

Organizational Behavior Management for Engineering Research and Development: A Classroom Experience in Ethical Engineering and Management Intervention

Hamid Khan
Our Lady of the Lake University
Graduate School of Business Administration

Engineers must be exposed to R & D management with the clear understanding of how Organizational Behavior Management (OBM) works for them from an ethical perspective in R & D environment. Organizational Behavior Management began as the application of behavior analysis in R & D organizational setting to improve engineering ethics. This discipline's main focus is on the behavior of individuals and groups in organizations. Organizational behavior modification is that field of ethics education which can be appropriately applied to product safety research and for displaying engineering ethics in product marketing. A case study of engineering/medical device will be monitored for effect on student ethics in a classroom setting, with a view to exhibiting proper and appropriate individual (whistle blower) behavior and collective behavior (organizational behavior).

The goal of this paper is to explore in the classroom setting the contributions of OBM to ethical performance improvement for engineers engaged in R & D. Through a case analysis it is hoped to bring about the importance of OBM. With the application of a fundamental principle of psychology $B = f(O, E)$, "Behavior is a function of interactions between a person (O) and that person's environment (E)," we will try to look at R & D performance and see why designs fail and managers cover up flaws, which should have been known to the public, as in Dow Corning, Ford Pinto or NASA shuttle disaster cases.

APPLICATION OF ORGANIZATION BEHAVIOR MANAGEMENT

Students must understand business practices and the following vocabulary to be impacted by ethical training: financial gain and profit motive, ethical standards in business, financially successful business, relevance of moral values, rules of business, and the game of business, the act-utilitarianism, and the rule-utilitarianism. Proper input will impact upon behavior of individuals in an organizational setting and this is called organizational behavior management. To monitor the impact students were given a MBTI pretest and a posttest as well a business cynicism pretest and posttest.

Business Cynicism Quotient Questionnaire-- Pretest

Answer the following questions as honestly as you can. Circle the number between 1 and 5 that best represents your own beliefs about business. The class averages are shown in bold and underlined.

		Strongly disagree		Strongly agree	
1. Financial gain is all that counts in business.	1	<u>2</u>	3	4	5
2. Ethical standards must be compromised in business practices.	1	2	3	<u>4</u>	5
3. The more financially successful the business person, the more unethical the behavior.	1	2	<u>3</u>	4	5
4. Moral values are irrelevant in business.	1	<u>2</u>	3	4	5
5. The business world has its own rules.	1	2	3	4	<u>5</u>
6. Business persons care only about making profit.	1	<u>2</u>	3	4	5
7. Business is like a game one plays is to win.	1	2	3	4	<u>5</u>
8. In business, people will do anything to further their own interest.	1	2	3	4	<u>5</u>
9. Competition forces business managers to resort to shady practices.	1	2	3	<u>4</u>	5
10. The profit motive pressures managers to compromise their ethical concerns.	1	2	3	4	<u>5</u>

Then the students were given the Dow Corning Case *before* any theories of ethics were discussed.

In the beginning of a senior business ethics class, students were given an ethical cynicism test. The class was pretty cynical, to say the least. The average cynical measure was 37 out of a maximum of 50. Six out of ten elements of ethics were on the most

*Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition
Copyright © 2004, American Society for Engineering Education*

cynical side. Students at this stage did not know how business ethics works. At least majority of them had a very strong sense of personal moral ethics- the unspoiled ethics. The students were advised that learning to make ethical decision making in the business setting will require them to learn many dimensions of ethics from a theoretical standpoint and then apply them selectively in the world of business using design and product safety, marketing advertising, utilitarianism, Kantian ethics, rights and value, justice and the market system, concept of whistle blowing, trade secrets and the conflict of interest, construct of privacy, health and safety, and ethics in finance.

Before the case was discussed, the class took an MBTI typology test to determine their approximate orientation toward judging category. 22% were judging type.

HUMANMETRICS OF THE ETHICS CLASS

Jung-Typology Pre-Test Averages of the class

INTJ

Introverted	Intuitive	Thinking	Judging
Strength of the preferences %			
56	11	11	22

Qualitative analysis of class type formula:

- **Moderately expressed introvert personalities**
- **Slightly expressed intuitive personalities**
- **Slightly expressed thinking personalities**
- **Slightly expressed judging personalities**

AN ETHICS CASE OF FAULTY DESIGN AND AGGRESSIVE MARKETING

Dow Corning's Breast Implants (Case adapted from Boatright¹) -- "On May 15 1995 Dow Corning Corporation filed for federal bankruptcy protection. Funded in 1943 as a joint venture of Dow Chemical Co. and Corning Glass Works later changed to Corning Inc. Dow Corning had prospered by making lubricant sealants, electrical insulators and other products from silicone. One product, however, silicone breast implants, now threaten to destroy the company.

