Chapter 14
Toward a Theory of Social Value Creation: Individual Agency and the Use of Information Within Nested Dynamical Systems

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This chapter explores the process of social value creation and its evaluation. We suggest that a process like discounted cash flow (DCF) is needed, but developing such a process is complicated in the social value context due to a lack of metrics and consistent social value constructs. Taking a dynamical systems perspective and using economic modeling as a guide, we argue that access to resources and information about their future use represent measurable social value. Further, we suggest possible policy approaches to address these difficulties.

Introduction

Social entrepreneurship has become an area of increasing interest both practically and in academia. The diversity of specific implementations and the variety in their objectives (Massetti, this volume) have made it a difficult subject to develop theoretically. As Goldstein, Hazy and Silberstang (2008) point out, one of the challenges facing those interested in a systemic definition and theory of social entrepreneurship is determining the constructs, relationships and metrics for social value creation. This is the question that we pursue in this chapter. We define the social value created by an organized activity as the net benefit that accrues to all stakeholders including those in future generations. Of course, the hard questions are: What is meant by "benefit" and how it is measured? Just are who the "stakeholders" and how do we determine the impacts on them? How does one anticipate the desires of "future generations" and how does one determine the benefits they receive?

One might argue that the meaning of social value is so apparent that it need not be defined. For example, when one feeds the hungry, social value is created. But such thinking is erroneous. Despite being a kind act, feeding a hungry child only creates social value if some broader social benefit is achieved. Jared Diamond (2004) tells the story of the deforestation of Easter Island. What had once been an idyllic Pacific island supporting thousands of inhabitants became over time a barren island that could support no one. Diamond wrote that he often wondered what the ancient man who cut down those last few trees might have been thinking as he pushed the ecology beyond its tipping point. What if he had done it to bring warmth to a freezing child? It would have been a kind and morally good act, but at what cost? The island community as a whole was destroyed. There is, of course, always a bigger picture. Social value has to include the big picture.

In theory, one of the advantages that economics has over the other social sciences is that it offers the tools and methods to express social value quantitatively. Economic value is a simple matter. It is easy to argue that individual wealth, aggregated across all individuals, sums to national wealth. But because social value involves stakeholders other than shareholders, and because it often includes assessment of value that is not monetary, the problem of evaluating it consistently is far more difficult.

Complexity science provides a broad mathematical and philosophical framework that connects the physical sciences—and therefore physical resources and environmental effects—with the social sciences and our understanding of human experience. It is a quantitative approach to modeling phenomena that if aptly applied may further our understanding of social value creation. This chapter will elaborate a means through which complexity can be utilized to develop a more rigorous definition of social value.

In order to quantify social value, we must establish a unit of measure. We argue that any measure of this type should reflect two elements: 1) a system's potential for continued access to necessary resources of various types including social resources *social capital* as Goldstein and Zeidan (this volume) describe, and 2) the acquisition and use of information that increases the potential for the use of those resources in the future, what Hazy, Torras & Ashley (2008) called technology leverage. The first is important because physical and biological systems require continued access to resources; access to them thus implies that value is created. The second is important because information about the resources and how to obtain them, as well as how to use them efficiently, increases the value of the resources that are being used; this notion of resource productivity is particularly important when resources are limited. This later aspect of social value creation is directly linked to innovation.

We begin with a discussion of dynamical systems theory and how it might help us understand and analyze economic and social value creation. (For a general overview of this topic see Goldstein, Hazy & Silberstang, this volume). Assuming, as is reasonable, that creation of economic value contributes to wealth and prosperity, it also leads to the creation of social value. The *extent* to which it does, of course, depends upon the impacts—including ones difficult to measure—such value creation has on stakeholders other than shareholders, including those in future generations. We therefore seek to broaden the approach commonly used in finance for estimating value creation—discounted cash flow analysis—to include other constituencies and impacts in a social value creation analytical framework. To do this, we frame both economic and social value in a dynamical systems context.

In what follows, we elaborate on the dynamical systems framework that we use to define social value and how value creation can be evaluated. We next describe the finance technique of discounted cash flow (DCF) analysis and how this can be interpreted in a dynamical systems sense. Using these ideas, we suggest how to expand this approach to evaluate the process of value creation in social systems. Before concluding, we suggest possible policy approaches that would go a long way to shifting our political economy toward one that actively creates cumulative social as well as economic value in the way Torras (this volume) has suggested.

Nested Dynamical Systems and Information

Most social and economic systems are highly interactive and nonlinear. As a consequence, they often defy the use of simplified analytical models that clearly predict outcomes. Some aspects of these systems can be idealized, and simplified models can be created, however. This is what is done in microeconomic modeling of the firm and macroeconomic modeling of the economy, for example, but it is also common in social system analyses such as demographic modeling, game theory studies and epidemiology. However, many important problems cannot easily be reduced in this way.

Fortunately, over the last fifty years a robust mathematics of dynamical systems has been developed in fields as diverse as physics, biology, neuroscience and economics. According to Hirsch, Smale and Devaney (2004), a dynamical system is a way of describing the passage of time through all points of a given space. For our purposes, "space" is not necessarily (nor usually) limited to the 3-dimensional physical space in which we live. Rather, it is an abstraction that represents the space of all possible states that an organization can assume, or of a group or even an institutional field. In these systems, the "states" assumed are represented by a set of variables that change over time such as employee engagement, customer satisfaction or profitability[1].

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1. For example, the dynamical system might describe the attributes of a business, its markets, its financial situation, its knowledge management systems, its climate and its culture. These variables might be $q_1, q_2, q_3,\ldots,q_n$ which we collectively designate as $\mathbf{q}$, a vector whose value represents a particular location in state space S of dimension n. The organization as it exists at a point in time would occupy a position $\mathbf{q}$ in state space depending upon the specific values taken by the various components, q_i. A financial manager might only be interested in profitability and therefore might only be concerned with—and recognize the importance of—q_3 for example, if q_3 measures profits. This does not mean that there aren't other relevant state variables, i.e. $q_1, q_2, q_4, q_5,\ldots,q_n$, for the system, only that this particular manager does not recognize nor use them.

In contrast to individual managers, complexity researchers are interested in the function $f(t)$: $S \rightarrow S$ that describes how all of the components of $\mathbf{q}$ change over time in state space S. The changes are designated $d\mathbf{q}/dt = k(\mathbf{q})$ for the particular initial conditions $\mathbf{q}_0$. The individual path that a system traces out in state space over time, given its initial conditions, is called its *orbit*. If such a system could be defined—and of course, doing so is not always easy—the dynamical system would describe how the states of these variables, and thus the component variables of interest change over time. Once defined, mathematical results can be used to infer important characteristics of the dynamical system, and thus presumably, of the changing organization that is being studied.

