

LEVERAGE POINTS IN SYSTEMIC CHANGE, AN EMPIRICAL EVALUATION OF MEADOWS TAXONOMY

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ABSTRACT

A system intervention is usually done with the view of changing some aspect of the system. That aspect might be the boundary of the system, the desired results of the system, the ability to apply a given set of metrics to the system or some other aspect. The nature of the intervention is always a matter of delicate selection.

Systems practitioners eventually learn that certain leverage points exist in all systems that can be used to initiate change in the system and thus avoid the frustrating effort of attempting to ‘muscle’ the system into a state of change. Of course the understanding of the existence of leverage points is really just the surface of the problem; the crux of the thing is the identification of the various leverage points in the system and the attempt to have some understanding of the possible unintended consequences of an intervention of that system through the adjustment of the identified leverage points.

Meadows developed taxonomy of systemic intervention points in 1999. Those intervention points are arranged from the one with the smallest overall effect such as changing constants, parameters and numbers (such as subsidies, taxes, standards) to that having the most dramatic effect upon the system; changing the ability to transcend paradigms. As of 2012 this taxonomy had not been subject to empirical validation. During a two year period three different cohousing communities were studied for the purpose of exploring the dynamic of the ethical change. The data collected was analyzed and various themes were developed. Pivotal ethical moments were identified and the leverage point in each change was distinguished and inspected for the effects of its application. This paper discusses systemic leverage points from the perspective of a larger study of ethical change within three cohousing communities that were studied over a two year period. Its purpose is to discover if Meadows taxonomy can be empirically validated as a useful tool to design a process of system intervention to achieve the greatest possible effect, or alternatively the least possible effect upon the system.

The communities that were studied were all located in the Northern California area of the United States and were selected through the process of snowball sampling as were the participants in the study. Data was collected through semi structured interviews and the personal observations of the researcher as well as an analysis of the public presentation of the various communities through their websites. The data that was collected was coded using Atlas.ti and themes developed from that data, in part focusing upon Meadows model.

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This paper is divided into an exposition of the various research sites and major pivotal moments within the sites. Those pivotal moments are then examined from the viewpoint of Meadows' twelve leverage points to determine if the data supports that model. Conclusions from the examination are drawn and suggestions for further research are made on.

Keywords: Intervention, Intervention Points, Leverage, Leverage points, Change, Ethics, Systems, Meadows

INTRODUCTION

A system intervention is usually done with the view of changing some aspect of the system. That aspect might be the boundary of the system, the desired results of the system, the ability to apply a given set of metrics to the system or some other aspect. The nature of the intervention is always a matter of delicate selection.

Systems practitioners eventually learn that certain leverage points exist in all systems that can be used to initiate change in the system and thus avoid the frustrating effort of attempting to 'muscle' the system into a state of change. Of course the understanding of the existence of leverage points is really just the surface of the problem; the crux of the thing is the identification of the various leverage points in the system and the attempt to have some understanding of the possible unintended consequences of an intervention of that system through the adjustment of the identified leverage points. (Senge, 2008)

There have been various attempts to identify leverage points within specific systems (Grzywacz & Fuqua, Hijorth & Bagheri, Proctor, Booth, et al. To date there has been only one attempt to develop an overarching taxonomy of systems leverage points that can be used in theory and practice as an analytic tool to identify the leverage points in all systems and more importantly to understand the effects (anticipated and emergent) of those leverage points.

An attempt to design taxonomy of Systemic Leverage points was made by Meadows ((2008). Donalla Meadows is primarily remembered as the co-author of two works, the Limits of Growth, Meadows, et al. (1974) and Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future, Meadows, et al. (1992). Unfortunately she was unable to develop her project of leverage points completely due to her early death. Since Meadows early work other systems researchers have explored the field of Systems leverage points but there has been no comprehensive attempt to develop a taxonomy that can be tested or applied in practice.

A recent study of ethical change in small communities has been an opportunity to empirically test Meadows taxonomy of leverage points and to identify consequences of interventions in those leverage points that were clearly unintended, Vodonick (2014). During 2012 and 2013 three different cohousing communities were studied for the purpose of exploring the dynamics of ethical change in those communities. This study was based upon mixed methods and consisted of the personal observations of the

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researcher, semi structured interviews of community members and an analysis of the public presentation of the various communities through their specific websites.

This paper discusses systemic leverage points from the perspective of a larger study of ethical change within three cohousing communities that were studied over a two year period. Its purpose is to discover if Meadows taxonomy can be empirically validated as a useful tool to design a process of system intervention to achieve the greatest possible effect, or alternatively the least possible effect upon the system.

