A Biblical Perspective on Engineering Ethics

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Introduction

It is very important for engineers to practice engineering in an ethical manner. An unethical practice of engineering can hurt many people. Engineering practice is regulated by codes of conduct that have been developed by various professional societies and the State Boards of Registration. As Christian engineers, we believe the Bible is a more important standard as to how to live and work. As Christians, we wish to be ethical in the practice of our profession. We are therefore interested in how the Bible and codes of conduct can be related to each other.

If we are to relate the Bible to codes of conduct, it is important that we understand these codes. This paper directly follows the paper we presented at the 2002 Annual Conference of the American Society for Engineering Education. Our paper at that conference was entitled: *"The use of Moral Theories to Evaluate Engineering Codes of Conduct"*[1]. In that paper we used different moral theories to evaluate the legitimacy of certain parts of the N.S.P.E. code of conduct. The theories we used were utilitarian theories, duty theories, rights theories, and virtue theories.

Our initial goal in this paper was to use the Bible to directly evaluate a typical code of conduct. However, as we did more research on the topic, it soon became apparent that we would need to do some additional preliminary work before we could directly use the Bible to evaluate a commonly used code.

Our paper has five major sections. Our first section deals with the nature of our calling by God. We then proceed to a discussion of what is the nature of work. Only

after that can we begin an actual discussion of engineering. We begin this next section with an attempt to define engineering. We then have a discussion of engineering codes of conduct in the next section. In the final section we use the Bible to examine several portions of a common code.

The Nature of Our Calling

In our analysis we have been heavily influenced by Os Guinness' book *The Call*[2]. Guinness points out that all Christians have two callings. We have a calling to God (to be a disciple), and we have a calling to our work. We need to have some balance so that one of the callings does not get overwhelmed by the other one. Guinness writes:[2] *"Calling is the truth that God calls us to himself so decisively that everything we are, everything we do, and everything we have is invested with a special devotion, dynamism, and direction lived out as a response to his summons and service."*

There are two major distortions to this concept of calling. The first distortion is to elevate the spiritual above the secular. This was seen in medieval times when many people thought that to be really committed you needed to be a monk in a monastery. A common modern distortion is the view that a really committed Christian is one who is working full time in Christian service, such as being a pastor or missionary. The second type of distortion is the elevating of the secular above the spiritual. This approach says that we serve God through our daily life. While this is true, it is not the only way we can serve God. Guinness[2] makes this point by quoting two prominent Americans of the twentieth century, Henry Ford and President Calvin Coolidge. Henry Ford stated: "Work is the salvation of the human race, morally, physically, socially." President Coolidge wrote: "The man who builds a factory builds a temple. The man who works there worships there." While work is important, many Christians would reject this conclusion.

The nature of work

Work was created before the fall of mankind, it is not a curse of the fall. This is made clear in Gen 1:28[3] where it is written: *God said to them, "Be fruitful and multiply, and fill the earth, and subdue it; and rule over the fish of the sea and over the birds of the sky and over every living thing that moves on the earth."* God expects us to spend time doing useful work. He even gave some specific work orders to the first human couple in Gen 2:15: *Then the Lord God took the man and put him into the garden of Eden to cultivate it and keep it.* Work is therefore important and not to be seen as just a necessary duty.

However, some aspects of work were made more difficult by the fall. As is written in Gen 3:17b-19: "*Cursed is the ground because of you; In toil you will eat of it all the days of your life… By the sweat of your face you will eat bread, till you return to the ground.*" This makes the point that work is more now more unpleasant than it was before the fall. Originally the command was to "cultivate"; now words like "toil" and "sweat" are used to describe what man was to do.

