TECHNOLOGY AND CATHOLIC SOCIAL THOUGHT

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Abstract

Technology perfuses the Catholic description of "the times", yet we lack an independent treatment of it in Catholic Thought. A vocabulary is articulated for this discussion in terms of Technology as Knowing, as Doing, and as Reality. Additional concepts of Energy and Stability are discussed. Social action is conceived in terms of a 4-agent theory involving Professions. The notion of a Profession of Technology is discussed along with suggested reforms to the status quo in Engineering.

Technology and the Signs of the Times

Considerable effort was devoted in the Vatican II documents to characterizing modern man, to interpreting his historical situation, and to the construction of approaches to appropriate social structures. Accordingly, much of the front matter of *Gaudium et Spes*[1] articulates our *technological* situation – depicting technology as the mediator of human interaction; voicing many now-familiar concerns about its promise and perils, successes and failures; and challenging the Universal Church to action in this increasingly abstract social situation. The succeeding analysis treats the contemporary social condition as one of *moral concern*, demanding new interpretations of social action, human dignity, and responsibility in an increasingly complex and *technological social context*.

Yet it is arguable that *Gaudium et Spes* does not offer guidance sufficient for men to make technology a true servant of the Common Good. *De facto*, technology is conceived therein as an *exogenous* trend in human history; social structures are conceived as *reacting to* this trend. But of course, technology is *made by humans*; it is an *endogenous* result of human activity. And as such, it carries moral burdens of responsibility.

The personal dimension of that responsibility is classic. But in addition, there is an *institutional* dimension, as for all broad historical-social phenomena. Institutions devoted to the development and right use of technology need to be brought forth now, along with "rules" for personal evaluation and engagement. They need to respect the complexity of this phenomenon, its natural human origins, and its historically overwhelming social influences. And, we need to be able to distinguish among institutional responses that are flawed and those with a chance of goodness.

So we must have a proper theory of technology as a foundation for this. Despite 40 years of technological acceleration, documents following *Gaudium et Spes* have not materially provided this. Relatively little exists in Catholic tradition for the treatment of technology as something that originates in humans naturally, and becomes an important instrument of their social action. A reactive theory, one that waits for technological developments, is necessarily inadequate. We seek a proactive theory of Technology to guide those developments.

By contrast, we have seen significant development of theories pertaining to economic activity and to governmental organization. It *may be* arguable that the proper conceptual approach to technology is through these other two types of institutions -- economies and governments -- and that technology is properly perceived as a natural creative freedom subject to market guidance, with proper attention to market imperfections by governments. In fact much of Catholic Thought would appear to be so oriented. *But* this conception misses the crucial point that markets and politics are today being fundamentally altered by technology. And, technological control of the great horrors of our generation – *e.g.* nuclear annihilation, genetic manipulation, the commercialization of violence, the abrogation of natural human responsibilities – are intensively sought after by corporations and governments. And, these institutions are themselves subject to imperfections of totalitarianism, individualism, greed, and hegemony which we are witness to. The current globalization of trade and commerce – *technologically mediated* – only heightens this concern. So at least empirically speaking, a "theory" of exogenous technology harnessed by classic institutions of government and market, is somehow lacking in explanatory power.

Some Recent Documents

Some recent documents generally confirm this lack of explicit technological focus, beyond its recognition as pervasive. For example:

1) The *Catechism of the Catholic Church* (1994)[2] addresses technology only twice, in two paragraphs (2293-2294), out of over 2800. In both cases technology is conjoined with science and scientific research.

2) The newer *Compendium of Social Doctrine* (2004)[3] is perfused with references to technology – 54 paragraphs out of 583 cited. This is not surprising, given the critical role that technology and technological organization has played in stimulating Catholic Thought. However, in an overwhelming percentage of instances, the word is conjoined with science and/or economy. It rarely has full, independent identity. And the various uses of the word reveal a multitude of referents – technology as subject or object; technological as adverb or adjective; the apparent distinction of technical (procedural?) from technological.

