

# The Ethical Decision-Making Processes of Information Systems Workers

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**ABSTRACT.** An empirical investigation was conducted to determine whether management information systems (MIS) majors, on average, exhibit ethical decision-making processes that differ from students in other functional business areas. The research also examined whether the existence of a computer-based information system in an ethical dilemma influences ethical decision-making processes. Although student subjects were used, the research instrument has been highly correlated with educational levels attained by adult subjects in similar studies. Thus, we feel that our results have a high likelihood of generalization to the MIS professional community. The results indicate that MIS majors exhibit more socially-oriented ethical decision-making processes than non-MIS majors measured by the Defining Issues Test. The results also indicate that the existence of a computer-based information system in an ethical dilemma may influence ethical decision-making processes. The study makes no statement regarding MIS majors making "more (or less) ethical" decisions. The business ethics literature is reviewed, details of the study are presented, implications for management are considered, and directions for future research are suggested.

## Introduction

Computer-based information systems are a growing

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part of the average person's daily existence. Whether making an airline reservation, paying a traffic fine, reviewing a bank statement, or selecting a seat for an upcoming opera performance, individuals face ever-increasing levels of interaction with computer-based information systems. In spite of this trend, little is known about the ethical decision-making processes of persons creating these systems or how information systems influence ethical decision-making behavior.

A lawyer specializing in technological issues recently noted the conflicting assumptions made by computer systems users and computer systems professionals. While users assume they have total privacy regarding their computer work, computer professionals assume they have total access to anything in the system (Elmer-DeWitt, 1987). This difference in opinion could create an ethical dilemma for the computer professional that accesses information a user thought would never be seen by anyone else. Similarly, recent increases in applying artificial intelligence (AI) techniques to problem domains such as medicine (Pople, 1985; Shortliffe, 1976; Weiss, 1978) and business (Applegate, 1987; Blanning 1984; Bouwman, 1983; Courtney *et al.*, 1987; Dhar, 1987; Nunamaker *et al.*, 1987; Paradise and Courtney, 1987; Shane *et al.*, 1987) create situations where understanding management information systems (MIS) developers' moral attitudes becomes important. Expert systems software, which employs AI techniques, makes "reasoned" deductions. These deductions are based on knowledge extracted from experts and encoded into the system. Hence, one may envision that an expert's biases and/or a programmer's prejudices could be embodied in an expert system (Paradice and Courtney, 1986). This situation, among others, has led AI researchers to give greater attention to ethical issues (Colby, 1986; LaChat, 1986; Waldrop, 1987).

Our interest in MIS-related ethics research is not solely philosophical. Computer-based systems affect all of the central tasks of well-managed organizations (Coates, 1985). Today's technology puts vast amounts of information at an analyst's fingertips. Competitive advantage worth millions of dollars may be at great risk if an organization's confidential information is disclosed by an analyst. In addition, the complexity in many systems today precludes any one person knowing exactly how a system operates. Thus, someone exploiting a system flaw for personal gain may go undetected indefinitely, perhaps costing an organization large amounts. Indeed, unethical MIS-related practices cost money.

### Research in moral development measurement

Before examining the prior research in ethics in MIS, we review the research in moral development measurement as it is a cornerstone of our experimental design and analysis. Pursuing research with broad social overtones is difficult at best, and may be doubly so given the complexity of ethical decision-making processes. However, the seminal work in moral development measurement, pursued by Kohlberg and his associates (Colby *et al.*, 1983; Kohlberg, 1969; Kohlberg and Candee, 1984; Kohlberg and Turiel, 1973), hypothesizes that moral development progresses through six stages of increasing social orientation. These stages are:

*Heteronomous morality* — decision-making behavior is governed by avoiding behavior that leads to punishment.

*Individualism, instrumental purpose and exchange* — decision-making behavior is governed by one's immediate interest.

*Mutual interpersonal expectations, relationships, and interpersonal conformity* — decision-making behavior is governed by exhibiting behavior expected by others. Concern for others becomes evident at this stage.

*Social system and conscience* — decision-making behavior is governed by exhibiting behavior that fulfills agreed upon duties. An attitude that laws are to be upheld except in extreme cases is exhibited at this stage.

*Social contract or utility and individual rights* —

decision-making behavior is governed by recognition that people hold a variety of values and opinions and that many values are relative to one's social group.

*Universal ethical principles* — decision-making behavior is governed by following self-chosen ethical principles.

The first stage is extant in the earliest years of youth; the last stage is exhibited only in rare adult cases. Reasoning at the two lower stages is termed "preconventional reasoning," reasoning at the two middle stages is "conventional reasoning," and reasoning at the two higher stages is "principled reasoning." A comprehensive review of research over a ten-year period provides evidence that Kohlberg's stage hypotheses are valid (Colby *et al.*, 1983). A specific result germane to this study is that there appears to be a relationship between the education level attained and the moral development stage.

Rest (1979, 1986, and 1987) has built upon Kohlberg's work in developing the Defining Issues Test (DIT). The DIT presents written moral dilemmas to subjects followed by a list of issues that a person might consider in resolving the dilemma (See the Appendix for examples.). The subject must decide how important each issue is in determining the proper course of action. The subject also indicates which four issues are the most important to consider in deciding what to do. The DIT is a multiple-choice test that has been "standardized" since the early 1970s.

The test-retest reliabilities for the DIT scores that have been reported are generally in the high 0.70s or 0.80s; Cronbach's internal consistency alpha index is generally in the high 0.70s (Davison and Robbins, 1978; Rest, 1986). Longitudinal studies have verified that the DIT scores change as expected with the maturity of the subject (conditional on education level attained) (Colby *et al.*, 1983; Rest *et al.*, 1978). Analysis also indicates that DIT scores correlate highly with other test scores measuring similar variables and the DIT scores do not correlate as highly with scores of dissimilar variables (Rest, 1986). Also, studies have demonstrated that individuals are unable to "fake good responses" easily (McGeorge, 1975).

