

## *Remote teaching with digital video: a trans-national experience*

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#### **Abstract**

This paper analyses the psychological, technical, administrative, organisational, institutional and general pedagogical problems encountered during Phase 1 (the trial phase) of a trans-European distance-learning project. Using basic-rate ISDN videoconferencing for remote interactive tutorials, Phase 1 involved the University of Wales Swansea and HEC Liège (Belgium), and provided practice in business English for Belgian students and business French for UK students of French and Business. The difficulties which have arisen during the phase have been many and varied, and not all could have been easily predicted from a review of the research literature. Solutions to some of them are suggested.

#### **Introduction**

We analyse in this paper the trial phase (Phase 1) of the project TABLEUR (Telematics Approach to Business Language in EUROpe). The phase, which lasted eight weeks towards the end of 1996, consisted of a digital video link between:

- the European Business Management School (EBMS) and the Department of French at the University of Wales Swansea, and
- HEC Liège (a leading Belgian Business School).

Staff of EBMS provided tutorials in English in a range of Business Studies topics for Liège students, while Liège staff provided similar tutorials in French for Swansea students of French and Business. The ultimate objective of TABLEUR is that trans-national distance-teaching of business will be incorporated into the curricula of a number of participating institutions across Europe, but in Phase 1 staff and students were merely volunteers. Further trials (in Phases 2 and 3) will be necessary before full integration into assessed courses can be seriously contemplated, but we are nevertheless in a

position to report results, some of which could not have been foreseen from our initial review of the relevant research literature.

That literature is extensive, and often either very technical (that is, intended for experts in communication technologies) or highly theoretical with respect to educational models. It is not our intention in this paper to review it. Rather, we concentrate on the results of our experience in having implemented and run a video teaching link over a period of time sufficient for practical, and inevitably in certain instances purely subjective, judgements to be made. We refer to parts of the literature where it appears to confirm our experience and our judgements, but our approach has principally been a pragmatic one intended to be of practical help to those who might consider setting up similar links. Thus we touch on the technology but only with respect to the effect of its limitations in practice. We gave the students some post-session tests in order to have a broad view of learning outcomes over the period of the trial, but our main objective was to identify psychological and organisational problems rather than to relate learning outcomes to the value of educational models. There is comparatively little in the literature on administrative issues associated with video teaching links, and these too have formed an important part of our thinking in preparing this paper, since we have learned that they are among the most significant problems to be faced.

### **Staff and students**

Real-time videoconferencing can supply virtual face-to-face interactivity, but is subject to more obstacles than its physical equivalent. One such obstacle is a constraint on the number of students individually identifiable on a TV monitor. Without very specialised equipment, it is not possible for a teacher to control a camera remotely, or for the remote camera to zoom in response to voice activation, and one must rely either on abandoning the idea of zooming in on a student who wishes to make a contribution, or having the camera controlled by a human being at the remote end. We tried both these methods, and they proved inadequate in their different ways: the zoom handled at the remote end not only produces an awkward and distracting effect, but also gives the teacher a sense of being out of control, while a permanent wide-angle view of a large number of students means that the teacher cannot clearly distinguish individuals. We therefore decided that the number of students involved in any tutorial should be strictly limited, and found that the most successful sessions from the point of view of interactivity involved only about six student participants.

The TV monitor watched by the students shows either the remote teacher or material placed under a separate document camera. The teacher can also write on a sheet of paper under the document camera which, in this way, replaces both an overhead projector and a whiteboard, blackboard or flipchart. A third camera, or the first camera operated by the teacher, can be used for showing an actual whiteboard, blackboard or flipchart, although this involves the teacher moving around rather than remaining seated behind a desk, something which, as we shall see, strains the ISDN (Integrated Services Digital Network) telematic technology used for TABLEUR. However, good use can be made

of a third camera for showing video clips if the hardware for transmitting such clips directly is not available.

