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ORIGINAL PAPER

The Relevance of Systems Thinking in the Quest for Multifinal Social Enterprises

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Abstract Human deprivation and suffering around the world are increasing despite the efforts of traditional aid-based approaches focused on alleviating poverty and improving the quality of life for marginalized communities. There is ample evidence that billions of dollars in aid money have been expended on development projects that are fundamentally unsustainable. On the other hand, social enterprises, which improve lives and livelihoods through practical market-based approaches, are growing in number. Systems Thinking can be especially helpful in navigating the complexity and chaos inherent in social ventures in developing communities. Lack of clarity in the roles, responsibilities, and returns for the various stakeholders epitomizes this chaos and is a major contributor to the failure of such projects. By employing Systems Thinking, entrepreneurs can establish accountability mechanisms, ensure equity for all stakeholders, and facilitate system sustainability. Though much research exists on both Systems Thinking and social enterprise, few sources discuss how Systems Thinking can be practically applied to conceptualize, build, and sustain social enterprises in an easy-to-understand manner. This paper synthesizes definitions of the tenets of Systems Thinking including interdependence, holism, multifinality, equifinality, differentiation, regulation, abstraction, and leverage points. The relevance of each of these tenets to social entrepreneurship is described, and further reinforced, with

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examples. A practical understanding of these tenets can empower entrepreneurs as they navigate chaotic environments in the quest for social enterprises that create win–win situations for all stakeholders.

Keywords Systems Thinking · Social entrepreneurship · Humanitarian engineering · International development

Introduction

Social enterprises, by definition, seek to achieve financial viability while contributing positively to society (Emerson and Twersky 1996). With multiple bottom lines to satisfy, innovators must skillfully navigate a myriad of complex economic, cultural, and social challenges. How does one most efficiently approach these challenge areas? What frameworks can an entrepreneur utilize to manage the chaos inherent to social enterprises? How do social entrepreneurs ensure that all stakeholders associated with an enterprise are satisfied? The tenets of Systems Thinking provide practical tools for managing and monitoring social venture development processes and operations. This conceptual paper synthesizes the tenets of Systems Thinking into an accessible and usable toolkit for the development and operation of sustainable and scalable social enterprises. Examples are provided that elucidate why Systems Thinking is relevant in the context of social enterprise and how incorporating Systems Thinking into the design and business strategy of social ventures can result in larger impact. A specific goal of this article is to make the seemingly esoteric buzzword of "Systems Thinking" accessible to practitioners.

Development, Social Enterprise, and Systems Thinking

In 2000, the United Nations (UN) initiated efforts to combat some of the most compelling challenges facing the world (Sachs and McArthur 2005). The UN's millennium development goals (MDGs) were established to address the challenges of poverty and hunger, primary education, gender equality, child mortality, maternal health, disease prevalence, environmental sustainability, and global partnerships. The UN established ten task forces in order to meet goals in each of these challenges by 2015. Now, less than 3 years from the target completion date, "few goals are entirely on track globally and, those that are, show substantial variation" (Waage et al. 2010). There have been several challenges to implementing change in developing countries (Sachs and McArthur 2005). For example, initially, nations and international organizations struggled to identify leadership for the MDGs. In addition, the goals were approached in a segmented fashion (Waage et al. 2010). The inherent interconnectedness of the problems confronted by the goals warrants a systemic approach to their resolution. To grasp the full scope of an individual goal and devise sustainable and scalable solutions, one must actively consider the adjoining systems that influence it.

Systems Thinking is a holistic approach to solving complex problems by considering every issue as a part of a web of interconnected and interacting systems rather than as independent issues with unrelated consequences. It has been applied to diverse disciplines including psychiatry, computer science, business, architecture, agriculture, engineering,

and public health. The tenets of Systems Thinking, when used together, exemplify how to strategically assess, enhance, and implement a system. For complex endeavors, as any development challenge can be described, Systems Thinking serves as an organizational tool and a means of project management. Integrating Systems Thinking into approaches towards the MDGs could have potentially alleviated the problems, by establishing leadership and task ownership (Waage et al. 2010). A second barrier to the realization of the MDGs is the weak state of healthcare systems in low- and middle-income countries (Remme et al. 2010). Applying Systems Thinking to healthcare can enable policy makers and change agents to "understand how health system building blocks, contexts, and actors act, react, and interact with each other" leading to improved and more efficient health interventions (de Savigny and Adam 2009).

