Multi-site real-time traditional conference characterized by synchronous presentations and synchronous discussions. Full two-way video links are part of the concept.

1998 - Multi-site real-time traditional conference characterized by asynchronous presentations and synchronous discussions. The concept has evolved so that the sessions would be recorded on CD-ROMS that would be available in each session room. Full two-way video links are still part of the concept for the discussions.

1999 - Web assisted single site conference. All presentations are downloadable from the WebConference site. Discussions take place asynchronously. These discussions may happen in a manner similar to the UMUC WebTycho distance learning environment or via a Listserver. Two-way video links are eliminated. The WebConference evolved into the WebForum (Kasser 2000) in late December.

LESSONS LEARNED FOR SYSTEMS ENGINEERS

As more was learned about the capabilities of the technologies and as the capabilities of other technologies were discovered, the requirements for the conference evolved. However, had the conference been held at any time since 1998, each concept would have met the initial set (as well as the changes) of requirements. Thus it seems that the goal of system engineering is to provide a system that:

- Meets the customer's requirements as stated when the project starts.
- Meets the customer's requirements as they exist when the project is delivered.
- Is flexible enough to allow cost effective modifications as the customer's requirements continue to evolve during the operations and maintenance phase of the system life cycle.

This is of course impossible with today's technology. However, in many projects it may be possible to come close and achieve a large degree of convergence between the requirements and the capability of the system using the following techniques.

The major lesson seems to be **not to identify all the requirements** at the start of the project, but to identify the:

- **Highest priority requirements** - The show stoppers. The risk here are the failure to identify the critical requirments and the failure to set the priority correctly.
- **Real requirements** - As opposed to apparent requirements. For example, two-way real-time video links do not seem to be a requirement in this case. By eliminating them from the concept, the system became much simpler. Again identifying the real requirements is not an easy task.

One way to make a start is to use the Categorized Requirements in Process approach (Kasser 1997) and estimate the cost to implement the requirements and well as their priorities. When high cost requirements show up as low priority requirements, the customer will either have to delete the requirement or change the priority.

Since the requirements change over time, there is a need for build planning. The system must be built in such a manner that the requirements are implemented in the order of their priority (Kasser 1995).

The design path takes one from the domain of where everything is possible to what is actually possible. Thus:

- **Detailed design decisions should be made on a just in time (JIT) basis.** There is no need to complete the entire design before starting a build. However, the design must be feasible. The risk here is in determining the feasibility of the design. For example, in this case, synchronous voice communications can be achieved using the conventional telephone service or over the Internet. There is no need to make that decision early in the design cycle. The characteristics of the telephone link are known. The characteristics of Internet voice links are less known. Experiments can take place and the actual decision made just in time to implement the communications links. Since there is a possibility that the requirement for synchronous communications may be deleted in the future, any design effort would be wasted if the requirement were eliminated. In addition, if the requirment is not eliminated, then advantages can be taken of improvement in technology and/or cost reductions over time.
- **Design decisions must also maximize the "don't cares" as well.** The example here is Internet voice works (risk minimal) but the actual choice of the software can wait for a while. A better example is from (Kasser 1995). In the Luz solar electrical power generating system, each local controller utilized a sun sensor for accurately positioning the mirror. The sun sensor used a lens to focus the sun onto a pair of photo diodes. During the assembly process, the diodes were glued to a baseplate with a transparent glue. The physics department who were building the sun sensors did not place a requirement that there be no glue on the side of the diode illuminated by the sun. After all, the glue was transparent. A year or so later, they found that the glue slowly became opaque when subjected daily to the very high temperature at the focal point of the lens. This phenomenon resulted in the need to replace all the sun sensors. From a manufacturing perspective, there was little difference in mounting the diodes if the glue could or could not be allowed to cover the face of the diode, just a matter of care in the handling of the diode. Nobody asked about the characteristics of the glue of long periods of time under high temperature. If the requirement had been placed on the process, not to allow glue on the face of the diode, the characteristics of the glue under the high temperature conditions would not have mattered and the expensive sun-sensor replacements would have been avoided.

CONCLUSIONS

Systems Engineering to Sydney has been an interesting learning experience. The WebForum platform has been developed and is on the web at http://www.seecforum.unisa.edu.au/WebForum/ While the project has not produced a fully technology assisted symposium with worldwide participation,

INCOSE is not holding the symposium in Sydney either. In both instances, close enough seems to be good enough.

The evolution of the concept and the major change from a synchronous to an asynchronous conference could not have been foretold at the start of the project.

While the project is relatively simple, it has illustrated many principles of systems and requirements engineering.

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BIOGRAPHY

Joseph Kasser D.Sc. C.Eng, CM, has been a practicing systems engineer for 30 years. He is the author of "*Applying Total Quality Management to Systems Engineering*" published by Artech House. Dr. Kasser is both a DSTO Associate Research Professor at the University of South Australia (UniSA) and a Distance Education Fellow in the University System of Maryland. He performs research into improving the acquisition process. Prior to taking up his position at UniSA, he was a Director of Information and Technical Studies at the Graduate School of Management and Technology at University of Maryland University College. There, he developed and was responsible for the MSWE degree and the Software Development Management track of the Master of Science in Computer Systems Management (CSMN) degree. He is a recipient of NASA's Manned Space Flight Awareness Award for quality and technical excellence (Silver Snoopy), for performing and directing systems engineering. Dr. Kasser also teaches systems and software engineering in the classroom and via distance education.