During the 1980s as an estimated 2 million women received silicone breast implants. Thousands of women began to experience severe headaches, unexplained rashes, pain in the joints and muscles, weight loss, and extreme fatigue. The women and

*Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition
Copyright © 2004, American Society for Engineering Education*

their doctors were baffled until a common thread began to emerge-- the presence of silicone. The implants themselves often caused a painful hardening of the surrounding tissues, known as capsular contracture. The semi liquid filling in the implants was suspected of bleeding through the pouch-like outer covering, and some women's implants ruptured, releasing silicone that eventually lodged in the liver, spleen, and other internal organs. A variety of autoimmune diseases--in which the body attacks its own tissue as if it were a foreign object-- were believed by doctors to a result from the bleeding and ruptured implants.

In December 1991, Dow Corning was found guilty in a San Francisco court of manufacturing a defective product and a fraudulently conceding evidence of safety problems. The jury awarded the woman in the case, of \$7.3 million a figure that was upheld on appeal. Dow Corning repeated its contention that scientific evidence showed the implants to be safe, and the company denounced the verdict as the politicization of the issue. At that time the Food and Drug Administration was deciding whether to continue the unrestricted use of breast implants. Before 1976, the medical devices of all kinds were unregulated, but law was passed that year by Congress requiring manufacturers to prove the safety of the products. In April 1992, the FDA ruled that sufficient proof had not been provided, and breast implants were ordered off the market (except for special cases of reconstructive surgery which were to be closely monitored).

More suits followed and in April 1994 Dow Corning agreed to contribute \$2 billion to a \$4.2 3 billion global settlement fund for women around the world, who claimed to suffer because of breast implants. At the time of Dow Corning's bankruptcy in filing, 410,000 women had submitted claims for compensation from the fund, and the company faced between 5000 to 15,000 suits from women who elected not to join the settlement. The bankruptcy filing put the global settlement fund and all unsettled suits in jeopardy. The two parent corporations, Dow Chemical and Corning, had to write off the \$374 million investment in the joint venture.

Dow Corning introduced the first version of a breast implant in 1963 for use in reconstructive surgery for breast cancer victims following a mastectomy. The prototype had been developed by Dr. Thomas Cronin a surgeon at Baylor University in Texas. Dow Corning performed no tests on the safety of the implant prior to the introduction, relying instead on a limited study done by Dr. Corning on dogs. However, the company believed silicone to be biologically inert on the basis of other animal studies and experience with a few other medical devices. In 1964, Dow Corning commissioned an independent laboratory to do a study on the safety of the medical grade silicone used in all implants. Researchers discovered that silicone injected into dogs caused "persistent chronic and inflammation," but the results were dismissed by Dow Corning officials as a typical foreign body reaction that is not specific to silicone. A 1969 study revealed that injected silicone eventually lodged in the vital organs of test animals, but this result too was not regarded as significant because the company did not advocate the injection of silicone directly into the body.

In 1975, Dow Corning introduced a new type of breast implant that was softer and more pliable. This second generation version was the result of crash program in response to entry of competitors into the market, several of which were aided by ex-employees who built on Dow Corning's existing technology. These upstart companies reduced Dow Corning's market share to 35 percent by providing plastic surgeons with an implant that produced a more natural look and feel. The fact that the newer implants were also suited for breast enlargement and not merely reconstructive surgery fueled an increase in purely cosmetic uses. Within four months the redesigned breast implant was ready to demonstrate to plastic surgeons and full production was achieved by September. No additional testing was done for the new product even though the changed design used a more liquid form of silicone. *Some Dow Corning scientists voiced concerns that a greater silicone bleed through the outer covering was possible and constituted an unknown risk. These fears were confirmed when the samples displayed to plastic surgeons became oily to the touch and stained the velvet showcases that were used. Sales personnel were instructed to change the sample often to wipe them before they were presented to the surgeons.*

In news articles based on internal company documents, Dow Corning was charged with conducting inadequate research and with suppressing memos and research reports that questioned the safety of breast implants. *One indignant salesperson wrote that selling possibly defective implants "has to rank right up there with the Pinto gas tank." And other person in marketing reported that he had a short a group of doctors "with crossed fingers" that Dow Corning had safety studies under way. The New York Times columnist described Dow Corning as "a company adrift without the moral compass." One of many cartoons in the press showed a Dow Corning representative explaining to a group of women, "We are testing breast implants on you to see if they're safe guinea pigs."*

Several in recent studies involving large populations of women over extended periods of time have found no increase in autoimmune diseases or any other illnesses among women with implants. Some doctors questioned whether the health problems of women with implants are due to silicone, because a certain number of women in any population will develop autoimmune diseases. The prestigious New England Journal of Medicine, which published one of the studies, questioned the need for the FDA's decision to pull breast implants from the market. If breast implants eventually prove to be safe, this fact will not satisfy critics who fault Dow Corning for going ahead with the product without having sufficient evidence. Nor will it save Dow Corning from its current financial crises. Ironically, in no year did breast implants account for more than 1 percent of Dow Corning's profits."