In Phase 1 of the project, the cohorts of students at each end of the link were taught for one hour per week each. Only two Liège teachers took part, as against seven in Swansea. The Liège teachers thus had more opportunity than their Swansea counterparts to practise using the medium in a live-tutorial situation, something which allowed us to determine that, while not every teacher is naturally suited to using the technology, with practice considerable progress in distance-teaching techniques can be made. All the Swansea teachers had good reputations among their students for handling small-group tutorials, but not all were equally successful as distance teachers. Some experienced serious difficulty in handling the technology at the same time as attempting to interact with the students, though were generally more at ease in "static" moments when they were explaining and the students listening; some displayed an uncharacteristic tension which students reported as making them feel uncomfortable; some simply talked too much, thus not allowing the students to participate sufficiently, or merely continually asked "Are there any questions?" instead of addressing individual students—the ensuing silence was far more noticeable, and created more tension, than happens in a conventional tutorial. We have found that in a remote-teaching situation, interactivity is achieved only if the teacher takes matters firmly in hand by asking questions directly of individual students. We shall have to wait until the completion of further phases of the project to determine whether or not new teaching skills and strategies can be easily learned by any teacher, or even perhaps that some teachers simply do not have the latent talent, but observation of the Liège teachers suggests very clearly that progress comes with practice. The medium happened to suit them from the start, but they also manifestly improved from week to week, plainly feeling increasingly at home with the technology and adopting an increasingly calm style. Comeaux (1995) notes that distance teachers who display a relaxed interpersonal attitude are far more effective than those who do not; we concur, but it would seem that such a style can be achieved only with experience even in those who have a natural aptitude. It is not just a matter of becoming familiar with the technology, although that is important; it is also a matter of adopting, and feeling at home with, certain teaching techniques (some of which are mentioned below), techniques which would not normally apply in physical tutorial situations.

There was also a difference in approach between Swansea and Liège as far as the student participants were concerned. All were second-year students following degree courses in business and a foreign language. However, as a deliberate policy, Swansea kept the same two groups of students for the entirety of the eight-week period, whereas Liège gave new cohorts a chance to try out the link from week to week. The difference allowed us to see that, as with the teachers, students need to adapt to the technology and to have time to dispel some inevitable initial nervousness which was discernible from week to week when Swansea was teaching Liège, whereas all the Swansea students, including the most nervous, appeared much more relaxed towards the end of the phase; this seems to have been reflected in their learning, as will be seen below.

### **Technical issues, psychological problems**

ISDN has two distinct advantages for a project like TABLEUR. In the first place, it represents an end-to-end digital link which does not use what will almost certainly play a crucial role in distance education of the future, but which is, despite the hyperbole surrounding it, as yet too unreliable and often too slow: that is, the Internet, that Information Superhighway which is susceptible to such frustrating traffic jams. Systems exist which can maintain a rapid, continuous digital-data stream across the Internet or across dedicated connections, but at present they remain in the specialist domain, whereas a basic ISDN system uses what nearly everyone already has, namely a telephone line. The second advantage is that the capital cost of an entry-level ISDN installation is comparatively low (less than £2,000). Trans-national connection charges are, at the time of writing, about £50 per hour within Europe (and set to fall), plus a small fixed recurrent amount. Here, of course, we have not counted human-resource costs such as those of teaching, supervisory and technical-support staff, but these costs would be similar with any videoconferencing system. We estimate the total cost of a basic ISDN link, including staff time, to be around £200 per hour in the UK. This is far from negligible, but in some circumstances may represent a cost-effective way of, for example, offering those students who for one reason or another cannot go abroad, some experience of interacting with a genuine teacher in a foreign institution, or of allowing exchanges of teachers without travel.

ISDN comes in different configurations according to the number of telephone lines it uses. Basic-rate ISDN uses two lines; a more sophisticated level uses six lines; and so-called Primary-rate ISDN uses 30 lines. The more lines, the more data can be sent and received, and this has a number of consequences, the most significant of which is the quality of the video signal. With two-line ISDN (ISDN-2), the video tends to be jerky, and the picture is not nearly as well defined as in the broadcast-quality video to which we are all accustomed (for an overview of the limitations of ISDN video for educational purposes, see Jacobs, 1994).

Our first trials revealed to teachers and students alike the constraints of our ISDN-2 system in the grainy picture, and in the lack of perfect synchronisation of the sound with the movements of a speaker's lips, particularly in close-up shots. Multimedia developers who encounter similar problems with space-hungry full-colour digital motion video, held for example on CD-ROM, often alleviate the difficulty of lip synchronisation by putting the video in a small window on the screen. This not only makes lip movements more difficult to distinguish, hence less noticeable if out of synchronisation with the audio, but also solves the problem in another way: the amount of data required for digital video is heavily dependent on the spatial resolution (the size of the picture in pixels), and digital video which uses less data can be the more easily synchronised with its sound. However, our view was that full-screen video was desirable even though the result with ISDN-2 is far from perfect. In order to avoid the digital-video problem, some courses delivered remotely via basic-rate ISDN have involved only audiographics (sound plus still images) rather than motion video (for example, Davis and Smith, 1994; see Kaye, 1994, for a review of some relevant audiographic implementations). This

