THE TRI-DIRECTIONAL INTERACTIVITY
– UTILIZATION OF A WEB-CONFERENCE SYSTEM IN DISTANCE EDUCATION –

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Abstract

It is taken for granted that the learners' motivation and the effectiveness of the learning process in a distance education setting can be enhanced by ensuring interactivity. Yet, it can be said that most previous efforts have been made to establish the interaction process between the learner and the learning material, which should be distinguished from the interaction between the learner and the instructor. In addition, being able to interact with other learners has the effect of reducing the learners' anxiety and their feeling of being isolated. We propose that assuring these three directions of interactivity would create an ideal setting in a distance learning situation. Two learning activities utilizing a Web-Conference System were conducted in order to put this idea into practice. The reflections that resulted from the endeavors are valuable for reconsidering the education/learning process in a typical traditional classroom setting also.

Introduction

   The University of the Air, which can be called the pioneer institution in distance education in Japan, has been using TV and radio broadcast system as the major medium for delivering lectures to its students. Although each course has an accompanying textbook, the students are expected to view or listen to the lectures by either receiving the broadcast lectures at home via the terrestrial, cable TV, or satellite channel, or by visiting one of the 50 study centers around Japan to watch the video tapes or listen to the audio tapes of the lectures.

   We recognize that there are great advantages to the TV or radio broadcast system; the guaranteed high stability of the transmission is one of the most important aspects of the broadcast system for us, which we rely on to use visually and/or acoustically sensitive material such as paintings and music in our broadcast courses. On top of the stability of transmission, the amount of information which can be conveyed via the TV or radio is indeed immense. We can insert many visual and auditory aids to assist the comprehension of the lecture content or to enhance the effectiveness of its presentation. What is more, using TV and radio broadcast system enables a wide range of audience to have access to the courses we offer.　In addition to our registered students, many "unregistered" people are also enjoying watching or listening to the lecture courses we broadcast.　This public broadcast system has helped immensely to promote our recognition by the public since we were established 20 years ago. We would not have achieved the same reputation as we hold today had it not been for the social recognition and permeation of TV and radio broadcast as media of communication.

   However, we do recognize that there are limitations to using the broadcast system in the educational setting. The two major disadvantages are the uniformity of the information being imparted and the uni-directionality of the information flow. Being a means of mass communication, it is inherent in TV and radio broadcast system that all viewers/listeners receive the same information regardless of what situation or condition they may be in, and the viewers/listeners have very limited channels for communicating with the information source.　In the context of education, these natures of TV and radio broadcast system translates into watching/listening to the same lecture content regardless of what stage of comprehension a learner may be at for a particular topic, the lack of opportunity for asking questions about the lecture content, and the most salient of all, the lack of direct interaction between those who teach and those who are taught.

   These limitations have been compensated by several measures. The students are provided with a "Question Form" or an e-mail address that they can use to send in their questions to the university, which will be transferred to the professor in charge of the

course or a lecture. We also provide many face-to-face classes in which students will have direct contact with a lecturer. The lecturers in these face-to-face classes are not always the same as the professors who are lecturing in a broadcast course, but the students enjoy the valuable opportunities for having direct interactions with the lecturer. The lecturers can also tailor their talks according to the condition of the students, just as any lecturer would in a regular classroom. We also hold mentoring sessions for BA- and MA-thesis writing, which provide additional opportunities for some students to interact with his or her advisor and other students. Yet, by and far the most effective and the strongest compensation to the limitations caused by the nature of the broadcast system (i.e., uni-directionality and uniformity) has been the students' motivation to learn and their active attitude for studying.

On the other hand, we have come to realize that the compensations mentioned above are not enough to cover the wide range of students' backgrounds, needs, and readiness for taking on a particular learning activity. Especially since the University started accepting students not only from the Tokyo Metropolitan Area but from all over Japan, the backgrounds of students became considerably diversified, and hence their needs and readiness have also diversified to a great extent. As a result, it has become more and more difficult in terms of time, locations, cost, and human resources to provide the measures to meet the diversified needs of the variety of students. Just to state an example, as the result of students living in various parts of Japan, the students who are taking the same class became more dispersed; that is, it has become more difficult for students to be connected to other students who are taking the same class. This also means that it has become more difficult for the professors who are delivering the lectures to grasp what the students are expecting of them, which could direct the content of the course away from what the students are really interested in. These issues could lower the students' motivation to learn in more than one ways; not being able to give timely responses to what the students are looking for could be detrimental to the quality of the course content itself, and the feeling of isolation felt by the students could lead to a passive attitude for studying, which is much less effective than an active studying attitude.

