

Christian Worldview and the Engineering Context

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Abstract

Baylor University's recent commitment to "Vision 2012" has created implied imperatives for the faculty to seek ways of using Christian perspectives to shape classroom instruction and encourage the expression of Christian faith in the intellectual life¹. Teaching from a Christian worldview is part of the University's charge and Engineering faculty members are investigating how Christian perspectives might interact with various elements of the engineering curriculum. For example, engineering faculty are exploring avenues that incorporate Christian perspectives into engineering design methodology in such a way as to produce uniquely Christian contributions to the engineering design process, especially in terms of responsible and sustainable design. Central to this incorporation is the development of a methodology that creates and exploits meaningful categories and paradigms that are capable of informing and illuminating engineering practice. One example is the "Creation, Fall, Redemption" paradigm that is a central tenant of the Christian faith. Using this paradigm, it is possible to explore the fundamental nature and scope of engineering problems, ranges of possible and achievable design solutions, ultimate and desirable goals, and illuminate valuing processes.

Valuing and the Engineering Context

Technology is the product of the engineering design process. Monsma, et. al. define *technology* as "a distinct human cultural activity in which human beings exercise freedom and responsibility ... by forming and transforming the natural creation, with the aid of tools and procedures, for practical ends or purposes."² These authors further assert that "doing technology [engineering] is not a [morally or ethically] neutral activity but one that involves valuing of a profound, fundamental nature."³ The philosophical basis for asserting that valuing is inherent in the engineering design process [technology] is that "any set of standards for determining what does or does not constitute a solution to a problem must clearly lie outside the problem itself".⁴ In other words, the evaluation of whether a particular design is a "good" or "bad" solution is not self-determined by a particular solution. Therefore, the presuppositions and pre-commitments of the designer [engineer] must play the central role in alternative design evaluation. In particular, one's worldview becomes an important factor in determining the final design solution.

Monsma, et. al. also define *design* as a structured "innovative activity whereby people [engineers] creatively use theoretical and practical knowledge and available energy and material in order to specify the size, shape, function, and material content of a technological object."⁵ Furthermore, "design results in a blueprint or set of detailed instructions for the physical characteristics of a technological object – either a product or a tool. Instructions for facilities and procedures needed to fabricate the object are included in these specifications."⁶

This definition describes the design process as the quest for a solution to a problem that is intrinsic or inherent in the resultant object itself. However, the design solution [object] must exist in a real world context, which defines the extrinsic interactions or externalities of the object. These externalities include elements of aesthetics, economic factors, safety, risk, reliability, maintainability, sustainability, cultural and gender appropriateness, ergonomics, environmental impact, energy efficiency, and end-of-life resource recovery, among others. It is within the realm of a design's externalities that cultural valuing is

most intensely focused and therefore the area where an engineer's worldview may have the largest impact on the design process.

Monsma, et. al. proposes a set of "eight normative principles" for regulating the design outcome.⁷ These normative principles are underpinned by the moral law, which is summarized in the two great commandments: "Love the Lord your God with all your heart, and with all your soul, and with all your strength, and with all your mind; and your neighbor as yourself."⁸ Although these two commandments are central to the Christian faith and extremely rich compared to all secular and non-Christian moral codes, many of their practical aspects are present in the Codes of Ethics adopted by most engineering societies.⁹ Additionally, these normative principles focus on the human element and do not specifically address the broader aspects of creation, i.e. issues dealing with animals or the environment. Although the moral code (law) is part of a Christian worldview it is not the distilled essence of the Creation, Fall, Redemption paradigm.

Constructing a Christian Worldview

A worldview forms the conceptual basis for a human being's interaction with his/her world and is the basis for interpreting and organizing the world in terms of linguist categories (semiotic systems) and intellectual (interpretative) activities, which give rise to permissible actions and values. A significant portion of one's worldview is formed from the cultural narratives (stories) that are embedded in one's learning and nurture environment. David K. Naugle develops these concepts of in "Worldview, The History of a Concept", especially chapter 10.¹⁰

A specifically Christian worldview draws from the narratives of the Old Testament accounts of the nation of Israel and the New Testament accounts of the person and work of Jesus the Christ. From these sources, historical theistic Christianity has constructed various narrative interpretations¹¹, which form the basis of particular doctrinal and creedal statements. Most of these statements contain explicit references [narratives] about human origins [creation], the human condition [fall] and the purpose of human life [redemption].¹²

Using these common terms, a meta-narrative framework centered on the concepts of Creation, Fall and Redemption¹⁰ can be constructed. [A meta-narrative is the ultimate or absolute narrative by which all other narratives are interpreted.] This meta-narrative declares: 1) God as beneficent creator (*ex nihilo*) of the universe (all that is seen and unseen) and the creation of man in God's image (implying that man is to be a creator also, although only in a derivative sense), 2) the fall of humankind into sin and the introduction of stress and decay into creation, and 3) the process of redemption for man and creation in order to restore both to the pre-fall state.