The DIT has been used in hundreds of studies (see Colby *et al.*, 1983 and Rest, 1987 for detailed bibliographies). Several generally accepted findings are relevant to this study (Rest 1987). First, the amount

of formal education that a person has is highly associated with adult moral judgment development. Second, there is no evidence of sex bias in the DIT. Third, strong, conservative religious beliefs tend to be correlated with low DIT scores while liberal religious beliefs tend to be correlated with high DIT scores.

One of the most significant conclusions from prior studies is that a person's formal education is highly associated with moral judgment development. In fact, studies indicate that adult scores are comparable with the scores of students who are currently at the highest educational level attained by the adult. As stated by Rest (1987, p. 7.3):

Cognitive restructuring of one's moral thinking seems to be more related to years in school than to years since birth in adults. In fact, the evidence at hand suggests that adults in general do not show much advance beyond that accounted for by their level of education. . . . Adult subjects who ended their formal education many years ago tend to have about the same scores as students currently at that level of education.

Therefore, although extrapolations of experimental results based on studies involving student subjects are always suspect, it is highly likely that this study's results may be validly externalized to non-student populations with similar educational backgrounds.

The most commonly used score from the DIT is the P score, P standing for "principled morality." This score reflects the number of times that principled reasoning stage development issues are chosen as most important in determining a course of action in a moral dilemma. This score is interpreted as the relative importance a subject gives to principled moral considerations in making a decision about moral dilemmas (Rest, 1979). The P score is usually expressed as a percentage, and can range from 0 to 95. The P score has shown the most consistent reliability and validity trends of any DIT score (Rest, 1986).

Another score calculated from the DIT questionnaire is the D score (Davison, 1978). While the P score considers only the principled reasoning stage scores of subjects, the D score is based on data from all of the stages. The D score is a composite score in which the score is higher when the subject gives high ratings to more socially-oriented stage issues, and the score is lower when the subject gives high ratings to less socially-oriented stage issues. The P

score measures only the principled reasoning stages; the D score measures preference for principled reasoning over reasoning exhibited in lower stages. Conceivably, a subject could have a zero P score and a "moderate" D score, if the subject did not consider any principled reasoning stage issues (the latter stages of development) and gave high ratings to the conventional stage issues (the middle stages of development). Hence, the D score may be a better indicator of overall development.

### Prior research in ethics in MIS

Having looked at the research in moral development measurement, the next step is to examine the research in ethics in MIS. Ethics research outside of MIS has been pursued widely. As shown in Table I, many variables have been hypothesized to influence ethical decision-making processes. Although some notable empirical studies have occurred (Hegarty and Sims 1978 and 1979, Fritzsche and Becker 1984, and Worrell *et al.*, 1985), much of the work listed in the table describes frameworks and conceptual models. Trevino (1986) and Bommer *et al.* (1987) suggest a continuing effort to validate framework components empirically.

Ethics topics within the MIS literature may be generally partitioned into three categories, as shown in Table II. One category considers broad, social implications of MIS practices. A second focuses on identifying differences between MIS and other professionals. The third considers the impact of technology on decision-making processes.

#### *Social issues*

Sackman (1976) included the tenet of "humanistic automation" in his outline of principal tenets of a man-machine systems theory. According to Sackman, computer systems exist to meet human needs and serve social well-being. Sackman observed that ethics and values could be treated as research hypotheses and therefore examined scientifically.

Recently, monographs have appeared which address ethics and computers (Johnson, 1985a and 1985b). Additionally, Mason (1986) addressed ethical behavior in terms of privacy, accuracy, property, and accessibility. Mason states that there exist certain

data items which individuals have a right (1) to keep private, (2) to ensure are accurate, (3) to own, and (4) to access. He noted that "information forms the intellectual capital from which human beings craft their lives and secure dignity" (p. 5). However, information technology may be misused in each of these four critical areas, reducing an individual's intellectual capital.

D. W. Johnson (1984) addressed ethical issues involving the proliferation of computer-based information. He focused primarily on the need for modification of existing rules governing human behavior. His work outlined the characteristics that an "ethic for a computer society" should exhibit.

A recently formed organization, Computer Professionals for Social Responsibility (CPSR), emphasizes the ethical responsibilities of computer industry professionals. An industry newsletter, *Conscience in Computing*, is devoted to providing a forum for the discussion of ethical issues in computer-based business environments (Computer Decisions, 1985).

#### *MIS group differences*

Weinberg (1971) noted that data processing managers must deal with moral dilemmas but did not examine whether data processing (i.e., MIS) professionals may differ from other professionals. Approximately a decade after Weinberg's writing, however, the results of a study of professionals' (technologists, managers, ethical philosophers, lawyers, and others) abilities to identify ethical issues in hypothetical scenarios indicated that perceptions of ethical behavior vary widely (Hoffman and Moore, 1981; Parker, 1979 and 1981). In most cases the professionals were divided when asked whether the scenario's actor had behaved ethically. In some cases, some professionals indicated there was no ethical issue in the scenario. Parker did not perform sophisticated statistical analysis in his experiment, but the results appear to indicate that differences may exist in the way these professional groups "process" a moral dilemma. A similar study by Paradise (1990) confirmed a statistically significant difference in the way that groups of students processed a moral dilemma.

More recently, Shim and Taylor (1988) studied the ethical attitudes of business school faculties. Their study partitioned faculty into MIS, accounting, marketing, business policy, statistics/MS/OR, and

"other" groups. Shim and Taylor's data indicate that MIS and statistics/MS/OR faculty are more likely to copy microcomputer software illegally than faculty in other areas. Shim and Taylor have extended their study to practicing managers (1989). They report that managers, unlike their academic counterparts, report little evidence of software piracy. This study also suggests that MIS professionals may view ethical dilemmas differently from other professionals.