Under these circumstances, we started looking for a means to make up for the limitations and drawbacks of our current system. One of the means we laid our eyes on was a Web-Conference System, with which several people in distant locations can interact with each other on a real-time basis. In this paper, we will report our endeavors to use a Web-Conference System as one of the compensatory means to our system of using TV and radio broadcast as the primary means of delivering our lectures. It

should be noted that the endeavors we report here were NOT conducted with the intention of conducting the usual face-to-face class simultaneously in multiple distant locations. Instead, they were intended as to investigate the possibility for providing interactivity to students who are being forced to receive their educational contents via the uni-directional and uniform media of TV and radio broadcast system.

Reconsidering "Interactivity"

In conducting this new endeavor, we began by taking a second look at what "interactivity" really was. Kazlauskas (2005) defines "interaction" as "communication, participation, and feedback between learners with other learners/or instructors/tutors (p.14)". Moore (1989) distinguishes between the three types of interaction in distance education as "Learner-Content Interaction", "Learner-Instructor Interaction", and "Learner-Learner Interaction" (p. 2-4). In a similar light, we will consider each of the three aspects in detail from our viewpoint[1].

Generally speaking, when "interactivity" is referred to in an educational setting, it usually indicates a communication channel with which a learner can take some kind of reaction to the educational content or information provided to them. In other words, the learning experience is obtained by the learner's initiative taken to select or choose the optimal information for his/her needs or readiness from the materials provided. The learner's initiative is evaluated and usually fed back to the learner in some form, thereby inducing the next initiative to further promote their learning. When in a mediated learning context, the individual learner must fulfill what requirements they are given in order to learn the material (such as sending back the assignments given before the deadline). In the case of e-learning, the learner usually responds to the information on the screen by operating the keyboard or a mouse; it could be simply clicking on to a button on a computer screen to get the correct answer to a problem presented, or e-mailing back a research paper to get some feedback from the instructor. These interactions mentioned above are all taking place between the learner and the learning material, or the educational content.

Nevertheless, the interaction between the learner and the educational content is not the only interaction that is taking place in an educational setting. It goes without saying that in a traditional classroom there are interactions between the learner and the instructor. It should indeed be noted, as Moore (1989) rightly mentions, that we should

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[1] In the course of writing this paper, we came across the four-directional model proposed by Dooley, Linder and Dooley (2005, p.81). However, since The University of the Air does not require their students to be IT-literate (although many of them actually are, it is not a formal requirement), we did not adopt their model in our conceptualization.

distinguish the interaction between the learner and the educational content and the interaction between the learner and the instructor. When the learner is interacting with the instructor in a traditional classroom, he/she is not necessarily interacting with the educational content provided by the instructor. The bi-directional communication between the learner and the instructor is possible precisely because the instructor is not only the provider of the educational content, but also is the guide in the learning process who is in a privileged position to know both the educational material AND the learner. We believe that the learners' feeling of being guided, or the sense of being grasped by the instructor, is at the core of the learner-instructor interactivity.

Such impression should also be vital in a mediated distance education; we can provide the learners with the sense of interactivity by making them feel that the instructor is there on the other side of the screen, keeping an eye on each learner. In terms of educational technology, establishing such sense of interactivity becomes an issue of providing the learner and the instructor with a media with which they can exchange multiple forms of information (verbal, non-verbal, textual, visual, auditory, etc.) in sufficient quality.

In addition, it is not only good for the learner but also for the instructor to have a sense of interactivity with the learners. As mentioned above, an instructor is not only a deliverer of the educational content to the learner. He/She is the one who is in charge of the class, the person who takes hold of the class by tracking each learner's learning process and progress. In distance education setting this has been done mostly by written verbal exchanges with the learner, but in traditional classroom the instructor usually gains a vast amount of information from the students by their non-verbal cues or from the air or the atmosphere of the classroom, which is extremely useful in order to not only take hold of the class, but also to grasp each student.