Work is therefore important to us for several reasons. God's commands to work predate the fall, so there is something important about work that transcends just the practical needs for someone to provide for his family. We do need to work to provide for our family, but there is something intrinsic to human nature that makes work important. When we work, we need to recognize that we are always really working for God. The Apostle Paul makes this point in Eph 6:7 *"With good will render service, as to the Lord and not to men."*

A Definition of Engineering

Creating a definition of engineering is not simple. There are some activities that are clearly the practice of engineering. There are some activities that are clearly not the practice of engineering. There are many activities in which it is not clear whether or not

engineering is being performed. There are many written definitions of science and the scientific method, but fewer attempts have been made to define engineering. We are indebted to the careful thinking on the nature of engineering that has been done by Dr. Billy Koen of the University of Texas. His definition of the engineering methods is[4] *"the strategy for causing the best change in a poorly understood or uncertain situation within the available resources and the use of heuristics."*

Koen's definition deals with several key points involved with engineering. One key point is that engineers must use the available resources to solve problems. Another one is that the facts of a given situation may be poorly understood. However, we believe that his definition is too broad. For example his definition could, in many situations, apply to Christian ministry. Many pastors are trying to solve problems with available resources in situations that are poorly understood. We have therefore created our own definition of engineering:

> *"The application of science and human experience to solve problems faced by people. This is often done in poorly understood or uncertain situations, using the available resources."*

Our definition includes an explicit reference to science, as well as human experience. The human experience part is important, for in many situations we may know what works, but not yet understand why something works.

Introduction to Engineering Codes of Conduct

Engineering codes of conduct have been developed by the various State Boards of Registration within the United States. These codes are binding on engineers who work in each state. These codes must be treated seriously, for failure to follow these codes can result in fines and loss of your engineering license.

Engineering codes of conduct have also been developed by the different engineering professional societies. These codes typically contain more specific

information than the state codes for they deal with issues unique to that given branch of engineering. Failure to follow these codes can result in your dismissal from the society. The society can also publicize your dismissal.

One problem we had in developing this paper is that there is no federally sanctioned national standard of engineering conduct. In this paper we will examine what may be the closest thing to a national standard: the code that has been developed by the National Society of Professional Engineers. This code is very similar to many state board codes. If an engineer violates this code, she has probably also violated the state code in her state.

In this paper we will assume that it is legitimate for engineers to have a written code of conduct. We recognize that not everyone agrees with this point, but an extended discussion of this subject could make an entire paper in itself. For now, we will assume that it is legitimate to have a code, and spend the rest of the paper analyzing the legitimacy of specific statements in a code of conduct.

A Biblical Perspective on Engineering Codes of Conduct

Modern engineering, with its significant scientific base, did not exist during the time of the Bible's writing. A type of engineering, empirically based on practical experience, did exist in some cultures. Examples of such engineering work include the Great Pyramids at Giza and ancient Roman aqueducts.

We therefore need to infer a Biblical approach to engineering practice from what the Bible has to say about certain other topics, such as building, work, and excellence in work.

Building things is praised in the Bible. An example of this is in the building of the ark of the covenant. It is written in Exodus 31:1-7:

Now the Lord spoke to Moses, saying "See, I have called by name Bezalel, the son of Uri, the son of Hur, of the tribe of Judah. I have filled him with the Spirit of God in wisdom, in understanding ,in knowledge, and in all kinds of craftsmanship, to make designs for work in gold, in silver, and in bronze, and in the cutting of stones for settings, and in the carving of wood, that he may work in all kinds of craftsmanship. And behold, I myself have appointed with him Oholiab, the son of Ahisamach, of the tribe of Dan; and in the hearts of all who are skillful I have put skill, that they may make all that I have commanded you: the tent 0f meeting, and the ark of testimony, and…

It appears from this Exodus passage that the interest and skill in doing this work was a gift from God. Similarly, our interest in engineering, and our ability to solve engineering problems are gifts from God. This does not mean that hard work is not required for us to able to use our skills to their fullest potential. The competent practice of engineering is hard work. However, we do need to recognize that our engineering interests and abilities come from God.

While God commends building and creating, we need to recognize that what we build is not going to last forever. This is pointed out in Ecclesiastes 2:4-6, 11, where the teacher states:

I enlarged my works; I built houses for myself, I planted vineyards for myself; I made gardens and parks for myself and I planted in them all kinds of fruit trees; I made ponds of water for myself from which to irrigate a forest of growing trees… Thus I considered all my activities which my hands had done and the labor which I had exerted, and behold all was vanity and striving after wind and there was no profit under the sun.