In the *Compendium*, there are major chapters defining significant progress, notably, those addressing environment and economy. Technology cites are distributed among them as follows:

Introduction	3
Church Mission	3
Social Principles	4
Family	3
Work	12
Economic Life	7
Political	3
Environment	14 (includes Biotechnology)
Peace	2
Ecclesiastical Action	2
Conclusion	1

3) In *Economic Justice for All*[4], the U.S. Bishops explicitly address many contemporary economic problems in moral terms. This valuable and long needed discussion added significantly to the scope of Catholic Social Thought, which previously had largely concentrated its institutional focus on governmental structures. Significantly, economic actions are not conceived therein as free of social responsibility due to their remoteness or abstraction. But, despite the significant interweaving of technology and economic organization in U.S. experience, there is no overt focus on the former.

These important current works generally reconfirm the notion that technology is a vague, yet pervasive "sign of the times", as clearly established in *Gaudium et Spes*. Whatever it is, *humans* are called to make it, control it, to put it to good use, to defend authentic human values from eroding in its presence. There is a clear tendency to describe it as a byproduct of economic organization, as opposed to a generator of same; and to run it together with better-understood scientific pursuits. The integrity of science as pure truth-seeking, and of market economies as distinctive organizations, are potentially compromised as well, by this alliance with something vague.

The Need for a Theory of Technology

Arguably, then, we need to look at Technology *per se*, in all of its facets. It is something new and different. We need to address its personal and its institutional aspects, and relate those to the corpus of Catholic Thought. And, we need to begin the discussion of means for making this ever-increasing presence in human history, a true servant of the Common Good.

Such a theory will need to embed and extend classic elements of **Catholic Thought**:

- A Catholic Anthropology – man as social, historical, fallen creature with intrinsic dignity, God-authored and God-seeking

- Social institutions as earthly facilitators of personal development; historical constructions with a transcendental goal
- The burden on humans to construct societies which are good – the common good – which is historically contingent, never complete or perfect, but necessarily oriented to the elevation of persons if it is to be authentically "good".
- The Gospel imperatives in the Last Judgement (Mt.) and the Second Great Commandment – enduring social imperatives to be played out in history
- The "Apostolate of a Trained Laity" [5] as earthly implementers of the common good.

Within this construction we will have to develop some foundational ideas. Necessary elements of a response include:

- a new vocabulary which allows us to speak and reason more cogently
- an acceptance of new forms of "governance[6] [7]" in the "new" vacuum of authority[8]
- a new sense of institutional ethics[9] to order our actions within same
- a public theology[10] [11] to convert ethics into authentic human norms. Is there truth to be found in ethical assertions? Or any standard of truth? Or, are we just exploring complexity? developing arbitrary concensus?
- a theoretical approach to corporate and government priorities; relation of people, professions, and communities of faith to those institutions; understanding of the global marketplace as a social institution.
- a reinvigorated notion of the Common Good[12] [13] [14]as the object of social constructions, and the proper role of technology in same.[15]
- Some specific interpretation of the Apostolate of the trained laity in terms of technology; in particular, the professional obligation of engineering.

We will touch on a few of these themes below. The objective is to instigate and help frame a discussion of Technology *per se*. Accordingly, we place high value on a useful vocabulary.

Vocabulary - Technology as "Know-How"

Philosophers have made important distinctions between *knowing* and *doing*, as conjoined in the term Technology.[16] [17] In everyday words, we are dealing with "Know-How". We may characterize the hazards and benefits associated with technology along these two axes – illustrated in **Table 1** below. If issues and discussions can be located on this plane, then we have clarified things somewhat.

The "Know" axis is one of proper epistemology, understanding of cognition, proximal and efficient causation, correlation, etc; the existence of truths unreachable by reason but facilitated by revelation; and the mediating ground of metaphysics, where some reasoned knowledge of non-physical things is possible. In this, we follow the familiar Thomistic tradition. There are hazards generated by an improper sorting here. Among the extreme

technology hazards are mistaking the nature of man, and an erroneous or missing sense of efficient causation

Along the second, "How" axis, we discuss the amplification of human agency toward *doing something*; the realm of the will and proximal causation; the potential for remote action facilitated by technology. The requirement for a moral dimension to this aspect of willful action, is clear.

This is more that a philosopher's duality. It is enshrined in various ways in many descriptors of our technological institutions.[18]

Technology as Knowledge

Concerning knowledge itself, it is prudent to distinguish some conventional boundaries. In technology we are dealing with knowledge of the *physical* world, that which concerns material experience and is simultaneously subject to human reason. This is the proper realm of science. Scientific procedure is to observe, discern patterns and correlations, and propose "laws" which explain and predict. The reasoning is inductive, applied to material phenomena; theories are postulated about natural law which underlie all material things. If the induction is good, then predictive deduction from the abstract law becomes feasible. It is a finding that such laws exist, can be found in human experience and articulated by human reason, and have predictive power. That finding legitimizes the scientific establishment. It makes technology possible.

