Solving Case Studies through Asynchronous Learning Networks: Possibilities and Limitations

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Solving Case Studies through Asynchronous Learning Networks: Possibilities and Limitations

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Abstract

Business Schools have been using case studies to present real or hypothetical situations to bridge the gap between knowledge and action. New communication technologies can be incorporated into the case method of teaching, allowing participants to be in different locations and to work at their own convenience. An Asynchronous Learning Network is a Computer-Mediated Communication System to support "anytime/anywhere" interaction by providing a combination of database and conferencing system. A field experiment was conducted to test the effectiveness of an ALN vs. traditional manual methods at both the individual and group level for the solution of a case study. Findings indicate that groups working in an asynchronous networked environment produced better and more complete solutions to the case study, but were less satisfied with the interaction process. Further research in the implementation of ALN's promises to enhance the quality of education and to provide future managers with essential expertise in new communication technologies.

1. Introduction

The use of Information Technology (IT) to improve teaching, learning and education in general is receiving increased attention in the academic literature and in the media. A number of technological, institutional and educational factors are contributing to this rise in interest. At the technological level, rapid advances in telecommunications are linking not only individual students with their peers and instructors, but also entire schools with their counterparts in other locations. The new technological possibilities are attractive targets for exploration when some educational institutions are faced with declining resources and are looking for ways to reduce costs or to expand their markets. At the educational level, the most important challenge is to develop pedagogically effective technology-mediated learning environments that enhance the quality of education.

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There are many ways in which IT can be integrated into education. It can be used to transmit content (to deliver instruction) and/or to support the administrative and communication activities that take place in a course. As a *content-transmission* tool, IT can complement or completely replace the traditional role of textbook and teachers. As a *communication-support* tool, IT can be used to extend the availability of the professors beyond office hours and to accomplish administrative activities such as distribution of materials, reminders and notifications. These two roles can be effectively combined in the context of a Computer-Mediated Communication System (CMCS), tailored to support educational activities.

One of the terms used to describe CMC-based education is "Asynchronous Learning Network" or ALN's. An ALN is a communication system designed to support "anytime/anywhere" interaction among students and between students and instructors. An ALN structures interaction by providing a combination of database and conferencing system that allows people to exchange messages and carry out asynchronous discussions in an organized manner.

ALN's represent a new paradigm for teaching and learning, with both unique problems of coordination and unique opportunities to support active, collaborative (group or team-based) learning (Harasim, et al. 1995). One area in which the potential of ALN's can be exploited is the discussion and solution of case studies. This paper addresses this issue and reports the results of a field experiment in this area.

2. Literature Review

2.1 Computer-Mediated Learning

Computer-Mediated Learning can be classified in terms of the framework proposed by Johansen (1992). The framework was originally designed to describe different modes of

interaction according to two dimensions: time and place. Interaction can occur at the same time (synchronous) or at different times (asynchronous). Members can meet in the same place (proximate) or in different places (disperse).

Figure 1 shows different alternatives for the integration of IT in the classroom. Same time/same place refers to situations where the traditional classrooms are furnished with computers for every student. In this mode of interaction, the traditional classroom environment is enhanced with IT. Same time/different place situations occur when lectures are taught at the same time to students located in (at least two) different places, using video and data links across locations. In this case, the traditional classroom is networked with other classrooms in different locations.

The different time/ same place category normally refers to people that work in shifts but share a common meeting room or project room where they leave messages for each other and share materials. A typical application would be a class in which lectures are available in videotapes and are offered at different times, but in the same physical location (e.g. library room). Finally, different time/different place refers to totally distance classrooms in which students and professors rarely meet face-to-face. Content-transmission and communication-support take place in the context of an ALN. This category corresponds to completely electronic classrooms or E-classrooms.

Figure 1: Typology of Dispersion

Place \ *Time*	Same	Different
Same	Synchronous/Proximate Technology-enhanced classrooms	
Different	Synchronous/Disperse Synchronized-Remote or Networked classrooms	Asynchronous/Disperse Electronic Classrooms or E-classrooms

Adapted from Johansen (1992)

Empirical studies in Computer-Mediated Learning can be organized in terms of this framework. Most of the research conducted in this area is based on the use of a groupware system in an educational context.