LECTURE OUTLINE OF THEORIES OF ETHICS USED IN CLASS

1. Teleological Theories "The rightness of an action is determined solely by its consequences." One lecture.

2. Deontological Theories “Ignore the consequences of actions and focus on the nature of the actions.” One lecture.

3. Classical Utilitarianism says that the “action is right if it produces greatest balance of pleasure over pain for everyone.” **Problems arise while calculating utility of pain and pleasure.** One lecture.

4. Act- Utilitarianism evaluates the rightness of any given act by the consequences of that act. One Lecture.

5. Rule-utilitarianism determines the rightness of the act using relevant rules of morality. (piety, honesty, reciprocity, obligation, sincerity) One lecture.

6. Justice and the market system. One lecture.

- Utility and the Market System: Adam Smith’s invisible hand argument to promote an end (welfare society) *without causing externalities. (This was emphasized for the Implant Case)*
- Robert Nozick’s libertarian entitlement theory. Emphasizes individual liberty, aesthetics and cosmetics, free from the interference from powerful others in the free market system.

7. Whistle blowing, and responsibility of a whistle blower

- Justification of whistle-blowing in the case of a dangerously defective design emphasized.
- Is there a right of an employee (an engineer, designer, doctor, production specialist or manager) to blow the whistle when he or she feels the civic responsibility, as in this case of dangerous implants.

8. Aggressive Marketing, Deceitful Advertising and Product Safety

- Ethical issues in marketing a potentially a dangerous product which has been tested on animals.
- Cosmetic Consumerism, Faulty Design and the Aggressive Marketing Concept
- Persuasion and behavior control/ deceptive design and marketing
- Theories of product liability/ due care theory/contractual theory/ strict liability

Then the students were given the Implant Case *after* theories of ethics were discussed.

Business Cynicism Quotient Questionnaire-- Posttest

Answer the following questions as honestly as you can. Circle the number between 1 and 5 that best represents your own beliefs about business. The class averages are in bold and underlined.

*Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition
Copyright © 2004, American Society for Engineering Education*

	Strongly disagree			Strongly agree	
1. Financial gain is all that counts in business.	<u>1</u>	2	3	4	5
2. Ethical standards must be compromised in business practices.	1	<u>2</u>	3	4	5
3. The more financially successful the business person, the more unethical the behavior.	1	2	<u>3</u>	4	5
4. Moral values are irrelevant in business.	1	<u>2</u>	3	4	5
5. The business world has its own rules.	1	<u>2</u>	3	4	5
6. Business persons care only about making profit.	1	2	<u>3</u>	4	5
7. Business is like a game one plays is to win.	1	<u>2</u>	3	4	5
8. In business, people will do anything to further their own interest.	1	<u>2</u>	3	4	5
9. Competition forces business managers to resort to shady practices.	1	<u>2</u>	3	4	5
10. The profit motive pressures managers to compromise their ethical concerns.	1	<u>2</u>	3	4	5

Students were given an ethical cynicism test at the end of reflection in action. The class was pretty non-cynical. The average posttest cynical measure was 21 out of a maximum of 50. Although statistical analysis could not be conducted due to paucity of time, the score is fairly significant, intuitively speaking. Ten out of ten elements of ethics were on the non-cynical side. The students learned to make ethical decision making in the business setting by learning many dimensions of ethics from a theoretical standpoint and then applied them selectively in the world of business using design and product safety, marketing advertising, utilitarianism, Kantian ethics, rights and value, justice and the market system, concept of whistle blowing, conflict of interest and trade secret, construct of privacy, health and safety, and ethics in finance.

It is apparent that some shifts that have happened may have been due to students' perception changes. For instance, due to the sense of "self flagellation" felt in the classroom due to human suffering, and engineers' precipitation to that plight, a sense of "whistle blowers attitude" prevailed in the classroom as the responsibility of whistle blower and heroism prevailed over the young mind. Nothing more can be predicted, except that the students were positively affected by the design failure episode.*

HUMANMETRICS OF THE ETHICS CLASS

Jung-Typology Post-Test Averages of the class

INFJ

Introverted	Intuitive	Feeling	Judging
Strength of the preferences %			
33	56	10	1

Qualitative analysis of class type formula:

- **Moderately expressed introvert personalities**
- **Moderately expressed intuitive personalities**
- **Slightly expressed feeling personalities**
- **Slightly expressed judging personalities**

It can be seen from posttest to pretest comparison of the class that students tended to be more reserved in being impulsively judgmental at the first opportunity and offered to make reasonably sound moral, ethical, and legal considerations before making a decision. There has been marked change in the average MBTI scores from Pretest to Posttest as seen below.

