2012

A Systems View of Time-dependent Ethical Decisions

Hamid A. Rafizadeh
Bluffton University

Brad Kallenberg
University of Dayton, bkallenberg1@udayton.edu

Chapter Five

A Systems View of Time-dependent Ethical Decisions

HAMID A. RAFIZADEH AND
BRAD J. KALLENBERG

SYSTEMS VIEW OF ETHICAL CHALLENGES

Every ethical situation has a "system" characteristic with a group of human and nonhuman elements linked in a variety of interactions and interdependencies. The system allows the elements to act in part or as a whole towards achieving a spectrum of goals, objectives, or ends.[1] The systems view asserts that any local and bipolar understanding of an ethical situation would be deficient as it would neglect certain interactions and interdependencies as well as overlook differing orientations of agents towards different goals and objectives. The purpose of this paper is to highlight the need for a systems-based view of ethics.

Systems thinking is not, of course, a panacea. It is one thing to have an intellect informed about the Good and quite another to have a volition reliably oriented to choose the Good. This latter issue is of central concern to Christian ethics but is not the focus of the present chapter. What is of concern to us is the usefulness of systems thinking

for revealing the Good. This paper details five "systems thinking" principles by analyzing a specific example of employee behavior under top management pressure.

From a systems point of view, ethical considerations are tightly intertwined with operational considerations and thus ought to attend to general features observed in system dynamics. For example, the observation that in operations people have a poor understanding of system dynamics would equally apply to ethical considerations. First, people see a system as an aggregation of components and not as interactions evolving over time. Second, people fail to recognize the significance of time delay between action and response because they tend to have a linear, here and now, view of causality.[2] Our thesis is that systems thinking can help sensitize us to the dangers of overlooking the time delay between actions and their consequences.

Each individual is located in a variety of multilayered systems. For example, as a worker, the average person stands in a web of relationships with co-workers, subordinates, and superiors. The pattern of interactions between them constitutes the system called the corporation. The corporation is not merely the aggregate of all the people who work there. It is the people plus the habits of their multilayered interactions over time. The corporation itself is a part of the local business community. As such it stands in various political and economic relationships not only to its own employees but also to other corporations, the consumers, the state, and so on.

But an individual also exists in a living community. As such, he or she is enmeshed in a web of relationships including nearby neighbors. The neighborhood interlocks with other neighborhoods, and together these comprise the political community. The pattern of relationships within this neighborhood and between neighborhoods makes up the corporate persona of this municipality. Municipalities relate to each other within economic realities and legal and political strictures within the county, state, and nation.

So then, each individual is simultaneously a worker, a neighbor, a family member, and so on. Each system is multilayered within itself and is intercalated with other systems. The layering is not predefined and can be variously dependent on where one draws a layer's boundary

and what one includes within it. Nonetheless, there are two features common to all systems. First, for all individuals the system is a nested structure. Second, some arbitrary boundary cutting across the layers is taken by a given individual as a "boundary of significance." The human attention and expenditure of resources primarily reside within the boundary of significance. For most individuals the boundary of significance encompasses the home and workplace. A similar layering exists for the corporation. It defines the boundary of significance through setting objectives and allocating budgets. We argue that ethics requires intentional expansion of one's boundary of significance to view the surrounding things in increasingly holistic ways.

For example, few people are conscious of the extent of their connection with the biosphere.[3] Let us start with the typical person's automobile, a popular component within the boundary of significance, transporting the individual between work and home. How much attention does the individual pay to the exhaust emitted from the automobile? There is a good chance that an awareness of the exhaust manifests once every two years when the automobile must pass its emissions test. Otherwise, the individual rarely if ever "sees" the flow of the exhaust gases into the atmosphere and even more rarely wonders about its effect on the atmosphere. Now consider the gas furnace in the house. Does the individual ever pay attention to gases going up the chimney and into the atmosphere? Perhaps in some winters, receiving the gas company's bill, he or she may complain about the cost and the furnace gas consumption, but the furnace's gaseous emissions remain unnoticed. Another element within the individual's boundary of significance is "electricity." To the individual it is a clean form of energy. His mind does not venture to the layer in which the power plant generating the electricity is located. Only there would the huge column of gaseous emissions rising into the atmosphere be noticeable.