A combination of values for these sets of variables is called a *point*, and the set of all possible points forms what is called a *state space*. An organization resides at a single point in this space at a particular time. The question to be explored is the state that the system will assume in the future. In practice, not all points in state space can be occupied by the system. When initial conditions are known, the subset of points in space that the system can occupy *based upon a particular set of the initial conditions* is called its *orbit*, just as the path that the planet Mars sweeps around the sun is its orbit[2]. Dynamical systems models can be compared to empirical evidence and indeed, in the case of physical systems, the models that have been developed are remarkably accurate[3]. It remains an open question if anything like this precision is possible for certain aspects of social systems.

Stability and Destabilizing Feedback

Many nonlinear systems contain divergent aspects, areas that build upon themselves with positive feedback, and therefore they never reach a stable orbit.

2. The planet Mars's state space includes the three physical dimensions—left-right, forward-backward and up-down—and three companion dimensions of momentum (momentum = mass X velocity), one in each direction. A dynamical system representing this planetary system would be one that describes how these six values change over time.

3. Dynamical systems models are generally less accurate in the social sciences. (Forrester, 1968; Sterman, 2000). This is because they ignore the micro-dynamics that occur at the individual interaction level and instead seek to describe the relationships among variables that describe mesoscopic quantities—like changing populations, profitability, sales growth, or even cash flows—to identify emergent patterns and structures that are of interest at the macro level. This approach can be frustrating to managers who operate at the micro level yet seek to impact macro patterns. (This issue is related to the non-ergodicity of human systems that is described in Note 9 below.)

Over the last half century, however, dynamical system models have increasingly integrated micro-dynamics with macro-dynamics. Separately, both Nobel Laureate Ilya Prigogine (1995) and Hermann Haken (2006) have described how global order can arise from local instabilities under *conditions of requisite complexity* (Goldstein, Hazy & Silberstang, 2008). As local instability increases inside the system, fluctuations are likely and tend not to be extinguished. At times, these fluctuations reflect the influence of forces acting from beyond the system's borders. When this occurs, it becomes possible for a dynamic pattern of stability to be recognized—a constant production level or growth rate, or even predictable oscillations like seasonal production patterns and monthly book closing routines. Under these conditions and with the proper metrics and observation instruments, macro structure can be inferred and models can be created (Crutchfield, 1994). According to Haken (2006), when such a structure emerges within the system due only to internal effects—in other words, outside forces do not explicitly impose the structure in the way that a star-shaped cookie-cutter forces cookie dough into the shape of a "star"—the structure is said to result from *self-organizing.* Self-organizing has been observed in physical systems such as lasers (Haken, 2006), chemical systems (Prigogine, 1995) and biological system such as ecoli bacteria (Nicolis, 1989). Our analysis extends these ideas to social systems.

However, dynamic stability is possible even in nonlinear systems. When the system tends to a fixed point in state space, the stable solution is called equilibrium, as in "equilibrium price" in economics. More generally, dynamic stability can be around different *dynamical attractors* that range from a fixed point, a periodic function (as in the planetary system in astronomy or a monthly book close cycle in business) or even more complex functions that are described later. What is important is that regardless of the initial conditions (within limits), the system does not run off into infinity but is eventually constrained within a subset of state space, what is called its *attractor cage* (Goldstein, Hazy & Silberstang, 2008)[4]. Observers may not be able to predict where the system is, but they can predict where it will not be. It will not be outside the cage. A business cannot lose money for long, for example. And in perfectly competitive markets, it cannot be too profitable for long either. Such observations implicitly assume that stable dynamical systems are at work.

Systems in dynamic stability—confined in an attractor cage—are often characterized by positive and negative feedback. This perplexing—and also generative—attribute of nonlinear systems is apparent when magnitude determines effect. Unbalanced positive feedback can lead to uncontrolled divergence in the system's dynamics—a destabilizing tendency toward infinity along some dimension[5]. Divergent dynamics can cause nonlinear systems to become unconstrained and increasingly unstable. As such, all stable systems must also have negative or balancing feedback to exert pressure which brings the system back into stability. An example of this is the case within a firm where hiring is constrained. Increased production amplifies overtime costs which puts upward pressure on prices thus limiting demand. Balancing feedback exerts pressure on the system to remain within a quasi-stable configuration. This quasi-stable configuration is roughly what is called "an attractor cage".

Convergence Toward Attractors

Attractors within a dynamical system are defined as subsets of state space such that when an orbit of the system enters the subspace, it does not exit unless the dynamics themselves change, and these are defined by certain system parameters. (We say more about these parameters later.) The orbit remains trapped within the attractor cage (Hirsch, Smale & Devaney, 2004). In other words, an attractor is a set of possible organizational states that in some sense "attracts" any nearby configurations, regardless of their initial conditions, and draws them toward the attractor state[6].

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4. The qualification with respect to initial conditions is critical here and is due to an inherent limitation to the resolution that is assumed as analysts define the model of the environment (Hazy & Silberstang, this volume). Because systems with divergence can be subject to sensitivity to initial conditions, the uncertainty in measurement arising from limited resolution leads analysts to models where the particular orbit of the system cannot be precisely determined. Thus, practically speaking the concept of attractors becomes the best way to think about the future state of the system.

5. The familiar piercing sound of an audio amplifier's "feedback" when an open microphone is pointed toward its speaker is an example of this.

6. More specifically, the basin of attraction within which solutions tend toward the

Under a particular set of conditions, even if the specific state of the system is not predictable, one can predict that the system will remain within its *attractor cage*. Each combination of parameters establishes a potentially different attractor cage. For example, the availability of funds or the level of work activity might establish parameters that impact the nature of the dynamical system's trajectory or even its relative stability. If parameters change, so too does the attractor cage. For example, Guastello (2002) describes empirical studies that show that changing the overall activity level in a work group qualitatively changes the dynamics of creative problem solving; a higher value for this parameter, i.e., more work activity, (in addition to other parameters) implies the type of dynamics that enable emergent creativity. By adjusting appropriate parameters, the system's behavior can be changed from dynamics that are drawn to a fixed point attractor to those drawn to a periodic one, or even toward a more complex attractor. In dynamical systems, parameters like these make a huge difference. Just what these parameters are and how they are changed are undeveloped areas of organization theory.

Fluctuations and Divergence Within Attractors

Up to now, we have assumed that dynamical systems are deterministic. In other words, information about the current and all previous states is all that is needed to determine conditions at some future point. But such conditions do not always, or even mostly, obtain. The invention of the microprocessor by Intel, for example, was serendipitous and unplanned. It was a surprise, and it fundamentally changed the operating environment both within the company and beyond it (Hazy, 2008a). Not only was it not predictable or deterministic, the event introduced divergence and instability into the system and its markets with dramatic long term effects[7].