solution is in some ways more acceptable since the obviously visible limitations of ISDN video are avoided, but part of the sense of a live presence is certainly lost, as teachers and students discovered when we briefly tested an audiographic link. Furthermore, while the problems of the lack of lip synchronisation and jerky video at full-screen resolution have been described by some experimenters as being severe obstacles to both teaching and learning (for example, Sebrechts, 1995), the comparatively poor video quality in TABLEUR was in fact soon forgotten. In a questionnaire completed by the students after their first experience of ISDN-2, questions concerning the limitations of the technology gave rise to a good measure of dissatisfaction, whereas in the same questionnaire completed only four weeks later, no complaint about the video quality was made. At the end of Phase 1, one student even commented that the poor quality of ISDN-2 video had been all too obvious at the beginning, and that she was pleased that we had "finally made the video run more smoothly" (in fact, it had not changed at all). There can of course be a difference between disregarding something and not being disadvantaged by it, but in this case we believe the two are equivalent, since interactivity and enthusiasm perceptibly increased in proportion as the intrusion of the technology appeared to decrease. Again, while the teachers were initially irritated by the video quality, it seemed to pose little problem once they—especially the Liège teachers—had become familiar with it (Colbert *et al.*, 1995, report more or less the same effect). Most surprising is that poor lip synchronisation would not appear to matter much to students even when one of the objectives is foreign-language acquisition.

Still, it would be inaccurate to say that ISDN-2 proved to be no obstacle whatsoever to teaching and learning at a distance. For example, while the document camera can be used as a whiteboard, it would occasionally be helpful for a teacher to use a real whiteboard. ISDN-2 will allow this, but it has difficulty in keeping pace with body movements: the more movement, the more jerky the video. The complexity of the image is also a factor (though less important than movement), so backgrounds should be plain (and jackets with herring-bone patterns should not be worn if strange video effects are to be avoided!). One becomes accustomed to such constraints, but one is plainly better off without them. It would also hardly be true to say that the link was without its technical hitches, the most significant being related to the audio element, something which is barely mentioned in the research literature on ISDN, although, as Bork (1995) rightly points out, the visual component of video is actually secondary to the sound. For TABLEUR, it took several hours of testing to achieve an acceptable sound level and quality at both ends. Further audio-related problems are outlined below.

Another point which can be loosely categorised as a technical matter is the question of the set-up of the teaching room. Comeaux (1995) points out major potential difficulties arising from a poor set-up, with communication and interaction being gravely hampered by incorrect positioning of the cameras and the microphones, and merely by the students seeing themselves on the TV monitor, and suggests that technological classroom designs of the future need to be more conducive to bridging the "psychological distance" as well as the physical distance. These points are certainly valid. The Liège teachers were, in general, more satisfied with the Swansea set-up than vice-versa

because Swansea used a purpose-built studio with sound-baffling, light-absorbing walls and well-directed diffused lighting, and in which the students were seated in the ideal position: a semi-circle facing the monitor and camera. Liège used a lecture room which produced too much echo (even when a good sound balance was finally achieved) and, because of the brightness of the walls, a back-lit effect which could make the teacher look like a dark shadow. Equally, the position of the Liège main camera caused a major difficulty. It was permanently set well above the teacher's console containing the monitor, and its position could not be changed because the lecture room was in constant use as the main teaching room when spill-over lectures using video were required. In a normal face-to-face teaching situation, eye contact is taken for granted. A lack of it not only creates an obstacle to learning, but also to teaching, because one is not sure, as a teacher, who is paying attention and who is not. Even though the problem as specifically related to videoconferencing has been identified for many years (Acker and Levitt, 1987), the extent to which it can affect one's teaching performance still comes a surprise in one's first videoconferencing teaching sessions. And it is an even more acute problem from the student viewpoint: the Swansea students found it bizarre to talk to a teacher who appeared not to be looking straight at them. Various techniques can be applied to overcome small misalignments of cameras and monitors (Rose and Clarke, 1995), but in the final account the teaching room must be constructed in such a way as to avoid the eye-contact problem.