Same time/same place studies (e.g. Alavi, 1994; Leidner and Fuller, 1996) have been mostly focused on the use of synchronous Group Support Systems (in decision rooms) to support discussion and solution of case studies in MIS courses. "A GSS environment is a special type of groupware to support face-to-face interaction. It usually consists of networked computer workstations for participants and a facilitator, a large public screen to display the results of group discussion, and software to support group processes such as brainstorming voting and ranking." (Alavi, Yoo and Vogel, 1997).

Same time/different place studies (e.g. Alavi, Valacich and Wheeler, 1995; Webster and Hackley, 1997) are based on the use of some form of audio, video and graphic link between two or more sites. The technology is used to support synchronized work (lecture delivery or case discussion) between local and remote participants.

Different time/different place studies (e.g. Hiltz, 1994; Benbunan-Fich and Hiltz, 1998) deal with complete distance learning environments where the students get the lectures via videotapes (or electronic lectures via computer) and use the ALN to communicate with the professor, or with other students.

Alavi, Yoo and Vogel (1997) conducted an exploratory study combining lectures delivered in networked classrooms at two universities (same time/different place category) and an out-of class team project (different time/different place) where students from both locations were grouped to discuss and solve a case study.

Consistent with the groupware literature from which they are derived, studies in the area of computer-mediated learning are mainly concerned with two types of outcomes: performance and perception. Performance outcomes try to assess the effectiveness of the

teaching/learning process from the student's perspective. They usually involve an assessment of task performance (e.g. quality of group report in case discussions) and assessment of learning (e.g. exam grades are typically used as proxy measures for learning achievement). Perception measures deal with attitudes toward the technology or system, satisfaction with the process and the solution, and other subjective indicators that could affect performance.

Many schools are experimenting with different combinations of IT to support lecture delivery and other educational activities (e.g. New Jersey Institute of Technology, Hiltz, 1994; University of Maryland, Alavi, 1994; Texas Christian University, Queen's University; Webster and Hackley, 1997). One of the most promising areas is the use of groupware and ALN's to support the discussion of business cases in undergraduate and graduate courses.

2.2 Learning Through Case Studies

Case studies are the hallmark of business education. Many schools are using case studies in their curricula to transmit content and real life experiences that require student involvement. The case method of teaching seeks to enable student to process instructional inputs and assimilate course materials (Leidner and Fuller, 1996). Case studies present real or hypothetical situations that demand group discussion and the use of concepts to develop recommendations or achieve a preferred solution.

The nature of case analyses can be proactive or reactive. Proactive analysis consists of anticipating the consequences of a situation presented by the case and to make decisions about *what can be done*. Reactive analysis is a retrospective analysis of the situation in order to identify the objectives and the outcomes, and to make recommendations about *what could have been done* differently (Silver, et al. 1995).

The use of case studies as teaching tools is based on four fundamental principles: situational analysis, student involvement, non-traditional instructor role and relationship between analysis and action. Situational analysis forces the student to deal with the characteristics of the situation presented by the case (absence of information, conflict of objectives and the imbalance between needs and resources). Student involvement is demanded by the very nature of the case method in which learning occurs through discussion and interaction with peers. In this process the instructor is a mere facilitator of the discussion, not the traditional knowledgeable lecturer. Case discussions force students to bridge the gap between the academic goal of knowing and the practitioner's necessity of acting (Barnes, Christensen and Hansen, 1987).

Preparation for case study discussions can be assigned to individuals or groups. Individual case preparation forces each student to think in isolation, using his or her own opinions, experiences and resources to analyze the situation and develop recommendations. In contrast, group case preparation is more enriching. Groups solving case studies are likely to experience process gains such as stimulation, synergy, more information and learning (Nunamaker et al., 1991), and the development of higher order cognitive skills (Hiltz, 1994). Teamwork produces the externalization of the thought processes, the comparison of alternative perspectives, social facilitation, better learning, high self-esteem and more positive attitudes toward the learning experience (Salomon and Globerson, 1989).

However, as in any other group endeavor, group discussions experience process losses such as information overload, and coordination problems (Nunamaker et al., 1991) and "free-riding" or social loafing (Shepperd, 1993). Instead of pooling their mental efforts, some team members may actually show reduced expenditure of mental effort, loafing behavior and even effort avoidance in ways that debilitate learning, just because solving the case is the responsibility of the *whole* group (Salomon and Globerson, 1989). To counteract free-riding and social loafing, team members are likely to exert a greater effort if their contributions are identified, if the outcome (or case solution) is important or

personally relevant, and if they perceive a clear relationship between contribution and outcome (Shepperd, 1993).