Fortunately the above quotation is not a final statement about building. However, it makes the point, that if all we care about are the things we create, we will inevitably be disappointed. This does not mean that building great structures is bad, only that such actions can not completely satisfy your life.

While we work, we need to do what we can while we can. Paul writes in Ephesians 5:15-16:

> *Therefore, be careful how you walk, not as unwise men, but as wise, making the most of your time, because the days are evil.*

We do not have unlimited time, so we need to be wise in how we choose to use it. We also need to strive for excellence, even if no one is watching. Paul makes this point in Col 3:23

> *Whatever you do, do your work heartily, as for the Lord, rather than for men.*

These two passages make the point that all of our work has God for an audience. Even if no one else appears to be watching, God is. It is therefore God's opinion about our work that really matters. Guinness refers to his as working for an "audience of one."[2] Guinness writes[2]:

> *When asked why he was not stung by a vicious attack from a fellow Member of Parliament, Winston Churchill replied: "If I respected him, I would care about his opinion. But I don't, so I don't." Similarly we who live before the Audience of One can say to the world: "I have only one audience. Before you I have nothing to prove, nothing to gain, nothing to lose."*

We need to do all of our work so that our Audience of One is pleased with what we do.

Our paper is based on the conclusion that God wants everyone to work in a productive manner. For most of us, our work will be "secular", but we should not ignore the fact that we are working to please God and not just other people. We need to recognize that the things we create will not last. This does not diminish the significance of what we create or the relationships we develop while we create.

For the sake of continuity we will examine the same portions of the code that we examined in our A.S.E.E. paper. This paper is available in the engineering ethics sections of Dr. Jordan's web page.[5] The four passages in the N.S.P.E. code were selected to represent different aspects of the practice of engineering. These same passages were

examined in our A.S.E.E. paper. All of the passages from the N.S.P.E. code are from their official web page[6].

Fundamental Canons of Engineering

Section II.1.a

> *Engineers shall hold paramount the safety, health and welfare of the public.*[6]

The canons appear to be very consistent with Paul's command in Galatians 6:9-10

> *Let us not become weary in doing good…as we have opportunity, let us do good to all people.*

We have an obligation to all people, not just the immediate client who has hired us. As Christians, we are pleased that this statement is at the very beginning of the code, making it clear what our ultimate aims should be.

Public Knowledge and Appreciation

Section II.2.C

> *Engineers shall endeavor to extend public knowledge and appreciation of engineering and its achievements.*[6]

Being pleased in what we do is certainly legitimate. If we are doing what God wants us to be doing, then we ought to be satisfied. The writer of Proverbs writes in 13:4

> *The sluggard craves and gets nothing, but the desires of the diligent are fully satisfied.*

However, as mentioned previously, we can never be totally satisfied only by our work. The teacher in Ecclesiastes writes (in 5:10):

> *He who loves money will not be satisfied with money, nor he who loves abundance with its income.*

We need to make sure that we do not get arrogant in our profession and in ourselves. In describing the reactions of the successful people in a well-to-do society the prophet Hosea warns us (Hosea 13:6):

They became satisfied, and being satisfied, their heart became proud; Therefore they forgot Me.

This part of the code may be seen as promoting a self-satisfaction and arrogance that is sinful. What is important is that our practice of engineering is ethical and competent. It is not so important that other people feel good about what we do.

Deceptive Actions

Section II.5.a

Engineers shall avoid deceptive acts. Engineers shall not falsify their qualifications or permit misrepresentations of their or their associates' qualifications.[6]

This portion of the code appears to be Biblical. We need to tell the truth at all times. It is written in Proverbs 16:14

Righteous lips are the delight of kings and he who speaks right is loved.

