A Multi-Disciplinary Analysis of Catholic Social Teaching with Implications for Engineering and Technology

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ABSTRACT

In this article we view Catholic Social Teaching (CST) in the larger context of history, culture, philosophy and theology, and social services, and consider three perspectives on its modern instantiation: social science and economics, modal and non-monotonic logics, and second-order cybernetics. We then apply these perspectives to questions of interest in the field of software engineering and issues of digital (or network) security as well as intellectual property. In each application scenario, there are potential conflicts between the rights and dignity of differing individuals and groups. We conclude that CST allows for ethical navigation of such conflicts and offers many helpful insights.

Keywords: Catholic Social Teaching, Philosophy, Theology, Logic, Cybernetics, Artificial Intelligence, Engineering, Computing.

1. INTRODUCTION

Catholic Social Teaching, sometimes referred to as Catholic Social Thought (CST), is a coherent body of principles, precepts, and practices that emerged clearly in the nineteenth century with a dual origin: philosophy & theology and social action. A combination of the industrial revolution and trends in European philosophy gave rise to concerns by Catholic philosophers, theologians, and Church leaders, most notably Pope Leo XIII (1810–1903) [1]. Since then, Pius XI, John XXIII, Paul VI, John Paul II, Benedict XVI, and Francis have elaborated CST. In fact, it has been a major emphasis of Pope Francis and others in the contemporary Catholic community [2].

While CST has various unique aspects, Christian communities with origins in the Protestant Reformation have adopted elements of the CST and have long-established and active social and charitable missions, as for example, the Salvation Army. Other faith traditions, such as Judaism and Islam, have similar religiously and philosophically founded models for social action. These vary according to doctrinal and cultural differences, but each focuses on both individual morality and social ethics. Models derived from diverse secular philosophies or non-theistic creeds exist as well. In some ways, the principles and practices of CST are an echo of the best of medieval monasteries (male, female, and dual monasteries), where monks and nuns provided spiritual, educational, social, medical, and other services to the surrounding community [3].

After King Henry VIII's dissolution of the monasteries, priories, convents, and friaries, (1536–1541) in England, Wales, and Ireland, appropriating their income and disposing of their assets, social services in England failed to reach the same level of community support until the mid- to late nineteenth century [4].

Social services in the rest of the Christian world were not affected to such a drastic extent, or as rapidly, but likewise fell from a standard that existed during the High Middle Ages, with the rise of nation-states, different economic and social models, and changes in church-state balance, even in countries remaining loyal to Rome.

CST is rooted in four fundamental values: truth, freedom, justice, and love. In addition, there are a number of foundational principles, expressed in different ways [5, 6, and 7]. The authors concisely define them this way:
1. Human Dignity
2. Common Good
3. Solidarity / Social Charity
4. Subsidiarity
5. Charity
6. Social Justice
7. Stewardship for Creation
8. Universal Destination of all Goods
9. Participation

All of these concepts are readily comprehensible as general concepts, except perhaps subsidiarity, the universal destination of all goods, and participation. "Subsidiarity" is in some sense related to the principle of least government, but generalized to entities including individuals, groups, and organizations. In principle, decisions and actions should be local as far as possible, and rights (and responsibilities) reserved to one entity should not be lightly overridden. Larger or higher-level entities should intervene only to support, to coordinate among entities and with society as a whole, to protect the rights of still lower level individuals or entities, or to promote the common good. The "universal destination of goods" is a pillar of CST which teaches that the goods of creation are destined for mankind as a whole, but also recognizes the individual right to private property, so long as they are not used against such universal interest. (An extreme example: obtaining a monopoly interest in a basic good and denying it to others, or charging extortionate prices, would certainly violate Universal Destination.) Finally, "Participation" is a call to all men and women of good will to engage fully and consciously in the life of human society.

The Center for Mission and Identity of Benedictine University (CMI) [8] ties CST explicitly to the wider Catholic Intellectual Tradition (CIT). CST both relies on and implements its goals of:

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1. commitment to the continuity between faith and reason [and action];
2. respect for the cumulative wisdom of the past;
3. an anti-elitist bent;
4. attention to the community dimension of all human behavior;
5. concern for integration of knowledge; and
6. a sacramental worldview—grace is at work everywhere in the world.

Particular connections between the CMI goals and the CST principles include the following. Continuity among faith, action, reason, and respect for the wisdom of the past, inform all the CST principles. In the following list, human dignity relates strongly to (4), as do solidarity and the common good, and also relates to (6); subsidiarity relates to (3) and (4), and charity to (3) and (6); stewardship to (4) as well as (5); and social justice to (3), (4) and (6); universal destination of goods and participation relates to (4) and perhaps (3). Table 1 summarizes these relationships.

CMI Goals		CST Principles		CMI Goals
1	Continuity of Faith, Reason, and Action	1	Human Dignity	1, 2, 4, 6
2	Respect for Past Wisdom	2	Common Good	1, 2, 4
3	Anti-Elitist Bent	3	Solidarity	1, 2, 4
4	Community Dimension	4	Subsidiarity	1, 2, 3, 4
5	Integration of Knowledge	5	Charity	1, 2, 3, 6
6	Sacramental Worldview	6	Social Justice	1, 2, 3, 4, 6
		7	Stewardship	1, 2, 4, 5
		8	Universal Destination	1, 2, 3, 4
		9	Participation	1, 2, 3, 4

Table 1. CMI Goals and CST Principles.