From "Moderately expressed introvert personalities 56%" → to "Moderately expressed introvert personalities 33%"

From "Slightly expressed intuitive personalities 11%" → to "Moderately expressed intuitive personalities 56%"

From Slightly expressed thinking personalities 11%" → to "Slightly expressed feeling personalities 10%"

From Slightly expressed judging personalities 22%" → to "Slightly expressed judging personalities 1%"

EMERGENCE OF FOUR ETHICAL POSITIONS

1. Class Position--critique of Utilitarianism

Kelman² says, “In order for the (*cosmetic*) cost benefit calculations to be performed the way they are supposed to be, all costs and benefits must be expressed in a common measure, typically dollars, including things not commonly bought and sold in the markets, and to which dollar prices are therefore not attached. (*sense of beauty and feeling of womanhood*) *emphasis added.*” The class agreed to his perception.

2. Class Position -- in favor of Utilitarianism (and cost benefit analysis)

According to Butters³ et al, “We disagree (and in doing so, we speak for ourselves, not for the federal trade commission, or its staff). Cost benefit analysis is not a means for judging private decisions.” The class agreed firmly on this.

3. Class Position – conditionally and moderately in favor of Whistle Blowing

According to De Gore⁴, “In addition to doing their jobs, engineers can plausibly be said to have an obligation of loyalty to their employers, and firms have a right to a certain amount of confidentiality concerning their internal operations. At the same time engineers are required by their professional ethical codes to hold the safety of the public paramount. Where these obligations conflict, the need for and justification of whistle blowing arises.” This perception of obligation was overwhelmingly sensible to most.

4. Class Position – strongly in favor of Whistle Blowing

Birsch⁵ says, “The ... case is a good example to use to try out this approach to whistle blowing. The principle which informs this position is: if it is in our power to prevent something bad from happening without thereby sacrificing anything of comparable moral significance, then we ought to do it. Did the engineers know that something “bad” was likely to happen? ... They were involved in producing a harmful product; i.e., they were involved in allowing others to be harmed.” This emotional appeal was very enticing for the students to act.

ACKNOWLEDGMENT

*I appreciate the insight of the reviewers that asked me revise the paper by elaborating the results of this study. Although it is not a statistical study for replication of ethical behavior, an effort was made to teach ethics rigorously and to see its impact in the classroom.

REFERENCES

1. BOATRIGHT, J. (2003) *Ethics and the conduct of Business*. Prentice Hall, Upper Saddle River.
2. KELMAN, S. (1994) *Cost Benefit Analysis: An Ethical Critique* in The Ford Pinto Case --A Study in Applied Ethics, Business and technology, Donald Birsch and John Fielder editors.

3. BUTTERS G., Johan Calfee, and Pauline Ippolito. (1994) *Defending the Cost Benefit Analysis: Replies to Steven Kelman* in *The Ford Pinto Case --A Study in Applied Ethics, Business and technology*, Donald Birsch and John Fielder editors.
4. DE GEORGE, R. (1994) *Ethical Responsibilities of Engineers in Large Corporation: The Pinto Case* in *The Ford Pinto Case --A Study in Applied Ethics, Business and technology*, Donald Birsch and John Fielder editors.
5. BIRSCH, D. (1994) *Whistle Blowing, Ethical Obligations and the Ford Pinto Case* in *The Ford Pinto Case --A Study in Applied Ethics, Business and technology*, Donald Birsch and John Fielder editors.

HAMID KHAN

HAMID KHAN is an Associate Professor of Management at the Graduate School of Business Administration of Our Lady of the Lake University. He teaches Organizational Behavior, Human Resources Management, Business Ethics Models, and Management Development in the MBA curriculum and in the Executive MBA programs. His research interest has been in the field of Management Development of Engineers and Technology Managers. Hamid has a BS in Mechanical Engineering, MS in Industrial and Management Systems Engineering, MBA in Management, and a Doctorate in Education. He has contributed about thirty five refereed papers to American Society for Engineering Education and Frontiers in Education conferences and chaired technical sessions. He has published and has been reviewer of the Journals of Engineering and Engineering Technology. Dr. Khan is a Registered Professional Engineer in the State of Texas since 1985, and has offered every year, his professional services to TAC of ABET program evaluation for strengthening engineering technology curricula and personnel.