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The Impact of using Computer Supported Collaborative Learning Tools on Moral Reasoning in A Multi-Institutional Computer Ethics Module

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Abstract

Concerns about the increased use and abuse of information technology have evolved into more formalized evaluations of computer ethics in many organizations. This trend extends to most of the universities where they provide different modules related to professional computer ethics. Although these formalized evaluations have become more common, very little is known about the effects of collaborative learning on students' moral reasoning and how to assess it.

This study uses an experiment, involving students in three universities: University of Limerick in Ireland, De Montfort University in England and Sacred Heart University in the USA. The authors will describe the implementation of virtual groups that comprise students from the three institutions and evaluate their use of Blackboard in their discussion and analysis of an ethical dilemma. We will also provide some analysis of the development of moral reasoning by pre- and post testing students using Moral Judgment Test (MJT) (Lind, 2000). The results of this research will be of great value for both academic and practitioners in the area of computer ethics.

1. Introduction

A study of the effects on learning of a multi-institutional approach to the teaching of professional issues was conducted amongst students from three different universities in Ireland, England and USA. The study is discussed more fully in Grodzinsky, Griffin and Jeffries (2002).

Students from the three universities following similar courses worked together in virtual groups to solve moral dilemmas. Seven groups were established. Each group selected a scenario from a list supplied by the course tutors and worked over a six week period using asynchronous communication tools provided by the learning management system, Blackboard. Upon completion of this task groups were graded independently by the three course tutors according to an agreed upon grading scheme (Appendix 1). The independent grades were then moderated and final grades awarded to each group. Individual grades were altered where there was evidence of different levels of contribution from group members.

In this study we have used an instrument, the Moral Judgment Test, to assess what if any changes may have occurred in students moral reasoning while working in multi-institutional virtual groups . Analysis examined the changes in the MJT C-index (Lind 2000 and see below) from the pre course stage to post course stage. Reasons for the changes in this score have been used to suggest alterations to the design of collaborative teaching in this academic field.

2. Measuring moral reasoning

There are many courses in many institutions worldwide that attempt to teach students how to deal with the moral questions that they may encounter in their professional lives so that the learners have the opportunity to develop their moral reasoning ability. Assessing academic performance is then usually done by using a standard approach such as an examination or by getting learners to undertake specific tasks such as analysing moral dilemma case studies. However, whether or not these assessment exercises actually tell us anything about the development of moral reasoning in the learner is open to question.

Lawrence Kohlberg (1958, 1964, 1984) has proposed one approach that might be used to measure moral reasoning. He based his stage theory of moral development on the work of Piaget (1965/1932).

Piaget developed a two-stage model of moral development. He found that when children under 10 or 11 years were thinking about moral dilemmas they regard rules as fixed and absolute. Children in this age group also base their moral decision making on a consideration of the consequences of their actions. Children of this group also believe that rules are handed down by authority figures such as God or parents and cannot be changed. As the child gets older he or she develops a more relativistic view in which rules are seen as being possible to change and as being there only to enable humans to behave cooperatively. Older children also base their judgments on intentions.

An example that illustrates this two stage theory is where the young child hears about two boys, one who broke a large number of cups trying to help his mother, and another who broke only one cup trying to steal biscuits. The younger child will typically think that the first boy behaved worse. The younger child focuses on the amount of damage that was caused, and the consequences, whereas the older child is more likely to assess the level of wrongness in terms of the motives underlying the act (Piaget, 1932, p. 137). According to Piaget's theory of development, the child of age 11 to 12 enters the general stage of formal operations of intellectual development (Piaget op. cit).

Kohlberg also believed that people progress through a series of stages in their moral reasoning development. But unlike Piaget he believed intellectual development doesn't stop at 12. In his research, Kohlberg interviewed children older than those in Piaget's study to see if there were more stages of moral reasoning than the two proposed by Piaget. This work eventually led to Kohlberg's six stage model on which the Moral Judgment Test is based.