In this paper, we examine CST from four interwoven perspective. In Section 2, we establish the principles of CST through philosophy and theology—in particular, ethics and society. Then, in Section 3, we analyze three perspectives, each with their own subsection: the social sciences and economics; modal logic—particularly deontic and ontological logics; and second-order cybernetics. The first subsection analyzes the CST principles for implementation and derives precepts and practices; the second evaluates these for consistency, and in considering novel situations; and the last reflects on the connection and interaction of individuals, their actions, their relationship networks, and society at large. We do not aim to critique or defend particular principles of CST or any competing theory, but rather to provide a multi-dimensional framework for a holistic understanding and assessment of CST and other such models.

CST has shown itself to be effective outside of Catholic, or even generally religious circles. In the 1940s, Catholic philosopher Jacques Maritain played a role in writing the UN Charter of Human Rights [9], and Pope Pius XI's 1931 articulation of the principle of subsidiarity helped crafters of the Maastricht Treaty in 1992 describe the relationship between the European Union and its sovereign nation-states [10]. More recently, Pope Francis' 2015 letter "On Care for Our Common Home," *Laudato Si'*, and subsequent advocacy, has influenced many including leaders of

nations to be attentive to the ethical obligation to be good stewards of the Earth [11].

2. SOME FOUNDATIONS OF CST

CST recognizes the importance of attending to the practical, contingent situations of life. However, equally important is being able to think about these fluctuating realities in light of important principles that give continuity and a certain logic to our actions. For the Catholic, these principles are not understood to be exclusively "religious," but rather healthy human principles. It is for that reason that CST has been able to speak to all of humanity regardless of religious or non-religious affiliation.

Nor is this accent on what is human a coincidence, for the foundation of CST is the notion of human dignity. CST begins from the idea that every human person is made in "the image and likeness" of God [12]. As a being created by God, every human person, regardless of race, religion, or any other affiliation, is a unique and unrepeatable vestige of God's work in the world. C.S. Lewis put this same thought another way when he wrote, "There are no *ordinary* people. You have never talked to a mere mortal" [13]. This pivotal point matters for how we think about our relationships: it is in light of this "…that we should conduct all our dealings with one another, all friendships, all loves, all play, all politics" [14]. This perspective ought to remain the outlook of Christians, even when another rejects the idea. Therefore, this being-made-in-the-image-of-God is the ultimate source of the value or dignity of each person [15]. Likewise, it is the ultimate source of human rights, those things, or actions due to another in virtue of simply being human.

Evidence shows that even today's secular, liberal democracies want to base human rights in something more than a mere social consensus [16]. Expression of this desire has become especially widespread since the "legal" atrocities committed in the mid-twentieth century. Yet, how to secure these natural rights without the theological context from which they spring, is a noted difficulty [17]. In the face of such difficulties, Joseph Cardinal Ratzinger, the future Pope Benedict XVI, proposed to the modern secular world, the idea of Pascal, the Renaissance philosopher and mathematician, to "seek to live and to direct his life '*velut si Deus daretur*,' as if God existed" [18]. To live as if there were a God and every person is an image of God.

The second basic principle of CST is called the "common good." The common good describes that good or goal a society directs itself towards. This good is "common" because it cannot be identified as the good of merely one person, but of the group taken as a whole. For example, while each student retains their own good, the good of the class is not identical to any single student's good. Thus, an overly talkative student might be interfering with the class's "common good" (or, alternatively, be enunciating concerns of fellow students that they do not wish to, or are unable to verbalize), and this—in either case—occurs irrespective of how personally interested the teacher was in those comments.

Reference to the "common good" can be found in a myriad of thinkers, not all in agreement. Thus, it becomes possible to understand CST's notion of the common good by comparing it to two other extremes. One extreme would be considered too "individualist" or "libertarian." Under this interpretation the common good is simply the setting of conditions for individuals to do whatever they please. While freedom is always of paramount importance for CST, this individualist notion of the

common good affirms individual's freedom to the detriment of any group cohesion or benefit.

Returning to our classroom example, we might imagine a class turned into a study hall, where students could study disparate subjects or not study at all. The only rule would be not inhibiting the other's study. Such a group would have little to no social cohesion, making it difficult to call them "a group" in any real sense. Thus, there is no real "common good" which they are pursuing – unless that good is viewed as advancing the non-competing good of each of its members. Jeremy Bentham and John Stuart Mill summarized this advancement well in their famous utilitarian dictum "that actions are right in proportion as they tend to promote happiness", where happiness means "pleasure, and the absence of pain" [19]. Doing so, these philosophers saw themselves as not only presenting a private ethic, but a social principle by which a disparate group of individuals could navigate their various social encounters. Alasdair MacIntyre has indicated this connection between individualist notions of the common good and an ethic of utilitarianism as one reason why utilitarianism's "distinctive idiom [is] so ineliminable from modern public discourse as well as from modern moral and political philosophy" [20]. In this light, utilitarianism can be seen as a failed attempt to seek a middle ground in understanding the common good. Ultimately, it failed for at least three reasons. First, it can be employed to make sense of the extremes. Second, as Kenneth Arrow demonstrated [21], one cannot always distill from an amalgamation of preferences any "collective will" or "preference" of a group [22, 23], and thus that there is no assurance that one can fairly determine "the greatest good for the greatest number." Third, as pointed out above, it presupposes a radical individualistic anthropology.