Another direction of interaction that takes place in a traditional classroom is the interaction between the learners, as Moore (1989) points out. As can be seen in the concept of peer-learning, it has been demonstrated that interactions between learners contribute greatly to the comprehension of the learning material by the individual learner (Hatano, 1995). In addition, we have all had some experience as a student of having learned from listening to the instructor's response to another student's question. Unfortunately, such interaction opportunities are difficult to be obtained in a distance education setting, because the learners are basically all in separate locations. It is the inherent nature of all distance education system that learning is dependent on the individual learning by each learner, even though the ensuing isolation of each learner can have negative consequences to the learning process by increasing the learners'

anxiety or decreasing their motivation to learn. Such negative consequences cannot be resolved by simply ensuring the sense of interactivity between the learner and the instructor; it is not only assuring but also practically effective for the lonely learner to know that there are other learners who are studying the same subject, the same class, the same material, perhaps going through the same difficulties or problems as himself or herself. We believe that this is another sense of interactivity that is vital to the mediated distance education. And once again, to establish this sense of interactivity, it is necessary to provide the learner and the instructor with a medium with which they can exchange various forms of information in sufficient quality.

In summarizing our reconsideration of "interactivity", we resound with Moore (1989) that it is important to distinguish between the interaction between the learner and the material, the interaction between the learner and the instructor, and the interaction between the learners. As Moore (1989) points out, all three directions of interactivity are necessary for creating an effective learning environment in distance education. Our endeavors to utilize a Web-Conference System were embarked in order to ensure this tri-directional interactivity.

Utilizing a Web-Conference System for Ensuring Interactivity

With the aforementioned concept of interactivity in mind, we decided to engage some of our students in a distance learning activity in which at least one of the three directions of interactivity comprises a vital part. In order to ensure the means necessary for the students to interact with the learning material, the instructor, or other students, we experimented using a Web-Conference System as the primary media in our endeavor. The activities we conducted over the Web-Conference System were 1) the mentoring sessions for MA-thesis writing, and 2) English-book reading sessions, which will be reported in the following section.

1. The mentoring sessions for MA-theses writing

At the University of the Air, we implemented the TV-phone connected via the ISDN (Integrated Services Digital Network) in all 50 study centers and the university headquarters around 1998 (the year that the University expanded out of the Tokyo Metropolitan Area to the entire nation), so as to facilitate the real-time, bi-directional communication between the professors and students in remote areas. These TV-phones were expected to be utilized in student advising and mentoring, or even in oral examinations and evaluations of BA theses. In theory, these TV-phones were to provide us the means to mentor our students regardless of where he/she lived, but in fact those TV-phones were far from the optimal media for the purpose. Apart from the fact that the

TV-phone system was very cost-ineffective, the very fact that those were telephones meant that it was impossible to transmit anything other than live vocal and visual messages (and I may add that the transmission quality of the visual image was extremely poor); that is, it was impossible to send any text data through the system. In addition, the capturing width of the TV-phone camera made it impossible to have more than two people appear on one end of the line, hence reducing all mentoring sessions to dyadic interactions. Even when the thesis advisor wanted to conduct a BA-thesis mentoring session in a seminar format, it was practically impossible under this TV-phone system. Furthermore, there were other inconveniences, such as being accessible only at one of the Study Centers or at the university headquarters, and being unable to handle two people trying to participate in different mentoring sessions from the same location.

In 2002, when the University established its Master's Course, we implemented a Web-Conference System in order to utilize it in mentoring sessions for MA–thesis writing. Compared to the previously (un)utilized TV-phone system, the Web-Conference System had several distinctive advantages, such as cost-effectiveness, being accessible from home or work (not only at a Study Center), the ability to send text messages in addition to the voice messages and visual images, and being able to handle multiple access from various sites, (regardless of whether two people were at the same location or not). Consequently, it has been a useful media when conducting a thesis-writing mentoring session, in which several students would have the opportunity to participate in the session, listen to the thesis advisor's comments on other students' draft, and having other students listen to the advisor's feedback on your own draft.

The mentoring session we conducted usually took the following form; the thesis advisor and his advisees would all access the Web-Conference System from sites of their convenience (home, workplace, a Study Center, etc.) at a predetermined date and time. The advisor would give feedback to each student while other students are listening to the session.   The advisor may sometimes impart useful information to all advisees (such as giving information about a certain reference material), but almost all mentoring processes would be on one-to-one basis with other advisees listening patiently until his or her turn, just as when a mentoring session is conducted in a seminar format. The student or the advisor can upload a text onto the Web-Conference System when necessary, and the advisor can even write on to the uploaded text on the spot inside the screen. After all advisees have had a chance to get feedback from the advisor, the session would be closed by deciding the date and time for the next session.