Kohlberg (1963, 1970) sampled young adults from a variety of backgrounds and cultures aged between 10 and 16. The subjects were presented with a series of ethical dilemmas and then extensively interviewed. The interviewer focused on the reasons behind answers in order to get an understanding of the subject's reasoning. In one ethical dilemma the main protagonist steals a drug to help his dying wife after a pharmacist refuses to supply it for half what he normally charged, a sum that would still have netted a 500% profit. In this example the children were asked if the protagonist had a right to steal the drug, if he was violating the pharmacist's rights, and what type of sentence a court should give him if he was caught. The main function of the questions was to determine the reasoning behind the answers. The interview then continued with further moral dilemmas so that a good sampling of a subject's moral thinking could be acquired. The results were then classified into stages. Kohlberg also established that his scoring was reliable by working out the level of *interrator reliability*. This was established by calculating the degree to which scorers agreed by getting a number of scorers to independently score the answers.

Table 1 shows the six stages of moral judgment that Kohlberg eventually identified (Kohlberg, 1981)

LEVEL	STAGE	SOCIAL ORIENTATION	DESCRIPTION
Pre-conventional	1	Obedience and punishment	Fear of punishment
	2	Individualism & Exchange	Returning favours
Conventional	3	Good interpersonal relationships	Putting yourself in other's shoes
	4	Social Order	Avoiding societal breakdown
Post-conventional	5	Social contract & individual rights	Obeying the law and upholding rights such as liberty and life
	6	Universal Principles	Guided by principles of justice, human rights and human dignity

Table 1. Kohlberg's Six Stages of Moral Judgment

Perhaps the major difference between Kohlberg's definition of moral judgment and that of Piaget was that Kohlberg defined morality in affective, cognitive and behavioral terms. In the affective domain the individual has moral ideals. These then guide moral behaviour. But for that moral behaviour to be morally mature there needs to be developed reasoning competencies. Fig 1 below summarises this.



Figure 1 Aspects of Moral Behaviour (after Lind 2002).

The relationship between these three aspects of morality led to the development by Kohlberg of criteria for the measurement of moral reasoning. He then designed the Moral Judgment Interview where subjects took part in an interview where they were asked to respond to moral dilemmas and then questioned on their responses.

Lind (1986) took this idea one stage further by developing the MJT where subjects were presented with moral dilemmas and a number of different responses (organised into pro and con statements), each response representing a different stage of Kohlberg's six stage model. Subjects were then asked to rate their agreement with the response on a nine-point scale from -4 to +4.

The MJT was designed so that it satisfied the main postulates, as laid down by Kohlberg, for an adequate moral reasoning measurement tool. These include:

- the ability to measure both the cognitive and affective aspects or moral behaviour
- the inclusion of a moral task
- non-fakeability (i.e. subjects should not be able to get scores higher than their moral reasoning competency)
- sensitivity to change, measure the subject's own moral principles rather than imposing external moral expectations
- equivalence of both pro and con arguments in terms of Kohlberg's six stages.

The MJT uses two moral tasks to assess the subjects' moral reasoning level. The dilemma is defined by Lind as "a situation in which a person cannot make a decision without transgressing an important moral rule or principle" (Lind 2002). In the MJT the moral dilemmas were concerned about a mercy killing situation, the Doctor's Dilemma and a Worker's dilemma about the employees' and employers' rights and the rule of law. The moral task is contained in the arguments that the subject is asked to score. Table 2 below shows some example statements.

<p>How acceptable do you find the following in <i>favour</i> of the doctor? Suppose someone said he acted <i>rightly</i></p> <p>20 because the doctor had to act according to his conscience. The woman's condition justified an exception to the moral obligation to preserve life.</p> <p>21 because the doctor was the only one who could fulfill the woman's wish; respect for her wish made him act as he did.</p> <p>22 because the doctor only did what the woman talked him into doing. He need not worry about unpleasant consequences</p> <p>23 because the woman would have died anyway and it didn't take much effort for him to give her an overdose of a painkiller.</p> <p>24 because the doctor didn't really break a law. Nobody could have saved the woman and he only wanted to shorten her suffering.</p> <p>25 because most of his fellow doctors would presumably have done the same in a similar situation</p>

Table 2: Extract from standard MJT (Lind 2002).