Knowledge of the *metaphysical* world, that which transcends the material, is quite another category. It is not properly within the scope of technology, although error here can have profound consequences. Human reason can go a little way into the metaphysical, reaching logical conclusions there. For example, God's existence and some of His qualities can be discerned.[19] Revelation extends reason here -- revealed truth can lead deductively to additional truth. But beyond this is a vast supplement of truth that is not reachable by human reason. So, we distinguish two logical metaphysical categories. In the first, more proximal category, we have metaphysical truth within which our reason can operate. In the second, we have truth that transcends reason.

It must be said that *knowledge is good*. It is our recognition of God's creation, through natural exercise of intellect, itself a gift of the Creator. In particular, physical knowledge, the stuff of technology, cannot be intrinsically bad in this sense. It is natural and good to probe creation, and discover what we can about it -- that is a natural human longing. (The method of probing, and the intention, is another matter.)

The boundaries among the realms of knowledge cannot be clearly and unequivocally established by us. Table 1 shows two broad *grey zones*, suggesting this. It is the leftmost grey zone separating physics and metaphysics that concerns us most here. It represents a changing, historical zone of human confusion, error, ignorance, speculation – what we *don't* know, and our perspective on it. The frontier of scientific research lies

therein. This frontier opens toward an infinite amount of physical territory; there is no reason to think that man can ever acquire all physical knowledge. Clearly, ever-more subtle physical phenomena are observed over the course of history, inviting new theories of natural (physical) law. There is likely *no limit* to this. Nothing suggests that God's creation or our intellect is bounded that way. And while actual human knowledge is finite, expanding; nevertheless it can never be complete. As a result we can never draw a line delimiting physical knowledge, nor can we describe the unknown in finite terms. The grey zone cannot suggest that.

The metaphysical infinity is similarly accessible to man, knowable (especially with the aid of revelation) but never exhaustible (*i.e.* never completely known). There is therefore a second, metaphysical knowledge frontier in the grey zone, separating what is known to us from what is not in this category.

But there is a *logical* distinction between the physical and metaphysical. These are two *qualitatively different infinities* of knowledge[20]. This is a second sense of the grey zone. Being logically separate, the grey "overlap" is one of perception, reflecting what we don't know and our own human perspective on it, which is always changing and imperfect. The two frontiers are not the same; they face out into logically separate, unknown territorities. They may be perceived, incorrectly, to overlap.

There is a common error in mistaking the metaphysical and the physical. It would be false science at best (or science fiction) to assert a physical basis for metaphysical phenomena.[21] Related, the notion that metaphysical phenomena and entities are only misunderstood physical ones, would be a misunderstanding of these two frontiers as some kind of single moving boundary converting grey-zone error into truth. This is sometimes expressed in technological ambition; it is a matter of concern. While the notion of a physical takeover of the metaphysical cannot be a legitimate one; yet fear of a tyranny of error of this kind, amplified socially, is legitimate. Truth-seeking from both sides is necessary. We can never be content with a finite, limited, or historically-fixed quantum of knowledge.

This is the first of the two technology axes: the espistemic or cognitive dimension; the "know" of "know-how". It is illustrated in Table 1. Of course this is a full field of philosophical investigation in itself. We invite that here!

Technology as Doing

The second, "how" dimension of Technology deals with actions. This represents the social dimension, the axis of volition. We may order the various meanings of technology along this axis, according to *social* content. In order from simple to complex, we have

a) Simple knowledge of material things and processes, as defined above, is the same in this discussion as pure science. Here is the origin of the conjoining of "science and

technology" in common use. At this end of the social axis, we find little social content *per se*. This is the scientific extreme. Of course very few aspects of knowledge actually fall into this category, but it can be a false hiding place for other activities with more social content.

b) Technology as **rearrangement of nature**. Here we have the willful interaction with the created universe. This must be accepted as a natural relationship. In fact the Genesis command gives technology in this sense a moral content *vis a vis* stewardship of God's gifts and their right use.

c) The technological **artifact** embodies knowledge plus material *realization* through human activity. Clearly, a simple artifact has no duty, no will, no opportunity to improve itself relative to an ideal; no innate recognition of itself as an image of something transcendent. The artifact itself has to be, with few exceptions, strictly neutral from a moral perspective. As a rearrangement/configuration of nature that God gives us, any artifact has a twin sense of quality: *inherent goodness* originating from the Creator's gift; and a sense of *contingent integrity* as a realization of the artisan's skill with that gift.