How do automobiles, gas furnaces, and electricity demonstrate the deficiencies of the typical moral vision? They do so by showing that the person focused on home and workplace does not see the consequences of gaseous emissions in layers beyond the home and workplace. Moreover, the typical ethical individual develops little understanding of the time delay between emissions from automobiles, gas furnaces, and

electric power plants and the accumulation of the society's emission gases in the atmosphere. The emissions within the individual's layer of significance seem small and innocent. Yet, in today's conditions, at the final global layer the gaseous emissions accumulate at the rate of 22 billion tons per year.[4] Assuming a human population of 6 billion, there is an accumulation of about four tons of gaseous waste per year per person. Any accumulation at the rate of four tons per year would have quickly caught the eye of the individual if it happened within the boundary of significance or even in the next layer or two. But this is taking place at the last layer, that is, at a global level. Can we argue that since this is the system's last layer, it may not be significant for the individual even if it accumulates at the rate of four tons per year per person? Such a conclusion is entirely unwarranted, because the buildup of gaseous emissions in the atmosphere can result in global warming. Here we arrive at the problem of "knowledge flow" across system layers. The knowledge relevant to the first layer may not reside there but in other layers. For example, while the words "global warming" may reach the individual, the implications of global warming do not. He or she would regularly dismiss as irrelevant the notion that earth's average temperature may increase by a degree or two.[5] The individual sees noticeably higher temperature variability from morning to noon every day. The knowledge that fails to reach the individual is that the "average temperature" of earth controls the weather pattern and the weather pattern controls the output of agricultural products. A few degrees change in average global temperature can produce weather patterns that wreak havoc in the world's food supply.[6] With deficient food, the items lying within an individual's boundary of significance, namely the home and workplace, can face immense danger. Yet such a systems-based linkage of the home, workplace, and the globe remains beyond the embrace of the individual's awareness. From the system dynamics point of view, this is not a surprise but a fact of human life—the inability to see time-delayed effects of one's actions within the context of the whole system. Driving between home and workplace, the use of a gas furnace to heat the home, and the electricity to light the house and operate various gadgets, produce byproducts that accumulate globally to endanger the individual's boundary of significance decades later.

ETHICAL DYNAMICS—ANALYSIS OF A SIMPLE EXAMPLE

The inability to see time-delayed relationship between action and response prevents the individual from comprehending the ethical dilemma of altering the atmosphere and its properties. Even if the adverse effect on agriculture does not materialize, annual dumping of four tons of anything in the global backyard is significant enough to be noticed, but it rarely is. Though the issue of gaseous emissions highlights ethical human behavior with respect to long-term global issues, it is not an ordinary daily activity. To analyze more specific system dynamics of ethical considerations we will rely on a more mundane example.

In a business situation in 1984 in a regulated energy company, the engineer/manager in charge of the forecasting department prepared an energy consumption forecast to be presented to the regulatory agency to set the prices the company charged customers. The forecasting department developed a complex econometric model that projected a 4 percent growth in energy consumption. When the results were presented to the company CEO, he stood firm that the forecast was too high. With tens of adjustable parameters in the econometric model, the company's forecasting expert could reset some to create a lower rate of growth. The first parametric adjustments produced a forecasted growth rate of 2.5 percent. The CEO remained adamant that it was still too high. Another round of parameter adjustments produced a forecasted 1.5 percent growth. The CEO was pleased but added that he would like to see a forecast with 1 percent growth. With some grumbling the forecasting expert adjusted a few more parameters and the company forecast exhibited a 1 percent growth in energy consumption. A thick report capturing the company's econometric model was prepared and submitted to the regulatory agency.

The first ethical question concerns "parameter adjustments." Is it wiser to set the parameters at what the forecasting expert deems appropriate or at what the CEO declares proper? The positions taken by the CEO and the forecasting expert intersect at the historical data. The

choice of action differs by the choice of pointing to different layers of the system. The CEO could point to the pre-1981 growth numbers which were at 1 percent or less and declare the 3 to 4 percent trend of 1981–1984 as an aberration, while the forecaster could point at the econometric model and claim that the higher trend was not an aberration but a result of underlying developments in the economy. Which position would be more correct?