Another extreme is too "collectivist." Under this interpretation the common good is a good the group pursues even to the detriment of the persons comprising that group. In short, the person becomes perilously subordinated to the group's good. Such versions of the common good open themselves to possible violations of human rights—as tragically lived out by millions in the last hundred years. Indeed, such violations would be and have been committed in the name of the (supposed) common good. Within the gambit of CST, then, any form of collectivism, whether manifesting itself in the political far right (absolute monarch) or the political far left (Communism), is *in principle* dangerously deficient.

CST's notion of the common good runs contrary to both these approaches as an intermediate position. On the one hand, while affirming freedom, the group seeks a good together. So, society exists for the person to freely grow towards their full flourishing. On the other hand, and contrary to the collectivist understanding, the common good underscores that the person's flourishing *is* the goal of the group. Thus, the person does not exist for the group, but the group exists to help those who make up the group. By definition, the group cannot flourish unless *every* individual is helped [24] (or, at a minimum, its practices are such that there is benefit available to every individual—since no individual can be constrained to accept that help). Flowing from this commitment of society to the person, CST articulates other important principles. These principles speak to one's use of property, the organization of governance, the commitment to others' good, participation in the group's good, etc.). Nevertheless, each of these principles is largely worked out in the light of CST's two pillars: human dignity and the common good.

Given our purposes here, it may be worth mentioning three thoughts on technology. CST has for decades recognized an important distinction between material or technological progress and the integral progress of peoples. It has been a continuing clarion call of CST that authentic progress attends to the genuine development of all peoples, not only technological progress [25]. Moral development must accompany technological development or one risks enslaving oneself. Pope Benedict XVI points out that an inadequate understanding of "nature" has had a detrimental effect on ethics and the ordering of society. He writes, "Theological arguments about the 'nature of humans' or 'natural rights,' resting as they do on the concept of creation, meet a look of blank incomprehension; in fact, they seem nonsensical, the relic of an archaic 'natural philosophy'" [26]. In reducing "human nature" to the mere biochemical structure of man, it is impossible to make ethical statements. All that can be done is to state what is feasible, not what is ethical.

Second and more recently, Pope Francis identified the human roots of our current ecological crisis as a "technocratic paradigm" [27]. With all the good technology has brought us, it also encourages a mindset, a paradigm, by which we begin to treat everything around us as raw material to be manipulated as we see fit. When we give in to such a mindset, we begin to treat everything around us—even one another—as material to be manipulated according to our own design. In so doing, we ignore the nature of the other. Among other problems, this mentality leads to further abuse of human rights, because it fails to attend to that which is due to a person in virtue of being human. Without denying the benefit and good of technology, the error rests in accepting a particular view of the natural world which technology is forever free to manipulate. Here, thinks the Pontiff, rests one of the roots of our current ecological crisis. This ecological crisis, however, is not only about our natural environment and climate change; it is a crisis in integral, human ecology. Consequently, it is this same technocratic rationale that "drives one person to take advantage of another, to treat others as mere objects" in a "use and throw away logic" [28].

Third, and perhaps less importantly, the effect of technology and new communication modes and media in all aspects of modern life strongly suggests that the "digital divide" and universal access to technology is a valid and significant concern for CST. However, the responsible use of such modes of communication remains a concern. Pope Francis has recently noted that these modes often only give the illusion of communication, while "blocking the development of authentic interpersonal relationships" making them insufficient to "really build community" [29].

3. THREE PERSPECTIVES ON CST

Social Science and Economics

The social sciences are those subjects which study individuals, the relationships between them, as well as the dynamics of groups and cultures. This includes a variety of approaches, from understanding how minds work to how societies as a whole function. The major social sciences include anthropology, archeology, economics, geography, management science, political science, psychology, and sociology, to which we might add environmental studies. In many American universities, the term might also include applied social sciences such as criminal justice, gerontology, and social work.

In this section, we focus on psychology (the study of the human mind and its functions, especially those affecting behavior), and sociology (the study of groups and interactions of individuals with groups), together with political science (whose purpose is evident) and economics (the study of individuals and groups in relation to wealth, labor, production, and consumption). Most social scientists would agree with many of the principles of CST listed in Section 1, even if ultimately not sharing its concomitant faith commitments.

One principal concern of psychology is the proper functioning of a healthy mind. Among the desirable attributes are a constructive mental state, as well as emotional and intellectual maturity. These appear to be correlated with altruism and compassion, respect for human dignity and autonomy, and a sense of justice and equity, with clear correspondences to principles of CST. Both sociology and economics are concerned with stable, functioning communities and organizations. Again, the principles of CST align fairly closely with those attributes concern for the common good, for the environment, for the dignity of individuals and of subcultures, and for a social system in which all are treated fairly and equitably.

Bringing together concepts from political science, economics, philosophy, and sociology, the twentieth century English Catholic writers G.K. Chesterton and Hilaire Belloc were strongly critical of both unbridled capitalism and doctrinaire socialism; they advocated for *distributism* as a preferable economic model [30]. Advocates of distributism believe that the world's assets should be widely owned rather than concentrated. They classify both *laissez-faire* capitalism and Marxism as profoundly flawed and exploitative. Distributism proposes economic cooperatives and member-owned mutual organizations, as well as appropriate antitrust regulations. It foresees that social services will be provided by Catholic parishes, religious communities, and fraternal organizations, or the equivalent in other cultures.