Over the past decade, educational institutions in the US and abroad have developed academic programs in social entrepreneurship in attempts to create sustainable social impact in their local communities and around the world (Colledge 2012). Such academic programs engage students in the conceptualization, development, and implementation of social enterprises in resource-constrained environments, often with a focus on technology-based ventures. These academic programs and emergent ventures collectively provide a different approach to international development—a way of effecting change in communities from the bottom-up. The successful praxis of social entrepreneurship necessitates a study of Systems Thinking, as the application of engineering to address complex social challenges can be viewed as a "maturation of the founding principles of systems engineering" (Burnham 2009). The systems approach to complex problem solving at times has failed because engineers and entrepreneurs have not taken influential factors into consideration, such as environmental challenges, trust issues, and social dynamics (Ackoff 1979).

Humanitarian engineering inherently includes the study of contextual information that often serves as a barrier for practitioners of Systems Thinking (Hughes and Hughes 2000). At The Pennsylvania State University, the Humanitarian Engineering and Social Entrepreneurship Program seeks to engage students from all disciplines to construct technology-based solutions to some of the world's most compelling challenges, including healthcare access, water availability, food scarcity, and pay equality in the ad-hoc labor market. The products developed by students involved in the program are assessed against the four hallmarks of sustainability: technological appropriateness, environmental impact, social acceptance, and economic viability. Through the program, students learn skills associated with engineering design, business strategy, communication, ethics, and grassroots diplomacy. Further, they become grounded in the tenets of Systems Thinking, in order to ensure that their solutions fit seamlessly into, and harmonize with, the pre-existing technological, cultural, socio-economic, and political systems in marginalized communities.

Applying Systems Thinking to technology-based social venture development enables a more thorough understanding and regulation of venture goals, reach, and impacts (Stepler et al. 2010). For all ventures, closed-loop regulation structures must be incorporated in order to ensure that all stakeholders (e.g., community members, industry partners, academic institutions, etc.) receive value from, and are accountable to, the endeavor. Additionally, the system must be viewed holistically, as doing so allows causal relationships to be established between component parts. Further, since social ventures are inherently dynamic, Systems Thinking frames problems as patterns occurring and recurring over time. If such patterns are established, solutions can be generated that get to the root of a problem, as opposed to palliative solutions that temporarily erase symptoms. Systems Thinking lends itself to entrepreneurial ventures as it imparts a perspective of scale. Instead of looking at a static situation, such as one person's experience in receiving medication,

Systems Thinking seeks to assess the broader field of healthcare (de Savigny and Adam 2009). Or, as described by Richmond, Systems Thinking allows one to see both the forest and individual trees. Systems Thinkers see both the generic and the specific—not just the latter. Behaviorally, they see both the pattern and the event (Richmond 1994).

Social ventures must be developed to work within pre-existing systems within partnering communities. Hence, the design efforts by venture creators need to be driven by contextual awareness. Designers must possess a thorough understanding of customer needs, their financial habits, preferences, and the political, cultural, and religious systems in which they exist. Tracking all critical systems of interest can quickly become unwieldy and chaotic, especially in the inherently unpredictable and paradoxical context of developing countries. It is in these situations that Systems Thinking can be especially beneficial to entrepreneurs as they seek to understand contextual dynamics and develop practical and sustainable solutions. The goal of this article is not to prove or disprove a certain hypothesis or approach to problem solving. Rather, it is a conceptual article that aims to aid entrepreneurs in their quest to create multifinal social enterprises. While multifinality is not by any means the most important tenet of Systems Thinking, it does reflect the ultimate goal of social entrepreneurs: to create ventures that efficiently utilize resources to address challenges and satisfy stakeholders' needs. Systems Thinking serves as a practical tool for anyone working in the development sphere, whether it be with a non-profit, a private company, or a university.