At first sight, it may seem like a waste of time to listen to other learners' being

advised while waiting for your turn, but this "listening participation" turned out to be precisely the key for reducing the isolation felt by many learners. By witnessing the thesis-writing progress of other learners, one comes to feel less anxious about how well or badly he/she is doing, or how far ahead or behind he/she is in the process. In addition, feeling the presence of the advisor on the other side of the screen is an immense addition to the sense of interactivity that we deemed vital in an ideal distance education setting. At the same time, just being able to "meet" other learners periodically seems to increase their motivation to study (we hear this comment often even when we are conducting face-to-face mentoring sessions in a seminar format). Even while the mentoring session for one learner is going on, other "listening participants" can use the chat function of the Web-Conference System to communicate with each other, thereby giving encouragements and reassurance to each other, creating the atmosphere of comradeship, which to most learners gives rare but appreciative feeling.

Needless to say, there were numerous troubles at first, such as access failure or insufficient transmission quality, but by building the knowledge and know-how of conducting these sessions, using the Web-Conference System in thesis-writing mentoring sessions has now reached a point where it is ready to comprise one of the supplementary education medium at the University of the Air.

2) English-book reading sessions

In the endeavor mentioned above, each student accesses the Web-Conference System from different locations using his/her own PC. In other words, they all use a web camera and a microphone exclusively by himself/herself. This setup enables all participants to access the system from separate locations. In essence, the participation is individualized (see Figure 1).

In our next endeavor, we attempted to expand the usage of the Web-Conference System to accommodate group participations in addition to individual participations. To investigate this possibility, we set up the system so as to connect two main sites via the Web-Conference System, while allowing IT-literate participants to access the system individually from a location of their convenience (see Figure 2). In the two main sites, multiple cameras and microphones were connected to a single PC used for accessing the Web-Conference System. In order to pick up even the softly-spoken voice of a quiet participant, each participant was provided with his/her own microphone to speak into. The digital video cameras were used for the purpose of capturing long-shot visual image of the main sites, and for capturing a close-up picture of the instructor (incidentally, it was found that this close-up picture of the instructor adds much to the feeling that she is present nearby, grasping the class and the participants). This setup enables the students

in separate locations to interact with each other verbally and visually – in fact, the idea for this setup evolved from an earlier comment by one of the participants that it is a shame not to be able to hear what the students in other sites are talking about, or what question is being asked to the instructor in other sites. In essence, this setup is configured to maximize the student-student interactivity, whereas the setup in the previous endeavor was configured to maximize the student-instructor interactivity. However, due to this rather complicated setup, an operator had to attend the system in each of the two main sites to help make the necessary adjustments. The instructor ran the session from one of the two main sites.

The instructor would start the session by having each participant speak into his/her microphone, the purpose of which is three-fold. For one, by having each participant speak into his or her microphone, the operator can adjust the volume of that particular microphone, or ask the participant to either bring the microphone closer to or farther away from him/her. Secondly, because of the rather insufficient quality of the visual image captured on the camera, it is not always apparent who is participating in that session, so by having each participant speak into the microphone the instructor is able to make sure who is present for that particular session. From the participants' viewpoint, this routine makes him/her feel that he/she is being grasped by the instructor. What is more, by speaking in to the microphone and getting some response from the instructor and/or participants at the other site, each participant get a sense of being a part of the communal learning process, which, again, is extremely effective for reducing the feeling of isolation inherent in all distance education system. Once all participants have had a chance to speak into his/her microphone, the instructor would go on to conduct a usual reading session, including activities such as reading the English text aloud, having each student read the text sentence by sentence, pointing out words and phrases that we should take note of, or having all participants read a paragraph together by following the model reading of the instructor. When it is necessary, the instructor can clarify the spelling of a word by writing it out on the whiteboard with which the Web-Conference System is equipped with, or present some material prepared in advance by displaying it on the window inside the computer screen.