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The research sites.

The communities that were studied are all located in Northern California and are cohousing communities. As Durett and McCamantt (1987) explain, cohousing is a movement that originated in Denmark, a movement of people who intentionally create neighborhoods where many of the resources are shared, and that community decisions come about through a process of building consensus. The primary purpose of establishing and living in a cohousing community is the creation of a sustainable and supportive community. For purposes of the study I have given fictitious (but not particularly inventive) names to the three communities: Alpha, Beta and Gamma.

Alpha Community.

Alpha community is located in Northern California in a town that has a population that is slightly more than fifty thousand people. Although there are numerous small businesses located in the area surrounding Alpha the largest employer is a college that has a large number of people living on campus. The town that Alpha is located in is progressive and environmentally minded. Forty percent of the residents of Alpha are graduate students at the local college and rent from owners of the homes that make up Alpha community. Alpha began as a housing cooperative in a neighborhood that consists of typical late 1950, three bedroom, two bathroom homes that became a cohousing community in 1986; from one dwelling Alpha has expanded to 19 houses through the process of buying adjoining structures (and two houses across a street) as they became available. This type of cohousing community is generally called a "retrofit" community inasmuch as it has been modified to fit the cohousing model.

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Beta Community.

Beta community is located in a metropolitan area of Northern California in a town with a public college. The local population exceeds 100 thousand and again is politically progressive. Beta began as a group of friends with a common leftist and emancipatory background, most of the members of Beta community are politically activist and participated in Central American solidarity movements. The group that eventually became Beta organized and began scouting for a site approximately six years before the Beta site was purchased and has been in existence for twelve years.

Gamma Community.

Gamma community is located on the outskirts of a metropolitan area in a city of a little more than 30,000 population. There is a community college located in the city and an instructor at that college was instrumental in launching Gamma. A cohousing organizing group formed in 1997, and in 1999 the site for Gamma was located. Gamma is a community built originally as a cohousing site. After the site was purchased 32 units were constructed including a new common house facility including with dining room, sitting room, kids room, teen room, guest rooms, laundry room, crafts room, swimming pool, hot tub, organic garden, workshop, and bike shed. Gamma community consists of 32 households, 48 adults and 21 children. The community is multi-generational facility with an age range from one month to 75 years.

Pivotal moments calling for ethical change.

In each of the communities studied conflict inevitable arose and the system had to adjust (or be adjusted) to come to terms with that conflict. The interviewees told of many such moments but only a few of them were of significance to the research project.

The Yard

In cohousing, members live in small homes and occupy small yards, all constructed and maintained to foster a community experience, to assist conversation and to bring nature into the individual homes. Alpha community has both front yards and back yards, but it is only the back yards that have become common. As houses were purchased and became part of cohousing the fences and other barriers were removed and paths between the various individual homes, gardens and the common house were developed. Members use their individual back yards for various things, loafing, barbequing, entertaining and growing flowers, vegetables and fruit. There are a variety of community activities that occur in the common areas (generally adjacent to the pathways) including, common gardens, chicken raising, volley ball playing and installation of children's playground structures. The play structures caused a problem in values in the community:

We had a fight with kids. Some of the couples who did not have kids who lived on the north end of the community did not want play structures, did not want kids hanging out in the north end of the community because they are too loud, too noisy. That got into some emails and that created strife.

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That was definitely stressful. I don't remember all the details of it but I remember it hurt people's feelings. I know we worked it out eventually.

The use of common areas became a highly charged emotional issue with Alpha. Some members did not want the children in the community using the common areas near their private homes or their yards at all; they did not want children helping themselves to the fruit and vegetables grown in their private gardens and did not want the boisterousness of children disturbing them. Other members of the community wanted children to feel wanted and as free to inhabit every part of the community and any part without feeling excluded and marginalized. A clash of community ethics that required consensus process, process that required communication between all stakeholders; those who did not want to accommodate children, those who were parents, those who wanted to accommodate children and of course the children.

The resolution to the problem of personal rights and community rights was an ethical shift towards inclusiveness within the process; the community realized that children were part of the community and needed to be part of the conversation if consensus was to be built:

We formed kids committees where kids facilitated their own processes when there were lots of kids living here. We did kids orientations and saw it in lots of ways. It was stressful, just emotional.

The process by which the kids committees and the kids committees facilitating their own process occurred rapidly in response to an emotional condition that required an immediate resolution and was not drawn out over a period of months.