The Theory of Systems Thinking

Systems Thinking is the process of understanding the interactions and influences between various components in a system. It may also be defined as an approach to solving complex problems by addressing every issue as a component of a larger system, rather than as an independent aspect with unrelated consequences (Ackoff and Addison 2010). According to a study by the Waters Foundation, Systems Thinking does not possess a definitive form, but instead manifests itself as a set of tools, habits, and practices (Waters Foundation 2012). Emerging in the twentieth century, Systems Thinking evolved through a critique of reductionism. Reductionism effectively distills various phenomena into their constituent parts and studies the cause-and-effect relationships between those parts. The influence of reductionism on Systems Thinking led to the core role of interrelatedness within the emerging discipline (Flood 2010). The utilization of Systems Thinking helps to map dynamic complexities (Waters Foundation 2012) and understand the causal relationships between the various component subsystems. The focus that Systems Thinking places on cyclic cause and effects, as opposed to linear cause–effect relationships, represents a major distinguishing characteristic of the practice (Checkland 1981).

Often confused, it is important to make a critical distinction between Systems Thinking and systemic thinking. Systems Thinking involves viewing a broad entity, its component parts, and relationships between the two. The latter term, systemic thinking, supposes only that the social construction of the world is systemic, implying that a large, complex system can be broken down into smaller parts and those parts can be analyzed individually. However, systemic thinking deemphasizes the interconnectedness of those parts (Flood 2010).

Tenets of Systems Thinking: Exploring the Toolkit

This section reviews eight tenets of systems theory: interdependence, holism, multifinality, equifinality, differentiation, regulation, abstraction, and leverage points. For each tenet, definitions from various established systems theorists are presented, followed by a synthesized definition based on the experiences of the authors. A crucial point to remember however, is that, just as Systems Thinking does not have one standard definition, standard definitions also do not exist for any of the tenets of Systems Thinking. These terms are highly contextual, and hence their definitions vary from one source to the other. The authors synthesized definitions to clarify each tenet's role in an entrepreneurial setting. These definitions are further elucidated by a practical application of each tenet to a social venture. The examples illustrate how the various tenets function congruently.

Throughout the subsequent definitions, various social enterprises will be used to illustrate the application of some tenets. For example, Kiva.org is a peer-to-peer microfinance platform that enables individuals to provide loans to small businesses around the globe. Donors can view entrepreneurs' profiles online and choose an individual to finance. Loans can range in amounts from as low as US$25. Kiva collects the funds and distributes them to partnering field entities, which in turn provide the loans to the intended community members. Loan recipients invest the money in retail enterprises, agricultural technologies, and housing improvement, among many other endeavors. Once the loans are repaid, the donors have the option of collecting their money or reinvesting it in another project. Kiva effectively designed, and now operates, a complex system that has the capacity to change the lives of individuals and the world as a whole. While the Kiva approach and platform might have its own inadequacies and not employ every aspect of Systems Thinking, it provides us a valid context with which to study the tenets of Systems Thinking.

Tenet 1: Interdependence

Interdependence, as defined by Senge, is the interactive effect of tasks, goals, and feedback combinations (Senge 1990). Saavedra, Earley, and van Dyne expand upon Senge's work and examine the dynamic relationships between all living things and the systems in which those relationships exist (Saavedra et al. 1993). Looking at interdependence in other contexts, Colman defines interdependence in game theory as a state in which all firms in a market or players in a game, though in competition, are dependent on the actions and strategies of all the other firms or players in that market or game. He goes on to say that, when players are interdependent, the moves of one will have ramifications for all other players in that game (Colman 1995). Similarly, Mackey and Santillán discuss biological interdependence through the example of what happens to one plant or animal also affects other plants and animals (Mackey and Santillán 2005).