The most exciting period during each session is when there is a "problem" in the text. The instructor may point out a word or phrase that requires some twisted interpretation, or a participant may pose a question to which the instructor tries to answer. When a participant is not convinced by the response of the instructor, he or she may present a different interpretation or viewpoint, to which a different participant responds from a distant location. Such interaction between the learner and the instructor

is nothing out of the ordinary in a traditional classroom but it is precisely what was unobtainable in a distance learning setting. By utilizing the Web-Conference System and expanding its usage, a virtual classroom can be constructed to which learners can join from any location. This is almost a dream-come-true for an instructor in a distance education institution who has been frustrated with the lack of interactivity.

Yet there still exists an obstacle that must be overcome before utilizing the Web-Conference System in this manner as a formal medium in our University's educational system. Unfortunately, the audio transmission quality is still too unstable as it stands. When the transmission condition is excellent, the only issue we have to tackle is the "talkback noise[2]", but when the transmission quality is poor, it is difficult even to catch a question asked in a distant site. It is almost ironical that by conducting this endeavor we came to realize the supreme stability of the TV and radio broadcast system, and how vital it is in providing quality educational content.

Conclusion and Reflections

Through conducting the endeavors we have reported here, we came to a new understanding about what "interactivity" in a distance educational context means. By distinguishing the interaction between the learner and the learning material from the interaction between the learner and the instructor, it has become clear that much of previous efforts in the education industry have been to ensure the "interactivity" between the learner and the learning material. On the other hand, the professors and the students at the University of the Air have always been frustrated because of the lack of interactivity between the student and the professor due to our unique method of delivering lectures via TV and radio broadcast system. We have learned that the atmosphere of being watched over by the instructor or the feeling of having been grasped by the instructor is the essential core of the sense of interactivity between a learner and the instructor; the mere fact that the instructor is usually the one who introduces the learning material to the learner is not enough to create the feeling of student-to-instructor interactivity. (Incidentally, this would help explain why the tutor system adopted by so many distance education institutions actually work - the learning

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[2] When the instructor speaks in one of the two main sites, her voice will travel through the Internet and come out of the speaker at the other site, which will be picked up by the microphones in that location, which will travel back through the system to the original site.   This "bounced" voice creates an echo-like output of the instructor's voice from the speaker at the original site. This "bounced" voice is once again picked up by the microphones at the originals site, and the loop goes on. This echo is called the "talkback noise".

material may indeed be presented to the learner by a high-ranked professor, but it is the tutors who give the learners the feeling of being watched over and being grasped. Needless to say, these feelings on the part of the learners are probably created through many exchanges of messages via e-mail or other means, which is dependent on the tireless diligence on the part of tutors.) In addition, we have been able to reconfirm that ensuring the interactivity between learners would help increase their motivation to learn, and that it reduces their anxiety and feeling of being isolated. Therefore, we conclude that these three directions of interactivity are indeed vital for a good distance learning environment.

In conducting this endeavor, though, we have come to question something that is almost taken for granted by most instructors; what are the elements that comprise a class?

This question crossed our minds when we noticed something that was unexpected in utilizing the Web-Conference System. When we are facing - or "meeting with", rather – our advisees or students in the computer screen, we do not feel that they are a "class". To be more precise, we feel that there are 5 or 10 or however many people we are meeting with to be present there, but we can never get over the feeling that they are 10 separate individuals. In other words, when we are meeting with, say, 10 advisees or students on the screen, it feels like we are not on a "one-to-ten" basis, but are instead on a "one-to-one-times-ten" basis, no matter how close we become with our advisees and students or how much expertise we accumulate in using the Web-Conference System. This experience made us think that there must be something - some kind of a vital element - in a traditional "class" that is missing in the condition created by the Web-Conference System. What could this "something" be? We have not been able to put our finger to the answer.

Of course, we can be sure that a class is not comprised by just a group of students and a teacher. There must be some very dynamic atmosphere in a class that is created by interactions between students and the teacher or between students. But those interactions were supposed to have been made possible by the Web-Conference System. Yet something was still missing, which probably indicates that simply providing a means to ensure the interactivity in various directions is not enough for creating a "class".

It is interesting that an endeavor conducted in the distance educational setting can foster new insights for looking at the educational process, making us reconsider what we used to take for granted. It is fascinating that things we do in distance education can feed back into the traditional mode of education in some of the most fundamental levels.

Considering the fact that being able to engage in a learning activity at any time from anywhere is still the greatest advantage of the distance education, the next step forward may be to extend this concept of tri-directional interactivity to an on-demand basis education, so as to overcome the constraints of time in addition to that of location.