This model responds quite well to Pope Leo XIII's thoughts on economic issues, and echoes can be found in the writings of Dorothy Day and in *The Catholic Worker* [31]. One can view the creation of Christian Democratic movements in late nineteenth and early twentieth centuries as attempts to temper capitalism as well as socialism with something like distributism and the principles of CST (or parallel Protestant approaches, e.g., neo-Calvinism). These European movements typically involve a synthesis of modern democratic ideals and traditional Christian values. The connection of the field of environmental studies with CST is clear, particularly with the involvement of Pope Francis and his encyclical, *Laudato Si'*, as mentioned above.

Organized Christian charitable activity goes back to the New Testament, as evidenced in Acts 4:33-35. However, when the Roman Emperor Constantine issued the Edict of Milan in 313, establishing religious toleration of Christianity, the Church had the freedom to expand its ministries, e.g., burial societies, poorhouses, homes for the elderly, homeless shelters, hospitals, and orphanages [32]. These ministries often received financial support from the Empire. When, not long after, Julian the Apostate became emperor and supported the restoration of Hellenistic polytheism as the state religion, he copied the Church's social welfare system and developed the precursor of modern, secular social work [33].

In Ireland, during the late fifth and early sixth centuries, monasteries became the most important centers of Sacramental, spiritual, and educational life, as well as centers for social concern ministry. These communities were either composed of monks, nuns, or both (i.e., a separate community of monks and one of nuns, joined in one institution). For example, the monastery of St. Brigid of Kildare at Kildare, was a double monastery, with both men and women, led by an Abbess. In sixth century Italy, St. Benedict of Nursia established a monastery at Subiaco, the Abbey of Monte Cassino, and other monastic foundations which would spread throughout the whole continent. Benedict's Rule, especially chapter 53, emphasizes hospitality and charity toward all who knock on the monastery door [34].

These ministries continued through the medieval period and into modernity. In light of nineteen and twentieth century CST, women such as St. Jeanne Jugan (1792–1879) emerged. Jugan was a French woman who founded the Little Sisters of the Poor and was known for her dedication to the elderly poor. In the United States, Dorothy Day (1897–1980) and Br. Peter Maurin (1877–1949) established the Catholic Worker Movement to make people aware of Church teaching on social justice as well as concretely serve the poor. St. Teresa of Calcutta (1910–1997), an Albanian-born woman, established the Missionaries of Charity, a religious community dedicated to serving the poorest of the poor, currently in over 130 countries. The Missionaries of Charity care for refugees, former prostitutes, the mentally ill, sick and abandoned children, lepers, people suffering from AIDS, the elderly, and others. Clearly, CST has had a substantial and enduring impact on the social welfare of many.

In the contemporary debate between liberal individualism, in which human rights and individual choices are paramount, and collectivism, which places value on functioning community and culture, CST can be seen illuminating a middle road, privileging individual and local choices so long as they follow moral principles, respect all individuals, and are not destructive of the common good, the community, or the environment.

Modal and Non-Monotonic Logics

CST begins with a certain set of principles, as discussed above, as well as other premises derived from Catholic theology and the broader Catholic Intellectual Tradition. We can restate and treat those principles as axioms for logical purposes, statements of fact about the world or individual situations, or assumptions about a specific case, as premises, using a variety of modal and non-monotonic logics [35] to support key positions in CST. This both connects back to Thomistic reasoning [36], and can serve to elucidate the social corollaries of Catholic moral teaching in the formation of clergy and other Catholic leaders.

For example, the right of labor to unionize can be derived from respect for human dignity. The following argument uses deontic logic (the logic of must and may) informally, with inference rules and some intermediate steps omitted for simplicity, to confirm that right.

1. Humans have a right to dignity and autonomy. (Axiom)
2. There is a universal obligation to respect the dignity and autonomy of human beings. (Inference)
3. Humans live out their dignity and autonomy through their work. (Proposition)

4. There is an obligation to support human dignity and autonomy through legitimate work. (Inference)
5. Workers are permitted to bargain for working conditions to support these values. (Inference)
6. In modern economics, there is a power disparity between labor and management. (Observation)
7. It may be impossible for individual workers to negotiate working conditions. (Inference)
8. It is permitted for workers to unionize to negotiate working conditions. (Inference)
9. It is forbidden for management to prohibit worker unionization. (Inference)

Catholic theology and CST are antithetical both to situational ethics as generally understood and to consequentialism—the theory that the results are the measure of morality, crudely understood as "the end justifies the means." But modal logic can reveal cases in which CST will acknowledge there are times when the consequences make a morally significant difference.

Ontological logic reasons about causes and effects. It can combine with deontic logic to reason about ramifications of decisions and actions, and to deduce concomitant prohibitions or obligations. For example, it may be the case that an action which causes good effects, without accompanying moral or social evils, is permitted (and encouraged), while an act that has wrongful effects, without compensating moral or social good in at least the same degree, is prohibited (and discouraged). This would prohibit acts, for example, whose two principal effects would be to unnecessarily damage the environment and to enrich an actor who is already more than self-sufficient, since the former is a social and in some circumstances moral evil, and the second would be neutral or at best a lesser good. However, it must be noted that while the Church does not rely on these forms of logic to *produce* her moral doctrine, these forms of logic manifest something of her reasoning, and can be used, more or less formally, in explicating that doctrine and its consequences, and perhaps for investigation of novel situations. It is not primarily on the grounds of effects (which are a form of circumstances) that one properly judges some action good or evil. Instead, it is in terms of the object of the act and the intended end, as distinct from mere effects. (On the other hand, one must weigh carefully whether one can perform an objectively good act that has a major and predictably evil effect. Even if the intent is good, one cannot ignore the likely results.)