#### *Technological impact*

Jastrow (1987) addresses the growth of computing power and relates this growth to man's evolution. He suggests the future may consist of a symbiotic relationship where computers minister to man's social and economic needs. Sheridan (1987) describes computer crime phenomena and asks whether an information system's presence directly impacts criminal activity. As observed by Bommer *et al.* (1987), managers acquire and process information from many sources at each decision process stage. Information selection and filtering at each stage is likely to have considerable impact on the ultimate decision made. Each of these situations implies that computer-based information systems influence actions.

Other MIS research has addressed the impact of technology on decision-making processes. When communication between organizational decision makers is discouraged, dysfunctional approaches to decision making, characterized by high levels of cohesiveness and conformity (i.e., "groupthink"), may begin. Group decision support systems research (DeSanctic and Gallupe, 1987; Nunamaker *et al.*, 1987; Straub and Beauclair, 1988) is aimed directly at mitigating the ill effects of group decision-making processes while retaining and enhancing its advantages. Thus, there is already a significant body of MIS research predicated on the assumptions that social factors influence decision-making processes and that technology can influence the impact of these effects.

In summary, theory-based empirical investigation of computer industry professionals' ethical decision-making behavior is scarce. Empirical studies in ethics research are difficult. However, De George (1987) observed that frameworks and hypotheses need to be tested to move business ethics research beyond discussions of morality to a point where tangible results that can impact organizational behavior can be identified.

Using these three MIS themes as a guide, a step toward more rigorous hypothesis testing in ethics research investigates empirically (1) whether Parker's distinctions between professional groups extends to MIS/non-MIS categories and (2) whether computer-based information systems influence a person's actions. For completeness any joint influence attributable to the combination of group affiliation and computer influence should be investigated. Ideally, the investigation should be couched in a social orientation. Formally, there are three sets of hypotheses.

*For investigating group differences:*

- H<sub>0</sub>: There is no difference in the ethical decision-making processes of MIS and non-MIS groups.
- H<sub>1</sub>: There is a difference in the ethical decision-making processes of MIS and non-MIS groups.

*For investigating computer influences:*

- H<sub>0</sub>: Computer-based information systems do not influence ethical decision-making processes.
- H<sub>1</sub>: Computer-based information systems influence ethical decision-making processes.

*For investigating the joint effect of group and computer influence:*

- H<sub>0</sub>: There is no difference in ethical decision-making processes caused by the interaction of group affiliation and existence of a computer-based information system in a moral dilemma.
- H<sub>1</sub>: There is a difference in ethical decision-making processes caused by the interaction of group affiliation and the existence of a computer-based information system in a moral dilemma.

### Experimental design

Two versions of the DIT short form (see Appendix) were utilized to test the hypotheses above. One version contained the original DIT dilemmas (designated Form R, for "regular"). The second version contained dilemmas modified to incorporate computer-based information systems (designated Form M, for "modified"). The two DIT forms were administered to 321 junior and senior level students in the College of Business. After removing incomplete forms and responses that failed the DIT's internal consistency checks, 237 usable responses remained. TABLE III displays the number of subjects by course of study and form administered.

TABLE I  
Representative ethics research outside of MIS

Study	Reference Area	Variables Examined	Description
Barnett & Karson (1987)	Business	Gender, Age, Functional work area	Conducted empirical analysis of individual self rating of concern on ethical versus economic decision dilemmas.
Bommer et al. (1987)	Management	Government/Legal, Social, Work, and Professional environments and Individual variables.	Developed a comprehensive conceptual model but did not validate.
Ferrell & Gresham (1985)	Marketing	Individual variables, Organization variables, Significant others, Opportunity	Developed framework and hypotheses but did not test empirically.

Table I (Continued)

Study	Reference Area	Variables Examined	Description
Fritzsche & Becker (1984)	Management	Coercion and control, Conflict of interest, Physical environment, Paternalism, Personal integrity	Theory-based empirical study using vignettes that examined each variable in model.
Hegarty & Sims (1978, 1979)	Management	Rewards, Personal ethics, Corporate policy, Profit goals, Competition, Individual variables	Empirically examined behavior of subjects confronted with kickbacks in a management simulation.
Horrigan (1987)	Finance	Financial theory	Subjective analysis of ethical ramifications of financial theory assumptions.
Hunt & Vitell (1986)	Marketing	Intention, ethical judgments	Synthesized prior marketing research into a general theory and suggested research hypotheses and methods.
Robin & Reidenbach (1986)	Marketing	Individual moral	Developed measurement scales with relatively high degrees of validity and reliability.
Trevino (1986)	Management	Cognition, Individual variables, Situational variables	Developed a conceptual model and is currently validating empirically.
Vitell & Grove (1987)	Marketing	Referent others, Authority figures, Field dependence, Locus of control, Consequence awareness	Synthesized theoretical model from sociology and marketing research but did not test empirically.
Worrell et al. (1985)	Management	Reinforcements, Corporate policy	Empirical study similar to Hegarty and Sims work.
Zey-Ferrell et al. (1982)	Marketing	Referent others, Authority figures, Opportunity, Reinforcement	Used regression and correlation analysis to study behavior.

A  $2 \times 2$  factorial experimental design was used to test the significance of the independent variables and any interaction. The subjects were categorized as either MIS majors or non-MIS majors. Within each of the two groups, the subjects were randomly assigned one of the two DIT forms. The dilemma order in each form was randomized. The DIT *P* score and *D* score were calculated based on the subjects' responses to the DIT.