The authors define interdependence as the mutually beneficial and reciprocal relationship between systems. Interdependence is aimed at satisfying the needs for development, co-creation, and resource optimization to achieve relational integrity within a larger system, of which every small individual system is a subsystem. Simplistically, interdependence means that all systems depend on other systems or subsystems to successfully meet their responsibilities. These responsibilities may be physical, emotional, financial, social, moral, and/or corporate. An example of this tenet can be found in the training and work practices of Johnson & Johnson, a global corporation. New employees undergo exercises in which they are linked in a manner such that no individual employee can succeed unless all

group members succeed. Group members are required to internalize how their efforts directly affect company progress (Johnson et al. 1998).

In the process of venture development, interdependence comes into play in several capacities. First, enterprise leaders must view all aspects of their design as being interconnected. For example, if the entrepreneurial endeavor is centered on a low-cost cook stove, all of the materials that comprise the structure must be compatible. If heat degrades the stove over time, the product strategy must be reconsidered. Additionally, when developing the business strategy, one must examine the existing systems (e.g., cultural, social, financial) that can aid or hinder venture acceptance. Components of these systems are inherently interconnected and must be viewed in unison to develop a full understanding of them. Finally, when considering how to implement a venture into an intended context, entrepreneurs need to identify partners than can corroborate their efforts. However, in social businesses, the stakeholders become increasingly interdependent as they often have multiple bottom lines to meet.

Let us consider three individual systems: the Internet, donating money in return for social goodwill, and seeking seed capital from a venture capitalist. These systems exist and sustainably survive within the global marketplace. However, from Kiva's perspective, these are highly interdependent subsystems that help sustain Kiva's business model. Kiva enables individuals to donate money to an entrepreneurial venture in a developing country via the Internet. In this case, these otherwise individually surviving systems are mutually dependent on each other. They collectively satisfy Kiva's needs for optimizing every donation so as to provide seed funding to promising ventures in their target markets.

Tenet 2: Holism

One of the first published works on systems theory by von Bertalanffy describes how component parts are interrelated and influence each other, with the end result being a whole organism that exhibits emergence (von Bertalanffy 1950). In 1971, von Bertalanffy modified his definition to say that holism is the idea that all of the properties of a given system—whether physical, biological, chemical, social, economic, mental, or linguistic—cannot be determined or explained by their component parts alone. Instead, the system as a whole determines how the parts behave (von Bertalanffy 1971).

In 1998, Flake, with respect to holism, stated that "the whole is greater than the sum of the parts." Holism is credible on the basis of emergence alone, since reductionism and bottom-up descriptions of nature often fail to predict complex higher-level patterns (Flake 1998, p. 454). Applying Flake's definition to action research, Flood defines holism as an emergent property of a whole, arising when a phenomenon cannot be fully comprehended if examined only in terms of its constituent parts (Flood 2010). Looking at holism from a cultural perspective, Eller defined holism as a part of the "anthropological perspective" that involves consideration of a certain aspect of a culture in relation to other aspects of that culture, and to the society where the culture is practiced as a whole (Eller 2009). Ultimately, there are two main aspects to holism: (1) the parts of any system can only exist and be understood in their relationships to the whole and (2) the whole is always greater than the sum of its individual parts.

An example of holism's necessity can be found by examining donation-based models of community service. Under such models, individuals or organizations raise funds in the Western world through donations and grants, and then install developmental infrastructure such as windmills or water treatment plants in developing countries. The rural communities, who should have played a major role in the development process, are often not

included in the decision making process. While attempts to understand the individual components of the system may occur, without community participation the system intricacies are not analyzed as they relate to each other and this lack of holistic approach causes the project to fail (Haimes 1992).

Looking again at Kiva.org and its three interdependent systems from a holistic viewpoint:

- Kiva as a larger system can only exist and be understood through its subsystems: Internet, donations for social goodwill, and seeking seed capital. Further, Kiva must assess exactly how these three independent systems will function in relation to each other for Kiva to meet its objectives.
- Kiva, within the context of providing funds to marginalized individuals, will always provide a higher value proposition than its subsystems operating individually.