In each argument the subjects then rate their response from -4 (strongly disagree) to +4 (strongly agree).

In all there are 24 arguments, 12 for each dilemma with six pro and six contra arguments. The arguments represent Kohlberg's six stages but are randomly ordered.

Subject responses are then scored using multivariate analysis of variance components to give C-index (full details of the scoring method can be found in Lind 2001). The C-index can vary from 1 to 100. C is graded as very low (1-9), low (10-19), medium (20-29), high (30-49) and very high (40-49) and extraordinary high (above 50).

The MJT is not designed for individual assessment of moral competence as a person's moral reasoning can be influenced by a number of factors such as fatigue, experiences, emotional state etc. So, in order to guard against misinterpretation of results, subjects are first grouped and the C -index scores are then averaged for each group.

3. The Study

Students from three universities had to work in groups to analyse a moral dilemma. The group comprised students from at least two institutions but in most cases there were students from all three institutions in each group. Table 3 below shows the make up of the groups. There were a further 126 students from the University of Limerick who worked in 20 single institution groups as controls. 16 of these had six members, two had 5 members and two had 4 members.

Group	Limerick	De Montfort	Sacred Heart	Total
Int 1	2	1	2	5
Int 2	2	2	2	6
Int 3	4	0	1	5
Int 4	2	2	2	5
Int 5	2	0	2	4
Int 6	2	2	1	5
Int 7	2	2	2	6
Total	16	9	12	

Table 3: International make up

The MJT questionnaires were distributed during the first and final lecture slots in the courses. Students were asked to fill out their responses in the lecture room and then forms were collected. The test administration states that the test should take “approximately 10 to 20 minutes to fill out” and this was the observed case. However, in some instances students who were absent from this initial lecture filled out the test papers in their own time. This may have affected subsequent results. Some students did not complete either the pre course and/or the post course questionnaires. Students who did not submit both the pre and post MJT papers had their C-score eliminated to avoid skewing the results. Table 4 below shows the number of completed test forms for all situations.

	Pre	Post
De Montfort	9	8
Limerick	100	117
Sacred Heart	12	11

Table 4: Completed MJT forms

4. Results

In order to avoid individual differences due to external factors such as fatigue, illness, emotional state etc., the MJT C-scores differences were calculated for each pair of

completed test papers and these differences were then averaged for each group (Lind 2002). A positive mark of >5 indicates that there has been a measurable improvement in moral reasoning for the group while a negative indicates an erosion of moral reasoning competence.

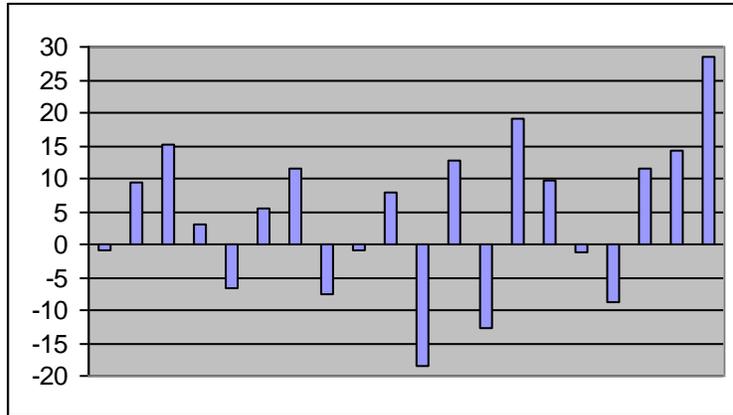


Figure 2 Single institution MJT averages.

As can be seen from Figure 2 above, 11 groups had an increase of >5 and 5 had a decrease of >-5.