Demographic variables such as age, sex, socio-economic status, religious conservatism, and ethnic

background were analyzed using multiple regression to determine their significance in predicting *P* scores and *D* scores. As found in other studies (Rest, 1979, 1986, and 1987), age, sex, and socio-economic background were insignificant variables. Although religious conservatism has been shown to be moderately significant in prior studies, such was not the case in our study. The majority of our subjects were religiously conservative; this homogeneity precludes religious conservatism having any significance. Similarly, the vast majority of our subjects were white,

TABLE II  
Categories of MIS/ethics related research

Area	Reference	Description
Social Aspects	Sackman (1967)	Developed a general theory and philosophy of man-machine systems.
	Johnson (1985a, 1985b)	A philosopher, identified ethical issues regarding computer use from a contemporary philosophical viewpoint.
	Mason (1986)	Identified privacy, accuracy, property, and accessibility as four ethical issues of the information age.
	Johnson (1984)	Outlined the characteristics for a computer society ethic.
	Computer Professionals for Social Responsibility	An alliance of computer professionals concerned about the impact of computer technology on society.
Group Differences	Weinberg (1971)	Considered MIS specific managerial concerns in ethics.
	Parker (1979, 1981)	Identified possibility of differences in professional groups.
	Hoffman & Moore (1981)	Conference focused on ethics and the management of computer technology.
	Shim & Taylor (1988, 1989)	Identified differences in MIS and non-MIS business school faculty. Extended results to differences in MIS faculty and MIS professionals.
	Jastrow (1987)	Suggests symbiotic relationship between man and machine.
Technology Effects	Sheridan (1987)	Considers impact of computer presence on criminal activity.
	Bommer et al. (1987)	Hypothesized that information filtering and presentation affects ethical behavior.
	Parker (1979, 1981)	Focused on dilemmas involving computer technology.
	Coates (1985)	Argues that current corporate ethics policies are inadequate in light of information technology's impact on organizational functions.

thus ethnic background was not a factor in our results. TABLE IV presents our sample's demographic profile.

### Statistical data analysis

Each subject's *P* scores and *D* scores were expected to be correlated: they measure related concepts. Thus, we begin our analysis with a multivariate analysis of variance (MANOVA) since we have two measurements on each subject. MANOVA assumes the covariance matrices are the same for all populations, and the vector of error terms associated with the model is assumed to be normally distributed

with zero mean and constant, finite variance (Johnson and Wichern, 1988).

### MANOVA analysis

The MANOVA results indicate that the scores are correlated ( $R = 0.6$ ). Our results indicate the main effects of course of study (major) and form are significant. Wilk's lambda for the major effect is significant below the  $\alpha = 0.01$  level ( $F(2,232) = 4.80$ ,  $p$ -value = 0.009). Wilk's lambda for the form effect is significant below the  $\alpha = 0.05$  level ( $F(2,232) = 3.21$ ,  $p$ -value = 0.043). The interaction of form and major was not significant ( $F(2,232) =$

TABLE III  
Distribution of subjects by form and major (forms are designated Modified and Regular)

Major	Form		Total		M		R
	M	R			M	R	
Accounting	3	1	4	MIS	44	37	81
Economics	0	1	1	Non-MIS	71	85	156
Finance	19	17	36		115	122	
History	1	0	1				
Management	13	22	35				
Marketing	29	36	65				
MIS	44	37	81				
Pol. Science	4	6	10				
Production	2	2	4				
	115	122	237				

1.37,  $p$ -value = 0.26). Thus, we conclude that there is an effect in the scores due to the subject's major and due to the form given, and the effects are additive (Johnson and Wichern, 1988).

As suggested by Rest (1987), we examined univariate analyses of variance (ANOVA) to obtain more interpretation of the effects we found in the MANOVA. Independent variable effects were evaluated in the ANOVA by examining the Type III sums of squares. Type III sums of squares are sometimes called partial sums of squares. In most circumstances

TABLE IVa  
Religious fundamentalism scores (scale: -14 (liberal) to +14 (conservative))

	-14--8	-7--1	0	1-7	8-14
MIS	0.00%	5.06%	1.27%	31.65%	62.03%
Non-MIS	0.00%	1.32%	1.32%	27.15%	70.20%
	-14--8	-7--1	0	1-7	8-14
Form M	0.00%	4.39%	0.87%	23.68%	71.05%
Form R	0.00%	0.86%	1.72%	33.62%	64.66%

TABLE IVb  
Self reported childhood economic environment levels (lower income, middle income, upper income)

	Lower	Middle	Upper
MIS	1.25%	87.50%	11.25%
Non-MIS	1.32%	80.13%	18.54%
	Lower	Middle	Upper
Form M	2.63%	81.58%	15.79%
Form R	0.00%	83.76%	16.24%

TABLE IVc  
Ethnic background of subjects

	Asian	Black	Hispanic	White
MIS	0.00%	0.00%	7.50%	92.50%
Non-MIS	2.65%	1.32%	5.96%	90.07%
	Asian	Black	Hispanic	White
Form M	2.65%	0.88%	8.77%	87.72%
Form R	0.85%	0.85%	4.27%	94.02%

TABLE IVd  
Sex of subjects

	Female	Male	Form M	Female	Male
MIS	43.75%	56.25%	Form M	46.49%	53.51%
Non-MIS	49.00%	51.00%	Form R	47.86%	52.14%

(including the model being tested here), hypotheses about Type III sums of squares for an independent variable do not involve parameters of other independent variables. These hypotheses are invariant to independent variable order. Thus, Type III sums of squares are considered by many to be the most desirable (SAS, 1982).