We need to recognize that this portion of the code does more than mandate truthfulness, it also forbids deceit. It is possible to not lie in the words we say, but still deliberately give a misleading impression. The forbidding of this deceitfulness is consistent with Biblical teaching that we need to control our thoughts and motives, as well as our action statements.

We need to speak the truth, even it does not appear to be in my immediate self interest. The Psalmist writes in Psalm 15:1-4

O LORD, who may abide in your tent?
Who may dwell in your holy hill?
He who walks with integrity, and works righteousness
And speaks truth in his heart
…who honors those who fear the LORD;
He swears to his own hurt and does not change.

There are times when it may appear that not telling the truth will help us in the immediate situation. We need to recognize that such actions are not acceptable, and not even in our

best interest. An example from one of the author's career (Jordan) may be relevant. Early in his academic career Dr. Jordan was working on a sponsored research project with a more senior faculty member. Dr. Jordan's portion of the project was done, and he was faced with a summer without income. The more senior professor had not claimed all of the summer support that had been due him. He had not noticed that he had more salary due him. As a co-principal investigator, Dr. Jordan could have claimed the salary support and it is unlikely that anyone else would have ever noticed. However, Dr. Jordan knew that claiming this support was not ethical, and he notified the other professor so he could claim what was due him. While this had some short term hurt (no income that summer) it has provided Dr. Jordan with the long term benefit of knowing he has done the right thing.

Example of changes in N.S.P.E. Code

The N.S.P.E. code has been changed over the years. Sometimes this change has been voluntary, but they have been forced to make changes at other times. This section describes one of these forced changes. The following is a direct quote from the N.S.P.E. code:

> *"By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients..."*
>
> *Statement of NSPE Executive committee*
>
> *In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: "The Sherman Act does not require competitive bidding"*
>
> *1. Engineers and firms may individually refuse to bid for engineering services...*

4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.[6]

Human codes of engineering conduct do change, since they are fallible instruments. While the circumstances of how we apply the Bible may change, the Bible (and its standards of behavior) does not change. This is shown in Isaiah 40:8

The grass withers, and the flowers fall, but the word of our God stands forever.

Since the Bible does not change and the codes do change, we believe that what the Bible says is more important than what the code says.

The above N.S.P.E. quotation is interesting for another aspect. The society was forced by a federal court order to change their code and no longer call the practice of submitting competitive bids an unethical act. However, it is clear that the society has not really changed its opinion. While it cannot officially call competitive bidding for engineering services unethical, it still clearly urges engineers to not practice it. The code appears to be trying to do two things at the same time. There is a behavior that it cannot call unethical, but it still urges engineers not to do it. They completely ignore the issue of how can something be ethical (as determined by the court) but still bad to do (as determined by the society). This section clearly shows the fallibility of the codes of conduct. They do change (sometimes voluntarily and sometimes by force). As this example makes clear, even when the words do change, sometimes the basic attitudes do not change.

Conclusions

The Bible was written in a pre-technological time and cannot be directly used to make decisions on technology. However, the Bible does provide us with insight into how we should practice engineering. The engineering codes of conduct, while reasonable in many respects, contain some statements that cannot be justified by Biblical teaching.

When faced with a difficult decision, a Christian engineer should consult both the code and the Bible before making a final decision.

References

[1] Jordan, W., Elmore, B., and Napper, S., *The use of Moral Theories to Evaluate Engineering Codes of Conduct"*, in CD based proceedings (no page numbers), American Society for Engineering Education Annual Conference, Montreal, Quebec, June 2002.

[2] Guiness, Os, *The Call*, Word Publishing, Nashville, 1998.

[3] Biblical quotes are from the *New American Standard Bible, UpdatedEdition*, Foundation Publications, Anaheim, CA, 1995.

[4] Koen, Billy, *Definition of the Engineering Method,* American Society for Engineering Education, Washington, D.C., 1985.

[5] Dr. Jordan's web site: www.latech.edu/~jordan/

[6] *NSPE code of conduct*, retrieved on January 8, 2002 from NSPE web site http://www.nspe.org/ethics/eh1_code.asp