Modal logic can also reveal instances where something is permitted at one time but forbidden at another. The logic of possibility (all worlds and some worlds) can be used to reason about what is permitted in a Catholic view of ethics, namely what may be permitted in some circumstances, and what is absolutely forbidden in all circumstances. Preserving a marriage is a moral good. Thus, it is permitted to tell one's spouse about a prior affair if this might strengthen the marriage moving forward. In other situations, it might help destroy the marriage, so it would not be permitted to do so. There is no situation in which defrauding the elderly can be good, because the act itself is evil (fraud cannot be ordained to eternal life with God), and therefore can never be good (social or otherwise) regardless of circumstances, even those in which it could be thought to result in a good.

Finally, doxastic logic (the logic of knowledge and belief) can be used to reason about moral responsibility, and default reasoning. Catholic moral thought utilizes this type of logic but must also make reference to acts that are freely chosen, i.e., "human acts." For example, one must factor in the consequences of actions done under duress (lacking freedom). An interesting example, combining these logics with abduction, lies in the development of pastoral practice for Catholic burial of victims of suicide. (It should however be noted that this represents the reasoning behind the change in practice, and that clergy do not judge, and do not have the authority to judge, individual cases regarding knowledge and consent of victims of suicide.)

1. Public Catholic funeral rites are forbidden if a person dies persisting in a manifest grave (possible mortal) sin (see CIC 1184 § 1-3).
2. To commit a mortal sin requires full knowledge of its gravity and full consent of the will.
3. Suicide with full knowledge and full consent would be a mortal sin.
4. Such a suicide would be denied public Catholic funeral rites.
5. Those who commit suicide are hardly ever in their right mind, and may lack the competence or freedom to fully consent.
6. Such a person may not have committed a mortal sin.
7. Thus, the clergy is permitted to perform public funeral rites and burial.

One can apply the same sort of reasoning to the unionization example above. Note that argument finished with "It is forbidden for management to prohibit worker unionization."

1. It is forbidden for Barbara to prohibit her workers from unionizing. (Prior result)
2. Barbara's workers want to create a local of the Goodfellas International Union. (Stipulated)
3. By default, Barbara should permit the workers to join the GIU. (Inference)
4. Barbara believes the union officials are corrupt and won't help the workers. (Stipulated)
5. Barbara is allowed to investigate the union. (Inference)
6. The union officials are found to be corrupt. (Observation)
7. Barbara knows the union officials are corrupt. (Inference)
8. Barbara is permitted to resist the workers' organizing a GIU local. (Inference)

Second-Order Cybernetics

The key observation of second-order cybernetics [37] is that the actor or observer of a system, and the action or observation, are included in a larger system with interactions. Catholics would also include God and all the created order. With CST, the actor, the action, the recipients, the community, and (with regard to Stewardship) the environment are all part of a larger interacting system with feedback loops. For all who would assert that such arguments sound naïve, there are clear philosophical and practical arguments that respect for human dignity enhances the dignity of both the actor and the community, and that supporting social justice and the common good leads to benefits for both. Stewardship, in support for the environment and sustainability, clearly has long-term practical benefits, if not for the individual, then for their families and for the community, (and thereby for the individual).

Charitable giving offers a richer and more interesting case. The community is an observer—even if giving is private, the community sees the effects. Charity changes the recipient, the community, and the giver. Interestingly, a recent article [38] shows that altruistic acts have benefits to the donor or actor beyond a sense of feeling good or even a release of endorphins, in that it can actually relieve physical pain.

This observation is not, of course, unique to Catholicism or even Christianity. For example, Jewish and Muslim teaching encourages similar behavior. In fact, charity is an obligation in Judaism. Dichter in [39] looks at Maimonides' Eight Levels of Tzedekah (Charity)—ranging from grudging gifts through cheerful donation, to anonymous giving and finally anticipating and forestalling need, or supporting someone needy in standing on their own—and comments that Maimonides suggests that all giving is not equal, that the motivation behind the gift has some moral content.

One may interpret Maimonides as teaching that the greatest gifts are those that create a relationship of equals between the donor and the recipient. Otherwise, the gift can create subservience or obligation, can undermine the dignity of the recipient, and can keep the recipient subjugated to the giver and in a constant position of need. This means that we, people in a position to give and people who encourage other people to give, need to think about the power dynamics that we create, and about ways to make the dignity of the recipient paramount in everything we do. Dichter further considers situations in which it is important that the donation not be anonymous—when encouraging others to give, demonstrating solidarity with the community, or taking a stand on a moral issue override the potential loss of dignity. That is, charity is best when it is one with fostering human dignity and respecting the common good, or arguing for solidarity and social justice.

The Third Pillar of Islam is *Zakāt*, or alms giving or charity, to the extent of one-fortieth of one's wealth each year, in the community from which it was derived. It is the personal responsibility of each Muslim to ease the economic hardship of others and to strive towards eliminating inequality. Those who are poor or needy should satisfy this requirement in other ways, such as good deeds and good behavior toward others [40].

In sum, humans and their communities live in multiple overlapping ecosystems—economic, social, biological, and physical. Actions in any of these spheres have consequences, not just on the targets or recipients of those actions, but on the actors or observers, on the community, and on the common good. If those actions are in accord with CST, then the effects on those entities and the common good will tend to be positive.