We claim that the CEO is acting legally but unwisely because he is choosing to ignore the best guess of the expert practitioner. This leads to an error that could have been avoided by expanding the range of one's system awareness.

We offer a remedy in five steps. The first step of systems thinking is that the parameters must be set in a context broad enough to view all of the relevant parameters. Therefore, the choice of parameters ought to be expanded to include the full range of logically possible parameters. In their conversation, not all parameters of the econometric model were well defined. For the sake of clarification of argument we will assume that the choices for each parameter could be represented by a normal distribution as shown in figure 5.1. Arguments based on statistics

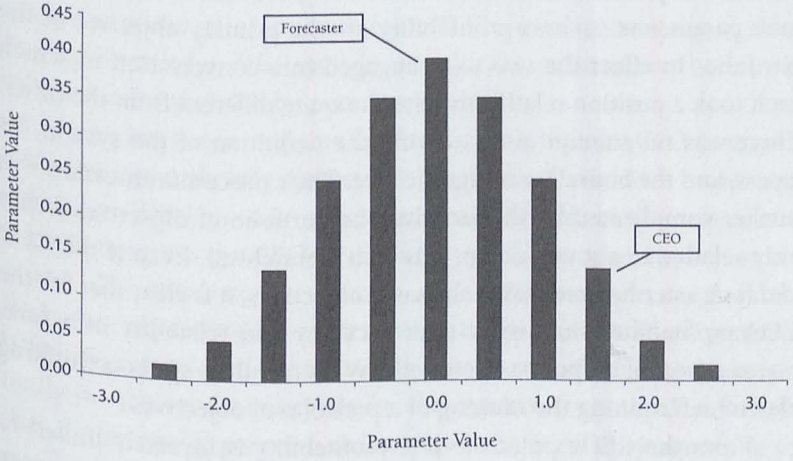

Figure 5.1 Which Choice is More Ethical?

would claim the parameter value should be set at the most probable. But statistical arguments do not overrule subjective considerations. For example, in flipping a coin the forecaster would go with 50 percent chance of heads or tails, while an expert gambler could go with the 100 percent feel of three consecutive heads. The statistical considerations cannot rule against the gambler's sense of events. They remain at a stalemate. Which position is more correct, the one purely based on most probable considerations or a mix of statistics and subjective considerations? Can the same argument be made for positions taken by the forecaster and the CEO?

The second step is to understand the system as an embodiment of a "portfolio of objectives." Since all systems are layered and intercalated with other systems, one must specify some range or other for analyzing the system(s). (To define the economic system as what's in my wallet is too narrow. To examine my household budget in light of its impact on India's soft-drink industry may be too broad.) Within a given range, each system has an ordered set of priorities or objectives. This set is called its "portfolio of objectives."

The larger a system gets and the more layers are considered, the more distributed the portfolio of objectives becomes. For the forecaster, the key issue within a narrowly restricted range is the reliability and accuracy of the forecast. But we can surmise that in the CEO's outlook parameters such as profitability are the primary objective of the portfolio. In effect the two were engaged in a conversation in which each took a position relative to a system quite different from the other. There was no attempt at identifying the definition of the system, its layers, and the boundary of significance. Their miscommunication was further complicated by the fact that the portfolio of objectives is not only relative to a given range, it is also hierarchical. Even if the CEO and forecaster had presumed the same objectives, it is clear that for the CEO profitability sits higher than accuracy and reliability of a forecasted aspect of corporate operations. What role does systems thinking play in determining the ranking of a portfolio of objectives?

From the CEO's point of view, profitability is inversely linked to the forecasted growth potential. Consider the regulated company's total expenses, including a reasonable profit, as Total Cost. This has to be divided by the average consumption over the period under consid-

eration to set the price charged to the customers. The average consumption, however, varies by the growth rate. The price the company can charge customers is thus determined by the relationship:

$$\text{Price} = \frac{\text{Total Cost}}{\text{Average } [C_o \prod_n (1+\alpha)^n]}$$

where α is the growth rate, n the number of years under consideration for rate setting, usually three to four years, and C_o a constant factor determined by historical consumption. The pi operator is a product operator. This equation simply states that price can be forecasted from the growth rate, and that the forecasted price is the product of growth in year 1, 2, 3, and so on.

