OBSERVING MANAGERIAL DECISION-MAKING AND INFORMATION FLOW FROM WITHIN THE BOARD OF DIRECTORS OF AN EMERGING ORGANIZATION: A LIVING SYSTEMS ACTION-RESEARCH PROJECT

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ABSTRACT

The investigation looked at a not-for-profit (NFP) organization referred to as SELF, which consisted of three for-profit, socially involved corporations, each serving on the Board. The problem was conceived of as an information overload situation which impacts the quality of decision-making at the highest organizational level, given the variety of information that must be processed by the Board of Directors, for example, financial, social, technological, and qualitative. The research used Living Systems Theory (LST) to take an organismic point of view in order to capture multiple forms of information as the organization evolves and adapts. The LST frame provided categories to tag and map information flows at a cross-level analysis at the "Decider" level. The research study is based on action-research, which takes place in iterative cycles of action and reflection. The research subjects were active participants in the research design and execution.

Keywords: decision-making, social entrepreneurship, Living Systems Theory, cybernetics, emergence, action research, Concrete Process Analysis, self-organization

INTRODUCTION – SELF-ORGANIZING SYSTEMS

Biological systems are different from mechanical systems in that they exchange information about the external environment without loss of autonomy and they self-generate their structural components out of their own parts. "Unlike closed physical systems, which conserve energy, biological systems are open thermodynamically, typically dissipate energy, and have attractors" (Kauffman, 1993, p. 182). Maturana (1975, 1990), Varela (1975, 1984), Maturana & Varela (1980), and Varela, Maturana & Uribe (1974) describe the organization of the living as *autopoēsis*, from the Greek for self-reproducing. Living organization is self-producing and self-organizing – it dissipates matter and energy and re-integrates, yet maintains autonomous and unified over time. Living systems are recursively organized such that an external trigger across the boundary between the system and environment does not necessarily cause a change to the overall unity of the system. Living systems are able to prevent disturbances from destroying their cohesion, as well as use information to adapt to chaotic environmental circumstances, and do so through the self-reproduction of their own components. "Communication happens essentially through a process in which a system interacts

recursively with itself, as new information only makes sense in relation to the structures created by previous information gathering" (Hernes & Bakken, 2003, p. 1513). Information cannot change behaviour even though it is linked to behaviour change. Systems must make meaning and sense of the information – otherwise they would not be autonomous. Luhmann (1992, 1995, 2002, 2009) relates the psychic systems of humans with communication of information about social systems. "Social systems use communication as their particular mode of autopoietic reproduction. Their elements are communications which are recursively produced and reproduced by a network of communications and which cannot exist outside of such a network"(Luhmann, 1986, p.174).

The compounding effect of entropy is a fundamental state of dynamic systems, and therefore cannot be made to simply go away. While entropic fluxes may be handled as somewhat predictable outcomes, for example, compounding interest on an unpaid credit card balance, chaotic instabilities suggest that a new order is occurring but is not reducible to a statistical value. Systems thinkers use chaos theory to describe the transition of a dynamic state as "phase transitions" or "fluid instabilities" (Gleick, 1987, p.128). From a communication perspective, when interaction occurs richly between components of a system, the quantity of information is "increased exponentially rather than by multiplication" (Ashby, 1972, p.5). In thermodynamics, maximum complexity is termed 'chaos' because the state is a non-deterministic pattern (Nicolis & Prigogine, 1977), therefore it is very difficult to make predictions. In social systems, Bailey (1993) describes when a system reaches maximum entropy 'system death' occurs, because the amount of disorder exceeds the overall cohesion of the system (p.122). According to Weick (1995), the goal of organizations, viewed as sense making systems, is to "create and identify events that recur to stabilize their environments and make them more predictable. A sensible event is one that resembles something that has happened before" (p.170). In chaotic situations, using linear reductions or repeating past actions will not simplify complexity because the system is transitioning into a new state, and this means that there are some variations that need to be accounted for, in addition to punctuation and regularity.
By "systems" perspective I mean a decision-making, problem-solving or information-processing model used to analyse action plans or situations within a systemic framework. (Dawidowicz, 2012). The criteria for social systems involves the following broad constraints:

(i) the importance of people rather than simply processes,

(ii) the interrelatedness of members of the system, and

(iii) the uniqueness of parts of a system when combined into a whole in comparison to their own separate natures.