4. IMPLICATIONS FOR TECHNOLOGY

CST intersects with important issues throughout computer science, software engineering, computer engineering, and data science. These include: implications of artificial intelligence, robotics, and other technologies in the workplace; ethics in knowledge-based industries including software engineering: issues of security, data integrity, privacy, confidentiality, and intellectual property; questions of safety; and uses of social media, particularly the validity and quality of information versus the right to information and multiple points of view. In each of these arenas, there are conflicts between the rights and dignity of differing individuals, groups, and often the society as a whole.

A recent example of such conflicts is the question of how DNS traffic (the network queries that translate domain names into server IP addresses) should be encrypted. The goal of any DNS encryption system is to prevent malicious actors from intercepting and redirecting users to sites that spread malware and/or phish user personal information. The disagreement is over how that encryption should be done: Hypertext Transfer Protocol Secure (known as "DNS over HTTPS") or Transport Layer Security (called "DNS over TLS"). Put very simply, for network administrators, DNS over TLS emphasizes security over privacy. It also gives administrators greater control. On the other hand, DNS over HTTPS emphasizes user privacy.

Fahmida Rashid writes,

> For the privacy-minded, DNS over TLS isn't good enough because anyone monitoring the network will know that any activity on Port 853 must be DNS-related. While an observer won't know the actual contents of the query because both the response and request are encrypted, the fact that anyone could know that queries are being made is enough to raise warnings flags for some. While secure, DNS over TLS isn't as privacy-friendly as DNS over HTTPS…DNS over HTTPS is more democratic, as anyone using a supported web browser automatically gets encrypted DNS. DNS over HTTPS stops all third parties—bad actors, Internet service providers, government agencies, law enforcement, and network operators (including corporate IT staff)—from seeing anything about what sites viewers are browsing. That's exactly what privacy advocates want, but it's the opposite of what network administrators and security teams need [41].

Might the principles of CST suggest a path to resolve this conflict? At the very least, it helps frame the issue in moral terms, but conflicts still remain, as at a minimum solidarity, social justice, and common good are involved. This is a subject for future investigation.

We also observe that there is great overlap between CST and professional codes of ethics such as the ACM/IEEE Software Engineering Code [42] expressed concisely below. It is worthwhile noting the distinct prioritization of "the public interest" and "professional standards":

> Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

1. PUBLIC – Software engineers shall act consistently with the public interest.
2. CLIENT AND EMPLOYER – Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest.
3. PRODUCT – Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
4. JUDGMENT – Software engineers shall maintain integrity and independence in their professional judgment.
5. MANAGEMENT – Software engineering managers and leaders shall subscribe to and promote an ethical

approach to the management of software development and maintenance.

6. PROFESSION – Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. COLLEAGUES – Software engineers shall be fair to and supportive of their colleagues.
8. SELF – Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

The parallels with CST are especially evident in the more recent, unabridged versions, which pay attention not only to obligations to one's employer and the project client, but also to obligations to society and, where relevant, the environment. Newly acknowledged or emphasized obligations include proper respect for coworkers regardless of sex, race, or other demographic factors; responsibility for reporting problems; and working in teams. Interestingly, the success of Agile methods relies in part on the principle of subsidiarity—allowing self-organizing teams to organize and control, within limits, their own work on a project, while stressing that individuals and teams receive suitable credit and compensation for the quality and creativity of their work.

CST also agrees with and emphasizes guidelines for proper conduct of statistical and data science projects. For work with human subjects, this includes: fair data collection methods (including survey design), informing subjects to the extent possible, cleaning data to eliminate spurious and misleading values, applying appropriate analyses, drawing proper conclusions and making proper use of these, and assuring the confidentiality of the data.

The CST principles of human dignity, common good, and subsidiarity likewise agree with related concerns about confidentiality and privacy, as well as security and integrity, for large data stores such as health records and student records, resulting in the HIPAA [43] and FERPA [44] standards, respectively, and in the protection of customer data, as seen in the recent large-scale Blackbaud incident [45].

CST's emphasis on human dignity in general and social justice in particular, together with the principle that the end does not justify the means, strongly argues against creation or dissemination of incorrect or deliberately misleading information, i.e., actually fake news, and against misleading solicitations. Its emphasis on solidarity and social justice would suggest that social media and other information providers may have a responsibility to evaluate whether fake news arguably extends to calumny or encourages behavior harmful to others or to society, or whether advertising or other solicitations might defraud and impoverish the vulnerable, and if so, to remove or post caveats on those posts.

While there is insufficient space to thoroughly address the topic, CST also has a great deal to say with respect to artificial intelligence and robotics [46]: replacement of human workers [47], the ethics of relying on the conclusions of algorithmic but heuristic reasoning, "machine ethics" [48], and much more [49, 50, 51]. On the other hand, as discussed *re* the digital divide, CST would also argue that for permissible uses of such technology, withholding the benefits, or distributing them in a highly unfair manner, is also a grave concern.

5. CONCLUSION, DISCUSSION, AND FUTURE WORK

Catholic Social Teaching provides principles and guidelines for individual and group behavior in the social, economic, and environmental spheres. It has a foundation in philosophy and Catholic theology, although it shares much with social obligations in other religions. While the underlying theology is well-established, and the principles have been consistent (even if the lists have not), the guidelines it provides have varied with changes in economic, social, environmental, and political models and settings.