This difficulty, together with some minor ones related to microphone position, will, if practicable, be corrected for Phase 2 of TABLEUR, although it has to be said that purpose-built studios and their associated equipment are expensive, and appropriate funding may not be available in all potential participating institutions. Most ISDN teaching experiments described in the literature start with well-equipped classrooms at each end of the link, in some cases complete with robotically controlled TV cameras and special-effects generators (see, *inter alia*, Coiro *et al.*, 1993; Harris, 1996), whereas we report here a trial based on a much lower level of equipment. However, even with professional studios, certain problems caused by the technology cannot be easily resolved, for example that of the perception of body and facial gestures. We have mentioned that too close a shot leads to a problem of lip synchronisation, and a partly effective remedy is to display head and shoulders instead of a close-up of a face. But the consequent loss of detail in facial gesture (especially if combined with the problem of eye contact) produced in Phase 1 of TABLEUR some unforeseen complications, principal among which was that neither teacher nor student could easily tell who wished to speak, or who was about to speak, or who clearly did not want to speak. In a physical situation, subtle facial and body gestures indicate, for example, a willingness or reluctance to answer a question: such gestures may be obscured in a videoconference link, especially using ISDN-2. Having said that, one of the Liège teachers succeeded in being able to pick up very subtle messages towards the end of Phase 1, evidence which reinforces the notion that with sufficient experience the limitations of the technology can to a large extent be overcome.

The problem is nevertheless compounded by other psychological difficulties caused by the technology. The international ISDN signal takes about one quarter of a second to

reach its destination, something which makes it hard to anticipate when one should interrupt a remote speaker. What is more, the delay in the sound signal causes a further effect which both students and teachers reported as being very distracting. As the signal arrives at the remote site, it is amplified and fed into speakers. The remote microphone picks up the sound from the speakers and transmits it back to the local site, so that as one is speaking one hears one's own voice with about one half of a second delay. Some find it almost impossible to communicate under these conditions. A system of echo cancellation can be implemented which should in theory obviate the difficulty, but which in practice is only partly effective and/or affects the quality of the sound. Reducing the sound from the speakers in the teaching room, or lowering the sensitivity of microphones, result only in the desire to raise one's voice (something which students are in any case often too self-conscious to do). One recommended solution (Coiro *et al.*, 1993) is to place the microphone behind the speakers so that the sound is not picked up so easily, but we found that this is impracticable unless the studio has been specifically designed in such a way as to allow it. Another possibility is for all involved to wear headphones, but we decided (after a short trial run) that this over-emphasised the high-tech nature of the experience.

Partly—but only partly—because of the delay and its consequent occasional disruption, even the most experienced teachers in the project found to a greater or lesser extent that they were unable accurately to judge the amount of material which could be covered in the time allowed. In general, one has to lower one's estimate: one simply cannot include as much in a telematic tutorial as in a conventional tutorial. Practice and experience are fundamental here.

Yet it is possible to foresee certain difficulties after just one trial session. Watching a recording of one's own teaching, or having somebody watch and subsequently comment, can be revealing. To take the most straightforward of examples, in a physical tutorial some teachers, after asking a question to which there is no immediate student response, may take the opportunity of the momentary silence to look at their watches to keep track of time, and it is usually obvious to the students that this is being done for that purpose. In a virtual teaching situation the effect of doing so is different because what the students see is a far more focused image of the teacher than they would normally see, and tend to interpret the gesture as one of impatience. The solution is, of course, to remove the watch so that one merely needs to glance at it, or to have a clock visible.

### **Administrative and organisational issues**

We have learned by our mistakes that good administration is one of the real keys to success in educational videoconferencing, but that it demands commitment, and substantial contact between the institutions involved, both outside the teaching sessions and occasionally also within them. Thus, an important lesson we have learned is that it is vital to have an ordinary telephone link between the two teaching rooms involved, a link which can be activated when things go awry, particularly if the ISDN connection is broken, for when it is, neither side knows who is at fault and therefore who should investigate and/or try to re-establish connection, and who should wait. Friendly

personal relations are crucial, too, because when things go wrong they must be accepted with good humour, and—most importantly—not blamed on the other side, for which there is unfortunately a strong temptation on the part of some technicians who may defend to the hilt their own expertise and even the infallibility of their own equipment. On the other hand, it is important that technicians always be available at both ends of the link, and that at least one speaks the other's language, or that there is someone there able to interpret. This means knowing the relevant technical terminology: the students are unlikely to be up to the task. A so-called anchor-person or monitor should also be present at the student end of the link for the entire session. This person's role is essentially managerial (Yi and Majima, 1993; Berge, 1995), but we have found that it is best filled by a teacher. We soon discovered that if students tend to be reticent, their reticence will be amplified in a virtual classroom, and by having a local teacher always present in Swansea, classes tended to be smoother than those transmitted to Liège where for much of the time the students were left on their own apart from technical support staff.