Given the glut of information being generated every single day by millions of people across multiple ICT platforms, I question what information is the most useful and relevant for helping to make choices in complex and rapidly evolving organizations. The problem with organizations which undergo rapid change is that transformation and

accelerated growth, or "start-up", must have some kind of impact on the ability of an self-organizing system to utilize information in its decision-making process, in order to achieve its social mandate. In chaotic situations where the end is indeterminate, a strategy for survival may be abeyance or delay. The delay may be needed for process review or reflection upon the processes that generate the problem or because the problems may be generated out of the system itself. However in a rapidly changing environment, an individual may not receive enough time to reflect and recover – remaining in a constant state of crisis. Conditions may change such that some people no longer fit in their role, or the system changes substantively, or people become out of touch, or organizations become no longer relevant. The unfortunate reality is that ignorance and incomplete knowledge may be an intractable problem that we cannot eliminate but only treat. Decision-making occurs within the boundaries of an organizational context and often it is the case that decision-makers are limited to a small group of two to three individuals, and in some cases a single person. When we make demands that an organization should change, we ultimately require that the decision-making body needs to address the issue. The big question – in a start-up or emergent situation – is that there may not be the capacity for the individuals within the decision-making body to have complete understanding of their responsibilities – especially when their roles are ambiguous and/or there is rapid change in functions and accountabilities. Smaller, seemingly innocuous choices, may compound over time to emerge as a full-on crisis, when it was originally conceived of as a solution – like in the case of a pharmaceutical that causes secondary health risks or death. In an environment where there are a small number of individuals involved in the start-up phase, it may be disastrous to remove a person for certain conflicts – except in cases of explicit deception, or physical transgressions. The conflict of interest may in fact help the founders and members of an innovation environment to gain deeper practical experience into why certain rules are in place or enable them to build strong internal regulatory systems that apply to their specific case. Therefore my main research question is:

How does an emergent organization utilize information in its decision-making process?

The scholar James Grier Miller, systems science pioneer and founder of behavioural science, stated that there are strategies for dealing with information overload, such as omission, error, queuing, filtering, approximation, multiple channels, escape, and chunking (Miller, 1962, p. 64), but there are discrete limits to which individuals and groups can process information, beyond which breakdown occurs. Just as physical systems degrade, and biological functions fade, people demonstrate a pattern of breakdown after reaching a certain threshold. Unlike a machine, a person cannot just blow a fuse and move on – each person has a range of capacity that varies over time and under diverse circumstances. Therefore the following sub-questions appear against the backdrop of technical acceleration, information overload, and human decision-making:

How are decisions made in emerging organizations?
How is information accessed?
How is information stored?
How is information categorized?

Observing Information Flow

How is information measured?
How is information transmitted and communicated ?
How is information and decision-making related to control and change in the overall organization?
How does decision-making impact the effectiveness of the organizational goal?

SOCIAL ENTREPRENEURSHIP

Since David Bornstein's groundbreaking book "How to Change the World: Social Entrepreneurs and the Power of New Ideas (2004) there has been a growing movement of ordinary people stepping in to address problems where governments and bureaucracies are failing or have withdrawn. It may simply be the case that traditional institutions are experiencing the disruptive effect of large-scale systemic change, and perhaps suffering from both future shock and the impact of complexification. Social Entrepreneurship, broadly defined, is using new ways to solve some of the vexing and intractable problems that plague our social reality. Social Entrepreneurship is often defined as a composite of traditional profit-making and capital generation models, and a social mission or public benefit emphasis (Kickul & Lyons, 2012, Curtis, 2010; Mair et al., 2006). These are seen not as competing, but as complementary goals. There are substantive problems with the approach because the traditional metrics for profit-making is increasingly under pressure to address greater social, environmental, and governance standards. On the other side, social mission or non-profit and NGO (non-government organizations) fields face higher and higher levels of financial accountability. From a purely financial point of view, traditional profit-taking requires a clear plan of investment of capital and resources over time in order to result in a profit; otherwise long-term losses will erode the company. But in the case where there is a social issue which may be "messy" or intractable, the revenue strategy may have a very long or uncertain horizon. And similar to the warnings of management cybernetician Stafford Beer (1975), the social issues may outlive the managers.