But the *purpose* of the artifact is another matter – that turns on human intentions. Moral neutrality presumes that an artifact *could* be directed to at least some good use; an artifact that lacks that prerequisite must be judged bad. Nuclear arms and other weapons have been discussed in these terms. Even then, the social context becomes critical in finding some redeeming potential uses -- deterrence, for example. (We seek not to judge these issues, only to locate them on our proposed axes.) In another sense, a "bad" artifact would be a defective one relative to human claims on its behalf. But it is the false claims that are bad; in themselves they do not assign any badness or lack of integrity to the artifact itself.

Engineering will often equate integrity (an artifact works according to design) with goodness. This would be an error, and there are many examples. Claims about goodness in this category are best converted to those addressing either a) integrity of the artifact; or b) the human intentions expressed in either the artifact's possibilities, or its use.[22]

d) We often speak of Technology as the **extension of human capability**: the combination of a neutral artifact, as above, with human action, whether merely possible, contemplated, or actual. "Systems" of engineered artifacts usually fall into this category, the system itself only an assembly of artifacts but clearly directed synergistically at something. It is natural for man to seek dominion, to make and use technology in his service. But here the end or intention of the human action matters; our actions are moral ones. The willful amplification of human action requires right ends, moral intentions. The means only amplify, enable, focus the human agency; they project and empower same. Technology *facilitates* action.

e) Technology **deployed** as **technical system**: here we have the previous item, *implemented* as part of the *social construction*. This is a higher thing. As a social

construction, it includes attached rules of human interaction as part of it, implied in the deployment (e.g. ownership, participation, a market, requirements for end-of-life disposal, an army). In this sense, technology is *not* ethically neutral. It has high social/moral content. It can be bad in itself; it can be part of a "*social structure of sin*," which we understand as living conditions which encourage or facilitate sin. On the other hand, it can contribute to the common good, by which we mean the community structure within which we find, know and serve God, as His creatures.[23] At this level, that the technological system has moral content, *a priori*, by virtue of what actions it enables. *If the Common Good can be technological, then the Common Bad can likewise be technological.* We interpret this common bad among the "Structures of Sin"[24]. We clearly have here a technological risk or liability, responsibility for which cannot be left unassigned. Forms of implementation make a difference: a commercially available product, mass-produced; a similar service; infrastructure like roads, water, power, ovens, guns, communications. These technological systems intersect with many other ones. Some enable individuals; some enable other professions (e.g. medical technology); some enable the economy and other social systems. All that is enabled, has social and therefore moral content.

f) Technological systems as augmenting, supplementing, distorting, **replacing nature itself**. The extreme intention is the **perfection of nature**. There is a conceptual and terminological quagmire here – What is natural? What is man and what are his abilities? Is he natural? What or Who sustains nature and its dependability? Can God's gift of nature be flawed? Can man cause changes in nature, by acting within it? Can he know good from bad nature? These are not questions that can be answered in physical terms; they demand metaphysical knowledge. Clearly, technology in this sense sprawls across the epistemic axis.

But at the same time, the social content is huge. One discusses *all* of nature, not just isolated instances within it. *Everyone* is implicitly involved whether as subject or object. And, assertions about enabling human action are universal. We locate this sense of technology at the extreme high end of the social axis.

There is a curious technological approach to the epistemic problems indicated — "just try it." Experiment is fundamental to *scientific* inquiry. One proceeds inductively from experience to the assertion of abstract laws of nature that can be used deductively. But experimental pursuit of *technology* in this sense can only be at great risk of fundamental metaphysical error and the gravest of social consequences. If the epistemic base is false, technology cannot deliver! But that does not prevent attempts, with potentially grave consequences.

Here, and perhaps uniquely, we can have technology potentially asserting the impossible – not merely the improbable or difficult. This could represent simple but grave ignorance; or the worst errors of human pride, avarice, presumption, deceit.