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attractor is determined by the presence of a Lyapunov function, while the parameters and their specific settings determine the attractor. A detailed discussion of these technical issues is beyond the scope of this paper. For details, we refer interested readers to a dynamical systems mathematics text such as Hirsch, Smale and Devaney (2004).

7. Thus, a more general expression of the relationship for change to **q** over time is one that includes surprises—that is, it includes a stochastic term. An equation that is often used to represent this situation is called the Langevin equation:

$$dq/dt = K(q) + F(t) \qquad (1)$$

Here, the change in the state of the system depends upon a deterministic part, *K*, as described in Note 1 above, and *F* which describes the random fluctuations—the surprises—inherent in the system.

In terms of equation (1) above, a non-zero value for *F(t)* implied that the state of the system **q** at time $t + 1$ changed in stochastic ways. Less destabilizing fluctuations—where there is no divergence introduced into the system—are also possible and happen all of the time. For example, individuals call out sick, or accidents occur in the work place. Many times, these "fluctuations" are quickly absorbed and dampened within the operating dynamics at work at the time; they thus expire with little lasting impact. It is those that persist due to the presence of divergent components that are the surprises

To understand why this occurred, it is useful to look at Haken's (2006) synergetics model. Haken generalizes Ginzburg-Landau theory which described physical state changes and argues that fluctuations which introduce divergence into a system's dynamics have the potential to reorder the system according to new attractors, sometimes in surprising ways. Certain fluctuations that occur naturally in the system can have certain components—those that are not dampened by balancing feedback—that tend to diverge[8]. If and when these components encounter potential forces in the environment that reinforce them, they can be sustained over a long time span, one that exceeds and eventually dominates the micro-dynamics defining the current operation of the system.

In other words, the organizational system may have fluctuations—random disturbances such as employee turnover or ad hoc product innovations—that sometimes have a component that diverges in some way. For example, Apple created iTunes as a way for computer users to download music to their Macs; this innovation resulted from a stir in customer support activities—a fluctuation—that addressed the original idea, but the activities just kept building on themselves and going in new directions—they diverged. Eventually this led to the launch of the iPod (Cruikshank, 2006). Unlike the iPod story, most often these fluctuations dissipate without effect. However, when the divergences come under the influence of new and potentially stronger forces in the environment—broader economic, political, or technical trends as was the case with iTunes—an industry or societal reordering becomes a possibility. Futurists sometimes refer to the divergent micro-level fluctuations that might signal larger scale changes as the "weak signals", the "long waves," or the "mega trends."

Because these external forces imply changing dynamics that are acting on the system to provide new ordering of the system, we call them *ordering forces.* They represent the value of potential forces of change in the environment. Haken (2006) showed that as these ordering forces change over time, they can sometimes be represented as dynamical systems in their own right. In other words, the technological and market conditions that led to the launch of the Intel microprocessor business and the subsequent reordering of Intel (Hazy, 2008a) can be thought of as a dynamical system sweeping out an orbit in its own state space. Attempts by analysts at Intel to model the firm's markets at that time amounted to an effort to identify this dynamical system's attractor cage.

The dynamics of this larger scale system (the market for microprocessors in our example) eventually dominated the activities within the system. For Intel, demand for microprocessors grew independently of their internal activities. Competitive products and new user requirements began to drive the evolution of the invention and the production of follow-on technologies. Intel eventually released a RISC processor, a different technology design, for example, even though management was against the idea as a strategic matter (Hazy, 2008a). The dynamics within Intel were overtaken and to a degree dominated by the

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we are interested in understanding as they may offer clues in regard to opportunities or threats in the environment.

8. Components diverge when they have a positive exponent (that is, the Lyapunov exponent) and have positive amplitudes for the various terms.

larger scale—"coarser-grain" (Crutchfield, 1994)—market dynamics. In other words, the forces exerted by the broader dynamical system with the longer time scale, the microprocessor marketplace in our example, can *take off* and even *take over* the system nested within it; in this case, it was Intel that became caught up in the market it created.

When this occurs there is a decrease in complexity in the models being used to describe this new regularity (Crutchfield, 1994) in an effort to act within the environment. The intricately-detailed, fine-grained micro-dynamics of stability within the nested system can become dominated (and to a degree irrelevant) within the attractor of the coarser-grain, but in many ways more powerful dynamics, constraining the larger scale and coarser-grained dynamical system (Haken, 2006)[9]. Even though the value in the original invention was in the intricacies of how it was designed and made, when the marketplace takes over, what becomes important is what the microprocessor can do. Simpler designs might in fact begin to drive the market, even if only briefly, as was the case when the market for reduced instruction set computing (RISC) processors began to take off.

At times, there can be a different kind of information available within the fluctuations that survive in the nested system, information that is not defined by its current attractor cage. Rather, the information generated in the totality of all of the fluctuations may be indicative of other possibilities developing in the divergent components of the system. These new dynamics may imply that there are as yet unimagined futures for the nested system. These futures become apparent as the system is buffeted about within the larger scale, coarser-grained system (Crutchfield, 1994) being constrained within its own attractor cage. Thus, if participants in the smaller nested system can recognize these "weak signals" and capitalize on larger scale patterns in the environment, they can ride the trend to new possibilities for continued stability and successful growth, as Intel managed to do.

Information and an Organization's Future Prospects

In organization life, each individual attempts to make use of available information about the patterns that appear regarding the workings of the systems and the environment in which they participate (Crutchfield, 1994). They do this, either individually or collectively, by developing models or programs that can reproduce and predict the workings of the system at different levels of coarse-graining (Crutchfield, 1994, Hazy & Silberstang, this volume). This modeling exercise

9. These observations are inferred from the research of Haken (2006) who worked with physical systems where micro-dynamics can reasonably be assumed to operate independently in a way that is technically called *ergodic*. Recent research has begun to identify examples where human systems are non-ergodic (Gell-Mann & Tsallis, 2004), meaning, roughly, that for the situation under study, one cannot reasonably assume that a model can predict how a particular individual will act over time by studying how a collection of others are acting currently even when the situation is assumed to remain unchanged. Exploring the implications of non-ergodicity in social science is a developing area for future research.

is complicated by the fact that each system has stochastic elements (such that the relevant quantities are random variables). Thus the information available to each individual is a probability distribution that not only has an expected value for the system's state (that profits have met the forecast each quarter, for example), but also exhibits a number of higher order moments such as the variance, skew, etc., for each outcome. Individuals use all of this information to further their understanding of the environment, make choices and take action within these systems. Information about random variables representing resource flows and the organizational system itself are used to frame the individuals' choices that define their participation.

Stability in one form or another makes some predictability in these models possible. Conditions of stability and near stability are characterized by models with convergence toward *attractors* in state space. But the measurements are random variables. Predictability in support of an individual's actions and choices within the system is based upon the presence of information within the system to enable the development of models to guide appropriate action. This includes information about the smaller nested system's attractor cage as well as information that might be available in the fluctuations and experiments occurring locally, but which might reflect convergence to the attractors in the larger, longer time-scale dynamical systems. To recognize these weak signals, the distracting urgency to drive toward the nested attractor cage must be reduced. A weakened drive to stability enables experimentation and within those experiments, agents might gain visibility into patterns that hint at larger-scale coarse-grained ordering forces[10].