Although the Creation, Fall, Redemption meta-narrative elements are ubiquitous in the Christian Scriptures, this meta-narrative is particularized by interpretive processes that exist within various Christian traditions and communities, for example, the Roman Catholic, Eastern Orthodox, Lutheran, and Reformed traditions or independent communities such as the Baptist and Quakers. Because of the diversity of Christian doctrinal beliefs and practices, there are, admittedly, a variety of narrative interpretations and thus a variety of worldviews that fall under the Christian umbrella.¹¹ However, there are many Biblical references that point to a particularly useful interpretation of the Redemption meta-narrative element.

Certainly other paradigms do exist that could provide an interpretative foundation for existence. The dualistic "Light versus Darkness" paradigm would be an example. This paradigm emphasizes the radical separation of spiritual and physical in a manner, which, from the authors' point of view, provides few meaningful categories capable of informing and illuminating engineering practice.

Some may find the limitation of “worldview” to narrative selection and interpretation, especially in light of traditional philosophical approaches to the topic, as overly simplistic and deficient. (Be that as it may, many engineering designs begin with simple design elements and add complexity when the simple becomes well understood.) Nevertheless, it must be recognized that the Scriptures are narratives rather than philosophical treatises and that the primary source for all theological constructions are narratives and their interpretations. Although non-Christians and Christians alike have contaminated the term “narrative” to such an extent that it is hard to use without secondary implications, for the purposes of this paper, the use of “narrative” is intended as a description of God’s self-consistent method of revelation as it exists in the Old and New Testament texts.

A concern that is often voiced by engineering faculty who express a desire to use Christian perspectives to shape their classroom instruction is that they feel inadequately prepared in terms of theological education. One benefit of the use of Scripture narratives is that it lowers this theological education barrier by allowing worldview formative narratives to serve as principle formative case studies, which are familiar teaching vehicles in the engineering classroom.

The Meaning of Creation, Fall, and Redemption

Central to orthodox Christian beliefs is the self-existence of one triune God who is creator of all that exists.¹³ Creation was designed to show forth God’s majesty and glory and divine attributes to humankind.¹⁴ However, the human race chose not to honor God but rather to turn away for the light of his self-revelation to worship the creation rather than the creator. In this state, God allows the effects of this idolatry (fall) to run its full course and all that humans undertake is infected by malevolence and corruption. The effect of this corruption spread not only within the human race but also overflowed into the natural order so corruption is endemic and pervasive. The apostle Paul confirms the impact of man’s fall into sin on the whole of creation:

“The created universe is waiting with eager expectation for God’s sons to be revealed. It was made subject to frustration, not of its own choice but by the will of him who subjected it, yet with hope that the universe itself is to be freed from the shackles of mortality and is to enter upon the glorious liberty of the children of God. Up to the present, as we know, the whole created universe in all its parts groans as if in the pangs of childbirth.”¹⁵

Redemption was effected by God, when His Son, Jesus the Christ, paid the penalty for man’s unrighteous actions. This redemption has a two-fold effect on humankind. First, it transforms the individual human heart¹⁶ moving it from a state of self-centered corruption (fall) to a state in which God renews the heart and mind in truth. In this renewed state, man becomes a true worshiper of God and understands that the universe is an expression of the creative nature and will of God. In his redeemed state, man spiritually returns to the original tasks of worshiping the One True God and “keeping and tilling the garden.”¹⁷ Secondly, for the redeemed, the source of this redemption, Jesus the Christ, now is the inspiration for a renewal and redemption of human culture from a positive and constructive position.¹¹ From the Pauline perspective, redemption was not just limited to humankind but was much more comprehensive, reaching to all of creation. In fact, what God has accomplished through the work and personhood of the Redeemer is fully eschatological in nature.¹⁸

This redemptive message was central to the proclamation of the Gospel in the early church as seen from Peter’s address to the Jerusalem crowd: “He [Jesus] must be received into heaven until the time comes for the universal restoration of which God has spoken through his holy prophets from the beginning,”¹⁹ and John’s apocalyptic vision of a “new heaven and a new earth.”²⁰ Clearly, there is “a soteriological and doxological purpose to human history, that God is glorying himself in the redemption of his people and the cosmos, terminating in a final judgment and the creation of a new heaven and a new earth in which righteousness dwells.”²¹

Worldview and Design

From Monsma's decomposition of engineering design into intrinsic solutions or technological objects and extrinsic interactions or externalities of the designed object, it would seem obvious that a worldview impacts the design's externalities to a much greater extent than it does its intrinsic elements. A Christian worldview is charged with perspectives that inform cultural valuing and at this nexus Christian faculty can make significant contributions that would guide engineering design in directions that value human life and ameliorate the impact of man's destructive actions on creation, i.e. redemption in a derivative sense. Christian faculty should not be apologetic about the interaction of faith informed cultural valuing but should unabashedly promote the high ethical ideals and values that are inherent in the Christian message (worldview).