From the CEO's point of view, a low forecasted growth rate would set the price high, improve profitability and reduce risk, while a high forecasted growth rate would do the opposite. While in appearance the CEO-forecaster dialogue is centered on reliability of the forecast, it in fact engages two totally different objectives simultaneously. The forecaster remains unaware of the CEO's profitability objective and can only assume the CEO's concerns emanate from the pre-1981 historical growth rate of about 1 percent. Is a dialogue that does not reveal the *entire* "portfolio of objectives" ethical? Or, more generically, at what level of knowledge deficiency do the ethical considerations become irrelevant, overwhelmed by poor knowledge?

As we have seen, systems thinking reveals that the CEO-forecaster conversation artificially restricts the portfolio of objectives under consideration. But their conversation is skewed because the forecaster mistakenly imagines the CEO as the only significant other in the conversation. The third step in systems approach, therefore, involves the forecaster expanding his or her vision to include the silent partners. What appears to the forecaster to be a local and binary interaction actually involves another key player, the regulatory agency. The forecast that the company prepares and sends to the regulatory agency is reviewed and scrutinized by the regulatory agency's forecasting experts. In setting the price, the regulatory agency can declare the company's forecasted growth rate low and adjust it to a higher number deemed

more appropriate by the agency's forecasters. It is the regulatory agency's function to protect the customers from corporate overcharging and high prices. The regulatory structure exists primarily on the assumption that the energy company will try its best to maximize profitability and charge the customers the highest price possible. Given such an arrangement, how does it modify our view of ethical behavior of the CEO and the company forecaster? Are the regulatory agency's forecasting experts and commissioners as ethically responsible, or perhaps even more responsible, than the energy company actors? Unlike the corporation, in principle, the agency should not have any internal profitability mandate, and its primary objective should be to set fair prices.

The ethically interesting aspect of this three-element view of the system is that often the regulatory agency chooses to accept *unquestioningly*[7] the company's forecast as valid. Is it possible that the regulatory agency and its own analysts do not comprehend the company's econometric model or do not understand the impact of growth rate on prices charged to customers? The truth is simpler than that. The regulatory agency allows overcollection by the company because it can allocate part of the overcollection to its own favorite social engineering experiments in the form of "energy efficiency projects" *which it has no other way of funding!* (In short, kickbacks make the world go 'round.) If the company is held, for example, to a consumption growth of 4 percent, the regulatory agency will have no leverage on the company to force it to take on the agency's "social engineering experiments." However, if the regulatory agency allows the company to collect more from customers under the assumption of a 1 percent consumption growth, then it can negotiate for a share of the over-collection towards the agency's energy efficiency programs.

Is any of this unethical? Not in the sense of being illegal. However, insofar as no party has troubled to look at the wider system, it is the economic equivalent of dumping pollution into the air by means of an inefficient furnace. After all, the regulatory agency does not take from customers for personal or organizational gain but for experiments that if successful may provide value to all customers. Similarly, from the CEO's point of view the negotiations with the agency are simply to set the level of profitability of the company. The more profitable the company, the more it will be able to serve the needs of the customers more efficiently at a higher level of financial stability.

From the systems point of view the ethical situation that started with the "choice of forecast parameters" ended up with "extra resources taken from the customers" and allocated to corporate profitability and social engineering. The different choices of the system's boundary of significance make it collectively defective.

For our present purposes, the difficulty in "seeing the whole picture" is a function of three things. First, the engineer/manager, the forecasting expert, and the CEO lack a systems thinking education. During their education, none learns the basics of defining and seeing the interactions and interdependencies of the workplace in systems terms. Second, no training program at the workplace corrects the lack of "systems thinking training." In fact the workplace's fragmentation and segmentation ensures that no one at the lower ranks would develop a systems view of the corporate operations. The executives at the top develop a biased view of the system tilted towards corporate profitability within a layer of significance defined by the corporation.