Tenet 3: Multifinality

Von Bertalanffy defines multifinality as attaining varied alternative objectives from the same inputs, all systems remaining constant (von Bertalanffy 1971). Cicchetti and Rogosch expanded on the concept of attaining varied objectives and defined multifinality as divergence: several outcomes from parameters in an interconnected hierarchical system (Cicchetti and Rogosch 1996). Luyten et al. defined multifinality as similar developmental factors leading to dissimilar outcomes (Luyten et al. 2009). Examining these definitions in the context of childhood trauma epidemiology, several studies have demonstrated that children exposed to similar childhood trauma may manifest multifinality. Similar stressors could be associated with distinctly different outcomes in different individuals (Menard et al. 2004). Similarly, Baykal defines multifinality in open systems as the possibility of attaining alternative objectives from the same inputs (Baykal 2009). In geo-spatial systems, where resource optimization is a critical challenge, multifinality is increasingly more important—a select set of sensor systems being able to provide various geological data amidst multiple influential factors (climate, power availablity, etc.) (Bennett and Tang 2007).

In all of the above definitions, if the contextual relevance is stripped, the idea behind multifinality proves identical: being able to achieve several distinct outcomes from one original system, product, or process. When discussing technology-based social ventures, the concept of multifinality refers to designing a system in which the individual actors and inputs, the subsystems, and their interactions all meet their own goals while the system as a whole also meets its goals (Stepler et al. 2010). For example, a healthcare enterprise would need to ensure that all stakeholders (patients, clinicians, funders, government leaders) are satisfied, but also that the enterprise meets its goal of increasing access to health care.

The Grameen Bank started as a microfinance institution. In 1976, Dr. Muhammad Yunus had conducted a research study in the village of Jobra, Bangladesh, which is near the University of Chittagong where he taught economics. He discovered that very small loans could make a disproportionate difference to a poor person. Upon talking to several commercial bankers, he discovered that the largest problem with loaning to "poor" people was lack of a collateral. When he gave out his first set of loans from his personal account, he set up a meeting with several members of the community, along with the women to whom he was providing the loans. The women's groups repaid the loans in a timely manner every single time. He experimented with this strategy several times, each time, just as successfully.

Analyzing the Grameen Bank for multifinality, we observe that it manifests:

- a "banking organization" from the perspective of a certain customer base;
- a "microcredit institution" from the perspective of another customer base;
- a "social capital feedback system" from the perspective of all customers;
- a "social network" from the perspective of group loan recipients;
- an "employment system" from the perspective of employees;
- a "training institution" from the perspective of potential employees and participants; and
- a "national economic progress system" from the perspective of the Bangladeshi government.

Tenet 4: Equifinality

Von Bertalanffy defines equifinality as the principle that, for open systems, a given end state can be reached by many potential means (von Bertalanffy 1971). Weisbord used this definition to describe productive businesses and said that firms may establish similar competitive advantages based on substantially different competencies, and these advantages may be called equifinal (Weisbord 1987). According to Wolfe and Mash, in psychology, equifinality refers to how different early experiences in life (e.g., parental divorce, physical abuse, parental substance abuse) can lead to similar outcomes (e.g., childhood depression). There are many different early experiences that can lead to the same psychological disorders (Wolfe and Mash 2006). In environmental modeling studies, and especially in hydrological modeling, two models are equifinal if they lead to an equally acceptable or behavioral representation of the observed natural processes (Beven and Binley 1992; Beven and Freer 2001). Croft defines equifinality in geomorphology as similar landforms arising as a result of several uniquely different sets of processes (Croft 1996).

Again, examining technology-based social ventures, Stepler et al. define equifinality as the concept of convergence: attaining the same desired output through several different channels/inputs (Stepler et al. 2010). The authors define equifinality as the concept of being able to achieve similar end goals through varied processes. The social, economic, and environmental impacts of each process must be determined to identify the optimal course of action. In the realm of social enterprise, equifinality is manifested through the various business structures that can be utilized to create sustainable mission-driven businesses. For-profit, non-profit, donation-based, and hybrid business models are all valid approaches to achieving economic, social, and environmental bottom lines.