The challenge for individuals processing information within such a complex environment is following strong signals that enable convergence to some coarse-grained attractors within the individual's own organization while at the same time parsing through the detailed finer-grained events in an effort to identify various weak signals that hint at a changing environment. Once possible patterns are identified, individuals must make choices and engage in action

10. The idea here is similar to how new sounds come alive when one retreats from the city. Patterns that were previously undetectable become obvious. Many of these are common sounds, insect or night animals, and these are easily recognized and dismissed. These "fluctuations or novelty" in the otherwise perfect quiet or white noise have all convergent components. Each is clearly contained within the moment and does not represent longer term effects, and so they can be set aside, extinguished and forgotten. But occasionally there is a sound that might signal the onset of a larger phenomenon. For example, the nearly inaudible rumble of an oncoming train, or the not so random explorations of an approaching Black Bear. By "lowering the relative volume" of signals that define the accepted norms for local action, other signals, less powerful, perhaps, can be heard. These are weak signals now, but as the illustration foreshadows, what was once a weak signal can become a strong one. Recognizing these things early brings considerable evolutionary advantage to those who are able. These conditions force a more probabilistic view of the future. In other words, they introduce the need to incorporate risk into models used to evaluate the signals being perceived and whether they will actually develop along the pattern that is recognized. They may or may not follow the predicted orbit.

that might help the organization recognize and verify the presence of an even coarser-grained, and possibly incompatible ordering force in their environment, and if recognized, take action to enable the organization to adapt to it.

To do this systematically, an analytical approach and consistent metrics that allow for comparison among alternatives are needed. The success of economics and finance as cumulative social sciences comes from the existence of these techniques and metrics. For cumulative positive action to develop in the other social sciences, they need something similar. We turn now to a framework that defines value creation in the context of the availability of various resources and the information needed to gather and use them effectively in the future. These concepts will form the core concepts of a new theory of social entrepreneurship and social value creation.

Economic Value Creation As A Model

To begin to develop a method for evaluating how social value might be created through social entrepreneurship, it is useful to look at how economists evaluate the creation of economic value by entrepreneurs. Let us begin by describing the key concepts and ideas that form the basics of *discounted cash flow* (DCF) analysis, the single most important technique in corporate finance. It provides a clear description of what a value creation formula might look like, albeit one with a single dimension, economic value creation for current shareholders. Although only the benefit to current shareholders is considered, the technique does consider the present value of future cash flows.

We take it as axiomatic that economic value creation is a type of social value creation. When economic value is created, wealth is created. If there are no counter-balancing negative effects from these activities in other relevant spheres of interest for various stakeholders, current and future—i.e., the social, political, physical or institutional environment—then social value has been created. In fact, in finance it is recognized that managers do not always try to maximize shareholder wealth because they have to please other stakeholders, such as government bureaucrats, customers, or employees. This implies that social value creation does in fact go hand in hand with economic value creation, a phenomenon not easily captured in current economic models.

The Nature of a Cash Flow

Net cash flow, or "free cash flow" (FCF) represents the flow of cash into an entity minus the cash that flows out. It is the amount of cash left to the firm after it has paid for everything it had to pay for, and invested in everything it had to invest in. The former is needed in order to fund the firm's current operations. The latter is needed in order to guarantee the firm's future growth and survival *vis-à-vis* competition.

The FCF belongs to the firm's various security holders and represents the return on their investment in the firm. It is available for distribution back to them based on the nature of their claims.

Discounting for Present Versus Future Value

The fundamental question that DCF analysis attempts to answer is how one compares cash in the pocket today with cash in the future. As we describe later, this can only be done because the organization exists within a well defined and stable, larger-scale dynamical system, the capital markets. Value is created when the activities within an organization generate projects that have rates of return exceeding the costs incurred while also acquiring the capital needed to fund these projects. In other words, value is created when a firm's activities earn profits in excess of financing costs now, and additional value is created when one can assume that the firm will continue to operate profitably into the future.

In more general terms, the firm has value when there is credible information available within the system implying that the firm will continue to have access to the resources that it will need (particularly financial capital, but also human, raw materials, technology, etc., which are acquired using capital) to operate profitably into the future. Since an organization obtains various types of capital from multiple sources on varying terms, the weighted average cost of capital (WACC) is utilized as a benchmark to determine a project's value contribution to security holders. Future returns that are assumed to be in excess of the WACC imply value is created. A firm's WACC depends upon the level of risk of expected FCFs—the greater the likelihood of missing the expected FCFs the greater the cost of capital.

The mobility of capital and the search for high returns with minimal risk by agents who control the capital can create a problem for firms operating in a marketplace with a high degree of uncertainty. An example was described by Friedman (2008) in his book *Hot, Flat and Crowded*. He describes a conversation he had with Jeffrey Immelt, the Chairman and CEO of General Electric, about the problem large firms face in trying to react to global climate change. He quotes Immelt:

Big energy companies won't make "a multibillion-dollar, forty-year bet on a fifteen-minute market signal. That doesn't work." Big industry players like GE need some price certainty if they are going to make long-term bets on clean power, and to those market dogmatists who say that government should not be in the business of fixing floor prices or other incentives to stimulate clean power, Immelt says: Get Real. "Don't worship false idols. The government has its hand in every industry. If they have to be then I'd prefer they were productive rather than destructive" (pp. 255-6).

Using complexity terms, what Immelt was saying was that the models that forecast FCFs are based on information in which there is a high level of confidence. A policy that fixed a floor price for oil, say $100 per barrel, would enable the development of models for new alternative energy markets that converged within attractor cages, a situation which is not tenable when there is wide variance in oil prices. We call information of this type "strong signals" because there is a clear expected value for the price. Analysts can therefore be more confident in their forecasts. In contrast, weak signals, like the vague concerns about long term global warming, can be detected as a pattern, but the expected values of the variables in the attractor are not yet well enough understood to be included in planning models—except as increased risk. Weak signals are therefore difficult to use in resource allocation decisions and are sometimes even consciously ignored, as GE is doing in some cases with global climate change. Acknowledging the risk inherent in this uncertainty would actually increase their cost of capital, a situation that managers seek to avoid.