### **Pedagogical issues**

All the problems we have so far outlined represent pedagogical issues, since all impinge on learning outcomes, and the question of how much and how well students learn in a remote teaching environment is clearly of importance. It is not enough that they may find the experience interesting: interest may generate motivation but is not in itself a learning outcome. However, in the case of Phase 1 of TABLEUR, a comparison between the effectiveness of distance education and that of conventional education could unfortunately not be undertaken. In the first place, it was impracticable to set up a control group because this would have involved the physical mobility of either the students or the remote teachers. Secondly, since Phase 1 was essentially experimental, it involved trying out a number of different procedures from session to session which will have affected learning. Finally, the fact that the volunteer students knew that any assessment would not count towards their mark for the year will certainly have had a significant effect. We nevertheless attempted to quantify student performance by setting tests towards the beginning and towards the end of the phase. The testing was done at Swansea because the two groups of Swansea students remained homogeneous. Each group took two tests, separated by four weeks, in which they were asked to answer some questions designed to show how much they had internalised. The questions were directly related to the subject matter of the four previous sessions, and the tests were conducted three days after the sessions of weeks 4 and 8. The results, shown in Figure 1 as overall average marks out of 100, are—at the least—interesting. We would not claim that they necessarily indicate the leap in learning they appear to represent, but they do confirm certain subjective impressions of observers at the Swansea end, in particular that, as time went by, the students were able to concentrate less on the technology and more on the content of the course. This is confirmed by the fact that the material for Test 1 was actually prepared beforehand in more detail than for Test 2.

Despite this latter point, the importance of prior preparation on the part of the students became increasingly clear to us during Phase 1 (although we did expect this, given

	Test 1	Test 2
Group 1	29%	73%
Group 2	32%	79.5%

Figure 1: Averaged marks for the two post-session tests

reports in the literature, for example by Latchem *et al.*, 1994, who also cite other relevant sources). One Swansea teacher and one Liège teacher did not send any material for study beforehand, decisions intended as experiments to see if interactivity would be increased. In fact it decreased. According to both the staff and students involved, it is generally far better if material is prepared in advance: it adds a feeling of security for both teacher and student, and well-prepared students are more inclined to participate than those who are less well prepared.

The other side of this coin is that nearly all the teachers stressed the need to prepare much more than for a traditional class, for example by thinking very carefully, as Carter (1995) predicts, about making up documents to be shown on the document camera (beyond the very soon understood need to ensure landscape format—TV screens, like cinema screens but unlike overhead-projectors, are intended for pictures whose width is greater than their height). And in the actual teaching situation, it became evident to the better teachers that certain modes of teaching which one would not normally consider using had to be used. For example, it is necessary to comment much more than in a traditional class on what one is doing or going to do, with statements such as: "I am now going to show you a document by switching to the document camera". One needs to ask for feedback more regularly than one would normally do because the students' signals are less easily readable, and because one cannot be sure about the viewing and listening conditions at the other end of the link. One must sit as still as possible: even discounting the video problem caused by too much body movement, all movement appears exaggerated when seen on a TV monitor. And it is important to give students more time to find the answer to a question than one might usually give. In one of the later sessions, a Liège teacher tried leaving a silence which in a physical tutorial would probably be far too long: some 30 seconds. This achieved better results on the part of the students in the form of answers which had been more carefully thought through, and articulated with more carefully constructed sentences. The particular moral here is that one should not be afraid of what might otherwise be considered as wasting time, and the general moral is that our experience in the whole area of staff development while running TABLEUR fully corroborates that of Ryan *et al.* (1995) who comment that the new skills distance teachers need to acquire are not merely desirable but essential.

The need for techniques which would not normally be employed in a traditional setting is doubtless to some degree responsible for the regularly reported fatigue of the teachers,

as also of the students, at the end of every session. It is perhaps not surprising that the students declared themselves exhausted, but that experienced staff should do so, after only an hour or two of teaching, came as a surprise (we found no mention of the fact in the literature).

### **Student reactions**

Since the same Swansea students participated in the entire experiment, they were asked to complete detailed questionnaires after three weeks and at the end of the phase. In Liège, students completed questionnaires at the end of the session they attended. The results of the two sets of data are not wholly comparable, but point in certain clear directions.