While social entrepreneurship has recently taken on a mainstream awareness, it also reflects the reality of many existing pubic organization and social institutions, such as civil society groups, social agencies, environmental activists, and educational centers. Today, more than even before, social benefit organizations are faced with a rapidly changing world of social media and information technology, at the same time as being required to adapt to sophisticated and highly volatile financial conditions. Social Entrepreneurship requires a longer than average commitment than regular entrepreneurship, given the intractable and persistent nature of social problems. It also seems to require an anticipatory rather than strictly linear problem-solving approach. It is for this reason that I believe that social entrepreneurship is an exemplary model of self-organization. The self-regulating aspect is related to holding two competing variables – one of business management and the other is social benefit; and that these two factors cannot be dropped. An obvious difficulty with compliance appears out of these ventures because of the need to deal with new conditions in an uncertain context. The process of incorporation is complicated and the problems of operating each business and addressing a social mission involve difficulty in measurement of both business performance and

social impact, not to mention overall governance and self-regulation. For this reason I feel that social science is well-suited to deal with an investigation into a particular case of social entrepreneurship because social innovation is composed of both discrete elements as well as dynamic patterns. In situations of uncertainty, innovation may appear as a new pattern and new way of doing something, such as in emergence. It may also appear as self-organization. Therefore I proposed to investigate an example of social entrepreneurship to learn more about the underlying phenomena.

Case Study – "SELF Organization"

The organization within which I conducted a preliminary study is one which I am one of the founders and a current member embedded in the overall structure. The organization is comprised of a non-profit organization (NPO) which was federally incorporated in 2007 in Canada to (i) identify social issues, (ii) match to entrepreneurs, and (iii) generate capital for sustained social mission. The NPO "SELF" acts as a hub to provide overall governance and control to the autonomous Members. Each Member is a provincially incorporated for-profit organization (FPO), each having a social mission and owned by an individual entrepreneur. In March 2012 (after five years) the NPO satisfied its minimum Membership requirement of enrolling three for-profit organizations as Directors.

LIVING SYSTEMS THEORY: MATTER-ENERGY AND INFORMATION FLOW

I selected James Grier Miller's Living System Theory (1978) because it is founded upon the doctrine of General Systems Theory and the principles of cybernetics. The theory is somewhat dated because it preceded the rise of the Internet, but it remains relevant because Miller anticipated large scale ICT. He was founder and president of EDUCOM which was a group of 13 American universities that were connected by a dedicated information communication system (Miller, 1966). The definition of Living Systems Theory (LST) is an "…integrative biosocial theoretical and applied approach to living systems and technology…" (Swanson & Miller, 1989, p. 153). The theory has been refined in 1995, and is often referred to as Living Systems Analysis, which is the applied or operationalized form. The model is highly accessible and can be adapted easily for use in a vast range of contexts. There are twenty functions or subsystems (Figure 1) that are common across eight broad levels – from the cellular to the supranational (Figure 2), and these are organized according to systems that process only Matter-Energy, those that process Information only, and those that process Matter-Energy and Information. New structures are always emerging out of complexity, and the theory accounts for the isomorphic nature of concrete systems. That is to say that while things change, there are basic functions that are apparent across different types of systems – LST provides a typology of subsystems for analysis.

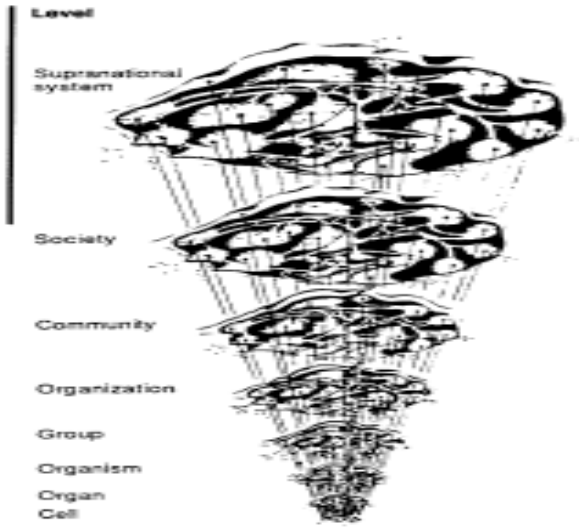


Figure 1. Living Systems level (Miller, 1978)