Third, even if the universities taught systems thinking to students and even if corporations adopted a code of conduct to train employees in systems thinking, system dynamics tells us the few that control corporate resources, namely the executives, *define* the system. The CEO would have no problem bypassing a systems-conscious forecaster by simply assigning the preparation of the forecast to a consultant who would gladly produce a 1 percent growth forecast in return for its consulting fee. Because of this power structure, the ethical character of the entire system would largely depend on the behavior of its resource controller, namely the corporate executives. Nevertheless, it is our hope that systems thinking education and training have the potential to substantially reduce the possibilities for unethical behavior by the executives.

SEEKING THE SOLUTION IN THE WISDOM OF CHRISTIANITY

It is wrongheaded to imagine blithely that, moving on separate paths, systems thinking and Christian ethics will inevitably converge on common morality. A systems thinking approach that is disconnected

from Christianity will inevitably narrate the world as an economic story of individuals and their aggregates (corporations) who compete against each other in a zero-sum game of survival of the fittest. Such opposition between players clearly does *not* tell the Christian story of creation and redemption. The resulting portfolios of objectives would be desperately disordered. The proper order will not emerge by simply staring at the data. Rather, what is needed as a fourth step is a theological vision of the system.

In other words, what is missing in the present picture is a Good common to all (because it comes as a gift), one that provides orientation for all the proximate goods and in light of which all other goods must be ranked. Pope John Paul II wrote in *Laborem exercens* that competition for profit is not the root of all evil—an unfair charge commonly leveled against Christian thought. Rather, keeping evil from taking root requires setting up the system in such a way that it (1) maximizes profit without destroying others, (2) maximizes creativity and internal goods for workers and practitioners, and (3) maximizes the Common Good for all, including those who are outside the walls of the corporation (not only the consumer, but also, for example, those who live down river from the plant).[8] This vision of the Common Good views the system at its widest scope. It asks us to see the business world as contributing to the Common Good rather than as epitomizing survival of the fittest.

The fifth step in taking a systems approach is to ask the question of time delay. Not only are systems "spatially" layered and intercalated, they and their component parts (in our case, human beings) are extended through time. It took the forecaster, Hamid Rafizadeh, about twenty years to comprehend the system dynamics of parameter adjustments he made in the econometric model. The revelation took place after a few years of studying and teaching systems thinking. Even then, it was accidentally triggered in the aftermath of a classroom setting in 2005 where the professor asked, "Have any of you been pressured by your boss to do something not morally right?" To the forecaster, now a student in the class, the 1984 actions in the 1984 time frame looked professionally and ethically above board. But looking at the events of 1984 with the knowledge base of 2005, which included a deeper un-

derstanding of the corporate and regulatory agency relationship, he was no longer sure. Could he have been able to stand up to the CEO's demands if he were as aware of the corporate system then as he is now?[9] But surely this is a moot point. For, the forecaster at that time simply could not see it.

Did his ignorance then make him innocent of any ethical wrongdoing? Maybe yes, maybe no. St. Thomas Aquinas explains that ignorance relates to culpability in a variety of ways. Blameless ignorance he calls "antecedent ignorance"—the kind of ignorance that is genuine and simply precedes the agent's action. But there are three other kinds of ignorance. *Concomitant ignorance* describes the case in which had the agent known better, the agent would still have chosen the present course of action. If knowing better makes no difference to the course of action, then the person acting is just as blameworthy either way. The other kinds of ignorance fall under the category of "consequent ignorance," so called because it is a state of ignorance adopted after or for the sake of the action taken. For example, *affected ignorance* describes the case in which the agent chose to avoid knowing for the sake of having an excuse! The other form of consequent ignorance is called *ignorance of evil choice*. It describes the case in which the agent was genuinely ignorant, but is so because of a flaw in his or her character. For example, perhaps the agent did not take the time to read the warning or was too lazy to study the appropriate data. In all these latter cases, ignorance does *not* spare the agent from being morally blameworthy.[10]

We see, then, that Aquinas does not give a simple answer. Yet in our story, the forecaster's ignorance seems genuinely of the "antecedent" variety. That is to say, the forecaster's ignorance is blameless in that it is not a product of some character defect in the forecaster. That being so, the forecaster is most likely *not* culpable for the economic sins committed by the power company against the consumers on the basis of the forecaster's report. Granted, the forecaster signs off on a growth rate that seems low, but still allowable within the parameters of the model employed. What the forecaster does not know as a young professional in 1984 is the hidden scheme of the CEO. But two decades later, it dawns on the forecaster that the CEO had ulterior motives for setting the growth rate lower than predicted.