The data from the first set of questionnaires indicates that students' expectations were on the whole fulfilled by their first contact with ISDN videoconferencing, 92% of all students indicating that their expectation—that the experience would not prove too difficult—was met or nearly so. Of the Liège students 70% found no impediment to learning in the general quality of the video, as against 51% of Swansea students. Most students found the experience an interesting one (90% in Liège, 94% in Swansea), and an almost equal majority found videoconferencing relatively easy (92% in Liège, 81% in Swansea). ISDN videoconferencing was also perceived as a perfectly viable method of teaching by 63% of Liège students and 85% of Swansea students.

The second set of questionnaires, filled in only by the Swansea students, and after some familiarisation with the technology, shows a development. The overwhelming majority were still interested by the project which they found useful both as a linguistic exercise and in terms of content. However, they were critical in their comparison of an hour of distance-teaching with a normal teaching hour, 31% judging it to be not as good, and 54% equivalent—perhaps because many by this time perceived this form of learning as being more difficult than in conventional classes (54%), or equally difficult (46%). Nevertheless, 69% still thought of it as a viable form of teaching and learning. These results roughly tally with other surveys done on student attitudes towards educational videoconferencing (see, for example, Ritchie and Newby, 1989; Schiller and Mitchell, 1992; Zhao, *et al.* 1995).

### **Institutional issues**

An institutional problem which will be typical of a link of the TABLEUR kind is the potential imbalance between the costs and benefits which accrue to each side. Liège incurred costs by teaching, and benefits by having students taught. In Swansea, EBMS incurred costs in supplying teachers but received no benefits because the student recipients of the teaching belonged to the French Department. The French Department provided no teaching because the Liège students required courses in English, and so incurred no costs other than providing an anchor-person. Such a disequilibrium is a potential source of conflict, even if call charges are paid by the department receiving the benefits. Altruism in the form of a corporate spirit does exist within institutions of higher education, but it is a fragile altruism when budgetary devolution is the order of

the day. Students in common is the answer, but this is not always possible, and it may be that some form of compensation will have to be implemented in future phases of TABLEUR.

A further institutional problem with a telematic link such as TABLEUR is that one needs an inordinate amount of support (equipment, teacher, anchor-person, technicians) as well as funding for connection charges, for a comparatively small number of students. It must be remembered, however, that the capital investment in equipment is non-recurrent. Moreover, assuming eight students per tutorial, £200 per hour works out at £25 per student/hour, a figure which can in any case be reduced after a while since technicians need not be present at all sessions, merely available, once things are running smoothly. Is £25 per student/hour excessive? Is roughly double that amount excessive (only four or five students involved in a session)? Not, perhaps, for the benefits gained, especially when these costs are compared with physical student mobility (see Lange, 1994; Faulhaber, 1996; Donahue, 1996), and perhaps even more so with staff mobility, though Latchem *et al.* (1994) cite an example of an Australian experiment in language teaching using videoconferencing equipment where the costs per student were eventually considered too high to justify continuing.

Besser and Bonn (1996) argue that the educational community must consider not just the direct financial costs but also the non-monetary costs and possible long-term negative effects on an institution of implementing a distance education programme, such as a perceived threat to jobs, the morale of technophobic staff, and the potential damage to the cohesion of the physical community with its important social advantages. We would not completely dissent from such views, but would strongly contend that unquantifiable benefits, such as enhancing the image of an institution, can be simply too good to refuse.

### **Conclusion**

Despite all the obstacles and difficulties described in this paper, we consider that Phase 1 of TABLEUR has on the whole been very successful, both *per se* and in what we as researchers and practitioners have gained through the experience. Overall, we have ascertained that videoconferencing challenges the tutor more than the learner. Apostolopoulos *et al.* (1996) ask whether in the future high-quality multimedia courses delivered at a distance by machines will be more common than inferior tutors teaching physically face to face. It may be that this will be so, but in the meantime the human tutor is the most important element in a distance-learning programme, as well as being the most difficult element to "fine-tune". That fine-tuning, as with all other aspects of videoconferencing, comes only with the hands-on experience of doing as opposed to reading or watching, let alone theorising. No amount of guidance before embarking on a project such as that of TABLEUR can substitute for the actual practice, and the authors of this paper have learned, by doing, as least as much as (if not more than) the students involved in the link. Nevertheless, prior guidance is not without some weight, because we have learned too that merely being aware of potential obstacles is part of the battle, which is our principal justification for adding to the literature on this subject.

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