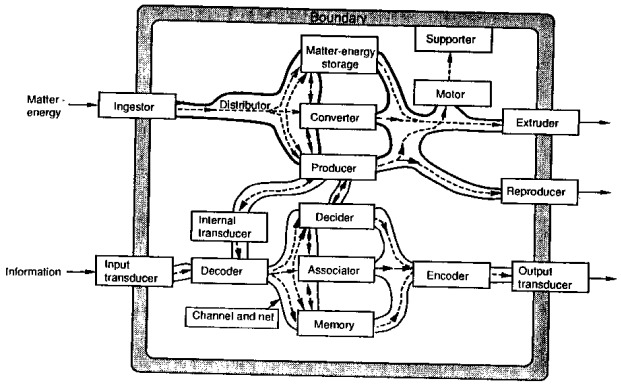


Figure 2. Relationships of Critical Subsystem (Tracy, 1989)

Miller stated that non-profit organizations are lacking the sales feedback from society therefore measurement of social goal is challenging, as opposed to the measure of profit. In "Basic Concepts" (1962) Miller explains that systems theory is more than just information theory "since it must deal with such matters as the muscular movements of people, the flow of raw materials through societies, or the utilization of energy by brain cells" (p. 198). Therefore LST integrates the biological, non-living, and human dimensions that are present in modern social systems. Organizations are concrete systems with multiechelon deciders whose components and subsystems may be subsidiary organizations, groups and (uncommonly) single persons (Miller, 1978, p. 595). The Decider processes information about all the other subsystems, which aids in maintaining the functions and coordination of the system. The Decider is also the subsystem that

generates its own information for overall coherence and control. It is not merely an information processing system, but generates new information or "meaning" about the system. The Decider is the only subsystem that processes the information from all the other nineteen subsystems. Simms (2003) explains living systems science by stating that living systems use information to respond to changes and make adaptations.

The Decider Subsystem

Definition: "the executive subsystem which retrieves information inputs from all other subsystems and transmits to them information outputs that control the entire organization" (Miller, 1978, p. 642).
Structure of the Decider: "the central decider of an organization is the group – or in some organizations, the person, that determines chief purposes, sets primary goals, and controls subsystems of the organization as a whole" (Miller, 1978, p. 642).

Part of the challenge of the Decider function is the amount of noise or interference on the transmission channel, and this reflects back to the work of Shannon and Weaver (1949/1965). Decision-making may appear to take place within a black box perhaps, but it is not noise-free, nor is it free from distraction, interference, and degradation of the message. This is relevant because people are in the Decider subsystem, and therefore the Decider is subject to some of the breakdowns that happen to people. Miller conducted extensive and ground-breaking empirical research into the behaviour of individuals as they carry out decision-making in groups (1964). He concluded that there are discrete channel capacities of individuals and groups to process information - beyond which errors increase and pathology occurs. The framework presupposes that things are changing and in flux, and that the actions of people are also subject to forms of system failure. His use of the term 'pathology' reflects his medical (psychological) background. Today we would prefer to use a term like system breakdown, or system incoherence, or system failure, or a syntax error, or perhaps in some cases 'breakthrough'. The Decider function links to Stafford Beer's concept of "complexification", where a structure is degraded in order to allow for a new echelon to emerge. As old structures are degraded, higher orders of decision-making structures appear. The disorder, disorganization, lack of patterning, or randomness of organization of a system is known as its *entropy* (S) (Miller, 1962, p.195). Therefore as things in organization invariably go out of order, the Decider must make adjustments to maintain the system coherence and adapt to changing conditions. I would consider the term "pathology" to refer to the disorder or randomness that inevitably appears as a result of operation. Organizations are not random and therefore any deviation from this order might be considered, in general, pathological.