To understand the concept of equifinality, we analyze four independent ventures that manufacture and/or sell solar lighting systems in the Indian market. Each venture faces unique challenges, though each manages to reach the same end goal of making solar lighting available.

Greenlight Planet

(http://greenlightplanet.com/) Every year, over US$38 billion is spent on fossil/alternate fuel–based lighting systems like candles, kerosene lamps, and wood in India. Greenlight Planet sells inexpensive small-scale solar lamps (US$20). In India, individuals spend approximately US$2/month on lighting using candles or kerosene lamps. If instead they either access a small loan or save enough to purchase a US$20 solar lamp, the return on

investment can be under 10 months. Beyond 10 months, the owner saves money by using their solar lamps. Greenlight provides a 1-year warranty to its customers, for which they provide free on-site testing, training, and repair. On the social side, their value proposition promises a safer living environment through brighter, non-polluting lighting as well as better community growth through their distribution network.

Selco-India

(http://www.selco-india.com/) Selco is a solar lighting company operating in southern India that proves ventures with a social bottom line can operate as commercial enterprises. Selco sells large-scale solar panels to groups for residential use, or to community-based organizations for the overall betterment of the community. Some of the most common uses documented are: lighting, water pumping, telecommunication systems, and computing. To keep the per capita cost of solar energy down, they provide long-term support for maintenance and repair, thereby increasing the lifespan of their products. Selco has partnered with regional banks to make available 3–5 year loans at 5–14 % interest rates with 10–25 % down payment. They thus have incentivized a culture of saving for communal growth. As part of their social bottom line, Selco provides training to their customers on how to install, set up, and maintain a solar power system to obtain maximum efficiency out of it. At the same time, they seek out interested candidates to teach and allow them to shadow the current mechanics. Thus, when these new candidates are ready, they can apply for a job at Selco, or pursue the entrepreneurial route and open their own maintenance and repair business.

SEWA

(http://www.sewa.org/) SEWA, or the Self-Employed Women's Association, is a group that functions primarily in Gujarat, India, and promotes women's rights and entrepreneurship. SEWA enables their female members to manufacture inexpensive solar lamps. After partnering with a technical school, learning materials were developed and a group of six women were taught how to make the lamps. Henceforth, the trained women served as the teachers for other SEWA members. SEWA's microfinance loan department helps interested women buy kits that include all the building materials. Women can buy these kits, invest time and sweat equity, and sell the lamps within or outside the SEWA network. Their eventual goal is for SEWA women to serve as the medium for increasing green lighting throughout six states in India.

Barefoot College

(http://www.barefootcollege.org/) Barefoot College is a non-profit based in Rajasthan, India that enables illiterate and semi-literate men and women from underserved communities in various countries to gain technical knowledge in solar power systems. Through the technical education program at Barefoot, they are taught the basics of manufacturing solar lanterns on a small scale and turning it into a business in their own communities. All the products developed at Barefoot are sold to households in neighboring communities, where each household pays a monthly fee. The monthly fee is determined by how much each family spends on kerosene, candles, torch batteries, and/or wood for lighting every month. The Village Environmental Energy Committee is responsible for ensuring that the Barefoot

solar power engineers install, repair, and maintain all the solar units properly and are paid their stipend on time.

All of the above organizations are addressing almost the same set of challenges. However, each entity has increased the adoption rate of their product in a unique, innovative, and sustainable manner, by either reducing the comparative cost or demystifying solar technology and decentralizing its application at the grassroots level. They each have created similar impact via different approaches, thus embodying the definition of equifinality.

Tenet 5: Differentiation

Senge defines differentiation as specialized units performing specialized functions within any given system (Senge 1990). Knodt and Rasch follow up on Senge's definition by saying that differentiation distinguishes or discriminates between things, aspects, subsystems, or processes. Differentiation enables interdependence, which necessitates holism (Rasch and Knodt 1994). While referring to human psychology, Bowen says that differentiation is the capacity of a person to manage his or her own emotions, methods of thinking, individuality, as well as their connection to others (Bowen 1974). In the context of socio-economic changes within a society, Naustdalslid states that differentiation is a means of increasing the complexity of a system, since each subsystem can make different connections with other subsystems. It allows for more variation within the system in order to respond to variation in the environment (Naustdalslid 1977). In their research on differentiation in large societal systems, Holmes et al. claim that, in modern society, systems interact with the complexity of the environment in which they reside. This interaction is often realized through the creation of interdependent subsystems and the environment (Holmes et al. 1983).