After an introduction to the philosophy and theology that support or illuminate CST, and a consideration of two of its principles, we examined CST from three perspectives: the social sciences, social services, and economics that necessitate and implement it; the logics that support the guidelines and practices that follow from its principles; and second-order cybernetics and community, which allows full consideration of CST's short-term and long-term effects.

We then looked briefly at applications and implications of CST in technology. We see substantial overlaps with secular perceptions in some areas, such as in professional codes and approaches. In other areas, including social media and the implications of artificial intelligence, its conclusions are largely ignored, even though other informed commentators may agree.

In sum, CST offers a different perspective, developed through but not unique to Catholic ethics, for reframing and evaluating our worldview, especially in dealing with questions of social justice, conflicting rights and obligations, technological access, and human dignity.

REFERENCES

1. Peter A. Kwasniewski, *A Reader in Catholic Social Teaching: From Syllabus Errorum to Deus Caritas Est* (Tacoma, WA: Cluny Media LLC, 2017).
2. Joseph R. Laracy, "Miserando atque Eligendo: By Showing Compassion and by Choosing," *Columbia Journal of International Affairs* (March 29, 2013), https://jia.sipa.columbia.edu/online-articles/miserando-atque-eligendo-showing-compassion-and-choosing (accessed January 10, 2020).
3. Alison I. Beach and Isabelle Cochelin, ed., *The Cambridge History of Medieval Monasticism in the Latin West*, vol. 1 and 2 (Cambridge, UK: Cambridge University Press, 2020).
4. Geoffrey Moorhouse, *The Last Divine Office: Henry VIII and the Dissolution of the Monasteries* (New York: BlueBridge Publishing, 2012).

5. Pontifical Council for Justice and Peace, *Compendium of the Social Doctrine of the Church* (Vatican City State: Libreria Editrice Vaticana, 2004).

6. United States Conference of Catholic Bishops, "Seven Themes of Catholic Social Teaching," http://www.usccb.org/beliefs-and-teachings/what-we-believe/catholic-social-teaching/seven-themes-of-catholic-social-teaching.cfm (accessed January 12, 2020).

7. Caritas Australia, "Our Values: Catholic Social Teaching," https://www.caritas.org.au/about/catholic-social-teaching-values (accessed January 12, 2020).

8. "About the Center for Mission and Identity," Benedictine University, http://www.ben.edu/center-for-mission-and-identity/about/index.cfm (accessed January 20, 2020).

9. Andrew Woodcock, "Jacques Maritain, Natural Law and the Universal Declaration of Human Rights," *Journal of the History of International Law* 8 (2006): 245-66.

10. A.G. Toth, "The Principle of Subsidiarity in the Maastricht Treaty," *Common Market Law Review*, 29, no. 6 (1992): 1079–1105. Also, see, Pope Pius XI, *Quadragesimo Anno* (1931).

11. Irene Burke, "The Impact of Laudato Si' on the Paris Climate Agreement," *Liechtenstein Institute on Self-Determination at Princeton University*, White Paper n. 3. Princeton University, (August 2018) https://dataspace.princeton.edu/jspui/bitstream/88435/dsp013b591c298/1/WhitePaper_No.3%28Burke%29.pdf (accessed January 4, 2020).

12. The Catholic, unlike many other Christians today, does not need to read every passage of the Bible as being a literal, physical history. Some passages, like the story of creation in Genesis, are read as a spiritual history introducing profoundly relevant truths regardless of time and place. It is in this way that CST takes very serious Genesis 1:27 where it reads: "God created mankind in his image; in the image of God he created them; male and female he created them."

13. C. S. Lewis, "The Weight of Glory," in *The Weight of Glory: and Other Addresses*, revised (New York: Harper Collins, 2001), 25–46, esp. 46.

14. Ibid.

15. Catechism of the Catholic Church, 2nd ed. (Vatican City: Libreria Editrice Vaticana, 1997), §1930.

16. Here natural and civil rights are distinct. In this context, natural rights refer to those things or actions due to a person considering his/her nature as a human person (e.g., rights to life, liberty, etc.), while civil rights are those rights of a person arising because they are a member of some community (e.g., right to vote, etc.). Of course, it is possible to advocate for "civil rights" because they are, in fact, "natural rights" as Martin Luther King, Jr. and so many others have done.

17. Andrew Brennan and Y. S. Lo, "Two Conceptions of Dignity: Honour and Self-Determination" in *Perspectives on Human Dignity*, Jeff Malpas and Norelle Lickiss, eds. (Dordrech, Netherlands: Springer, 2007), 43–58, esp. 58.

18. Joseph Ratzinger, "The Subiaco Address", April 1, 2005 in Tracy Rowland, *Ratzinger's Faith: The Theology of Pope Benedict XVI* (New York: Oxford University Press, 2008), Appendix 1 (156-165).

19. John Stuart Mill, *Utilitarianism*, ed. George Sher (Indianapolis: Hackett Publishing, 1979), 7.

20. Alasdair MacIntyre, *Whose Justice? Which Rationality?* (Notre Dame: University of Notre Dame Press, 1988), 342.

21. Kenneth J. Arrow, "A Difficulty in the Concept of Social Welfare," *Journal of Political Economy* 58, no. 4 (1950): 328–346.

22. Kenneth J. Arrow, *Social Choice and Individual Values*, 2nd ed. (New York: Wiley, 1963)

23. Marc Fleurbaey, "Economics and Economic Justice," *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta (Winter 2016) https://plato.stanford.edu/archives/win2016/entries/economic-justice/ (accessed December 2, 2020).