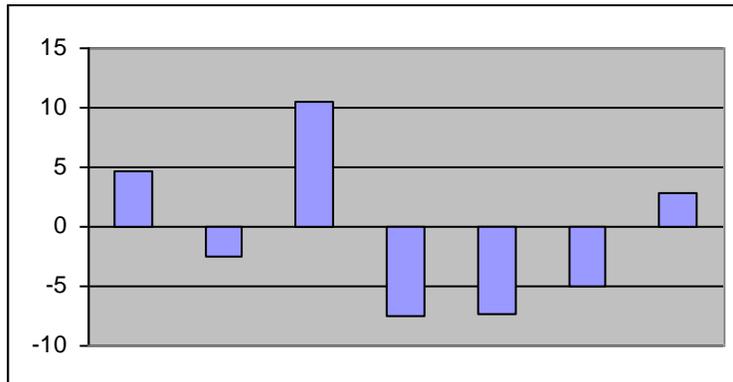


Figure 3 Multi institution MJT results

In multi-institution groups only a single group showed an increase >5 and four showed decreases => -5.

Single institution groups scored higher on average (3.9) than multi-institution groups (-0.12). However as neither score is greater than 5 no significance can be attributed to these. Also a higher percentage of single institution groups achieved positive C-score differences between the pre and post test conditions than was achieved by multi-institution groups.

Group	Country	N	Completed MJT tests	C -Score average
Int 1	Irl	2	2	3.25
	UK	1	1	37.71
	US	2	1	-25.5
Int 2	Irl	1	1	-7.3
	UK	2	2	-3.97
	US	2	2	1.37
Int 3	Irl	4	4	12.83
	US	1	1	1.24
Int 4	Irl	2	1	8.13
	UK	2	2	-10.47
	US	1	1	-17.43
Int 5	Irl	2	1	5.23
	US	2	2	-13.53
Int 6	Irl	2	2	-1.1
	UK	2	2	-2.79
	US	1	1	-17.6
Int 7	Irl	2	2	7.22
	UK	2	1	-1.67
	US	2	2	0.82

Table 5 Breakdown of C index scores by country for each international group

Table 5 shows a breakdown of the C index scores for each multi-institution group. It also shows the average scores achieved by students from each country and the number of completed (pre and post) MJT questionnaires.

It can be seen that the averages varied within groups, and across national representations. It should also be noted that not all students from a specific institution in a group completed the pre and post test questionnaires. In all only 9 averages could be taken where $n > 1$. As a result, there is little valid analysis that can be applied to these results.

4.1. Unanticipated difficulties that might have impacted the results of the MJT

As well as problems with the data analysis, there are a number of other factors that need to be flagged here as they have implications to the future design on such studies.

The first issue concerns the level of importance students gave to the completion of the MJT questionnaires. If we examine the results in Table 5 we see that in Int 1 one student achieved an increase of 37.71 while another student (who was part of the same learning group) had a score of -25.52, a dramatic decrease in moral reasoning. This decrease in ability is highly implausible. And wide differences in intra group scores achieved by all students (virtual and face to face) has been recorded. We therefore have assumed (supported by some anecdotal evidence) that students did complete the MJT questionnaires with the required level of cognitive engagement to provide us with results that can be validly analysed.

In order to overcome this in a future iteration of this study, methods will be introduced to impress upon students the seriousness of taking the MJT. It may be that by relating the completion of the MJT to the grade they can achieve would have this effect.

There were also a number of practical management issues. In order that the study could proceed one of the first hurdles to be overcome was finding institutions that taught the same courses to students of the same level in the same semester. Following a fairly exhaustive trawl three institutions (on four sites, see below) were eventually identified. The difference in student numbers in each course meant that not all students from the largest group (University of Limerick) could be in the international collaboration groups but the authors decided that those who were not could make up control groups. Perhaps the fact that the single institution groups had more ready access to their course tutor is reflected in the higher average marks for these groups.