ANOVA P score analysis

Table V and VI present the ANOVA results. No interaction terms were statistically significant. Table V indicates that course of study (major) is a significant variable in the P score model. The Type III sum of squares is significant below the  $\alpha = 0.05$  level. Table VII shows the mean P scores for the subjects by course of study (major) and form. The MIS majors' mean score is 4.9 points, or 13 per cent, higher than their non-MIS counterparts. P scores in our study ranged from 0.00 to 70.00. A confidence interval (calculated using Tukey's method) around

TABLE V  
Univariate ANOVA of the P scores

Mean P score: 38.104					
Source	df	SS	MS	F	Pr > F
Model	3	1367.97	455.99	2.21	0.09
Error	233	48120.15	206.52		
Total	236	49488.12			

Source	df	Type III SS	F	Pr > F
Form	1	0.13	0.00	0.98
Major	1	1290.10	6.25	0.01*
Form*Major	1	56.38	0.27	0.60

TABLE VI  
Univariate ANOVA of the D scores

Mean D Score: 21.567					
Source	df	SS	MS	F	Pr > F
Model	3	115.02	38.34	2.72	0.05
Error	233	3281.91	14.09		
Total	236	3396.93			

Source	df	Type III SS	F	Pr > F
Form	1	88.43	6.28	0.01*
Major	1	18.29	1.30	0.26
Form*Major	1	12.73	0.90	0.34

TABLE VII  
Mean P and D scores by course of study (major) and form

	Form M	Form R
MIS	P = 40.9092 D = 22.8433	P = 41.8919 D = 21.0599
Non-MIS	P = 37.0034 D = 21.7648	P = 35.9216 D = 20.9625

this difference supported the conclusion of a significant difference at the  $\alpha = 0.05$  level.

Figure 1 presents a plot of the average score at each stage for the two groups. The stage scores from the highest stages are used to determine the P score. This plot exhibits exactly the pattern that is expected if one group is using consistently more socially-oriented stage reasoning than another group. Specifically, the non-MIS group has higher average scores for the three lower, self-oriented stages, while the MIS group has higher average scores for the three higher, socially-oriented stages. The shift occurs between the third and fourth stages.

ANOVA D score analysis

Table VI indicates that the form is a significant variable in the D score model. Again, the Type III sum of squares is significant below the  $\alpha = 0.05$  level. Table VII shows the mean D scores for the subjects by population and form. The mean score for

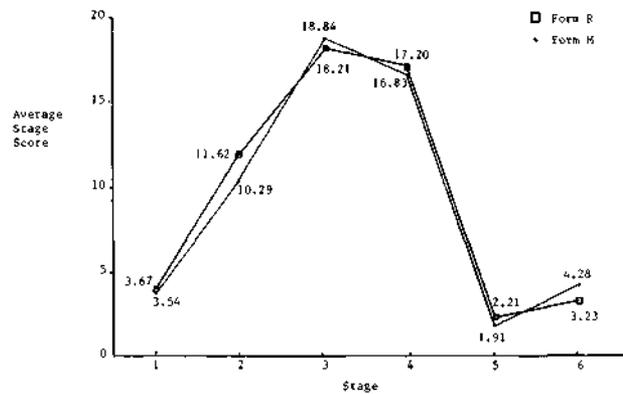


Fig. 1. Average stage scores for each population.

all students is 1.18 points higher on the computer-influenced (modified) form than the form containing no mention of a computer-based information system. *D* scores in our study ranged from 10.44 to 31.92. A confidence interval calculated as above supported the conclusion of a statistical significant difference at the  $\alpha = 0.05$  level.

However, examination of Figure 2, which presents the average score at each stage for each form, casts some doubt on the statistical results. No clear shift to more principled reasoning is shown in this plot. Instead, Form *R* has higher average stage scores in the first two stages, then Form *M* has a higher average stage three score, then Form *R* has higher average scores in the fourth and fifth stages, and finally Form *M* has a higher average stage six score. A pattern similar to that shown in Figure 1 would be more reassuring.

### Discussion of the statistical analysis

The *P* score analysis indicated the MIS majors generally used higher levels of principled (socially oriented) reasoning when confronted with moral dilemmas than did non-MIS majors. Thus, we reject the null hypothesis in our first set of hypotheses. The MIS majors' ethical decision-making processes are different (on average) and consider societal effects more than some other subjects. We emphasize here that this does not imply that MIS majors are "more ethical," only that their decision-making processes consider societal effects to a greater degree than individual decision maker effects.

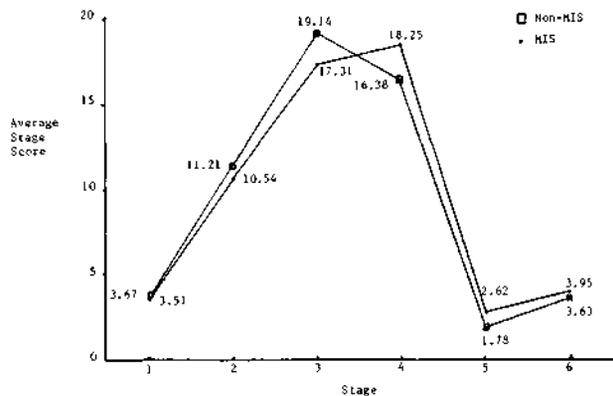


Fig. 2. Average stage score for each form.

Initially, this result appears to contradict prior studies that information systems workers have a low need for social interaction (see Couger *et al.*, 1979). However, our result speaks only to a mental social orientation, not to a need for social interaction. One need not be extroverted to have concern for society. Thus, we feel our finding can stand as complementary to existing knowledge of information systems workers, not as contradictory to it.

All subjects in the study have completed an introductory MIS course. All subjects have demonstrated basic functional computer skills and have been exposed to the role of MIS in organizations. Therefore, we believe our results are not reflecting a situation wherein only the MIS majors are familiar with computer concepts.

Similarly, we do not believe changes in the wording of the DIT issues may have contributed to a group bias. Only three words changed in the thirty-six issues: the word "woman's" was changed to "patient's" (twice) and the word "drug" was changed to "computer output." "Computer output" is the only change that could possibly be a cue to the MIS majors. However, all of the word changes appear in issues that measure self-oriented stages, not socially-oriented stages. Thus, these issues are not even considered in calculating the *P* score. Therefore, we conclude our results are not biased by the wording of the DIT issues.