The existence of alternatives is a key institutional factor that explains why capital markets work to allocate capital resources efficiently. If a business is not creating adequate value for the level of risk that is assumed, the money can be taken out of the firm and invested elsewhere. Just as firms allocate capital internally in an effort to exceed their WACC, capital markets allocate resources to firms who succeed in doing so because investors seek to maximize returns among their alternatives. This is why we said earlier that DCF analysis of economic value creation *within a firm* only works when organizations are considered within a broader capital markets context that allocates resources efficiently *to firms that succeed* in doing so. Capital markets are where the financial securities of these organizations are traded, a process that creates a process of efficient capital allocation and determines each firm's WACC. All of this is based upon information and on the models that agents create to predict the information they observe about the system and environment (Hazy & Silberstang, this volume).

Returning to the firm, at its basic level, a DCF analysis estimates the firm's FCFs, typically on an annual basis, in perpetuity. While such estimation is very complicated, at its core it is based on the firm's projected growth rate in sales, its perceived future cost makeup and its capital structure. The latter refers to the firm's future choices regarding debt versus equity financing. Next, the analyst determines the appropriate discount rate to be used to convert each of the firm's future FCFs to their respective present values. These present values are then added, and the sum, called the present value (PV), is the economic value created. The PV of FCFs to the firm is what is available to both debt holders and equity holders. It represents the maximum of the firm's potential and must be in excess of other possible investments with similar risk. If not, investors will dissolve this firm and put their money in those other investments that generate higher present value of Free Cash Flows[11]. Note the importance of a market for capital in driving resource allocation decisions.

Fluctuations Complicate the Models and Calculations

There are an extremely large number of events that affect the firm's FCF, and their arrival is very difficult to predict. One obvious source of fluctuations would be changing prices for inputs—oil, for example, or agricultural commodities the prices of which fluctuate due to weather conditions. Because such fluctuations

11. To complete the story, after the estimated amount of debt that the firms will be carrying is subtracted from the PV of FCFs, the residual amount is called the FCFs to equity holders. The analyst then divides this residual part by the number of equity shares held by shareholders. The value per share is calculated and used by investors in their share trading decisions.

impact the firm, they impact cash flows and cash flow forecasts. These in turn cause the present value to fluctuate, and the value per share likewise fluctuates with the arrival of these events.

Most of the time, such disturbances are inconsequential. In fact, organizations are often designed with the explicit purpose of absorbing such fluctuations in inputs as well as those inside the company and dampening their effects while still delivering consistent, stable outputs such as consistently delivered earnings and revenue growth. Vertical integration to stabilize access to inputs, employee cross-training programs, and clearly documented policies, procedures and work rules which are hedges against employee turnover risk are just three examples of tactical initiatives that do this.

On the other hand, at times, aspects of these fluctuations might be more difficult or impossible to contain. This occurs where perceived variance is driven by a consistent force in the economy or the broader society; some of these effects might have traditionally been considered as aspects of systemic risk. When an apparent trend is observed, but its implications are not yet recognized or understood, the information is embedded in what are called weak signals. For example, increased absenteeism among employees might be caused by a growing influenza epidemic that has not yet reached the threshold level that would destabilize the firm to the point that it can no longer operate its factories. The weak signals are there, but they go unrecognized.

Fluctuations can also lead to innovations. This happened at Intel in their formative years in the late1960s and early 1970s when they took on various randomly selected, customer-specific design projects as a way to generate cash flow and maintain engineering talent (Aspray, 1997). One of these projects led to the invention of the microprocessor, an experiment that occurred in the context a general industry trend, a weak signal, associated with improved process technology that enabled a single chip design. Ultimately, sales of this new invention far outpaced the firm's core business which had been dynamic random access memory or DRAM (Hazy, 2008a)

At the same time, the choice to pursue the newly identified attractor might lead to a perception of reduced risk. This also occurred at Intel. As its memory-chip business came under assault by more efficient Japanese companies, Intel's unique risk increased for that part of its business. At the same time, however, its microprocessor "distraction" with its strong convergence towards this new attractor reduce perceived risk and saved the company (Hazy, 2008a).

Economic Value Creation in Dynamical Systems

We propose that economic value creation can be seen in the context of how individuals, managers and investors gather, share and use information to make choices and act within a dynamical system model of the organization and the environment. The forecasted cash flows that sum to PV represent a way to gather and use information about the system and the environment to inform actors within the organization and in financial markets about the organization's prospects for acquiring and processing needed resources in the short and the long term (Helfat *et al*., 2006).

We argue that the relationship between FCF and the modeling of an organization's current and future access to resources of all types is a fundamental one. The ongoing need to evaluate current operations in detail and then to use the information that is available to assess an organization's current and continuing prospects for acquiring and processing needed resources would logical imply that an analysis technique like DCF would be needed in any case. A DCF analysis includes predicted access to resources of all types, assumes price levels for factors of production, and evaluates how this access might change in the future. A positive net present value (NPV) at the end of DCF analysis process—where all of the terms added together are greater than zero—implies that value is expected. It also implies that the organization will be viable into the future because it has and can acquire the resources that it needs.

We suggest that an analytical technique like DCF is necessary for evaluating innovation and social entrepreneurship in the context of social value creation. We argue that an approach that mimics DCF but that explicitly addresses an organization's value creation potential in the context of both resources and information is what is needed. In particular, an organization's value creation should be described according to the: i) level of access the organization has to necessary resources, both that it needs to operate and that are consumed or appropriated by its stakeholders; ii) information about those resources and their likely availability in the future; and iii) knowledge about how to use resources with maximum productivity. As we describe in the following sections, a modeling approach that uses a dynamical systems perspective would represent a more general and theoretically complete rendering of economic value because it could be modified to include the impact to other stakeholders and the potential for technology leverage (Hazy, Torras, & Ashley, 2008) and other value assessment techniques to increase the value of the resources.

DCF and Dynamical Systems

Traditional DCF analysis is actually a model of the firm as a dynamical system with cash flow as the variable of interest (Henderson & Quandt, 1980). Over time, the system's state—as reflected in its free cash flows—changes. The value of cash flows is a function of a number of variables and is constrained by certain parameters. Traditionally, in the explicit calculation of cash flows, the availability of raw materials, human resources, and financial capital are implicitly assumed as being fully reflected in market pricing mechanisms and in the process of estimating risk (Hazy, Torras & Ashley, 2008). As such, prices are included as variables in the firm's production function, and thus the prices are variables in the dynamical system reflecting the firm's FCF. Most often simplified linear models are used to estimate prices, however, such as a 5% per year price increase in raw materials. This is obviously oversimplified, in particular when resources are scarce. During the financial crisis of 2008, business and consumer credit (that is, financial resources) became unavailable, conditions where capital pricing models are irrelevant. Dynamical systems models that only use pricing inputs and ignore nonlinear constraining effects can become useless in these situations (because they ignore the impact of control parameters). Firms such as The

Big Three US automobile makers that were dependent on credit were caught off guard in the 2008 credit collapse and because of these nonlinearities, were threatened with collapse.