Regardless of the approach to case preparation (individual or group), the case method of teaching is based on the case discussion, where participation is the crucial element. "The spirit of the methodology mandates people reacting to each other and learning through the synergies of conversation" (Hashim, et al. 1991: 374). However, interaction patterns are generally restricted to face-to-face lectures in which many factors such as social desirability, air-time fragmentation and blocking constrain the students' ability to participate in the process.

In general, lack of participation in a face-to-face case discussion is due to a number of elements. For example, fear of reprisals, fear of being evaluated or being mocked by peers, fragmentation of available speaking time, cognitive inertia (the tendency to think along the same lines), production blocking (inability to produce a meaningful contribution) and domination by more knowledgeable peers (Nunamaker, et al. 1991).

ALN's are designed to overcome many of the factors that constrain participation in a face-to-face discussion. A communication system can increase group process gains, such as synergy, pooling of more information, objective evaluation, cognitive stimulation and learning; and decrease group process losses, such as fragmentation, blocking, domination, evaluation apprehension and information overload (Nunamaker, et al. 1991). In particular, asynchronous interaction increases the time available to read or reread a message and formulate a comment. This can improve in-depth reflection and development of a topic (Harasim, 1990). Increased opportunity for member input may also enhance the quality of decision-making (Rice, 1984).

Probably the biggest advantage to the use of ALN's to support case study discussions is the integration of external expertise in a systematic way into the curriculum. Multidisciplinary teams composed of students, professors of different areas and

practitioners can meet at their own convenience through an ALN to discuss case studies. These multidisciplinary groups can leverage the students' knowledge and allow business partners to take an active role in the education of future professionals. Not to mention, the employment possibilities that can flourish from these alliances.

The downside of ALN's includes procrastination. Since students do not have to participate at any specific time, they may not participate regularly at all. The anxiety produced by delays and different participation rates or "login-lags" (Dufner et al. 1994) may reduce the quality of decision making. Members may go along with an initial suggestion, even if they do not agree with it, in order to accelerate the process and meet a deadline (Harasim, 1990). In addition, students may feel that the medium is not as warm or personal as face-to-face classes, and this may also decrease motivation. Instructors should develop the right incentives for the students so regular and legitimate participation is achieved.

Table 1 summarizes the advantages and disadvantages of using ALN's to support the solution of case studies.

Table 1: Solving Case Studies through ALN's

Advantages	Disadvantages
Increase group process gains	Procrastination
Decrease group process losses	Frustration due to "login-lags"
In-depth reflection of topics	Pressure to meet deadline
Higher quality decisions	Impersonal medium
Integration of external expertise	Incentives for participation

Consistent with prior studies in the area of computer-mediated learning, two types of outcomes are of interest: performance and perception. In the context of case study discussions, performance outcomes could be subjective (e.g. grade as a proxy of quality of the solution) and objective (e.g. length of the final report). Perception outcomes refer to individual opinions about the process (e.g. self-reported learning, satisfaction with the group discussion).

Based on this review of the relevant literature, the next section will present several hypotheses that require empirical testing.

3. Hypotheses

3.1 Solution Quality

In general, groups are better than individuals at making decisions (Hill, 1982). Partly, this is because groups are more creative at generating options and probing their advantages and disadvantages than are single individuals (Turoff and Hiltz, 1982). Moreover, according to the moral reasoning literature, ethical discussions among group members are superior to an individual's consideration of a dilemma (Peek, et al. 1994). Increased opportunity for member input may enhance the quality of decision making (Rice, 1984). Therefore, one would expect group solutions to be better than individual solutions to ethical case scenarios. In line with these ideas, we hypothesize:

H1a: Groups will produce higher quality solutions to ethical scenarios than will individuals.

Due to the nature of the asynchronous environment in which participants can reflect longer about their contributions (Hiltz, 1994), ALN-supported conditions will tend to produce higher quality solutions than their manual counterparts (Ocker, 1995). Therefore,

H1b: Participants working through an ALN will produce higher quality solutions to the ethical scenarios than will their manual counterparts.

