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Some Possibilities on the Use of General Systems Theory and Thermodynamic Theory in the Development of Local Communities

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ABSTRACT

Social work is analyzed from the view of general system theory as presented in works of J.G. Miller and thermodynamics theory, particularly the second axiom. Thermodynamics theory helps explain some life experiences in local communities from a wider prospective and provides a more complex understanding of dimensions of social work.

Human's desire for a universal idea to encompass the complexity of being and the environment in which we would like to live, as well as the one we are forced to live in, is a never-ending constant in human intellectual creativity. No theoretical trend, nor serious and comprehensive theory, whether of natural or social sciences, has such an aspiration, at its base. Religion is the only area of human intellectual endeavor in which this ideal has completely succeeded. Religion has come close to the struggle by recognizing the imperfections of human experience and of the infinite nature and completeness of the divine. That the soul is universal is deeply rooted in religious teachings, is a significant inspiration for many theoretical approaches and is a sociological factor for scholars both directly and indirectly through culture. General systems theory is another attempt by human thinkers to find some kind of general answer to inherent reality. General systems theory emerged as a response to a branch of research about Cartesian's fear, an expression coined by Richard Bernstein denoting a situation where nothing exists except for two possibilities--to either create a theory based on a solid foundation or to not create any theory of any kind. Some of the proponents of systems theory emphasize that it originated from a need to bridge the enormous amount of scientific material that is increasing at such a rate that it is fast becoming unserviceable. The world catalog of scientific magazines has redoubled every 15 years (Miller, 1978). This led George Miller to call the world scientific periodicals "the catalog of spare parts for the machine which has never been built" (Miller, 1978, p.5).

A second, more substantial, reason for the development of general systems theory was opposition to the Darwinian way of thinking, that points out the differences in the entities to be found in nature. Systems theoreticians, in contrast to Darwinists, are more impressed by the many similarities in the entities which surround us than with their differences. From this flows the desire for one sufficiently general theory, which is implicit about the unity of science as a general and universal characteristic of humans. Such unity will encompass all natural and social processes and enable researchers and thinkers to consider the widest areas of life.

Systems theory may also make possible the development of a uniform and generally understood scientific language for researchers from a variety of disciplines. The intention of theoreticians of

general systems theory is not a new or a specific philosophical monism, according to which all essentially phenomena, both social and natural, are the normal consequence of methodological unity. Rather, theoreticians of general systems theory warn that the use of some methodological, as well as

theoretical concepts, from for example, the area of natural sciences, in the area of social sciences are as metaphors and not as a direct methodological arsenal (Khalil & Boulding, 1996). They warn that care must be taken when these various constructs (metaphors) are employed so that mistakes will not be made in their identification.

CHARACTERISTICS OF LIVING SYSTEMS

James Grier Miller (1978) emphasizes seven basic characteristics of living systems:

1. They are open, with the entrance, passage and exit of matter, energy, and information clearly identifiable.
2. They maintain a stable condition of negentropy; that is, they are able to maintain this condition even when entropic changes occur.
3. They contain specific schematic messages relating to the organization and its operation.
4. They have regulatory mechanisms, or mechanism for the management of the system.
5. They are composed of a specific number of necessary sub-systems.
6. These sub-systems are integrated into one whole.
7. They can only survive in an adequate environment.

System process are all the exchanges of energy matter and information which occur in the course of time and through the structure of a system. Entropy is a process in which energy is transformed from a higher into a lower form of utilization. Entropy in a closed system functions at maximum disorder to the system, until it leads to complete self-destruction.

The essence of the second thermodynamics axiom is “Transformation of energy is nothing else but destruction of one difference to create another difference” (Prologine, 1982, p. 121). “For dust thou are and unto dust shalt thou remain” in light of thermodynamics theory is not only a Bible proverb for death, but a scientific meaningful reality. It explains that an energy unit has changed from one form into another which, in that condition, can not be used any longer. It does not rule out the new energy potential to be used within a new system. And certainly it does not get used.

The term entropy is often used for a disorder. The term often bears negative connotations, and becomes unacceptable in presentations of system development and dynamics. Organized or structured systems exchange energy potentials within themselves as well as with their environments. This is a condition for the system’s survival. Order is also a condition for systems’ existence, at least speaking of its existence in form, purpose and goal; but disorder is also a necessary condition for system development, including structure differentiation. It is necessary to spend energy for a system to develop a differentiated structure; after this the world will not be the same as before (Knezevic, 1992, p. 39). Order, in thermodynamics theory, does not mean perfection, and disorder does not mean a bugaboo of evil. These are simply manifestations of motion, development, and form alternation.