		Knowledge →				
		Physical (Material World)	Frontier Zone of Speculation ?	Metaphysical		
				Reachable by Reason	?	Not Reachable by Reason
Action ↓	A: Simple Knowledge					
	B: Simple Rearrangement of Nature					
	C: Artifact					
	D: Extension of Human Capability					
	E: Deployment; Social Construction					
	F: Redirection of Nature					

Table 1 Technology as Know-How. The multiple senses of the word are conceived along the Epistemic and Social axes.

Technology as Reality

There is a third axis of consideration. Its poles are the actual versus the merely possible.

Along the Epistemic axis, we distinguish between what *can be* known, and what *is* known. This was introduced above in the discussion of the "grey zone". Along this axis we begin to see different issues related to research prioritization; education; etc. Current issues surrounding the search for sustainable technology may reside here – energy technology is a good example. Another example: the relative priorities in security studies versus ecological studies.

Along the social axis, we find qualitatively different considerations in the difference between what is merely possible and what is actually realized, implemented. Here we find the potent question, "since we can do something, should we?" Contemporary issues related to chronic poverty may illustrate this. Technology is clearly capable of delivering much better service than is actually implemented. So we have potential technology, but not real technology it that case, far along the Social axis.

This is the Reality axis; discussion of it appears in limited ways it the discussion of the first two axes, but it really is a separate dimension of technology.

Technology as Science or Economy

This classification is useful in understanding the joint use of Science, Technology, and Economy which was alluded to earlier. At the origin of the Knowledge and Action axes, Science and Technology are the same. There is a tendency to locate Technology at the simpler end of the Knowledge axis, although "High Technology" is likely situated in the grey zone. Similar considerations may pertain to the Reality axis. Science as Natural Philosophy may not be conceived as so limited.

The Technology/Economy merger occurs along the Action axis. Their increase along this axis are correlated, as technology is normally implemented within economies, real or imagined. "High Technology" would likely be referring to the Grey Zone at high Social content, but not yet realized.

Energy

Physical energy is well-established as a technological descriptor. Generally, systems, components with this energy are vastly potent, and can be dangerous.

It is useful to identify a concept of social energy to supplement this. The knowledge dimension is generally devoid of this; there is no action. But as we progress in the "doing" dimension, technology acquires increasing level of social energy that amplifies individual ability. The more energetic, the greater is the burden of responsibility. In this sense, technology as knowledge is not energetic; but technology deployed, is energetic and full of consequences.

Information systems are a special case in point. Although they consume physical energy, their value lies elsewhere, in their social energy.

Money is a special contributor of social energy. As a medium of exchange, it is fundamentally social. It does not align with all social energy, as markets are limited and imperfect.

The analog of potential and kinetic physical energy occurs along the Reality axis – real versus contemplated social energy.

Stability and Error

By stability we mean the speed by which consequences are realized; their reversibility on the same timeframe; and the possibility of knowing the consequences of technical actions before they continue to unfold. Scientists are very familiar with this idea in the physical arena. Errors and imprecisions can lead to catastrophe if things are not stable.

Technology presents us with the Social extension. Clearly, all human knowledge is finite and limited by historical circumstances. And, to err is human. Is human error self-correcting? Can highly energetic technologies greatly amplify and destabilize simple epistemic errors, doing great damage? The 20th C is full of examples.

The two major axes of knowing and doing, are different. Along the epistemic axis, human errors *are* self-extinguishing. The pursuit of truth by humans will, over time, reject false claims. It is the transcendent referent of truth that makes this possible, along with an innate orientation to truth in our being. Without it, there could be no science, as mistakes once made would multiply endlessly.

There is thus a stability about truth, a central tendency, which renders it findable, teachable, re-discoverable, independently verifiable. Error cannot stand uncorrected; only social measures (enforced ignorance, coercion) can counter this.

Along the social axis, however, we have a different situation. There is no similar guarantee of immutable, findable truth in our social relations. Man is a fallen creature; he cannot recover the Garden of Eden in this life. He is endowed with free will, and his willful actions are necessarily flawed. He is obliged to seek goodness within the world, but cannot perfect it or his relations within it. A consequence would appear to be that we cannot find or implement an ideal state of worldly being – it does not exist. Lacking a central referent, the social dimension of technology cannot be judged stable. We must live with this possibility, and guard against its down side. The corpus of Catholic Social Thought would appear to contain the principles.