Another management problem concerned the withdrawal of one group of collaborating students. De Montfort university teaches the PCICT module to two groups of students on two different campuses. Groups were to have been constructed with students from both of these sites. However, some weeks into the study the students at one site decided they did not want to be involved in this project and as a result all the established groups had to be re-organised. This is likely to have caused considerable damage to burgeoning group cohesion.

A further difficulty concerned the academic calendars of the three institutions. Although each college was teaching the module in the second (Spring) semester, it was only after the project was in the advanced planning stages that it became apparent that one institution started their semester in January while the others started in mid-February. This meant that some students were much further advanced in their courses than their collaborators. Added to this was the arrangement for vacations and other breaks. Students in Ireland celebrate St Patrick's Day with a long holiday weekend, students in Sacred Heart and DMU, England had two weeks holiday at Easter whereas students in Ireland had only a two day break. Also students had differing commitments from other courses, which in Limerick meant that one week of teaching was suspended to allow students to demonstrate final year projects. Finally, students at Sacred Heart University had mid term exams in March and the seniors had Senior Project Presentations in April.

All in all this meant that there were periods when not all members of the international groups were working on this particular task.

Another area that may have affected results is the way the virtual groups were formed and sustained. Anderson et al (2001) in their Community of Inquiry model, postulate that learning occurs through the interaction of three core components in computer conferencing systems. These are cognitive presence, teaching presence, and social presence. Elsewhere (Griffin, Grodzinsky and Jeffries, 2002) we discuss the importance of cognitive presence.

The formation and sustaining of virtual groups is, according to the Community of Inquiry model influenced strongly by 'social presence'. This is defined as the ability of learners to project themselves socially and emotionally in a community of inquiry. The function of this element is to support the cognitive and affective objectives of learning. As the MJT measures changes in both the cognitive and affective domains there are implications for the increase in C-index scores (and *inter alia* student learning) in establishing and sustaining virtual groups in teaching interventions such as in this study. As a consequence, lack of expertise by both faculty and students on how to behave socially in virtual groups may have inhibited the potential for success in this project. A future iteration of this project will include work to deal with these aspects of the process.

One of the reasons for embarking on this study was to provide students with the opportunity of working in virtual collaborative groups. It was felt by the authors that this was a useful secondary skill in the area of communications that students increasingly need to have had experience with while at university. However, students themselves found a number of difficulties with this approach. The most notable of these were:

- the asynchronous nature of the tool (often students were waiting before they could move on to the next task)
- lack of organization skills of students in using this kind of media for division of work (they just expected things to happen rather than specifically articulating them)
- lack of roles within the group (the groups that achieved the highest grades, took our suggestion to have group roles, those that did not had no leader or organizer and students just expected others to do the work)
- perhaps this seemed less pressing because it was virtual and not "real" (no tutors constantly monitoring progress as opposed to other course where there might be constant pressure from regular face to face tutorials)
- allowing virtual groups to self organise (setting own deadlines and milestones)
- more time to get to know each other, to articulate their strengths and weaknesses

There may well be a need to formally teach our students how to operate in virtual groups, how to manage projects, assign roles and review progress.

It is also worth noting that students from different universities contributed different amounts to the asynchronous discussions. As this assessment task carried different weightings for the three course, students may have had differing levels of extrinsic motivation to become involved in this collaborative task. With different rewards, it is hardly surprising that these groups did not function as learning units working towards the same goal.

Ethical analysis Guidelines (Appendix 2) given to students were mainly confined to logical reasoning and lacked moral emotions and associated psychological processes. The MJT measures both the affective and cognitive changes and students may not have developed these during the project. According to Lind (personal communication) "in face to face interaction, those things (emotional involvement) are unavoidable and may contribute to the development of judgment competence". A possible solution here would

be to develop the ethical guidelines given to students to include advice on the affective aspects of ethical analysis.