An example in social work is the family with a so-called overprotected child. A system with rigid and solid boundaries is not a system in disorder, but, on the contrary, is a system in perfect order (if order means orderliness). The parents of the overprotected child use the child’s energy for their own growth. Marginal social groups which gather around themselves solid, impermeable social boundaries succeed in their own activity by drawing potential and energy from each member.

STRUCTURE OF SYSTEMS

Structure of a system relates to the position of its sub-systems and components in a three-dimensional space and at a concrete moment in time. A system is a hierarchy composed of sub-systems of greater and lesser levels. Differences between the particular levels of the system are based on:

- similarity of components within a specific system level;
- proximity, vicinity and relationship of the individual components;
- common fate of those components; and

- identifiable differences in components' behavior on various system levels. (Miller, 1978, p. 125).

Suprasystems are the next highest hierarchical level comprising a number of system components or sub-systems. Sub-systems are integral structures found within a system; sub-systems are defined by function. Miller identifies several types of sub-systems and their relations (1978, pp. 31-32):

Local Sub-System. A system in which the borders of the system and borders of the components are congruent. The system in this case is dependent on one component. If we consider social work, as a process or component, then, in the local subsystem, social work as the process and social work as the subsystem coincide as part of the system structure. In this case social work would be an institution which in a community that carries out social work duties.

Combined Sub-System. The borders of a sub-system are not congruent with the borders of components; the sub-system is located in a space smaller than the component. The sub-system shares the component with other sub-systems. This type of sub-system depends on only one part of the component in its activities. A component of the system is wider than the subsystem and covers a larger field than a subsystem. This means that more subsystems will use social work. For example, old people's homes, police stations, hospitals, all use social work activity as a component of their work. Of course implementation of social work with combined subsystems is more complex than in a local subsystem. The activities of social work must meet far more diversified demands, therefore input as well as information challenges are bigger and more complex.

Laterally Dispersed Sub-System. A sub-system is laterally dispersed if it is greater than its component; that is, its activities include more than one subsystem component. This type of activity demands a satisfactory level of communication between the various parts. The subsystem covers a larger space than the space of a component, thus it requires application of several components to fulfill its functions. This is frequent in social work practice; it is often necessary to coordinate the activity of many different, often specialized elements. The process of specialization of some forms of social work requires application of diverse components. Coordination of various parts is the most important condition for a successful functioning laterally dispersed subsystem. Thus social work planning in a local community is an important condition.

Luhmanns' (1981) dilemma on explanation of the organizational purpose into means bears theoretical and practical significance. If, for example, the structure and process of some organization was taken out from the purpose of the organization, it would lead to an unavoidable functional conflict, which reflects degradation of material-energetic resources. The dilemma is illustrated by laterally dispersed subsystems.

Expansion of different methodological approaches in the social work, as well as organizational structures, was not motivated exclusively by a developing social work network and by increasing diversity of the services for different categories of dependents. We observe a very high service role in the national economy in societies where the number of techniques has increased enormously. To enter the market and maintain a position, it is necessary to produce more updated services of their latest forms. Therefore, the purpose of survival in the market is found in clients, concrete persons. One has to produce clients to survive in the service market. The approach is supported by claiming that purposes have an advantage before means (Luhmann, 1981, p. 59). We can not identify extreme forms

of such phenomena in social work probably because we have never dealt explicitly with the subject. In some other fields, such as medicine, this process is dramatically visible. For example, plastic surgery has to find clients, to make a profit from those unhappy with the shape of their nose to those unhappy with the size of their penis. Awareness of this process in social work and of equipping people for social work is as important as awareness that some social groups have been deprived and need help.

Associated Sub-System. In this situation a sub-system shares part of or a whole component with other sub-systems. The sub-system is, at the same time, a part of more than one particular local system. A subsystem of social work may carry a role in two or more subsystems, but only performs simultaneously in one of them as a constituent part. Social work may, for example, provide services to a system in some local community where production takes place (such as solving problems of employed in an industrial plant), but performs the duties in a part of the health system of some other systems or subsystems, which require social work services. The system in this case shares the social work component with other systems.

Upwardly Dispersed Sub-System. The process proceeds in such a way that it establishes a system at a

the case of an upwardly dispersed subsystem, a local community as far as function of the social work is concerned, is dependent on the system that is positioned on the higher level. In bigger cities, for example, it is possible for social work to be functionally organized on the city level but services are to be provided according to particular local communities. Such a situation is frequent in centralized state functions, when social work is organized as a state institution. Social work has an important control function in the society, whether we liked or not; the state will attempt to assure some functions of control via social work. Through the organization structure one can control material and energy resources which the state has had on its disposal and which is distributed to the lower level via local communities.