Speaking after the fall of Soviet Empire, Pope John Paul II criticized the both major poles of Capitalism and Communism. Significantly, "The Church has no models to present: models that are real and truly effective can only arise within the framework of different historical situations…the Church renders her social teaching as an indispensable and ideal orientation…"[25]

We conclude that with respect to stability:

- Knowledge is a divine edifice. We must find it using our brains and our abilities to deduce, inspect, examine, reason, observe. We will never know everything, and we will make errors. But knowledge alone is stable with respect to error.

- The social aspects of Technology represent a man-made edifice. In the face of human error it can be unstable, lacking a central tendency. There is high social energy when technology is deployed; it is fast when backed by capital. These exacerbate the potential of instability.

Social Interaction and Professions

How do we order our interactions within today's complexity? Elsewhere[26] we develop a "4-agent" theory of social interaction (see Figure 1 below). The 4 agents are distinct logical types: persons, governments, corporations, and professions. Three of these are human institutional types and are confined to the historical plane. The purpose of the graphic arrangement in Figure 1 is to highlight a) the person/individual duality as in Maritain[27]; and b) the social plane as affected by humans for their own benefit; c) the historical social interaction among human individuals and their 3 types of governance institutions (the three vertices of the social triangle); and d) the ultimate transcendent end of each person, all persons' development being the right object of social constructions.

Interactions with governments and economies are heavily explored in the literature. Here we call attention to the profession as institution, implicitly responsible for ordering some portions human affairs.

Classic definitions of professions emphasize two distinguishing features:

a) The cultivation of specialized theoretical knowledge
b) The direction of that toward the Common Good

The second quality is crucial – lacking it, we have only an occupational specialty. In that case, the common good orientation is submerged within the employer's goals. Today the most common specialties are employed in corporate or governmental units – the other two types of institutions. Legitimate aspects of the common good that lie outside these institutional authorities, but still require specialized knowledge, require the existence of professional institutions. It is a too-familiar premise that contemporary life in the West is losing this Professional distinction, its Professional institutions not keeping up with the span and authority delegated to governmental and economic institutions[28].

In this context we find a most potent interpretation of the "Apostolate of a Trained Laity"[29]: the rededication of Professions toward implementing the common good. The flip side of this is equally important, the social vesting of authority in them, within their limited spheres of expertise. Was this not among the referents in *Pacem et Terris*?

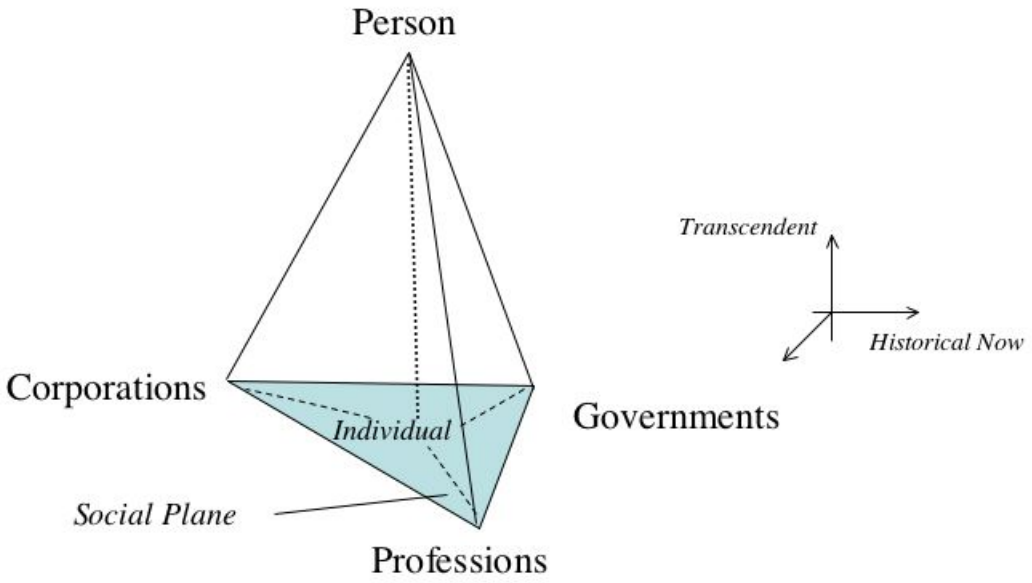

Figure 2. 4-Agent depiction of social interaction among Individuals, Corporations, Governments, and Professions in the historical plane. The person/individual duality is stressed; the individual is the projection of the person, in matierial history.