The MIS major responses appear to reflect an increased perception of "professional ethics" used to resolve the dilemma. The recent emphasis given to business ethics in the mass media coupled with growing recognition of computer-based information systems' impact in general (e.g., recent issues regarding the influence of computer-based stock trading and computer viruses) has been noticed by this group. However, because the difference holds across both forms, the MIS majors' knowledge of technology does not appear to be influencing the results. (We note, too, that the interaction term in our model is not a significant factor.)

One explanation of these results is the highly analytical, integrative nature of the MIS curriculum. The curriculum emphasizes the use of computer-based systems in supporting other functional business areas. Baxter and Rarick (1987) have noted that integrative education is most effective when developing universal ethical judgment abilities, because

integrating knowledge from several areas allows the decision maker to determine the full impact of a decision.

The *D* score statistical analysis indicates that on average all subjects show more socially-oriented reasoning than self-oriented reasoning when faced with a moral dilemma containing a computer-based information system. The difference is small, however, and closer examination of the average stage scores did not provide conclusive evidence to support the statistical result. In terms of our second set of hypotheses, we have statistical evidence to reject the null hypothesis that the information system in the dilemma is not significant.

In our attempt to determine whether this significant statistical difference is also practically significant, we have noticed several characteristics of our instrument. In constructing the instrument to analyze the *D* scores, our intent was to introduce a computer-based system into the DIT dilemmas while minimizing the change in the dilemmas. We also sought to vary the influences of the computer-based system. The *D* score results may indicate that we attempted to do too much in this short (i.e., three dilemma) format. We recommend replicating this study with the dilemmas revised slightly to address these concerns.

Finally, no interaction effect was found between the two groups and the two forms. Thus, we cannot reject the null hypothesis in our third set of research hypotheses.

## Summary and conclusions

Given our results, one might reasonably ask what are the implications of these results for managers. We consider each of the three areas introduced earlier.

### *Social issues*

Surprisingly, perhaps, given the stereotypical view of computer workers as "loners," we have found that on average, MIS majors' ethical decision-making processes are more socially oriented than some other business students. Thus, these "loners" are still very concerned about the impact of their technology on society. This result is encouraging, especially if one

agrees with Jastrow (1987) that the ultimate role of computer-based technology in society is as a symbiotic entity. The result also suggests that MIS workers would not be expected to violate the individual rights of privacy, accuracy, property, and accessibility outlined by Mason (1986). Sackman's tenet of "humanistic automation" (Sackman, 1967) may yet be realized.

### *MIS group differences*

Our results seem to corroborate Shim and Taylor's later study (1989) in which MIS managers reported little unethical activity occurring in their organizations. The conclusion that MIS majors differ from other business school students has other managerial implications. Responsibilities of MIS staff may need to be clearly delineated to other functional areas. For example, the employees of other functional areas may perceive different obligations of corporate responsibility when compared to MIS personnel. This difference may place MIS workers in situations which they perceive as ethical dilemmas (see also Paradise, 1990). Additionally, managers may wish to include MIS personnel in project teams where a project's objective has societal implications for the organization.

### *Technological impact*

These results also extend the Bommer *et al.* (1987) model. That model hypothesized that managers acquire and process information from many sources at each decision stage. Our study indicates that these sources may also influence the decision-making process. In addition, organizational theorists claim that "computer technology will broaden the base of decision making while it simultaneously broadens the base of decision makers" (Coates, 1985). Organizational structures are expected to become flatter, with increasing decision-making responsibility places lower in the organization. Our result that information technology appears to direct decision-making processes of all subjects toward more social-oriented behaviors is again encouraging. The decisions made in the organization will likely consider society at large.

### Limitations and directions for future research

This research is a first step in understanding the influence of information systems technology on ethical decision-making processes. Some similar empirical research has been pursued in other fields. However, no prior attempt has been made to quantify information systems technology impact on the decision-making processes invoked to resolve ethical dilemmas.

Our study results also provide statistical evidence that computer-based information systems may influence ethical decision-making processes, although we must recognize that our modifications to the standard DIT dilemmas may contain other cues confounding this result. Statistically, the influence appears to invoke higher level ethical reasoning processes than are invoked in similar ethical dilemma situations in which no computer-based information system plays a role. We found no interaction effect between the subject's course of study and the appearance of a computer-based information system in a dilemma.

As we noted earlier, our sample was predominately white and religiously conservative. Prior studies have not revealed a racial bias in the DIT (Colby *et al.*, 1983), so we have no reason to suspect our results are prejudiced racially. However, since religious conservatism tends to be correlated with low DIT scores (Rest, 1987), a replication of this study in a more religiously liberal area of the country could see a general upward shift in the DIT scores. We would expect the shift to occur across all groups, however, thus our results would still hold. Still, we encourage other researchers to replicate this study with populations of different characteristics and report their results.

Another limitation of our study is our use of student subjects. As we noted earlier, the DIT is highly correlated with academic experience. Thus, we would expect MIS professionals with undergraduate college education to score similarly if this study was replicated with that group. However, one variable that was not controlled in this study was work experience. We did not determine the work experience of our student subjects. Do MIS majors with work experience exhibit more socially-oriented decision making processes than those without work experience? A recent study that investigated this

variable determined the average work experience of our students to be approximately four months (Kim, 1990). We would encourage a replication of our study that controlled this variable to determine its influence on our results.

Many research avenues exist based upon these results. More detailed explanations of these results must be determined. Is there something in the course work of MIS majors that makes them more socially attuned in ethical decision-making situations? Situational variables must be identified, so that methods of increasing ethical decision-making processes may be developed.