When individuals work alone and have to produce reports by hand, the quality of the solution to the case study will be a function of their own knowledge, understanding and resources. Furthermore, the benefits of working in a computer-supported environment will not be available to those individuals. Hence,

H1c: Individuals working alone in a traditional manual setting will produce lower quality solutions to the ethical scenarios than will the rest of the conditions.

3.2 Length of the Reports

Another element that could be used to judge task performance is the length of the reports. It is expected that group reports will be longer than individual reports, because groups are able to pool more ideas and to combine information from different sources (Nunamaker, et al. 1991). Therefore:

H2a: Groups will submit longer reports than individuals working alone.

The use of an ALN will also allow participants to submit longer responses than their manual counterparts, because of the ease of editing and improving the text using a computer editor as opposed to pencil and paper.

H2b: Participants working through an ALN will submit longer reports than their manual counterparts.

For unsupported face-to-face groups, two opposite effects will be present. On the one hand, due to the combination of contributions from different team members, longer responses could be possible. But, on the other hand, there may be a tendency to summarize the discussions and to shorten the reports because groups will not have access to the technology to compile individual contributions. The combination of these two factors (more contributions and ease of compiling them) could produce an interaction effect that is more than the sum of the main effects:

H2c: . ALN-supported groups will produce the longest reports.

3.3 Process Satisfaction

When communication is mediated by an ALN, it is expected that process satisfaction will be low due to participation problems: absent members (Smith and Vanecek, 1988), "login-lags" (Dufner, et al. 1994), and delayed feedback (Rice, 1984). Hence,

H3: ALN-supported groups will report lower levels of process satisfaction than will other conditions.

3.4 Collaborative Learning Perception in groups

The perception of collaborative learning should not differ between supported and non-supported groups. Traditionally, face-to-face has been the method for group discussion, but computer-mediated communication systems are well suited for collaborative learning activities (Hiltz, 1994). Hence,

H4: ALN-supported and face-to-face groups will report about the same levels of perception of collaborative learning.

4. Research Methods

A quasi-experimental field trial was conducted to examine the effectiveness of different approaches to solving a case study. The experimental design was a 2x2 factorial crossing teamwork (individual vs. group work) with communication support (manual-offline vs. asynchronous computer conference). See Figure 2. The task was the solution of a very short case scenario in computer ethics ("Case 7: Software Risks" in Anderson, et al. 1993).

Figure 2: Experimental Design

		Computer Support Manual	Online
Teamwork	Individual	IM	IO
	Group	GM	GO

In the Individual/Manual condition (IM), students solved the case individually in an open-book in-class exercise. In the Individual/Online condition (IO), students submitted their individual responses in a computer conference by using the Question-Response activity software on the "Electronic Information Exchange System" (EIES2). This feature allows students to submit their individual responses without seeing what anybody else has written,

but after their solutions are posted, they can read the answers of others. Students in the IM condition were given the case one-week before the date of the in-class exercise and were advised to prepare the solution for the upcoming session. In the IO condition, the case was posted online in a computer conference one-week before the due date.

In the Group/Manual condition (GM), team members solved the case by interacting in a face-to-face session. They discussed the scenario and wrote the final report without ALN support. Here again the students were given the case one-week before the date of the group discussion and were advised to prepare their individual position statements for the group discussion. In the Group/Online condition (GO), team members interacted asynchronously using the computer conference as the only means of communication to discuss and solve the case. Each group was placed in a different computer conference. All conferences were seeded with the same comments regarding instructions on how to proceed and the text of the case.

Participants were undergraduate students in one of the core courses for computer science majors ("Computers and Society") at the New Jersey Institute of Technology. The task was implemented as one of the assignments in the course. From a larger pool of subjects that participated in this field experiment, a subset of 72 students taught by the same instructor was selected for this analysis. There were 18 subjects in each condition. Data collection instruments included a pre-test questionnaire to gather demographic information, and a post-test questionnaire to collect the students' perceptions.

5. Statistical Analyses

Since this experiment was conducted in an actual field setting, there was a limitation preventing a truly random assignment of subjects to conditions. Students in the distance section of the course could be assigned to online conditions only, while students in the traditional (on-campus) section could be assigned to any condition. As a result of this,

most of the participants who ended up in online conditions came from the distance section.