Downwardly Dispersed Sub-System. The process proceeds in such a way that it establishes a system at a lower level of the hierarchy. The sub-system is dependent upon other sub-systems in its activities. Systems theory is built on the idea of a hierarchical structuring in relationship between systems and subsystems. In this case, the system is dependent through the social work activity on a subsystem which is on the lower position. An example is the regulatory sub-system, called decider by Miller (Miller, 1978). It is unlikely, within complex structures, for social work to be positioned in the decider position in a local community. When more complex communities are considered, it is more likely that social work will be positioned on lower levels of the system, and not those which have regulatory functions. If the function is understood as a regulatory one, however, then the social work can be regarded as a regulatory mechanism.

Outwardly dispersed sub-system. The process proceeds in such a way that it is executed by some other system. When the social work system is positioned outside the local community system, the local community must address an outside system to use the services of social work.

FUNCTIONS OF SUBSYSTEMS

In addition to structure, subsystems can also be classified by functions. There are critical sub-systems which process energy and information.

Producer. This sub-system is concerned with the production of energy or resources necessary for maintaining a system or of products which the system sends to another system for the purposes of exchange.

Energy storage. A sub-system which serves as storage for energy potential. Social work does not participate in production, not even in storage within the system, but it is very important for social work to identify elements of production as well as places and forms for storage of the material-energy resources of a community. Having such information available will help social work to determine its activities, as well as to plan requirements for the future. Incomplete and incorrect information on places of production, as well as places and capacity of storage, will lead to poor social work performance.

Reproducer. The reproductive basis of communities, males and females who make possible the community's growth and development or who render it impossible, is rarely considered as an independent sub-system. Human reproduction is very often connected to mythology and the functions of love, God's will, and other types of spiritual concepts. It is almost immoral to consider men and women who produce new members of the community as a sub-system of reproduction. Another part of this sub-system are those social mechanisms which enable population increase through entry of new members, or which introduce restrictive measures making the entry of new members into the community impossible.

Because the biological roles of men and women are different and because the gestation period in the human species is relatively long, different social mechanisms exist to balance the number of males (of which there are a surplus) through various forms of celibacy. In modern urbanized communities, legalized homosexuality and the struggle for homosexual rights is a social mechanism which compensates for the surplus males in local communities.

The reproductive function is significantly dependent on energy resources; thus, a variety of mechanisms control the amount and intensity of reproduction and try to adapt reproduction to the available economic resources (demographic stimulant or restrictive measures). This link between economic resources and reproduction feeds a variety of dynamic structures. The community, whose material resources are relatively poor, will behave toward its own environment with relative rigidity; it

will form strong links between individual constituents of the system and will not enable them to have a significant level of local variability. This type of structure is relatively insensitive to stimuli from the environment and must establish relatively firm boundaries around this sub-system. However, it

remains directed in the long-term towards its inner energy resources and its rigidity increases the level of entropy.

Boundary. This subsystem is on the edge of the community, protects the community from external stresses, keeps the elements of the structure together, and allows or prevents the entry of matter-energy and information into or out of the system. Territoriality is a biological characteristic of humans. We have a need to construct boundaries between ourselves and others. One of the most important reasons for conflict in public transport vehicles is the unease we feel when somebody steps over the boundary and enters our personal field. Local communities, besides the sometimes physical borders which they establish, have boundaries around some members of the community. Some social groups have special rituals which constitute a boundary between themselves and non-members of the group. Boundaries are very important in the evaluation of the dynamics of social groups. Strong boundaries, which firmly prevent the entry and exit of matter-energy and information, isolate the social group from its environment. They increase the level of the system's entropy; as the strength of boundaries increases, the system becomes more closed. A totally closed and isolated group would most probably be a system which, according to the second law of thermodynamics, creates a maximum self-entropy. This is the case with some extreme religious sects whose absolute exclusivity leads to personal and collective destruction.

A similar case concerns families with overprotected children. What is the situation with this child from a thermodynamic position? This kind of child is located in a closed system and is of low rank. The child is the lowest level of the family structure. The entropic process flows so that in equalizing the energetic potential, the child's energy sources are exhausted first. The child invests the most in the family. We can no longer talk about an overprotected child, but rather of an unprotected child. That is one type of child abuse.