We feel the *D* score analysis challenges us to isolate computer-based issues that may lead to more socially-oriented decision-making processes. A more focused experimental manipulation would begin to answer why a computer-based information system might influence ethical decision-making processes. Once identified, we may begin to address the question of how computer-based information systems ethically influence planning processes and, perhaps more significantly, how plans are ethically executed.

We would like to compare Computer Science majors with MIS majors, and also pursue a deeper analysis of MIS majors and a general cross-section of other business students. Which functional areas are different? Which are similar? Answers to these questions could be useful in constructing project teams developing information systems in order to maintain a better balance in ethical decision-making processes.

What impact do these results hold for automated factories of the future? One avenue that could be addressed is the expected employee behavior in firms that are highly computerized (or automated) versus those firms that are not highly computerized. Similarly, what will be the impact of increased levels of automated information systems in the service sector? Our research indicates that ethical decision-making processes may be affected; better information about how these processes are affected is required.

Perhaps an investigation of any new technology would reveal the same impact on ethical decision-making processes. Thus, other technologies can be investigated. Also, longitudinal studies could help determine how ethical decision-making processes change as new technology is assimilated. We feel there are many exciting research areas to pursue.

Appendix

Both versions of the DIT short form are set out below.

Form R: The "regular" form.

Should Mrs. Jones report Mr. Thompson to the police and have him sent back to prison?

- Should report him
- Can't decide
- Should not report him

IMPORTANCE:

GREAT	MUCH	SOME	LITTLE	NO	
					1. Hasn't Mr. Thompson been good enough for such a long time to prove he isn't a bad person?
					2. Everytime someone escapes punishment for a crime, doesn't that just encourage more crime?
					3. Wouldn't we be better off without prisons and the oppression of our legal system?
					4. Has Mr. Thompson really paid his debt to society?
					5. Would society be failing what Mr. Thompson should fairly expect?
					6. What benefits would prisons be apart from society, especially for a charitable man?
					7. How could anyone be so cruel and heartless as to send Mr. Thompson to prison?
					8. Would it be fair to all the prisoners who had to serve out their full sentences if Mr. Thompson was let off?
					9. Was Mrs. Jones a good friend to Mr. Thompson?
					10. Wouldn't it be a citizen's duty to report an escaped criminal, regardless of the circumstances?
					11. How would the will of the people and the public good be best served?
					12. Would going to prison do any good for Mr. Thompson or protect anybody?

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

ESCAPED PRISONER DILEMMA

A man had been sentenced to prison for 10 years. After one year, however, he escaped from prison, moved to a new area of the country, and took the name of Thompson. For eight years he worked hard, and gradually saved enough money to buy his own business. He was fair to his customers, gave his employees top wages, and gave most of his profits to charity. Then one day Mrs. Jones, an old neighbor, recognized him as the man who had escaped from prison eight years ago, and whom the police had been looking for.

What should the doctor do?

- Should prescribe an overdose?
- Can't decide
- Should not prescribe an overdose

IMPORTANCE:

GREAT	MUCH	SOME	LITTLE	NO	
					1. Whether the woman's family is in favor of giving him/her the overdose or not.
					2. Is the doctor obligated by the same laws as everybody else if giving an overdose would be the same as killing the woman.
					3. Whether people would be much better off without society regimenting their lives and even their deaths.
					4. Whether the doctor could make it appear that the prescribed amount in this situation was an accidental overdose.
					5. Does the state have the right to force continued existence on those who don't want to live.
					6. What is the value of death prior to society's perspective on personal values.
					7. Whether the doctor has sympathy for the woman's suffering or cares more about what society thinks.
					8. Is helping to end another's life ever a responsible act of cooperation.
					9. Whether only God should decide when a person's life should end.
					10. What values the doctor has set for himself in his own personal code of behavior.
					11. Can society afford to let everybody end their lives when they want to.
					12. Can society allow suicides or mercy killing and still protect the lives of individuals who want to live.

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

DOCTOR'S DILEMMA

A lady was dying of cancer which could not be cured and she only had about six months to live. She was in terrible pain, but she was so weak that a good dose of pain-killer like morphine would make her die sooner. She was delirious and almost crazy with pain, and in her calm periods, she would ask the doctor to give her enough morphine to kill her. She said she couldn't stand the pain and that she was going to die in a few months anyway.

Should Heinz steal the drug?

- Should steal the drug
- Can't decide
- Should not steal the drug

IMPORTANCE:

GREAT      MUCH      SOME      LITTLE      NO

GREAT	MUCH	SOME	LITTLE	NO	
					1. Whether the community's laws are going to be upheld
					2. Isn't it only natural for a loving husband to care so much for his wife that he'd steal?
					3. Is Heinz willing to risk going to jail for the chance that stealing the drug might help?
					4. Whether Heinz is a professional wrestler, or has considerable influence with professional wrestlers.
					5. Whether Heinz is stealing for himself or doing this solely to help someone else.
					6. Whether the doctor's rights to his invention have been respected.
					7. Whether the essence of living is more encompassing than the termination of dying, socially and individually.
					8. What values are going to be the basis for governing how people act toward each other.
					9. Whether the doctor is going to be allowed to hide behind a worthless law that only protects the rich anyway.
					10. Whether the law in this case is getting in the way of the most basic claim of any member of society.
					11. Whether the doctor deserves to be robbed for being so greedy and cruel.
					12. Would stealing in such a case bring about more total good for the whole society or not.

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

HEINZ'S DILEMMA

In Europe, a woman was near death from a special kind of cancer. There was one drug that doctors thought might save her. It was a form of radium that a doctor in the same town had recently discovered. The drug was expensive to make, but the doctor was charging ten times what the drug cost to make. He paid \$200 for the radium and charged \$2000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about \$1000, which was half of what it cost. He told the doctor that his wife was dying, and asked him to sell it cheaper or let him pay later. But the doctor said, "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and began to think about breaking into the man's store to steal the drug for his wife.