Bifurcation and Qualitative Change

In contrast, although we agree that resources—land & raw material, labor & human resources/skills, financial capital, and knowledge/technology including entrepreneurship—are critical to an organization's functioning, we argue that the *level* of resources available to the organization also acts as an external constraint on the system, implicitly serving as a bifurcation parameter for the system's dynamics. Changes to this parameter do not usually have a linear effect on growth. Traditional sensitivity analyses that are routinely done with DCF models are likely to miss the essential dynamics that ultimately determine the FCF stream. This is because the quantity of a resource that is available implicitly determines the system's internal dynamics and the nature of the attractor cage within which the system is constrained, and these may be sensitive to small changes in input, and when the underlying attractor cage changes, so too might the dynamics. Prior models may no longer apply.

An example of the bifurcation dynamic is the impact that access to financial capital has on a firm's FCF growth curve. An expansion stage company is often capital constrained and as a result pursues a self-funding operating plan. An injection of incremental funds from a venture capitalist might, if it crosses the threshold point, operate as a bifurcation parameter enabling innovation. Excess funds allow the organization to make choices including the funding of a portfolio of projects that might enable actors in the organization to identify an opportunity that is emerging due to ordering forces in the environment. A portfolio of "experiments" in turn generates a set of distributed information about the patterns within those forces. Analysis of this information from all of these experiments might allow managers to infer the presence of a consistent opportunity. If so, they can target their innovation activities toward the opportunity, as happened at Intel (Hazy, 2008a).

The bifurcation is thus as follows: Either the firm's management processes effectively channel excess funds to a set of value-creating projects that accelerate FCF growth, or the funds are squandered on unsuccessful projects where growth does not materialize and a lower performance path results, perhaps even liquidation. During the period of choice between these two results, increased complexity and instability are apparent, conditions that are called *dynamics of requisite complexity* (Goldstein, Hazy & Silberstang, this volume). This is when innovation and change become possible. Situations where two distinct stable states become simultaneous possibilities, even if one, potentially, is dissolution, are signals of a possible bifurcation.

On the other hand, if the value creating projects are funded, incremental funding above and beyond these successful projects might do little or nothing. The number of value creating projects that are available to a firm is limited by the opportunity potential in the environment; if there are no more opportunities, incremental funding will not drive additional growth. There is an optimal funding level, and even though additional funding above that level does not appreciably change the result, it is also true that a certain minimal level of funding is still needed to allow the firm to find the high growth path. Absent a cash injection, this bifurcation in FCF growth would not occur as the firm continued to follow its self-funded trajectory. To summarize, incremental cash (above a critical point), but not too much (still below a second critical point), enables the firm to either grow more rapidly of fail to capitalize on the opportunity. This nonlinear description of the dynamics of innovation is consistent with empirical results developed by (Nohria & Gulati, 1996) who found a nonlinear relationship between organizational slack and innovation. It is also consistent with computation complexity theories of innovation (Crutchfield, 1994).

Ordering Forces in the Environment

Organizations do not exist in isolation. Often, the environment is benign, but at times, a consistent pressure, an adaptive tension (Uhl-Bien, Marion & McKelvey, 2007), is placed on the system. For reasons described earlier, when adaptive tension originates as a consistent flow or force in the environment that is reshaping industries or societies—for example, the flow of manufacturing from the US to China due to wage differences—we call these "ordering forces." We represent them as potential functions acting on the units of the system, for example, individual workers, as well as on the system itself. Sometimes, information about ordering forces can be observed within fluctuations, and sometimes this information can be reproduced and predicted by actors within the systems intent on creating a dynamical system model to describe the environmental opportunity. Presumably, this was what was done at Intel when they prepared their first microprocessor business cases.

Ordering forces (that are driving the system toward an attractor) in this larger system operate as downward influence on the nested systems within because they impact the smaller system's ability to maintain its access to the resources it needs; new markets or new technologies can all be relevant variables. Dramatic changes in the coarse-grain dynamical systems within the environment can therefore set off a structural reordering of nested finer-grain organizations if their agents are in a position to recognize the weak signals associated with the ordering forces and reorder their systems accordingly. For example, in the late 1990s and early 2000s, US information technology (IT) jobs were increasingly outsourced to India. This trend was driven by several factors—wage differences, educational achievement in India, and the adoption of total quality management processes—that could have been modeled using dynamical systems techniques. Experiments within US companies that made use of these offshore services allowed those companies to detect the weak signals and potentially recognize a pattern and build models (e.g., business cases) to reflect the dynamical systems that were driving the trend. These experiments allowed participating companies to see the new pattern that in turn implied a new emerging attractor (off-shoring of IT) as an alternative to the one (local IT staff) that had previously governed the dynamics within the nested system.

Social Value Creation

How can the DCF approach be translated into an analytical technique for the calculation of social value? First, it is necessary to define a single metric for the social value created, one that considers the nature of the value created. It would likewise be helpful if the metric is analogous to free cash flow and that all flows into and out of the system are considered. Next, a method of discounting, or one that is comparable to discounting, which can be used for comparing future value created to current value created must be identified. Finally, market mechanisms analogous to capital markets are needed to determine the discount rate.

Social Value as Ensuring Continuing Access to Necessary Resources

It is necessary to identify a single metric for purposes of a general approach for comparing projects across sectors. The new metric need not be the only possible one. It could also be a "vector" that includes several metrics like the triple bottom line. In any case, once it was introduced, it could be used to compare different projects against an objective scale while other factors could also be considered as alternatives are evaluated.

We recognize that all of the inputs and desired outcomes of various and unrelated social projects cannot always be easily reduced to dollars and cents in a manner that would be internally consistent. However, we do see a dynamic that seems to be common across many types of social projects. It also might imply a common metric, particularly if units in this metric can be traded in markets. Embedded in the objectives of projects as varied as health care, literacy, education, family planning, disaster relief, and climate change is what amounts to a generalization of the adage: "if one gives man a fish, he eats for a day; but if you teach a man to fish, he eats for a lifetime." In other words, a certain type of social value is created when the target groups gain access to resources ("the fish") *and also when they are given access to information* or knowledge about how to continue to gain access to resources and use them efficiently ("knowing how to fish"). This is true whether the resource is food, education, health services or fresh water. The adage can also be interpreted in DCF terms.

Access to and use of resources in the current period (if this could be measured) is comparable to business activities that result in free cash flow (FCF) in the current period. Because the relevant target groups have access to information and know how to use it—they know how to fish—they have the relevant capabilities to continue to have access to resources. As a result, using only information in the current period, but because some aspects of dynamical systems are stable and can be predicted, their ability to access fish in the future can be assessed and models can be built to forecast future periods (FCF in future periods). Finally, by modeling the stock of fish and competition for fish as well as other relevant dynamics, the probability that the necessary capabilities (knowing how to fish) will retain their ability to access fish can be estimated. In such dynamical systems models, the variance or volatility in outcomes (and thus the volatility of FCF in future periods) can be estimated. This is the essence of discounting. Resources and information about acquiring and processing information are the key elements of the analysis.