Gamma has also had a transformative moment engendered by the use of a front yard. Gamma has several young children that are part of the member families. The use of front yards has been an emotional topic for several years without reaching consensus; should the front yards be kept neat and groomed? Should members be allowed to keep their recycling containers in their front yard? Should children's toys be kept in the house or in the yard? Should children be kept out of yards other than their own? This issue had not been resolved by the time that I conducted my interviews in Gamma; however it appeared as though it was well under way to being resolved due to a caring action. A member had been very proud of a front yard and had planted a bush that she was particularly fond of. The children of the community destroyed the bush in the enthusiastic activity of one game or another; this destruction resulted in an immediate email from the injured member to the entire community. This email engendered dialogue and in the middle of the night the bush that had been destroyed was mysteriously replaced. This was perceived by the community and more to the point by the owner of the yard as a lovely act:

So there is a lot of goodwill done just by that act and the goodwill generated and it was really lovely. I think really that my experience, the bad experience at corner was a personality, conflict and I don't know. I don't think it was over the issues or this person was very stressed at the time so she perhaps needed to make something I don't know, but she's a nice person I like her. And she's an important person in the community...

The identity of the person or persons who repaired the yard of the member remains unknown, it could have been the family of the children who damaged the plants

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or it could have been the entire community or it could have been an ad hoc group of members; the important part is that it occurred. The night visit occurred rapidly, in response to an emotionally highly charged condition and outside of the formal consensus process of the community.

Stranger in the Night

A new member of one of the communities that I studied is a Sikh and wears a turban. He was not seen by a lot of the members, since he worked at night and accordingly was not familiar to them. Late one night he was seen by a guest of one of the members in the parking lot and the guest took him for a “terrorist.” The guest called the police and reported the “terrorist.” The police engaged the member who became embarrassed and hurt.

The community did not engage in consensus building to wrestle with this problem; rather some of the members immediately created perceived strategies to deal with the event and its repercussions. Groups formed to discuss the event, to try to understand the dynamics of the event, to share feelings about the event and to develop strategies to avoid events like that from ever happening again. Posters and signs were displayed communicating the diverse nature of the community. A safety team was organized as the community’s methodology of responding to perceived threats as an alternative to police intervention. These responses to this event occurred outside of the consensus process that had been in place for years and was seen as destructive to the process itself:

All of these policies began to develop without community meetings; they were just like we're going to put these policies into effect. So just net worked out and it was not consensus. I felt like they were really pushing fast they wanted to calm his jittery nerves and keep him here. I kind of cited what a few people who said we are violating our process here, we have voted on this, we haven't had a meeting and we need to come it is a bad process. So that was a case where caring was running away from reason. And a couple of people protested and got process to slow down. They tried to correct and it did slow down.

A Death in the Family

Death is a part of life and it is a part of the life of a cohousing community. There were several encounters with death in the communities that I studied and each of them was a transformative event for the community.

The event of an impending death of a member of the community raises questions that are compelling. Of course the community wants to support and to help but to what degree?

We care about you but can't we care of you for the few months that you're not working? You know, then it gets to be a question of you know, you can't carry everybody and if everybody can claim that they're caring for somebody then we can't carry everybody because then one person whom I'm very close with said to me frankly, I don't wanna be punished for the fact that I'm an able-bodied, young single man whose parents are deceased and who doesn't have kids. I don't wanna be punished for that. I don't wanna have to pay more than you or I do more than you. So, but these conversations I would say have been fruitful, really great.

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Significantly when two children became very ill and were admitted to intensive care the entire community immediately supported the family even though they were relatively recent members and had not had the opportunity to contribute. But when another member who did not have particular history with the community continued to have needs after her health improved the community withdrew its support and that member moved from cohousing. Consensus was unable to come to a rule based solution to the problem of death and illness.

Once again the community decisions involved an ethical change that occurred rapidly and outside of the formal decision making process. Children are taken care of regardless of their lack of contribution; an adult who had continuing needs had support withdrawn. These decisions were ad hoc, immediate and in response to an emotional condition involving the community.

Lord of the flies

In the process of conducting this research, it became quickly evident to me that being a member of a cohousing community is a delicate balance between autonomy and community, individuality and solidarity. For example, a new member of cohousing had little experience with consensus process and community ethics. This person had a chemical sensitivity and had issues with soaps, fertilizers and other substances used in the community. Since much work in cohousing is done in committees several of the committees that this person served on were difficult due to her chemical sensitivity. It became very difficult for these committees to carry out their tasks and that created a great deal of frustration and eventually a great deal of anger. Anger gave way to expression and an email flood expressing frustration and anger was the result. Eventually the member was asked to move from the community; she was emotionally devastated as a result. As this community member recounted in an interview:

And I remember one night we had a discussion and one person said, God look what's happened that the whole community would call out one person a nice community, good people, good people that would get so freaked out over this experience and they would call one person on e-mail like that one after another without any let up. While there were four of us in the community who said this instead of stop-stop this this is not okay.