CONCEPTUAL MODEL – FLOW OF CONCRETE PROCESSES

The basic principle of the Living Systems model is that concrete inputs flow through the system, resulting in certain outputs that correspond to the purpose and goals of the organization. By definition, a system ought to have expected outcomes within a specified range of behaviour and functionality, otherwise a system might be considered random or spontaneous. Additionally, Living Systems are able to produce information that may lead to a reproduction of parts of the system, or in some cases, a reproduction of the entire

system. The key to LST is that is also pays attention to the processes which take place in between the input-output functions. In theory, the Decider function is able to control the flow of matter-energy through the system in order to maintain its coherence and carry out expected functions in respond to variations. The information generated by the Decider is crucial for the system to respond to changes in the environment by making adjustments to parts of the system. Therefore, the Decider subsystem is connected to both internal functions, as well as external factors, thereby accounting for the throughput of matter-energy and information within the system. In order to study the Decider function, I conceptualize the organization as a flow of matter-energy and information – and not just a dynamic flow in and out of the system, but also accounting for some feedback to be generated from within the system, like a back channel. The Decider is not external to the organization and thus it must generate information from within the boundary of the organization. I use a technique called Concrete Process Analysis (CPA) in order to map the basic Inputs, Throughputs, and Outputs of the Decider function. CPA was developed by G.A. Swanson (1982) to adapt general accounting practices to Living Systems Theory. The intent is to provide a "neutral metric" to count concrete processes as they flow within the system, prior to interpretation by generally accepted accounting practices.

Concrete Inputs

The concrete inputs are categorized broadly according to a simple binary which is consistent with the basic principles of thermodynamics: (1) Matter-Energy or (0) Information. The distinction is that matter-energy is primarily composed of material or has high energy content – MATERIAL, COMMUNICATION, PERSONNEL, and ENERGY. I have modified the categories to also include a WASTE flow, to reflect our contemporary interest in this factor.

The categories do not replace generally accepted accounting interpretations, and provide a simple way to count organizational inputs.

The Information flows are reflective of the matter-energy elements and while they generally have a degree of materiality, they are primarily information *about* the matter-energy categories: CREDIT, SOCIALIZATION, MONEY, SYSTEM, and OWNERSHIP. Concrete Process Analysis does not require any in-depth knowledge of accounting; however we might presume that the average administrator has a certain degree of awareness about basic accounting functions required to operate a formal organization (i.e. financial statements, balance sheet, tax reporting). Therefore I propose the following concrete process categories:

Matter-Energy markers: MA + CO + PR + EN + WA;
Information markers: CR + SO + MO + SY + OW.

Concrete Outputs

There are two concrete outputs of a system that correspond to the same matter-energy and information CPA categories. However what is pertinent for understanding the Decider function is the information that is generated as a result of the overall system processes and feeds back into the Decider for interpretation. The result is that the inputs should produce the expected outcomes according to the purpose and chief goals, as a result of some kind of non-random process. The role of the Decider is to interpret this information to measure against the organizational goals. All organizations produce financial

statements, and generate a number of standard reports, such as lists of shareholders, funders, members, officers, and directors. In Canada, basic financial information is reported to the Canada Revenue Agency, for example, profit and non-profit corporations file T2 statements and charities produce T3010 forms to report overall results. As well, certificates, registrations, awards, deeds, titles, and other evidence of ownership of property are examples of public records that indicate performance results. In North America the use of GIFI (General Index of Financial Information) and NAICS (North American Industry Classification System) provide a standard set of categories for reporting. In general, it is this type of information that the Decider uses to determine how the organization is performing. However the historical problem with measurement in non-profit or social purpose organizations is the lack of feedback from the market, such as sales revenue or profit (Miller, 1978. P.xx). It is difficult to measure social impact, but not impossible, and these types of outcomes might not be contained in annual reports or quality performance metrics.