Although not quantified, Seitanidi (this volume) provides an example of how social value was not created in the sense meant here. She laments the fact that although considerable value (resource benefits in the current period) was created in the specific projects that resulted from a partnership between the Royal Bank of Scotland Group and the Princes Trust, a charitable foundation, little future value was created. This was because information from the Trust did not flow to the bank to change their procedures more broadly. An opportunity to create lasting social value was lost. Unfortunately, with current methods this opportunity cost could not be quantified.

In contrast, Tapsell and Woods (this volume) provide an example of how social value can be, and in fact was, created among the Maori of New Zealand through both resources and information. In a classic social entrepreneurship venture, young Maori developed a company that compiled and sold maps of traditional cultural sites for the Maori. It was an economic venture and so the economic value that was created could be measured with traditional DCF techniques. In addition, however, intangible social value was created. By compiling, documenting and making information about the Maori's cultural heritage available not only to tourists, but also to Maori young people who were increasingly alienated from their history, cultural resources were made available and future access to them was enabled.

Of course the social value generated was not measured, but if it had been, both current and future value could have been assessed. Further, by using dynamical models of demographic changes as well as models of natural and social systems, the probability that the Maori maps would provide future value could also be estimated. If the probability is high and variance is low, the discount rate would be low. If the variance or volatility is high, the discount rate would be high, meaning less value was created in the future by this particular program. These ideas suggest the following proposition:

Proposition 1: *Both access to resources in the present and information about how to acquire resources in the future are important components of social value creation and therefore also to economic value creation.*

With respect to economic value creation, FCF measures both of these. In the current period, explicit calculation of the "resources acquired through markets versus those consumed" are core to the calculation of current period FCF and is critical for establishing a starting platform from which value is calculated. Based upon this information, forecasts about the future of markets, operations and technology leverage—forecasts which implicitly use the information available in the current period—are used to forecast continued access to and use of resources in future periods. FCF from any period measures the accumulated "buying power" available for the acquisition of resources in the future. It represents the potential to reinvest in the business going forward, to grow its capabilities. This current period value accumulated through organizing activity and resource processing technology that was implemented during that period. In this respect, economic currency and ubiquity of markets provides a ready measure of an organization's success at positioning itself to gather and use the resources that are required to remain viable well into the future.

When an organization has an operational or dynamic capability (Hazy, 2008b; Helfat, 2006), it has the capacity to perform some function which adds value to the organization, like manufacturing or distribution capabilities. The organization has the resources and the information, knowledge and technology to continue in the future what it has done successfully in the past (assuming the environment and the competition remains relatively stable). In short, the organization "knows how to fish" in some sense, and thus one has confidence that resources will be available for that firm in the future. It is the job of CEO, CFO and management in general to build capabilities and develop business strategies that address potential changes to resource availability, in other words, "changes in the availability of fish" (Teece, Pisano & Shuen, 1997).

The challenge for the social entrepreneurship community is determining a metric that is analogous to FCF for social enterprises. Certainly, to the extent that value provided can be reduced to a dollar value, FCF is relevant. But we believe that a more encompassing measure is needed, a kind of social currency that can be earned, used to acquire social services resources, and be traded in markets. We will return to this idea shortly.

Assessing Risk in the Delivery of Future Social Value

Unfortunately for all of us, simply knowing how to fish does not necessarily mean there will be fish to catch. In other words, there is always risk when forecasting future benefit. This relates to the challenge of recognizing weak signals that reflect reordering forces in the environment. If these signals are detected, and if a structural reordering is forecasted to be possible, there is a potential in the environment for a change to how resources will be gathered in the future. This is analogous to the risk that future cash flow will not be realized.

The uncertainty and risk associated with possible futures must be included in any assessment of future potential for access to social services resources. At present, aside from an ad hoc process that attempts to reduce some aspects of social value to dollars and cents and then using DCF to evaluate risk, there is no method for quantitatively assessing future risk in social enterprises and then comparing outcomes and an associated variance with current value. The method we suggest in Proposition 1 opens the door to assessing risk and implies a second proposition:

Proposition 2: *When forecasting future access to resources, the stochastic nature of the system implies that information about the system, and potentially about the reordering forces in the environment, are observed as random variables. This implies that not only is there an expected value, but there are also higher order statistical moments such as variance, skewness and kurtosis.*

The existence of these statistics makes it possible to quantify a level of risk in the future with respect to the potential for the system to continue to acquire resources in future time periods. Estimating risk enables discounting in the calculation of social value.

As in the case of the earlier proposition, the DCF process fits this model as well. When forecasters determine the discount rate to be used in the DCF calculation, they either explicitly or implicitly incorporate observed variance in the value equations of their analysis. It is assumed that greater uncertainty implies greater variance in future expected outcomes, and these together imply a higher discount rate. Thus, the DCF model is conceptually consistent with the framing described in Proposition 2.

Making a Market for Social Value Risk that is Analogous with Capital Markets

Even if a metric can be developed and risk can be incorporated in the analysis, an efficient distribution of resources in the present depends upon market mechanisms to establish relative value or prices. For instance, how does one compare access to health care to access to clean air or water? Creating new markets that establish relative value based upon supply and demand dynamics is the greatest challenge for policy makers. Although these various interests might ultimately prove to be incommensurable (Torras, this volume), the potential benefits of a unified approach are such that a continued effort along these lines is warranted.

Existing cap-and-trade programs for atmospheric emissions are examples of using a market approach to realize social benefit although the value is not directly reflected in the market price. Although individuals breathe the air and benefit from controlling global warming, it is the producers who interact with one another in a market context to determine the cost of emissions (including regulator imposed costs for polluting) and thus the value of investing in emission control equipment. If it is cheaper to buy units of emissions, the equipment investment is deferred. This allows market mechanisms to drive the efficient allocation of resources.

Social value is realized because emissions overall are reduced. However, this value resulted, not because it was measured directly, but rather because a cost was attached to pollution, creating an incentive to pollute less; clear air thus became available to the community. Information about the system and about the environment (in the form of emission control technology and equipment) was used in the dynamical system models that were developed by the industry players to predict the future state of the organization and the environment. This in turn provided continuing access to greater quantities of clear air and water going forward.

This approach is consistent with Proposition 1. It also implies the following:

Proposition 3: *The existence of markets for trading social services delivery units among providers and those who are obligated or who otherwise choose to provide services would, by establishing relative value, lead to an efficient allocation of resources among various social services projects with differing objectives.*

The unsolved challenge for policy makers, of course, is doing this in a general way. In particular, using the cap and trade analogy, the issue of assigning a cost to be borne by the appropriate commercial actors and that can be addressed directly (in the example, through pollution control equipment) or where rights not to provide the service (the right to pollute) can be traded in markets is a knotty one. Problems like specific location requirements for health care delivery and other unique needs not universally demanded are only some of the difficult challenges that would need to be addressed. In the end, however, we imagine a marketplace where units of emissions can be traded with units of healthcare delivery or work-training programs for the disabled. If these deep commensurability problems can be solved, market-based mechanisms could be used to efficiently allocate scarce social services resources across sectors.