A Profession of Technology?

At the outset we observed that Technology and Economics were frequently run together in Catholic documents. It is certainly true that many "technologists" would describe themselves as acting within the economic sphere; that they deal with economic goods exclusively; and that technology is a product of the economy. But this is far too restrictive for a technology that is such a heavy determinant of the "Signs of the Times". Indeed, one of these signs is that technology is transforming economies – the roles are reversed! In fact, it may be conceded that much of what technology has to offer us, must be *delivered* via the economy. But that need not be confused with the setting of priorities. We are accustomed to a large activity on the part of governments to decide priorities outside the price system, but to deliver within it.[30]

The consequences of nesting all of technology within economic theories and institutions leaves several important concerns behind -- for example the distiction between economic and noneconomic "goods"; the distinctions among rights, wants and needs; the types of

distortions in practical markets; the interaction with the environment; etc. These are all features of a "common good" nature. So we ask, "Is there a profession of technology? ", and can it be an important advocate of right technological progress?

An implied premise here is that Engineering is a *candidate* for such a profession. But, its present organization lacks a full common good orientation independent of its employers'. Instead, it presently expresses a deep-seated market orientation that does not get outside the priorities expressed in the price system.

Elsewhere[31] we explored this question. Features described there which need development include the prioritization of technological activities in terms already announced in Catholic Social Thought. These could be discussed in terms of "technological rights":

- Participation (right to work)
- Baseline Human Services – a material baseline appropriate to Human Dignity in our times (implied in the Universal declaration of Human Rights)
- Sustainable Access to Natural Resources (the Universal Destination of Material Goods)

Technological activities include doing (design, build, construct) as well as research. An approach to prioritization has to be free of imperfect market constraints, allowed to exert a preferential option for the poor.

An implied agenda is the reworking of Engineering organization to reflect these ends. Current organization is almost universally in terms of means with no ends: mechanical engineering, electrical engineering, chemical engineering, etc. Unless this means-orientation is overwritten with an ends focus, Engineering will likely not rise to the professional challenge.

Acknowledgement

This work was begun during a Sabbatical at the Catholic University of America.

[1] *Gaudium et Spes: Pastoral Constitution on the Church in the Modern World*, promulgated by His Holiness, Pope Paul VI, December 7, 1965. Pauline Books, Boston. 1994
[2] *Catechism of the Catholic Church*, J. Cardinal Ratzinger, Imprimi Potest. Libreria Editrice Vaticana Edition, 1994. English translation, Pauline Press.
[3] *Compendium of the Social Doctrine of the Church*, Pontifical Council for Justice and Peace. Libreria Editrice Vaticana 2004.

[4] *Economic Justice For All: Pastoral Letter on Catholic Social Teaching and the U.S. Economy.* National Conference of Catholic Bishops, 1986. Reprinted with commentary in the 10th Anniversary Edition, which includes the essay "A Catholic Framework for Economic Life" and a decadal retrospective by the Bishops in 1995. U.S. Catholic Conference, 1997.

[5] *Pacem in Terris: Peace on Earth*. Encyclical letter of His Holiness Pope John XXIII, 1963. (Pauline Books and Media, Boston.) Paragraph 149 begins the discussion of the Apostolate of a trained laity. It follows immediately on a description of scientific, technical, and professional competence, par. 147-148.

[6] We are using "governance" in the general sense of "ordering human affairs", as for example discussed by J.S.Nye and J.D. Donahue in their Introduction to *Governance in a Globalizing World*, Nye and Donahue, eds. Brookings, 2000.

[7] The multi-volume set *God and Globalization*, edited by M. L. Stackhouse and others, provides a comprehensive look at contemporary "governance". See especially, Vol. 2: *The Spirit and the Modern Authorities*. Trinity Press International, Harrisburg, PA, 2001.

[8] Here we are thinking in the terms established by Y. Simon, *A General Theory of Authority*, 1962; reprinted, 1980, U. Notre Dame Press.

[9] Friedson, E., *Professionalism: The Third Logic*, u. Chicago Press, 2001, p. 216.