Concrete Throughputs

In between the inputs and outputs, some kind of process takes place which changes the inputs into a desired output. For example, raw material such as wood can be transformed into a bookshelf, or a student can be shaped into a Doctor of Philosophy. This is often referred to as the "black box" of an organization, because the internal processes are often shielded or protected, or they are not easily viewed because of their complexity. The difficulty with understanding the throughputs is that some of the information coming into the system is actually tacit, and possibly located within a person, or has not been made explicit. We might presume in rapidly developing or start-up organizations that documentation of processes might be sparse. While it is not impossible to extract this kind of information, is does present some major challenges for empirical data collection. In fact, it would seem somewhat obvious that information feeding back into the Decider would be transmitted through a host of forms, such as visual, verbal, experiences and perceptions, in addition to the interpretation of reports and output results. To capture this information, I conceptualize the following throughput categories which are based on simple nominalization – people, places, and things. Additionally, within a given organization, it is necessary to identify the MEMBERS of the organization as defined by the system. Members may be people or other organizations. Each organization is also subject to the regulations and impact by various INSTITUTIONS that both guide and constrain the operations. For example, the Ministry of Industry which registers organizations in Canada, as well as the Canada Revenue Agency, which regulates financial information and tax status, and Universities which grant degrees. Therefore I propose the following Throughput categories:

MEMBERS + INSTITUTIONS + PEOPLE + LOCATIONS + THINGS.

METHOD - CONCRETE PROCESS ANALYSIS

The conceptualization uses the foundation of LST because the model provides a very reliable and stable viewing frame for general system functions. CPA allows for a way to categorize certain processes as they occur within the model and together I would refer to this as a form of Living System Analysis (LSA).

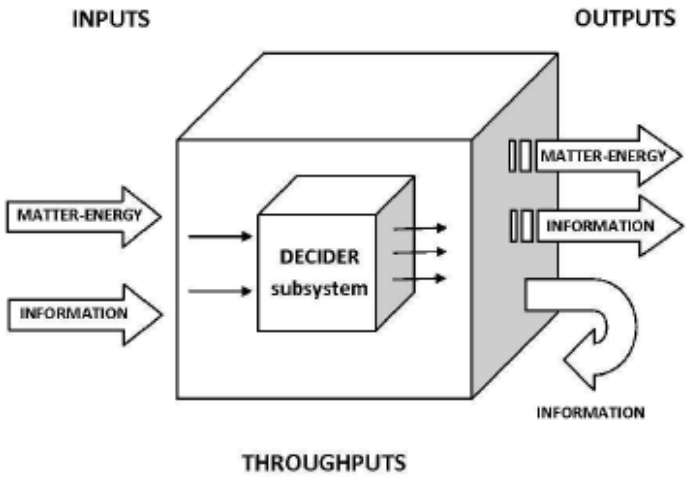


Figure 3. Concrete Process Flow

Inputs: on the left side of the model, flowing into the system, across the boundaries of the system, are represented by a set of Matter-Energy flows, and Information flows. Matter-Energy is connected and not easily broken apart. In some cases there is more matter than energy, or more energy than matter. People are counted in this as PERSONNEL.

Outputs: matter-energy is depicted flowing out of the right side of the model. The inputs have been changed in some way, as a result of the processes. This also results in some form of WASTE, as a result of organizational process, because no thermodynamic system can achieve 100% efficiency.

Throughputs: these are sub-systems that are composed of 19 functions which are contained within the BOUNDARY of the system. For simplification, they are captured under the general Throughput categories of MEMBERS, INSTITUTIONS, PEOPLE, LOCATIONS, and THINGS. The DECIDER function is connected to all other subsystems and transmits information in order to control the entire organization. Therefore it is sufficient for the purposes of concision to focus on the Decider function, without directly mapping the other subsystems.

Using advanced artificial neural network software called NeuralWare Predict® we collected the following categories of information: Board meetings; Corporate member ID number; Financial assets under administration; Non-financial assets under administration; Organizational objectives of Board (as outlined in the Letters Patent). The goal of the research was stated as: "to help participants generate more self-awareness around the information they receive and the decisions they make", therefore we asserted that the latter variable was independent (because the objects were approved at corporate founding). However it is also highly subjective because SELF Directors must determine some qualitative measure of variance from the objectives with little historical data and few peers. In order to follow the LST model, we understood that all the information under investigation must be reflected according to the broad categories of Matter-Energy and Information, and more specifically into the following categories of flow: Material, Personnel, Energy, Communications Waste; and Creditors, Socialization, Money, System, and Owner. Non-financial assets are reflected in the first five flows: Net Matter-Energy (NME) is composed of all the physical materials flowing in and out of the organization, such as equipment and fuel. Financial assets are reflected in the latter five flows: Money Information Markers (MIM) are the symbols which we use to count financial and monetary values, for example taxation, currency and ownership certificates.