Data on gender, age, race, months of full-employment, grade point averages and SAT scores was used to identify differences between traditional and distance sections. These analyses showed that employment was the only variable significantly different. Students enrolled in the distance section had much more work experience than those enrolled in the traditional face-to-face section. To control for this difference, the variable "months-of-full-employment" was used as a covariate.

Analyses of covariance (ANCOVA) were conducted to test for main effects and interaction effects between the two factors (teamwork and computer support) on the following dependent variables: solution quality, report length and process satisfaction. In addition, group conditions were compared in terms of their perception of collaborative learning.

6. Results

6.1 Solution Quality

The final reports submitted by the participants were evaluated by a panel of three expert judges blind to experimental conditions. Judges scores were analyzed to assess the level of agreement (inter-rater reliability = .85) and then the scores were averaged out to produce a measure of quality. Table 2 presents the results of the Analysis of Covariance of report quality.

Table 2: Solution Quality Results

Means by Condition[1]	Manual	Online	
Individuals	45.95	73.23	59.59
Groups	62.27	78.10	70.18
	54.11	75.66	
$R^2 = .64$			
Model	F = 29.04	p = .0001	***
TW (Teamwork Effect)	F = 18.22	p = .0001	***
OL (Online Effect)	F = 63.66	p = .0002	***
Interaction (TW*OL)	F = 5.35	p = .02	*

1 mean = 64.72; stdev = 16.71; min = 26.00; max = 96.67
* = Significant at p < .05; *** = Significant at p=<.001

According to the score provided by the judges, groups submitted better reports than individual participants did. This result supports H1a at p = .0002. Online conditions submitted higher quality reports than their manual counterparts, thus supporting H1b with p=.0001. There is a significant interaction effect (p = .02) whereby individuals working manually under performed the rest of the conditions, as predicted by H1c. Figure A (in Appendix 1) illustrates this interaction effect.

6.2 Length of the Reports

The number of words in each report was computed using the word count function of Microsoft Word for Windows™ (V. 6.0). Table 3 presents the results of the Analysis of Covariance on the length of the solutions submitted by groups and individual participants.

Table 3: Length of the Solution Results

Means by Condition[1]	Manual	Online	
Individuals	293.62	650.83	472.22
Groups	402.27	989.30	695.78
	347.94	820.07	
$R^2 = .57$			
Model	F = 21.71	p = .0001	***
TW (Teamwork Effect)	F = 15.42	p = .0002	***
OL (Online Effect)	F = 58.03	p = .0001	***
Interaction (TW*OL)	F = 4.09	p = .05	*

1 mean = 583.01; stdev = 353.52; min = 244.00; max = 1613.00
* = Significant at p =< .05; *** = Significant at p=<.001

Participants who worked in groups submitted significantly longer reports than participants who worked alone, which supports the prediction of H2a (p = .0002). The use of the ALN enabled participants to submit longer responses than those working manually, thus supporting H2b (p = .0001). There is also a significant interaction effect. The combination of teamwork and computer support resulted in significantly longer reports than in any other condition (See Figure B in Appendix 1). This supports H2c with a significance level of p = .05.

6.3 Process Satisfaction

The perception[1] of process satisfaction (in solving the case) was measured in the post-test questionnaire (= .83). Table 4 presents the results.

[1] Perception measures were collected in the post-test questionnaire with scales adapted from other empirical studies (Hiltz, 1994). Factor analysis was conducted on the survey questions to assess construct validity. Before testing the hypotheses, each of these scales was validated to assess their level of reliability. A scale was considered reliable only if a Cronbach Alpha Coefficient (α) of .7 or greater was found. In this case, the scores of the items used to create the scale were added up and analyzed for statistical significance to test the corresponding hypothesis.

Table 4: Perception of Process Satisfaction

Means by Condition[1]	Manual	Online	
Individuals	11.05	11.23	11.15
Groups	12.80	10.85	11.83
	11.93	11.04	
Model	F = 3.28	p = .01	**
TW (Teamwork Effect)	F = 2.62	p = .11	N/S
OL (Online Effect)	F = 3.78	p = .06	N/S
Interaction (TW*OL)	F = 6.33	p = .01	**

1 mean = 11.54; stdev = 1.82; min = 6; max = 15
** Significant at $p < .01$;

There is an interaction effect between teamwork and computer support. Online groups were the least satisfied with the process, lending support to H3. Figure C in Appendix 1 clearly shows this "disordinal" interaction[2] (Pedhazur and Pedhazur, 1991). In this case, the rank order of the process satisfaction goes from best to worst between manual and online groups.