Form M: The "modified" form.

Should Mrs. Jones report Mr. Thompson to the police and have him sent back to prison?

- Should report him
- Can't decide
- Should not report him

IMPORTANCE:

GREAT	MUCH	SOME	LITTLE	NO	
					1. Hasn't Mr. Thompson been good enough for such a long time to prove he isn't a bad person?
					2. Everytime someone escapes punishment for a crime, doesn't that just encourage more crime?
					3. Wouldn't we be better off without prisons and the oppression of our legal system?
					4. Has Mr. Thompson really paid his debt to society?
					5. Would society be failing what Mr. Thompson should fairly expect?
					6. What benefits would prisons be apart from society, especially for a charitable man?
					7. How could anyone be so cruel and heartless as to send Mr. Thompson to prison?
					8. Would it be fair to all the prisoners who had to serve out their full sentences if Mr. Thompson was let off?
					9. Was Mrs. Jones a good friend of Mr. Thompson?
					10. Wouldn't it be a citizen's duty to report an escaped criminal, regardless of the circumstances?
					11. How would the will of the people and the public good be best served?
					12. Would going to prison do any good for Mr. Thompson or protect anybody?

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

ESCAPED PRISONER DILEMMA

A man had been sentenced to prison for 10 years. After one year, however, he escaped from prison, moved to a new area of the country, and took the name of Thompson. For eight years he worked hard, and gradually saved enough money to buy his own business. He was fair to his customers, gave his employees top wages, and gave most of his profits to charity. Then one day an old neighbor that worked for the government, Mrs. Jones, entered Mr. Thompson's name into the computer-based information system where she worked and noticed that Mr. Thompson closely resembled the man that had escaped from prison eight years ago, and whom the police had been looking for. Through a little more effort, Mrs. Jones was able to confirm her suspicion that Mr. Thompson was indeed the escaped prisoner.

What should the doctor do?

- Should prescribe an overdose?
- Can't decide
- Should not prescribe an overdose

IMPORTANCE:

GREAT      MUCH      SOME      LITTLE      NO

GREAT	MUCH	SOME	LITTLE	NO	
					1. Whether the patient's family is in favor of giving him/her the overdose or not.
					2. Is the doctor obligated by the same laws as everybody else if giving an overdose would be the same as killing the patient.
					3. Whether people would be much better off without society regimenting their lives and even their deaths.
					4. Whether the doctor could make it appear that the prescribed amount in this situation was an accidental overdose.
					5. Does the state have the right to force continued existence on those who don't want to live.
					6. What is the value of death prior to society's perspective on personal values.
					7. Whether the doctor has sympathy for the patient's suffering or cares more about what society thinks.
					8. Is helping to end another's life ever a responsible act of cooperation.
					9. Whether only God should decide when a person's life should end.
					10. What values the doctor has set for himself in his own personal code of behavior.
					11. Can society afford to let everybody end their lives when they want to.
					12. Can society allow suicides or mercy killing and still protect the lives of individuals who want to live.

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

DOCTOR'S DILEMMA

A doctor was working with a programmer to develop a program that would recommend the best type of treatment for cancer patients. One day during development of the program, the doctor remembered several of his patients that had had terminal cancer and had six months or less to live. Each of these patients had been in terrible pain, and were so weak that a good dose of pain killer like morphine would have killed them. In fact, each had become so delirious and crazy with pain on occasion that during calmer periods each had asked the doctor to give them enough pain killer to kill them. All of the patients knew they would die soon anyway. Now the doctor had to specify how much pain killer the program should recommend under these same conditions, and he wondered how much to recommend.

Should Heinz hire someone to break into the doctor's office and run the program?

- Should hire someone
- Can't decide
- Should not steal the drug

IMPORTANCE:

GREAT	MUCH	SOME	LITTLE	NO	
					1. Whether a community's laws are going to be upheld
					2. Isn't it only natural for a loving husband to care so much for his wife that he'd steal?
					3. Is Heinz willing to risk going to jail for the chance that stealing the drug might help?
					4. Whether Heinz is a professional wrestler, or has considerable influence with professional wrestlers.
					5. Whether Heinz is stealing for himself or doing this solely to help someone else.
					6. Whether the doctor's rights to his invention have been respected.
					7. Whether the essence of living is more encompassing than the termination of dying, socially and individually.
					8. What values are going to be the basis for governing how people act toward each other.
					9. Whether the doctor is going to be allowed to hide behind a worthless law that only protects the rich anyway.
					10. Whether the law in this case is getting in the way of the most basic claim of any member of society.
					11. Whether the doctor deserves to be robbed for being so greedy and cruel.
					12. Would stealing in such a case bring about more total good for the whole society or not.

Most important item \_\_\_\_\_  
 Second most important \_\_\_\_\_  
 Third most important \_\_\_\_\_  
 Fourth most important \_\_\_\_\_

**HEINZ'S DILEMMA**

In Europe, a woman was near death. Unfortunately, her symptoms were so numerous and confusing that her doctors did not think they had time to run the tests necessary to identify exactly the cause of her illness. She knew she would die soon. The only chance for the woman was to input her symptoms into a special computer program that had been developed, because the program could analyze the data quickly and indicate the most likely cause of her illness. The doctor that had developed the program charged \$2000 to run the program. The sick woman's husband, Heinz, went to everyone he knew to borrow money to pay for running the program, but he could only get together about \$1000, which is half of what it costs. Heinz told the doctor that his wife was dying, and asked him to sell the use of the program for only \$1000, or let Heinz pay him later. But the doctor said, "No, I wrote the program and I'm going to make money from it." So Heinz became desperate and began to think about hiring someone that could run the program to break into the doctor's office and get the output Heinz's wife needs.

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