RESULTS

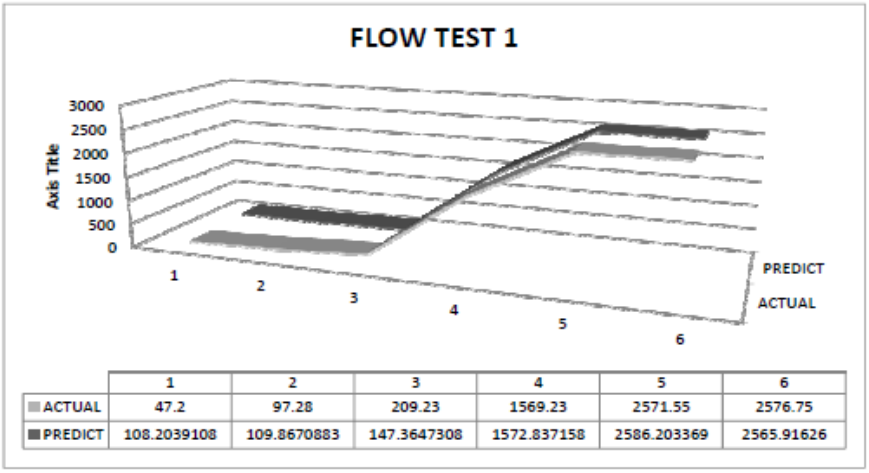
The following requirements were completed with respect to the key research elements of the project for which the findings follow:

- Phase One represents the concrete elements which were organized according to Concrete Process Analysis (Swanson, 1995). The data was presented in a factual manner according to a standard metric of items and categories, such as financial transactions and inventory of goods, to describe the concrete flows of material and information. This data became known as the 'MLP' because the software creates a "multi-level perceptron" to assemble the information in a systematic manner.

Observing Information Flow

Sequence number	Posting Date	Description	M-flow	P-flow	E-flow	C-flow	W-flow	Mo-flow	Cr-flow	So-flow
101.1	11-Sep-11		420.62	0	0	0	0	0	0	47.2
101.2	17-Sep-11		420.62	839.39	0	0	0	0	0	50.08
101.3	24-Sep-11		420.62	839.39	995.1	0	0	0	0	111.95
101.4	24-Sep-11		420.62	839.39	995.1	0	0	0	0	1360
101.5	24-Sep-11		420.62	839.39	995.1	0	0	8712.5	0	1002.32
101.6	24-Sep-11		420.62	839.39	995.1	0	0	8712.5	269.27	5.2

108.2039108
109.8670883
147.3647308
1572.837158
2586.203369
2565.91626



	1	2	3	4	5	6
ACTUAL	47.2	97.28	209.23	1569.23	2571.55	2576.75
PREDICT	108.2039108	109.8670883	147.3647308	1572.837158	2586.203369	2565.91626

Figure 4. Matter-Energy Input-Output Flows "MLP"

- Phase Two involved the construction of a matrix of the various institutions, locations, and people related to and interacting with a specific organization. The arrangement of data input involved a degree of interpretation because some roles are specific to certain institutions, and some individuals carry out multiple, overlapping roles. While some of the information is generic, a small portion relates directly to specific individuals and therefore requires a special process to manage enduring privacy concerns. This data became known as the 'SOM' because the software creates a "self-organizing map" to maintain the strength of relationship between data points.

DATA CATEGORY:
INSTITUTIONS

IDENTIFIER	DATE	CODE	TAG	DESCRIPTION
GOVERNMENT		CCA	201.1	Corporation Canada
GOVERNMENT		ICA	201.2	Industry Canada
GOVERNMENT		CRA	201.3	Canada Revenue Agency
GOVERNMENT		CIPO	201.4	Canadian Intellectual Property Office
FINANCIAL		TDCT	202.1	TD Canada Trust
		ALT	202.2	Alterna
		PAY	202.3	Paypal
REGULATORS		WSIB	203.1	WSIB
		UT	203.2	University of Toronto
		OES	203.3	Ontario Electronic Stewardship
		CFGR	203.4	Canadian Foundation for Governance Research
		SBN	203.5	Sibername
SUPPLIERS		RGRS	204.1	Rogers Wireless
		SBRN	204.2	Sibername
		GT	204.3	Grand & Toy
		DRB	204.4	Dropbox
CLIENTS		C0003	205.1	YHP
		C0086	205.2	ADL
		C1015	205.3	UT
		C0008	205.4	SNC
		C0317	205.5	AIG