6.4 Collaborative Learning Perception

The perception of *collaborative* learning was measured in the post-test questionnaire for group conditions only ($\alpha = .91$). See Table 5.

Table 5: Results of Collaborative Learning Perception

	GM	GO	Model F	p
Collaborative Learning Perception[1]	23.24	22.28	.18	.84

1 mean = 22.83; stdev = 4.96; min = 6; max = 30

[2] Disordinal interaction means that the predicted scores for one condition will not be consistently larger than those for the other condition (Pedhazur and Pedhazur, 1991: 49).

The perception of collaborative learning was about the same between supported and unsupported groups. Therefore the null hypothesis (no difference between the means of both conditions) can not be rejected. This result is consistent with H4.

7. Discussion

Regarding solution quality, teams outperformed individuals and online participants produced better reports than their manual counterparts. In online conditions, the potential visibility of individual responses combined with in-depth reflection that can be achieved through asynchronous work resulted in higher quality reports. Groups online benefited from the availability of a written transcript of individual contributions in order to create the final report, which may have improved even more the quality of their solutions. The absence of these two factors (teamwork and ALN support) had a negative impact in the quality of the reports submitted by individuals working manually.

In terms of report length, as expected groups submitted longer reports than individual participants did. The contributions of different members in the discussion process made their reports longer. Groups/Online (GO) also benefited from the availability of a written transcript of the discussion produced by the system. Due to the combination of these two factors (group input and written transcript of discussion), GO submited the longest reports.

With respect to process satisfaction, GO were the least satisfied with the process due to the nature of asynchronous interaction, characterized by delayed feedback and "login-lags". Groups working in an asynchronous environment had more difficulties to coordinate the distribution of work and to check for absent or missing members. These elements may have lowered their level of satisfaction with the process. One of the challenges for designers of ALN's is to provide organizational tools (such as agenda, voting, and polling) for structuring asynchronous interaction and overcome the inherent limitations of the medium.

Finally, there was no difference between face-to-face and computer-supported groups in terms of collaborative learning perception. This result is consistent with prior studies of computer-mediated learning using synchronous (Alavi, 1994) and asynchronous (Hiltz, 1994) systems. It seems that a computer-mediated environment is as well suited as face-to-face interaction to carry out collaborative learning activities.

The implications of these findings are manifold. First, the use of an ALN enhances performance, due perhaps to the potential visibility that the system can provide to each response, combined with deeper reflection in asynchronous work. The second implication is that the combination of teamwork with the use of the system results in better and more complete reports than if only one of these factors is present. Third, an ALN was found to be as effective as face-to-face interaction for collaborative learning activities such as case study discussions.

In this field experiment, students who never met face-to-face were able to interact through the system and discuss a case study. By using an ALN, part-time students could definitely team up with full-time students without the typical scheduling conflicts. But more importantly, the use of this system opens up new possibilities for establishing partnerships with practitioners in different fields to leverage business education, as suggested by Alavi, Yoo and Vogel (1997).

8. Limitations of the study

The use of a field experiment to conduct this study is the source of its strengths and limitations. An experiment conducted in a real setting (a field experiment) has great potential for the generalization of results, but can be affected by the many factors that can not be controlled for in the real world (Hiltz, Johnson and Turoff, 1991). In this field experiment, some of the internal validity was lost because experimenters had no control

over what students are enrolled in which sections (traditional or distance). Having better potential for the generalization of the results compensates for this loss.

9. Conclusions

The increased use of computer-mediated communication technologies opens new possibilities to enhance the quality of business education. One of such innovations could be the use of Asynchronous Learning Networks to support the discussion and solution of case studies.

The results of the field experiment reported in this paper are very encouraging. The study found that groups who used an ALN to solve a case scenario submitted better and more complete solutions than their counterparts. However, team members had to deal with the problem of absent members and lack of participation. Since no other mean of communication was allowed, it was up to each team to decide when to stop waiting for absent members. For these reasons, groups who used the ALN were the least satisfied with the process.