[10] McElroy, R.W. *The Search for an American Public Theology – The Contribution of John Courtney Murray*. Paulist Press, 1989.

[11] Stackhouse, M.L. "Globalization, Public Theology, and New Means of Grace". The Santa Clara Lectures 9 (2) Bannan Center, Santa Clara University, January 2003.

[12] J. Maritain, *The Person and the Common Good*, Scribners 1947, reprinted 1985 bu U. Notre Dame Press.

[13] R.McInerny: "The Primacy of the Common Good", in *The Common Good and U.S. Capitalism*, O.F. Williams and J.W. Houck, eds. University Press of America, 1987.

[14] M. Novak, *Free Persons and the Common Good*, Madison Books, 1989.

[15] See, for example, the recent symposium "Professions and the Common Good", proc. in press, *Current Issues in Cathlic Higher Education*, D.R. Lynch, ed. Association of Catholic Colleges and Universities, Washington DC 2005. We are thinking of the piece "Toward a Social Theory of Professions", by the editor, therein.

[16] Grant, G.P., "Thinking About Technology", Chapter 1 in *Technology and Justice*, U. Notre Dame Press, 1986.

[17] Mitcham, C. *Thinking Through Technology. The Path Between Engineering and Philosophy.* U. Chicago Press, 1994. There is a helpful diagram on p.160.

[18] One of the familiar icons of one of the Massachusetts Institute of Technology depicts a scholar and a blacksmith; the motto being *Mens et Manus*.

[19] Here we are thinking of the famous proofs of St Thomas Aquinas, e.g. *Summa Contra Gentiles Book 1: God*, U. Notre Dame Press edition, trans. A. C. Pegis, 1975.

[20] See, for example, L.R. Kass, *Life, Liberty and the Defense of Dignity*; Chapter 10, "The Permanent Limits of Biology." Encounter Books, San Francisco, 2002.

[21] This is not to assert that metaphysical phenomena do not have a physical expression. The question is one of origin, causation.

[22] Besides function, another aspect of integrity lies in aesthetic appeal: the beauty of the artifact, as in a work of art of a fine design of architecture.

[23] The *Catechism of the Catholic Church* (*op. cit.* articles 1905 through 1916) gives our operative definition of the Common Good. The internal quotes are from *Gaudium et Spes, op.cit.)*

"In keeping with the social nature of man, the good of each individual is necessarily related to the common good, which in turn can be defined only in reference to the human person …

"By common good is to be understood, 'the sum total of social conditions which allow people, either as groups or as individuals, to reach their fulfillment more fully and more easily.' The common good concerns the life of all. It calls for prudence from each, and even more from those who exercise the office of authority."

"The Common Good is always oriented to progress of persons: 'The order of things must be subordinate to the order of persons…'." … "Much care should be taken to promote institutions that improve the conditions of human life."

[24] *Sollicitudo Rei Socialis: On Social Concern*. Encyclical Letter of Pope John Paul II, 1987. (Pauline Books, Boston). The social structures are discussed at par. 36, 37. At 37, idolatry of technology is suggested as hiding behind decisions apparently inspired by economics or politics.
[25] *Centesimus Annus*, Encyclical Letter of the Supreme Pontiff John Paul II, on the Hundredth Anniversary of *Rerum Novarum*, 1991. The quote is from Paragraph 43. Pauline Books and Media, Boston.
[26] "Toward A Social Theory of Professions", D. Lynch, in *Professions and the Common Good*, *op. cit.*
[27] Maritain, J. *The Person and the Common Good*, U. Notre Dame Press 1966; originally, Scribner's, 1947.
[28] See, for example, W.F. May, *Beleaguered Rulers: The Public Obligation of the Professional*, Westminster John Knox Press, Louisville, 2001.
[29] *Pacem in Terris*, *op. cit*., par 147-149. Paragraph 149 begins the discussion of the Apostolate of a trained laity. It follows immediately on a description of scientific, technical, and professional competence, par. 147-148.
[30] We are thinking of the classic "Public Goods" category; see for example I. Kaul, *et al*., eds.: *Providing Global Public Goods: Managing Globalization*, Oxford University Press, 2003.
[31] "The (Re)Formation of Professions: University Challenges relative to Engineering", D. R. Lynch. *Conversations*, Fall 2003:30-36.