Differentiation can be defined as a method of identifying individual components of a large system. One objective of differentiation is to consider individual components in relation to each other and in relation to the entire system, so as to increase the complexity of the system. Additonally, differentiation can be applied to a larger system, so as to simplify it into individual components and then to analyze those individual components in relation to each other. Kiva's business model and its individual subsystems can be used for clarification. While analyzing interdependence, we considered three interdependent systems. We then approached these three systems from a holistic perspective and showed that they were interdependent. However, at the heart of both interdependence and holism lies differentiation. The Internet is a subsystem within various major systems, as is money donation and seeking seed capital. However, for the Kiva.org model to work effectively, these integrated systems need to be demystified and analyzed individually; they need to be differentiated. Then, we can analyze them together in a holistic manner and identify their interdependencies.

Tenet 6: Regulation

Regulation can be defined as a method of feedback that is necessary for the system to operate predictably and to counteract entropy (Carr 1996; Skyttner 2006). Along the same lines, Stepler et al. conceptualize regulation as employing feedback to ensure that the system is actually working and all stakeholders are accountable to each other and the system (Stepler et al. 2010). Flood interprets regulation rather more literally: to bring to conformity with rules or principles, to impose actual regulations. All of the above

definitions, however, could be evolved or emergent versions of Cannon's definition of regulation from 1932, when he suggeted that regulation is synonymous to homeostasis in general systems theory (Canon 1932). Homeostasis, many researchers agree, is the property of a system, either open or closed, that regulates its internal environment and tends to maintain a stable, constant condition (Canon 1932; Tononi and Cirelli 2003).

We suggest the following functional definition for regulation: a process of ensuring intrinsic feedback to bring about desired operation of the system and to counteract entropy. In social ventures, the stated mission must directly align with the organization's activities and outcomes. However, assessment of outcomes related to social change proves difficult, particularly when working in a developing country. Entrepreneurs must work to ensure traceability of all activities, partnerships, and evaluations to the overarching system goals.

Returning to the Grameen Bank example, when Yunus developed its lending rules, a core philosophy was that loans would only be given to women, in groups of at least six or more. By lending only to groups, Grameen Bank leveraged each of the recipients' social standing, a form of social collateral. In order to make sure that loans were repaid, every member of the group was liable to pay their share. If one of the women failed to contribute their share, all of the women would suffer, and this imposed social pressure. This was, and is, Grameen Bank's process of employing regulation: a feedback mechanism to ensure sustainability.

Tenet 7: Abstraction

Abstraction is a process for thinking and describing anything with multiple dimensions. It provides a means of viewing a concept in the context of a larger scenario and is typically employed by discussing levels of abstraction. Increasing the level of abstraction implies moving away from specific details about an object, event, or idea, and shifting the discussion or analysis to include broader aspects. Effectively, it provides a gradient of ideas related to a core concept (Floridi 2008). Foster elucidates the function of abstraction as "extracting the underlying essence of a concept…and generalizing it so that it has wider applications" (Foster 2009). Though commonly used in computer science, psychology, and information systems, abstraction can be used in any discipline. Smith, Farber, and Arbaugh provide an explanation of systems in conjunction with levels of abstraction. They discuss that "systems are organized as layers to limit complexity. A common layering principle is the use of levels of abstraction to mark layer boundaries" (Arbaugh et al. 1997).