A further problem may be that the actual dilemmas that students were given may lack a level of authenticity in that they focus on asking for academic reasoning about the scenarios. More work on the design of dilemmas might produce better scenarios by which students can apply their moral reasoning and by doing so develop same. It is worth noting here that a lot of groups went directly to legal analysis and bypassed any ethical analysis or added it as an afterthought. If they did not engage in the ethical analysis then no improvement in moral reasoning could be expected to have taken place. Again this could be the lack of comfort level with ethical analysis.

Related to this is the fact that although students were given these scenarios to analyse, this was their first attempt at such analysis and it was also the one in which they were assessed. Had they had more opportunity to analyse ethical dilemmas in a situation where they received feedback from tutors then more learning may have taken place. In the single institution groups, ready access to the course tutor meant that although these students were also assessed on their only attempt at ethical analysis, they were able to discuss their progress more easily than students in the virtual groups. Impromptu conversations after lectures, in coffee bars etc. may have had an effect on the ethical reasoning of those students in Ireland.

5. Conclusions

Although there have been significant difficulties in this pilot study, in particular in the use of the MJT to assess learning, the authors feel that the lessons learned can now be applied in a further study to truly test out hypothesis that collaborative learning in virtual groups will improve moral reasoning.

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Appendix 1 Scoring Rubric

Objective	Unsatisfactory	Satisfactory	Meets Expectations	A
Students will be able to demonstrate effective communication skills and solid ethical reasoning: Writing ethics papers	<=39%	45%	55%	
Purpose <ul style="list-style-type: none"> ▪ <u>Focus</u> ▪ <u>Significance</u> (shows an awareness of main ideas) • <u>Assignment topic</u> 	Objective not clearly stated, paper lacks central focus Lack of awareness of main ideas or wrong interpretation of main ideas Doesn't write on topic	Satisfactory attempt at stating the objectives and focussing the paper. Covers basic subject matter adequately but insufficiently analytical. Some irrelevancies/ omissions evident	Objective adequately stated paper has central focus Some awareness of main ideas and some critical analysis Mostly sticks to assigned topic	Objective has good Good awa Clear evic judgemen Meets all

<p>Discussion Contributions</p> <ul style="list-style-type: none"> ▪ <u>Structure</u> (Individual Postings) ▪ <u>Coherence</u> (Group Discussion) ▪ <u>Paragraphing</u> (transitions f/one idea to next) (Group Discussion) 	<p>No clear structure or pattern to contributions. Irrelevant postings that do not add to/further the debate.</p> <p>Entire discussion lacks clarity; story lacks coherence overall.</p> <p>Lack of transitions between ideas</p>	<p>Covers the basic subject matter adequately and is appropriately organised. Attempts to further the debate.</p> <p>Some limitations in the ability to select and present relevant material in a coherent way.</p> <p>Some attempt at transitions between ideas posted</p>	<p>Adequate structure or pattern evidencing ability to structure and organise arguments. Adds to the debate and evidences some individual reading and research.</p> <p>Discussion is generally clear; coherent overall</p> <p>Adequate transitions showing some evidence of extending the discussion</p>	<p>Clear evidence, judgement and analysis contributing to supported</p> <p>Discussion ability to</p> <p>Good to good award be a contribution</p>
<p>Organization</p> <ul style="list-style-type: none"> ▪ <u>Audience</u> ▪ <u>Introduction and Conclusion</u> 	<p>Inappropriately targeted.</p> <p>No clear Intro and/or Conclusion</p>	<p>Some awareness of audience evidenced.</p> <p>Satisfactory attempts at providing an Introduction &/or Conclusion</p>	<p>Guides reader</p> <p>Clear Introduction &/or Conclusion provided</p>	<p>Shows a good audience</p> <p>Good Intro that reveals originality</p>
<p>Evidence</p> <ul style="list-style-type: none"> ▪ <u>Accuracy</u> (statements) ▪ <u>Support</u> (opinions are adequately supported) ▪ <u>Documentation</u> ▪ <u>Counterarguments</u> ▪ <u>Social/Ethical Analysis</u> 	<p>Sources are inadequate Inaccurate statements made.</p> <p>Lack of support for statements/opinions</p> <p>No sources identified in the body</p> <p>Missing counterarguments</p> <p>Doesn't make use of ethical & social analysis and theories</p>	<p>Sources adequate. Some minor inaccuracies.</p> <p>Satisfactory attempt to support opinions</p> <p>Some sources are identified and referenced appropriately in the body</p> <p>Counterarguments presented but not fully analyzed</p> <p>Minimally & unconvincingly uses ethical & social analysis and theories</p>	<p>Most statements are accurate.</p> <p>Adequate support for statements/opinions</p> <p>Most sources are identified and referenced appropriately in the body</p> <p>Counterarguments presented,</p> <p>Makes good use of ethical and social analysis and theories</p>	<p>Statements</p> <p>Good support statements</p> <p>All sources referenced in body</p> <p>Counterarguments some analysis</p> <p>Uses ethical and theories</p>
<p>Mechanics</p> <ul style="list-style-type: none"> ▪ <u>Sentence structure</u> (grammar, sentence structure, spelling, punctuation) ▪ <u>Appearance</u> (Paper, References) 	<p>Many errors in grammar, spelling, and/or punctuation. Mechanics interfere with reader's understanding of the text</p> <p>Poor appearance of Paper, No References included or References incorrectly laid out.</p>	<p>Acceptable standard of grammar, spelling and punctuation.</p> <p>Acceptable appearance of Paper, References included and correctly laid out.</p>	<p>Few errors in grammar, spelling, and/or punctuation. Minimal distraction.</p> <p>Good appearance of Paper, References included and correctly laid out.</p>	<p>Good use of grammar and punctuation mechanics</p> <p>Very Good Paper, all included</p>