A community member is marginalized, becomes an outcast and is eventually forced to leave the community. This self-realization of such injurious conduct gave rise to an immediate process of critical evaluation and immediate action.

Man's best friend

One of the core ground rules of Alpha community was a simple statement. No dogs allowed. After all, dogs growled, dogs made messes and of course dogs can be menacing. This consensus based rule was seen to be rational and reasonable.

Alpha loses members during the summer months when student members leave college for elsewhere. During one summer a person sublet the rented home of a student member and this sub lessee arrived at Alpha with the dog Samson, a lovely, well behaved and very friendly dog. Samson lived at Alpha for the entire summer and then left. This

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opened the door because when another member who happened to be a homeowner fell in love with a dog owner who moved in with her the issue was presented as a new consensus to be built. The community built a new consensus that replaced the dog rule with a dog policy; every dog and every dog owner were evaluated separately on their own merit by a committee to make sure that the dog and the owner were both well socialized and responsible for the rules of the community.

This policy broke down eventually because some dogs who had been vetted by the community became territorial in the homes that they had come to live in and would bark at community members who came to visit. Eventually, one long-time member who was morbidly afraid of dogs simply dropped out of the community:

We eliminated the rule and exchanged it with the dog policy, the dog committee. That rule is just gone. One of the things is the dog wasn't vicious; it was just protecting its house. And she didn't like it, she was dog phobic. Then you have to deal with these issues. Well, you've got this irrational fear of something or you're slightly off in some ways in your phobias, all of us have some variations on the spectrum of something wrong with our mental ability to see realistically as it really is. How much do we care about that and how much do we see it in ourselves?

Eventually the no-dog rule was replaced with a dog policy through building consensus; but the initial offer of hospitality to a dog came in the middle of summer, with one dog who was friendly and well behaved. The initial invitation came through an emotional response and almost immediately.

The fruit pile

Cohousing communities seem to be drawn to gardening. There is an abundance of fruit, flowers and vegetables. At Alpha an excess of fruit resulted in the creation of a "fruit pile" in front of the community. Any member who had excess fruit was given the opportunity to place the fruit in a designated area in the fruit pile which was share with the public. The fruit pile became problematic:

Some people didn't like it, because they felt like it attracted like not so desirable people, and that was sort of, and I know other people and I found that kind of offensive, because it's sort of like, you know, how are you classifying who is like threatening? And does this have to do with like appearances of homelessness, or like people of color? Like, you know? And, and but that's also something that's very difficult to talk about.

The discussion about the existence of the fruit pile became sensitive itself since in large part the conversation dealt with the communities judgment of other people as homeless or as people of color, not an easy conversation to have and a difficult one for this community to build consensus upon. The conversation was so difficult that it may have been avoided entirely:

I don't know how, but eventually like, you know, somebody complained about it to the City, and it's ill - it's technically illegal. And so, you know, and so they came in and cited. And so it's sort of like this other system kind of came in and intervened. And to say that, you know, it was not okay: you can't do this. And

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that was, I know like that was, that was upsetting to a lot of people and it still is. Um, but other people are really, really happy it's gone now, so.

This community had adopted an ethic of care to those in need without regard to membership in the community. Someone or some ones had found that ethic to be unacceptable and had reached out to a larger community as a corrective. Obviously this action was outside of consensus process and clearly this action was immediate.

Meadows taxonomy of systems leverage points and change

Meadows (1999) developed a taxonomy that identifies 12 leverage points that are available to intervene in a system where a small shift can produce large changes to the system. Those leverage points from the smallest shift to the largest shift are:

- 12. Constants, parameters, numbers (such as subsidies, taxes, standards)
- 11. The size of buffers and other stabilizing stocks, relative to their flows
- 10. Structure of material stocks and flows (such as transport network, population age structures)
- 9. Length of delays, relative to the rate of system changes
- 8. Strength of negative feedback loops, relative to the effect they are trying to correct against
- 7. Gain around driving positive feedback loops
- 6. Structure of information flow (who does and does not have access to what kinds of information)
- 5. Rules of the system (such as incentives, punishment, constraints)
- 4. Power to add, change, evolve, or self-organize system structure
- 3. Goal of the system
- 2. Mindset or paradigm that the system — its goals, structure, rules, delays, parameters — arises from
- 1. Power to transcend paradigms (Meadows, 2008, pp. 147-165)

The four most effective leverage points, or places that a systemic intervention can have the most effect in relationship to the effort involved in Meadows' taxonomy are: the power to add, change, evolve, or self-organize system structure; the goal of the system; the mindset or paradigm that the system — its goals, structure, rules, delays, parameters — arises from; and the power to transcend paradigms.