The clever reader will have discerned that the "time dependence" given by the two examples is clearly not equivalent. In the case of the automobile and furnace emissions, global warming is the natural accumulation of greenhouse gases over time. Because the time of the accumulation is very long—much longer than twenty years—the significance of the single consumer is trivial. The impact of a single consumer goes unnoticed. In the second case, "time dependence" refers to the maturation of the forecaster over a twenty year period. The forecaster's gaining of awareness is not simply the accumulation of information; otherwise the time delay could be countered by intensive uploading of information on the front end of the forecaster's career. But growth of insight can never be simplified to mere acquisition of information. Rather, his coming to know was time consuming because in addition to information, the forecaster needed time to develop the skill of sorting what he was seeing. As Aristotle noted, cultivating the habits of moral vision necessarily takes time. While twenty years is the blink of the planet's eye, twenty years is a very long time in the life of an individual.

Educators and mentors of engineers are players in a system that includes, for example, forecasters for power companies. The leverage they exert on students and underlings falls short of being able to orient volition—only God can do that! But they do have a role to play in shaping the outlook of those they teach and guide. It has been said that if a burglar is breaking into the house, it is too late to *start* lifting weights! Fortunately, students are not yet facing burglars, corrupt CEOs, or crooked regulatory agencies. In the meantime, educators must urge students to begin lifting moral barbells. In our view, the five steps of systems thinking is a helpful conditioning program that promises to shorten the time delay between now and the day when students become engineers who see and act holistically when faced with ethical decisions.

NOTES

1. Howard Eisner, *Essentials of Project and Systems Engineering Management*, 2nd ed. (New York: Wiley, 2002), 5; A. Kossiakoff and W. N. Sweet, *Systems Engineering Principles and Practice* (New York: Wiley, 2003), 3; Harold

Kerzner, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, 7th ed. (New York: Wiley, 2001) 70; Benjamin S. Blanchard, *System Engineering Management*, 3rd ed. (New York: Wiley, 2004) 6; A. P. Sage and J. E. Armstrong, *Introduction to Systems Engineering* (New York: Wiley, 2000), 5–6.

2. John D. Sterman, *Business Dynamics: Systems Thinking and Modeling for a Complex World* (Boston: McGraw-Hill, 2000), 21–22.

3. David Ehrenfeld, "The Cow Tipping Point," *Harper's Magazine* 305, no. 1829 (2002): 13–20.

4. Robert E. Morrison, *Global Climate Change*, Congressional Research Service Issue Brief, Report No. 1B89005, March 2, 1989, 4.

5. Less that 9°F separates us from the last Ice Age; "Evidence of Global Warming," 2005, http://www.ecobridge.org/content/g_evd.htm, last accessed October 2005.

6. H. M. Kaiser and T. E. Drennen, eds., *Agricultural Dimensions of Global Climate Change* (Delray Beach, FL: St. Lucie Press, 1993).

7. A case of what Thomas Aquinas called consequent ignorance (specifically, *affected* ignorance).

8. *Laborem exercens* names as "the indirect employer" all stakeholders and consumers. These are all each of the corporate system and thus have both rights *and duties*.

9. Even if he were capable of systems thinking as he is now, as a lone individual would he not be powerless to influence the CEO when tens of millions of dollars of corporate profits are on the line? He would be thrown out and replaced with a more accommodating forecaster or bypassed for a consultant who would create a forecast desired by the CEO. This brings us to the question of the power dynamics of the system. The powerful person at the top cannot be swayed by actions of a lone individual. The fate of the corporate whistleblowers is well known. See C. Fred Alford, "Whistle-Blowers: How Much We Can Learn from Them Depends on How Much We Can Give Up," *American Behavioral Scientist* 43, no. 2 (October 1999): 264–77; and M. P. Glazer and P. M. Glazer, "On the Trail of Courageous Behavior," *Sociological Inquiry* 69, no. 2 (Spring 1999): 276–95.

10. See St. Thomas Aquinas, *Summa Theologica*, trans. Fathers of the English Dominican Province (New York: Christian Classics, 1981), I–II.6.8.