Investor. This part of the system enables matter-energy to pass through the boundary of a system. In larger, more complex social groups, this function is highly specialized; in smaller communities it is executed alongside other functions. It is important to observe investors in a local community analysis because the energy supply is controlled through the function of investor. The investor control function is carried out from the higher system level. Input control into a local community creates a possibility to subordinate the community to a part of the system which is executing control. In a social crisis (for example, a refugee crisis), it is necessary to organize fast and efficient catering for a large number of people. Authorities in such cases choose the most efficient way, by centrally organized catering on the location as well as distribution of food. If authorities wanted, however, to keep a group of people under control, they would postpone the possibility of families taking over their own meal preparation. One could control such a group of people via centralized catering. The organization of centralized catering for socially imperiled people may have resulted from a desire to carry out some forms of efficient social control rather than to help them in the most efficient way.

Distributor. This sub-system conveys matter-energy which has entered the system to individual parts of the system's structure. This is done in accordance with the regulations which exist inside the system. Distribution may depend on the social groups' position inside the wider social system. Just as hierarchical systems are largely structured according to the principles of objective and resources (Luhmann, 1981), the objective determines the dynamics and quality of the distribution, and not moral order. In other words, those parts of the structure of a social system which are considered important for that system have priority in distribution. Non-privileged social groups in a community have continually weaker prospects in the distribution process.

Converter. This sub-system enables the input of matter-energy to be processed into a form which is useful to the system. Matter-energy, in the immediate environs of the system, does not always come in a shape which the system can use. Thus, it is necessary to transform it into a useful form. Social work helps communities to realize this function. Social work alone is not an immediate converter of energetic resources of the social community but it has an active role in offering information, to other parts of the system on how and for which segments to convert material resources. Entire categories of population would be in more difficult situations, if social work did not assist the system to convert products from environment in an adequate way. For example, the struggle of social workers to make public premises, transport and public institutions accessible to handicapped person is an important function that social work bears as a subsystem.

Extruder. A sub-system which serves to eliminate waste matter from sub-systems. Social processes have their own by-product, which is named social pathology. By linking thermodynamic theory and systems theory, by-products of social processes can be considered all those parts of the sub-system whose energy levels are useless on the level at which the system operates. These are, in short, all those

people as well as parts of a system which have equalized their energy potential. The system thus invests its energy into maintaining them. This includes persons and social groups which enter the system (newborns, newly introduced) with reduced energy potential and for which the system thus must invest its own energy potential. (This terminology is used as a metaphor; its eventual placement into a context of values is unnecessary and damaging.)

Many dimensions of social work are concerned with by-products or even waste products resulting from the operation of the social system. Retirees, with very small incomes which are insufficient for a dignified lifestyle, are a by-product of the functioning of the social system. Children who, due to a nonfunctioning social system, become subjects of soulless exploitation and hired workers are also a by-product of the functioning of a social system. Social work, when used in the function of social control, is concerned with the elimination of by-products resulting from the functioning of a social system.

Motor. This sub-system serves to move a sub-system or its parts across a fixed space. By this is meant movement where parts of a sub-system draw closer to other sub-systems, or parts of sub-system draw closer to one another during their activities. The motor structure element of a community is frequently omitted in analysis. In the modern world, however, distances are time-costing; analysis of each local community has to discover this component even when speaking of social work as the subsystem. Insufficient potentials of social workers to access their clients in the field diminishes possibility for action.

Supporter. This sub-system insures an adequate distance between components of a sub-system enabling them to function orderly. Complex sub-systems need a normal space to be able to function. The banging of one element into another would make this impossible. In social systems there are very different forms keeping distance. Even though social distance is sometimes considered in a negative context, as, for example, the class struggle in Marxist literature, it is a necessary element of social organization at all levels. Distance determined by age, for example, helps community members from functions which are not appropriate for their age.

Social workers also execute the role of the social distance. When, for example, we prevent clients from performing a function, which could be dangerous in their situation, we are carrying out a justified and useful function of keeping distances. When, on the other hand, social work is used as a function of social control from higher mechanisms, it could create social distances which become unjustified or even malignant.

Input transducers. The role of these parts of the sub-system is to introduce information which is important for system-functioning. They then convey this information to other parts of the sub-system. Incorrect and delayed information in an extremely disturbed time period, such as the war in Croatia and Bosnia/Herzegovina were noxious for lives of many young people. Development and access to information channels and networks was impressive in the war. People who belonged to the upper social class managed, before the war broke out in their area, to secure their property by physically moving it to a safer place. Even more important, they had an opportunity to protect themselves and their families by moving to a safer place long enough before fighting had started. The lower social class members, who either did not have access to information channels or were not involved in the networks, were affected the worst both by material or human standards. Both, their material as well as human losses, were the greatest.