Figure 5. Throughput Categories "SOM"

What was accomplished through the phases is the establishment of a digital platform where the major elements of the conceptual framework were transposed into a digital format for mapping purposes. The project procured, tested, and practiced how the physical hardware actually worked together as the project moved from a concept on paper to a live practice. Each step of procurement, installation, testing, and application set the groundwork for process refinement and increasing sophistication. For example, the initial period of the project involved sourcing and procuring equipment which would satisfy the outcomes of the research process, as well as be effective for the formal Thesis work. However as equipment was tested I learned that there were smaller components (cables, Apps, techniques) required to refine the data collection process and that some software applications were ineffective or additional elements were required. The speed of transmission of the hardware exposed potential gaps in privacy related to email transmission or shared cloud storage, for example.

FINDINGS AND DISCUSSION

Phase One (MLP):

- The recursive relationship of the flow category "Socialization" to itself and to other categories. This category makes a provision for a basic metric of social activity as more than mere taxation. It is not the amount of money expended on socialization charges that is meaningful, but that socialization charges are constantly calculated and reported. Socialization includes membership fees, licenses, certificates, degrees, and other social activities that embed organizations within a social framework.

- The tenuous nature of the Ownership category - how ownership is determined and the relationship between owners and custodians depends upon the structure of the organization. According to Concrete Process Analysis, in private business ventures, the ownership claim is based on the expenses incurred by the owner, not just the residual assets after operations. The notion of ownership is completely different in the case of a not-for-profit corporation and is murky in a situation where a for-profit is connected to a not-for-profit for a social benefit.

Phase Two (SOM):

- The power relationship of institutions and groups which provide socialization as well as legitimation, and have affective influence on overall organization. Regulators and Funders do not have direct control of an organization however can exert a degree of influence to effect change. For example, universities have special powers to constrain actions related to scientific research, just as clients may withhold payments without insurance certificates.

- The special (vulnerable) place of people who are embedded within organizations and can occupy multiple roles and ambiguous identities. Limited liability organizations protect the individuals who operate as roles however can also assign blame to a role and then terminate the role. In start-up situations, many roles can be carried out by one individual which then leads to decision overload. Firing the owner of a young

start-up venture is an oxymoronic situation that calls into question how to deal with steep learning curves and inexperienced people.

Organizations are composed of people, and people are constantly making meaning and interpreting information. Meaning-making in complex self-organizing systems has an impact on the way in which observations can be made about empirical phenomena. Time lag in dynamic emerging environments means that we need to collect data and analyse information as quickly as possible, because it will soon degrade, or be distorted through communication transmission. Therefore we need a research approach that will address the interconnectedness of systems, as well as account for the uncertainty of information, and also take into consideration the difficult nature of observation while within self-organizing systems. The field of action research (AR) or participatory action inquiry are forms of scientific observation that best address dynamic social contexts:

> "Action research is a form of *collective* self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out. " (Kemmis & McTaggart, 1988, p. 5).

In order to observe the dynamics of decision-making for human interpretation, Living Systems remains a theoretical frame that integrates modern information theory, is consistent with the principles of thermodynamics, and accounts for an inter-systemic relationship between non-living, biological, and social systems.

CONCLUSION

In complex, self-organizing systems, each system is embedded in other systems and therefore every system is a subsystem of another system. My preliminary application of Living System Theory demonstrates the adaptability of LST and the usefulness of Concrete Process Analysis in observing discrete and recursive functions. In applying the typology of subsystems – specifically the Decider function – the investigation illustrates that the information used within the organization is composed of both internal and external entities, acting in a dynamic flow. Furthermore, CPA flow categories provide a useful handle for observing information flows, and in this study the Socialization (SO) category provokes insights into the kind of information used for decision-making within an emerging organization. Further refinement and improvement of the research method is required to increase the robustness of the result.

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