Comments:

Appendix 2

Analysing Scenarios for Ethical Implications

- (after Blaise Liffick)

Basic Check List

This list is intended to get you started in analysing your chosen scenario. It is not exhaustive and is not meant to be linear - you will have to revisit each area in the light of the fresh information being produced during the course of your investigations.

1. **List all participants** - primary, secondary, peripheral
2. **List key statements** - do not make implications that are not present. You may need to make proposals based on different sets of assumptions at a later stage.
3. **Prioritise lists for key players and issues** - some are more important than others
4. **List possible justification for the participant's actions** - these should be limited to legitimate justifications and not wild conjecture
5. **List possible legal implications** - this should form a basis for more in-depth investigations - include what might be standard company policy in this area
6. **List possible ethical implications** - just because there is not a law or policy prohibiting an action does not mean that the action is ethical - the appropriate codes of practice and conduct must be consulted
7. **List possible options of the participants** - this should cover choices that could have been made before the situation has got to the critical point as well as a number of ways forward. Do not attempt to make value judgements about the future choices at this stage
8. **Compare options with ethical and legal codes.** Has any law or code been broken ?
9. **Examine other models and related issues.** Computing is not an isolated field - have similar situations that can be learnt from arisen in other areas ?
10. **What should be the organisation's / individual's course of action ?** Is recourse to law a viable option ? In each case you need to justify and rank any alternative suggestions, clearly stating the pros and cons. You will not be making the final decision only recommendations.
11. **Explain Technical terms:** Always explain technical terms when they are first introduced.
12. **List any legal conflicts:** If you find a law that applies in one country then it is a good idea to see if equivalent laws exist in other countries and if not why not. You could always write to TDs or their equivalent.
13. **List other contradictions:** Look for contradictions between different codes of ethics/conduct and between codes of ethic and the law. Also consider conflict between the laws of different countries and between national laws and international treaties.
14. **Stick to the point:** Don't extend the scenario to include other possibilities, concentrate on the information given, e.g. say software systems are implicated in the faulty design of a building - don't start examining the possibility that faulty materials were used.

15. **Don't make assumptions:** Clearly state all of your assumptions but also consider what would be the case if your assumptions did not hold.
16. **Support with ethical theories ***We added this******