A Tentative Proposal: Markets for Trading Social Services

As mentioned earlier, as a starting point for discourse, we suggest that what amounts to a social services currency and a trading marketplace be created for storing and evaluating social value. Some specific ideas on this are offered later. Although this may seem challenging proposition, there have been policy precedents such as school vouchers and cap-and-trade markets as mentioned above. What we propose is a more general and encompassing approach that uses the ideas from this Chapter to connect various aspects of social value and eventually allow industrial and governmental players to trade a number of units that reflect the right to pollute the air for a number of units that represent obligations to provide schooling for children. These would be traded as a means to reflect the relative value of these social services to society.

The process might work like this. When individuals use a social service, the social service provider earns what we call Social Service Provider Units (SSPU) for having provided the service. In other words, the SSPU represents "resources made available by service providers" to be consumed by individuals in need during the current period. Thus, SSPU is compatible with item 1) in proposition 1. It measures the availability of resources in the current period.

But how would one determine the relative value of different services in SSPUs? This is where market mechanisms offer help. Using the example of school vouchers, a surrogate for SSPUs, the standard argument is that vouchers use market mechanisms to allocate resources. Parents are issued vouchers and they can use them to "buy" access to the school of their choice. Unfortunately, these vouchers are given to parents and there is no independent valuation mechanism that determines the value that is created by the services provided. Vouchers are assumed to *cover the cost* of providing education and do not *reflect the value* provided by the education. As a result, there is no "profit" to be reinvested in the enterprise.

We believe that in addition to obvious political resistance, one reason that school vouchers have not caught on is that they use markets to offset costs rather than to generate value. At present, there is a fundamental difference between economic goods and services and social goods and services. When social services are consumed, although they increase comfort and even, potentially, individual value in the short term, they do not create additional structural capacity to create more social value that builds upon itself into the future (the positive feedback cycle) the way that economic value builds wealth. Although one could argue that educating a child brings value to that child over its lifetime, this is not the same as a positive feedback cycle where profitable sales leads to excess cash flows that can be reinvested into greater structural capacity to produce more value in the future. Unlike economic goods and services where the act of purchase for consumption actually creates value to producers in the form of positive cash flows, when social services are consumed, no "social value" is created *in the provider* in the sense that there is no intrinsic incentive to increase the provider's capacity to provide more services in the future. There is no "return on investment" to the service provider or its stakeholders (other than the obvious psychological benefits).

In the social wealth creation process we envisage, the key stakeholders are the providers of various social services on the one hand, and the social actors—whether from the private or the public sector—who choose to fund the services on the other; the users of the social services are only indirect stakeholders as beneficiaries (but not direct funders) of the services. This group is analogous to the breathers of fresh air. Users create competition on the delivery side of the service equation, but they have only indirect influence on resource allocation decisions. Thus, an alternative use of market mechanisms is to create active markets among producers of social services (supply) and those obligated or who desire to provide such services (demand), markets where profits can be taken in the form SSPUs in excess of costs.

Parents would be able to send their children to any accredited school, a process that would create competition for quality, but there would be no vouchers. As an example, when a school educated 100 third graders, it would get a certain number of SSPUs. If the next year, it attracted 200 third graders, it would get twice as many units even if the incremental cost was nominal. This amounts to "profit" that can be reinvested in innovation and improved delivery in the future. On the demand side, school districts would purchase, from various suppliers, the SSPUs they need to support their constituents. Because the value of the services would be determined by a market mechanism, the additional "value" created in the current period could be stored or invested in building capabilities—learning how to do a better job "fishing"—that would enable the entity to attract and provide access to more services resources in the future.

As more schools showed improved performance, competition would drive down the "price" of units of this service. The market mechanism would thus enable funding sources on the demand side to shift their value creation efforts to other priorities, reducing greenhouse gases, for example, as more firms entered these "markets" to provide these services in the hopes of building long term value. Oversupply of a given service would drive down prices, while under-supply would encourage new entrants and eventually reduce prices. Efficient provision of social services would eventually result. The pricing would occur through trades between those obligated to offer these services and those organized to provide them. Social value creation could then be evaluated in terms of the net present value in SSPUs.

Concluding Remarks

In this chapter we argue that if social entrepreneurship is to form a solid basis for social development, as opposed to becoming just another fad (Trexler, this volume), we need a clear definition of the social value that it seeks to create. Also needed is a method to evaluate the value creating potential of various and competing projects. For ideas, we looked toward economics and finance as representing an area where an analytical framework and model building discipline have been developed and used successfully to support cumulative value creation in the form of economic wealth. In particular, we described the discounted cash flow (DCF) analytical technique as a prototype method that includes in its calculations the benefits realized in the future as well as those realized in the current period. We argued that DCF could be understood as a means to evaluate two kinds of value: the value of the resources accumulated by current operations and the value of the information that exists and models that have been developed to the predict access to resources in the future. This same approach can be used to better understand the cumulative value building process in the social sector.

Based upon the above analysis, we suggest initial steps to enable the systematic analysis and evaluation of social value creation. We propose that a complex systems perspective be adopted as a background in which competing projects are considered. In particular, we suggest an epistemological stance that includes the assumption that the agents within this complex system, including observers and analysts, have the capacity to develop dynamical systems models of the social and economic environment in which they participate. These models are useful in that they can replicate and predict the environment with a degree of accuracy and economy that promises stability. We argue that it is precisely this stance that is taken, perhaps implicitly, by economists and financial professionals when they use DCF modeling to evaluate competing projects in economically-driven dynamical systems. With a broader framing that includes non-economic factors and stakeholders in these dynamical systems, we argue for an analogous technique to be used to evaluate social value.

Such a program is not without its challenges. First among these is the problem of establishing a method to measure social value that is transportable across sectors. Such a measurement would enable projects to be compared and choices to be made among competing agendas. To compare the future with the present, a method analogous to discounting is also needed, and this requires a measure of risk about the future. Conceptually, as we have described, dynamical systems models include uncertainty in their predictions; as such, these models can be the basis for a generalized discounting process.

Finally, policy issues must be addressed. Mechanisms that are analogous to exchange currency and markets are needed as a means to allocate resources efficiently. Difficult economic and political environments make these hurdles difficult, but not insurmountable. Perhaps the shocks in the current global economy, like those of the financial crisis of 2008, may have created a situation where such changes become possible. Perhaps this is a bifurcation moment. The weak signals are everywhere; will policy makers recognize the potential and seize the opportunity?

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