When applied to social enterprises, abstraction provides a means of showing how grassroots action can affect wider change. Similar to the Open Systems Interconnection (OSI) model (Zimmermann 1980) of abstraction for the functions of a communication system, each abstraction layer has implications for the more specific layers comprising it and for the broader layers above. For example, consider an academic institution engaged in the development of appropriate technology solutions. If a faculty member and her students were developing a Tanzanian venture to distribute low-cost irrigation systems, many different players and entities would exist within the venture's domain with varying roles and objectives. For example:

- the U.N. cares about ensuring global food security;
- the U.S. government cares about international development and institutional research;
- public universities care about teaching, research, and outreach;
- the college cares about developing innovative and impactful technologies;
- the department cares about the leadership of their researchers in advancing agriculture in Tanzania;

- the researcher cares about the sustainability of an irrigation system in Tanzania and the research publications that emerge from this endeavor; and
- the farmer cares about improving yields, feeding his/her family, and achieving a better lifestyle.

The farmer's yield is directly impacted by the researcher's work, which consequently is affected by the department's research directions, etc. Each increasing level is characterized by decreasing specificity, but also has the potential to encompass more components. Similarly, social enterprises can benefit from developing various layers of abstraction. Abstraction can be used to define the value created by social ventures, as it exposes the value generated through the sub-systems and the macro-level value created by the enterprise as a whole (Sulewskiet al. 2012).

Tenet 8: Leverage Points

Leverage points can be defined as "places within a complex system (a corporation, an economy, a living body, a city, an ecosystem) where a small shift in one thing can produce big changes in everything" (Meadows 1997, p. 78). These changes could be positive or negative, but ultimately lead to vast reshaping of the status quo. The process of determining leverage points is, in itself, a form of regulation, as it enables entities to determine if their actions are toward the point, or if their work has gone awry. Explained in mathematical terms, a "good" leverage point increases precision of an intended pattern, whereas a "bad" leverage point skews data, or detracts from a goal (Rousseeuw and van Zomeren 1990, p. 635). Leverage points exist in almost any situation, though discovering them and recognizing their potential value often presents a greater challenge. Klein and Wolf describe leverage points as "the application of experience to detect fruitful starting points in the construction of novel courses of action" (Klein and Wolf 1998, p. 158). They further discuss that novices are often at a disadvantage regarding action strategies. Their problem solving capabilities and creativity greatly improve as they learn to identify and utilize leverage points.

When working in an international context, uncovering leverage points can be a painstaking process. Social entrepreneurs must navigate interconnected and unfamiliar social, economic, and behavioral webs as they seek to implement their ventures. Ultimately, their aim is introduce "new paradigms at critical leverage points that lead to cascades of mutually reinforcing changes in social arrangements" (Alvordet al. 2004, p. 262). For example, Husk Power Systems provides electricity from biomass for customers living in rural India. The system operates on a pay-for-use model and a key leverage point is that community members regulate the power distibution. If individuals overconsume or underpay, they must face and answer to their neighbors. The use of social status as a leverage point has enabled the venture to achieve success in multiple Indian states (Husk Power Systems 2012). Key permissions and partners are also simple leverage points. For example, finding on-the-ground champions can open doors and lead to new, previously unconsidered trajectories to success.

Conclusion

Scientists and philosophers have long wrestled with the problem of how to understand and make sense of the world, while entrepreneurs have strived to understand the world and create sustainable value. There are both descriptive and prescriptive approaches to

understanding our world. On the descriptive side, theories of cognition, perception, and thinking describe how humans organize stimuli and make sense out of them. On the prescriptive side, there are two approaches to making sense of the world: one is reductionism and the other is a systems approach. Systems theory has a long history in the realm of human knowledge but the application of the theory primarily has been relegated to the confines of academia and elite research institutions. Systems Thinking can be especially helpful in navigating the complexity and chaos inherent in social enterprises in developing communities. This article synthesized definitions of Systems Thinking tenets and illustrated their relevance to social enterprises. The conscious application of these tenets can help social entrepreneurs address global challenges, while creating tangible and sustainable value for their customers and themselves. This multifinality of outcomes for the diverse stakeholders epitomizes the praxis of Systems Thinking to create an emergent reality of a freer, fairer, friendlier, and more sustainable planet.

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