References

Dooley, K. E., Lindner, J. R., & Dooley, L.M. (2005). Engaging adult learners and fostering self-directedness.   In   K. E. Dooley, J. R. Linder, and L. M. Dooley (Eds.), *Advanced Methods in Distance Education: Applications and practices for educators, administrators, and learners*. Hershey, PA: Information Science Publishing.

Hatano, G. (1995). Rikai to kyouju no sougosayou [Instruction for comprehension]. *Jinkou Chinou Gakkai Shi* [*Journal of Japanese Society for Artificial Intelligence*]*, vol.10 (3)*, 24-30.

Kazlauskas, E. (2005). Management strategies. In H. F. O'Neil (Ed.), *What works in distance learning*. Greenwich, CT: Information Age Publishing.

Moore, M. G. (1989). Three Types of Interaction (editorial). *The American Journal of Distance Education, vol.3(2)*.   http://www.ajde.com/Contents/vol3_2.htm
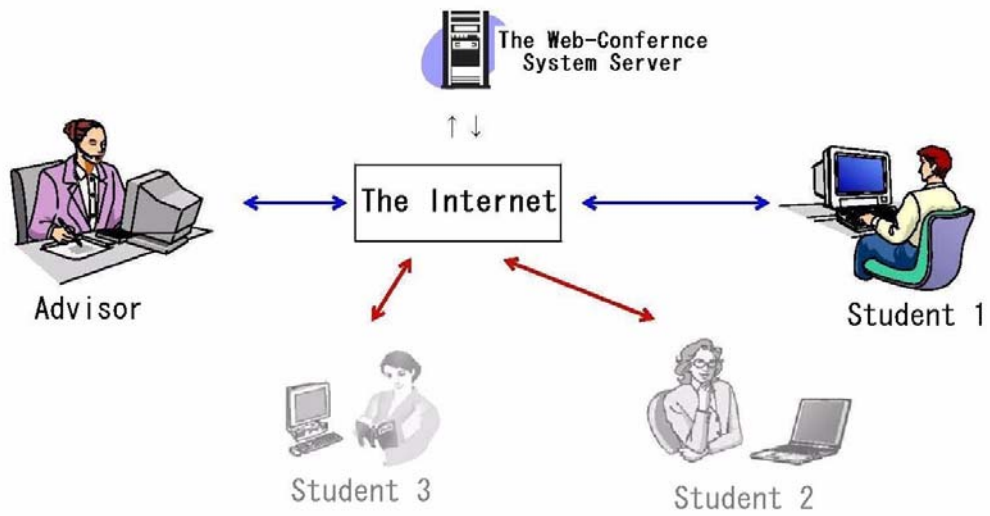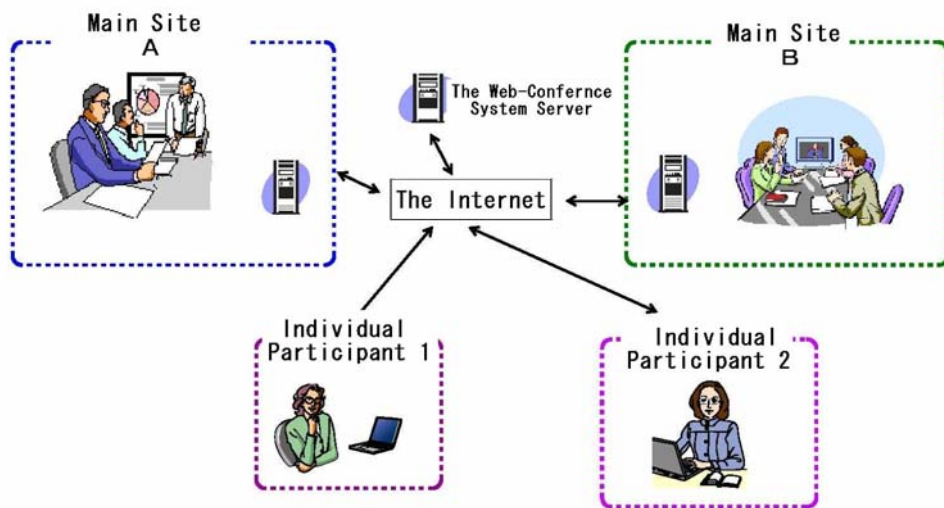
Figure 1.   The Original Setup of a Web-Conference System

Figure 2.   The Expanded Use of a Web-Conference System