The use of Christian perspectives to inform engineering design can be incorporated into classroom instruction by assigning particularly relevant scripture passages (narratives) as part of the background research associated with a customer needs statement. For example, when considering the cost benefits of additional design efforts to accommodate a device's use by physically impaired individuals, relevant narrative passages from the Gospels that document Jesus' healing miracles or passages from the Old Testament prophets related to God's concern for the poor and downtrodden could be used to emphasize the importance of accommodative alternative designs.

A Proposed Response

Accreditation requires all engineering programs to include design elements but does not prescribe how to teach design. Individual programs must determine how design will be taught in a manner that satisfies accreditation criterion. In the criteria are statements such as "an understanding of professional and ethical responsibility," "knowledge of contemporary issues," and "a broad education necessary to understand the impact of engineering solutions in a global and societal context."²²

Since elements of design are generally taught across the engineering curriculum, it is important that all engineering faculty take a holistic approach to design topics; teaching the extrinsic as well as the intrinsic elements of design. The holistic approach would generate opportunities for students to consider the insights their particular worldview (be it Christian or otherwise) might bring to the design table. Where a student's worldview might appear to be deficient, the instructor should be ready to dialog with the student to expose fallacies and underscore the need for a thought-out value system.

Even engineering science courses, which may contain little design content, should contribute to a student's awareness of extrinsic design elements. For example, electrical materials courses, which normally cover topics related to the electrical properties of materials, can address issues of materials toxicity and environmental impact, end-of-life recovery, and safety. Or a course in electromagnetics can cover the effects of EM radiation levels on living organisms. A course in software development could cover issues of human computer interaction that relate to system utilization by individuals with sensory impairment and other physical disabilities. A course in thermodynamics could address issues of energy conservation, energy efficiency and energy production by-products (pollution). A course in machine design might address issues of appropriate technology, sustainability, and maintainability.

The non-engineering humanities coursework should also support a student's developing awareness of extrinsic design issues. Selected courses in religion, languages, literature, sociology, psychology, and world cultures, to name the obvious, generate a broad spectrum of preparatory and foundational materials that are necessary for a student to develop a comprehensive perspective of life (worldview). Assuming student's exposure to such materials, engineering faculty should be able to efficiently address complex issues related to extrinsic design elements with some assurance of a meaningful dialog with students and a real hope that students will be able to produce holistic and non-trivial design artifacts. Concomitantly,

engineering and liberal arts faculties must build bridges in support of shared values and compatible Christian worldviews to prevent the appearance of mutually exclusive and incompatible pedagogy.

A Christian worldview can also help engineering students evaluate the relative significance of potential career choices or provide insights on how to pursue a vocation in a manner that avoids the trivial and focuses on the significant. Admittedly, most young engineers struggle with larger life issues that are not addressed by typical engineering course content but which can be otherwise addressed by faculty mentors who possess a well thought out Christian worldview.

Conclusion

A good engineering program operating from a Christian worldview should engage the students in reflection on the motivations that underlie the engineering profession. Accordingly, using the Creation, Fall, and Redemption paradigm, Christian engineers are called to a vocation that is pleasing to God and which redeems human endeavors and enterprises and promotes good stewardship. From this vantage point, a pedagogy focused on the supporting aspects of a Christian worldview should raise each student's awareness of complex issues of values and culture which can make a significant impact on the design process and outcome. If there is validity in this line of reasoning, then departments of Engineering at schools with a Christian heritage should develop and nurture pedagogic elements that give expression to Christian values and ideals (worldview) within their engineering curricula.

Baylor's School of Engineering and Computer Science has made this commitment explicit though a published mission statement: "to provide a superior education through instruction, scholarship and service that prepares graduates for professional practice and responsible leadership with a Christian worldview."²³ However, the Department of Engineering faculty recently voted to remove the "Christian worldview" phrase from its program mission statements because of issues related to ABET assessment. If the point of view expressed by Monsma, et. al. and the authors of this paper are valid concerning the importance of valuing in relation to the extrinsic elements of design, and then there should be little concern associated with the assessment process, since design externalities must be addressed in some form to meet accreditation requirements.

References

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