24. This view is best articulated by the Second Vatican Council. See, Second Vatican Council, *Gaudium et Spes* (1965), § 26.

25. "Economics and technology are meaningless if they do not benefit the human person, for it is the person they are to serve." *Populorum Progresso*, § 34.

26. Joseph Ratzinger, *In the Beginning…: A Catholic Understanding of the Story of Creation and the Fall*, trans., Boniface Ramsey (Grand Rapids: Wm. B. Eerdmans Publishing Company, 1995), 92.

27. Francis, *Laudato Si'* (2015), 101.

28. Ibid., 123. More recently Pope Francis has tied this same attitude to racism, the treatment of the elderly during the COVID-19 pandemic, the unborn, expansion of poverty. See, Francis, *Fratelli Tutti* (2020), § 18-21.

29. Francis, *Fratelli Tutti* (2020), § 43.

30. Dale Ahlquist, "G. K. Chesterton's Distributism," *The Distributist Review* (August 11, 2011) https://distributistreview.com/g-k-chestertons-distributism/ (accessed January 14, 2020).

31. Leo XIII, *Rerum Novarum* (1891), §48-61.

32. Alexander C. Flick, *The Rise of the Mediaeval Church and Its Influence on the Civilisation of Western Europe from the First to the Thirteenth Century* (New York: Burt Franklin, 1909), 112-130.

33. Hans C. Teitler, *The Last Pagan Emperor: Julian the Apostate and the War against Christianity* (New York: Oxford University Press, 2017).

34. C.H. Lawrence, *Medieval Monasticism: Forms of Religious Life in Western Europe in the Middle Ages* (New York: Routledge, 2015).

35. Thomas J. Marlowe, "Extensions and Limitations to Logic: Chapter 5" in *Philosophical Perceptions of Logic and Order*, ed. Jeremy Horne (Hersey, PA: IGI Global, 2017).

36. Thomas Aquinas, *Commentary on Aristotle's Posterior Analytics*, trans. Richard Berquist (South Bend, IN: St. Augustine's Press, 2008).

37. Stuart A. Umpleby, "The Science of Cybernetics and the Cybernetics of Science," *Cybernetics and Systems* 21, no. 1 (1990): 109-121.

38. Yilu Wang, Jianqaio Ge, Hanqi Zhang, Haixia Wang, Xiaofei Xie, "Altruistic Behaviors Relieve Physical Pain," *PNAS* 117, no. 2 (January 14, 2020): 950-958 https://doi.org/10.1073/pnas.1911861117.

39. Sasha Dichter, "Reflections on Maimonides' 8 Levels of Charity (Tzedakah)," https://sashadichter.com/2008/07/31/reflections-on-maimonedes-8-levels-of-charity-tzedakah/ (accessed January 22, 2020).

40. Aron Zysow, "Zakāt", *Encyclopaedia of Islam*, 2nd ed., eds. Peri J. Bearman et al., http://dx.doi.org/10.1163/1573-3912_islam_COM_1377 (accessed January 21, 2020).

41. Fahmida Y. Rashid, "The Fight Over Encrypted DNS: Explained," *IEEE Spectrum* (November 27, 2019),

https://spectrum.ieee.org/tech-talk/telecom/security/the-fight-over-encrypted-dns-boils-over (accessed November 1, 2020).

42. "ACM/IEEE Software Engineering Code," https://ethics.acm.org/code-of-ethics/software-engineering-code/ (accessed January 29, 2020).

43. "Standards of Care, Confidentiality, and HIPAA," https://www.standardsofcare.org/understanding-care/confidentiality-and-hipaa/ (accessed November 24, 2020).

44. U.S. Department of Education, "Family Educational Rights and Privacy Act (FERPA)," https://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html (accessed November 24, 2020).

45. Isaac de la Garza, "Blackbaud Security Breach: What you need to know," EideBailey (August 26, 2020) https://www.eidebailly.com/insights/articles/2020/8/blackbaud-data-breach-what-you-need-to-know (accessed November 24, 2020).

46. Jack Jenkins, "The (holy) ghost in the machine: Catholic thinkers tackle the ethics of artificial intelligence," *Crux Now* (May 2018) https://cruxnow.com/church/2018/05/the-holy-ghost-in-the-machine-catholic-thinkers-tackle-the-ethics-of-artificial-intelligence/ (accessed January 30, 2020.)

47. Brian Roewe, "With robots on the way, human labor challenged to keep its place," *National Catholic Reporter* (September 2, 2017) https://www.ncronline.org/news/justice/robots-way-human-labor-challenged-keep-its-place (accessed November 11, 2020).

48. Brian Green, "Social Robots, AI, and Ethics: How to shape the future of AI for the good," Markkula Center for Applied Ethics at Santa Clara University, https://www.scu.edu/ethics/focus-areas/technology-ethics/resources/social-robots-ai-and-ethics/ (accessed 11/17/2020).

49. Daniel Finn, "Human Work in Catholic Social Thought," *The American Journal of Economics and Sociology* 71, no. 4 (October 2012): 874-885.

50. Emmanuel Agius, "New Challenges and Opportunities for Catholic Theological Reflection," *Pontifical Academy for Life General Assembly 2019: Roboethics: Humans, Machines and Health* (Vatican City State: February 25 & 26, 2019).

51. George E. Schultze, "The Technological Paradigm and Discerning Our Response," (lecture, John A. Ryan Institute at St. Thomas University, St. Paul, MN, June 20, 2018).