Research findings also showed that the perception of collaborative learning was not affected by the use of the medium; both supported and unsupported groups perceived fairly similar levels of collaborative learning. It appears that an ALN is as well suited for collaborative learning activities as traditional synchronous methods.

Since an ALN can be a feasible medium to carry out collaborative learning activities, it can be used to team up groups of people that would have been very difficult to assemble in face-to-face situations. Business practitioners could have a first hand involvement in higher education and contribute to develop the human resources they need for their own companies. For students, this would represent a definite enhancement in the quality of business education. Their interaction with professors from other disciplines and real-life

managers through an ALN, would help them bridge the gap between "the academic goal of knowing and the practitioners necessity of acting".

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APPENDIX 1

Figure A. Interaction Effects: Solution Quality

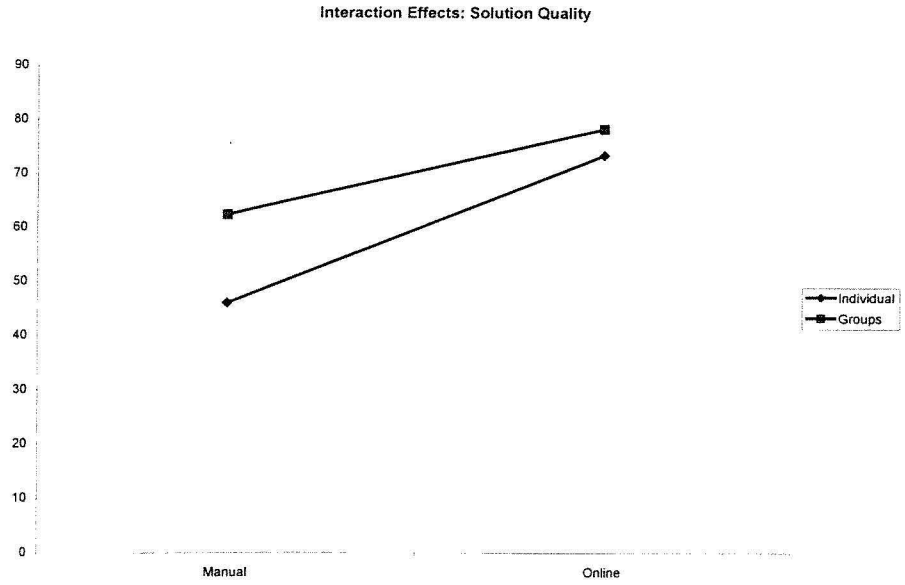

Figure B. Interaction Effects: Length of the Reports

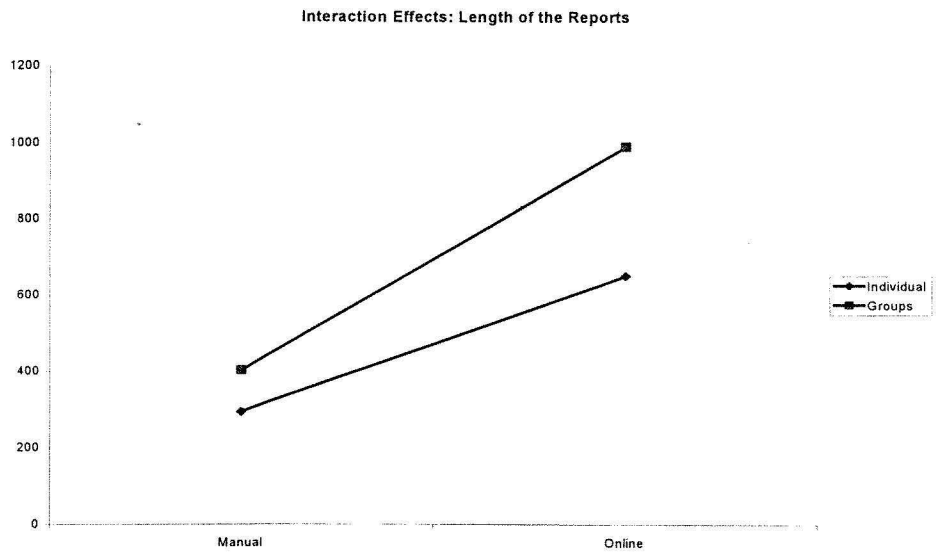

Figure C. Interaction Effects: Process Satisfaction