Decoder. This sub-system transcribes information into information codes which are understandable and useful. This subsystem is practically a condition for existence. These elements of the structure make possible understanding of different cultural documents in social systems of complex cultures. Social workers frequently act as decoders. Sometimes, information from the higher system level is indistinct, especially administrative procedures and legislation related to local communities and citizens' rights. Signal decoding from other elements of the system has an important cultural dimension. Various culture groups may code information in different ways; correct coding and decoding is a necessary condition for understand processes taking place in the local community. On the other hand, in disturbed circumstances, information gets decoded in compliance with the system condition. During the war in Croatia and Bosnia/Herzegovina, warring systems often did not understand codes which came from local communities.

Associator. This enables joint activity of individual parts of the sub-system structure in those situations where joint activity is necessary. Common community activities may develop in a way that each community member, or at least an active community member, is aware that common activity of community members is necessary for goal accomplishment. Complicated local communities develop in different ways, often through sophisticated forms of this subsystem. Successful local communities

are careful when organizing local activities so that their implementation connects all elements of the community.

Decider. This operating mechanism of social structures insures the activity of the whole structure of a sub-system. The structure of a decider, like every other sub-system, depends on many factors. It may be concentrated at one point of the subsystem, or it may be a part of the authority transported to another section. In larger, more clearly structured local communities, the decider is the most formally determined part of the system. In smaller communities, it may be necessary to find out with careful analysis where the decider is located. Social workers, working in local communities, need to pinpoint the decision making source to be able to carry out their duties within the system. By identifying the decider, social workers avoid competition which might occur between them and the decider unless it was clearly identified.

Output transducer. This part of the sub-system is necessary for conveying information from individual parts of the system to its environment. Social work often plays the role of informing outside elements about the situation in a local community. The worse the situation in a local community, the more important is the role of social work as the information carrier to the outside. Communication to other system levels is necessary if a local community is not able to solve social problems alone. Information on the system condition is a crucial issue for the community.

Memory. This part of the sub-system stores information of the sub-system. Memory is not a precisely limited and defined sub-system on the local community level, except for larger and more complicated communities. Different archives and other forms of information storage are seldom at the local community level. This sub-system is often dispersed to large number of local community members who are perceived as the collective memory. The collective memory is a very important element of each community. Some traumatizing experiences can lead to a disturbance in community functioning. Cultural patterns can be very important. Social work pays attention to the past, but usually at individual rather than at local community level. Social work is often less aware of collective memory, which is always present to many elements of the local community.

GENERAL SYSTEMS THEORY AND SOCIAL WORK

A living system is an organized system spatially and temporally. It must comprise energy, matter, and information, which are then exchanged with its environment. It is an organized being containing sub-systems and components (Miller, 1978). Many forms of social organization can be regarded as systems and in every day communication have been called systems. In the seventies, systems theory was very popular in social work practice; the term became very common in everyday professional communication so almost every complex issue was described as a system. However, this may not be correct since some forms of social organization do not meet the condition of 19 necessary sub-systems.

Systems theory enables the successful and effective linkage of the relatively separate theoretical approaches in the large body of social work theory. It enables a consistent development of social work theory. Concepts in the framework of systems theory are applicable to the broad spectrum of people and phenomena which emerge in the practice of social work. As a result, this theory allows both a broader conceptualization as well as greater freedom. The role of the social worker is liberated from the context of the institution, which undertakes the most basic activities, and at the same time is integrated more actively into it. The principles of general systems theory enable conceptualizing the social worker as a dynamic part of the social system, who is in a never-ending exchange with all sub-systems, at both higher and lower levels.

The social worker is not placed in the role of somebody who needs to change parts of the complex whole, but rather as somebody who ensures the possibility of transaction in this process. The theory enables activity to be directed both at the individual and at larger systems. The scale of values becomes significantly more relative (not including, for example, the question of guilt) and directs itself to communication as a whole, and not its characteristics. The theory must be directed to the

system's objectives and all its components, as in this way all of its functions will become clearer. Researching into a local community, its subsystems and components, is crucial for social work in a community setting. If, for example, an input transducer was missing, information directed to a local community system would neither become an integral part of the community nor be distributed in the system. Therefore the local community would not be able to take advantage of many available dimensions of the social work. Failing to observe that the dimension of system characteristics is

absent will result in the loss of time or financial resources.

On the other hand, social work is a profession that engages in very dynamic social activities. New techniques are rapidly being developed or adopted from other scientific disciplines. It is very important to consider whether a new technique is to be applied within a social structure regarded as a system or in some other sort of structure which does not have system features. Social work can contribute to the growth and development of a social structure that is the process of transformation from a condition which can not be regarded as a system to a condition which has the features of the system.

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