It can be seen that the decision to affect these leverage points themselves are an ethical decision (or else it is the effect of a negative or positive feedback loop). That being said, the leverage points to affect ethical change in the communities that I have studied in this dissertation only occurred in relation to the four last (most effective) points: the power to add, change, evolve, or self-organize system structure, the goal of the system, the mindset or paradigm that the system — its goals, structure, rules, delays, parameters — arises from, and the power to transcend paradigms. The last and most powerful leverage point, the power to transcend paradigms, is not really a leverage point at all, but rather is the realization that all human organizations are constructed and can be

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transcended, disregarded or changed at will. It is the understanding that all human organizations are constructions of the mind and the social systems in which people live. For that reason, a discussion of that particular leverage point is not useful to this research.

In Meadows taxonomy, the power to add, change, evolve, or self-organize system structure is the fourth most effective leverage point to make systemic change. Self-organization allows the system to add structure, modify rules or making new negative or positive feedback loops. Perhaps the most dramatic illustration of the use of this particular leverage point in ethical change is that change that occurred in Alpha community to resolve the stress between some of the members and the community that arose from the inability of the children to discern between common property and private property. The change that was made was to change the structure and the rules of the community to include the children in the conversation. By including the children in the conversation the children came to understand the view of the members of the community that were protective of their yards and fruit, the children began to understand the complexity of the social system that they lived in and grew into the system, the adult members of the community began to see the children as agents growing into the system and the community itself gained a richer experience.

The third most effective way to achieve ethical change in an organization is to make changes to the organizational goals. Gamma's experience with its member who was arrested due to his perceived difference as a stranger to the community due to the fact that he wore a turban. A part of the community intervened in this condition to post signs, create safety groups and develop conversation to communicate the fact that different in dress, religion or aspect did not equate to danger or threat to the community. Obviously the members of Gamma knew that their cohousing member was of a religion that traditionally wore a turban; he was a member of the community and was accepted. The goal of the community has been to be inclusive within the community and that goal had been met and was followed; with this change the boundary of the community discourse was changed from being wholly internal to the community to adding those external to the community to the conversation as well. From a goal of being an inclusive community the goal became communicating the notion of inclusivity to everyone coming into the community regardless of their status of membership in Gamma, or their reason to be in the community. The result of this change was to orient the community view of inclusivity from internally communicative externally-focused as well; a narrative that stressed the presentation of the community to the environment in which it exists.

The second most effective leverage point in the ethical system within the communities that I studied is the mindset or paradigm of the system. In this context the experience of Beta community is the best illustration. Beta formed itself as a community before it had a physical location and its members had a long history of social involvement and progressive causes. Beta was organized on the principles of common ownership of land and consensus process. Over the years building consensus became more and more difficult as the value of autonomy gained weight within the community; eventually consensus process became so burdensome, difficult and fruitless that it was given up completely. At this point the community made a paradigm shift from a system that was

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based upon the ethical value of building consensus for the benefit of the community to one that was based upon the ethical value of decision making for the benefit of the individual. This change of paradigm or mindset resulted in ripple effects throughout the other leverage points in Meadows taxonomy; for example the goal of the system is no longer community oriented but rather individual oriented and axiomatically the self-organization of the community have changed as well since decisions are now being made with the goal of the individual agent primary rather than the community being primary.

Understanding leverage points involves teasing out the dynamics of the specific system itself; in the leverage points just discussed the primary puzzle is what the leverage point is. It could be argued that the question of the rights of the community owners to their fruit and yards to be free of the depredation of the children was a leverage point directed to a change to the mindset or paradigm of the system, but that is not the case; if it were the case the issue would have been one of changing the entire focus of the ethical system to be oriented toward the children of the community. In fact the change was to include the children in the conversation that made the community, the community itself kept the same mindset only the structure changed.

The intervention that Beta experience was patently a change in the rules of the system, a point that would almost be the middle of Meadow's taxonomy. In fact what the intervention point was aimed at was a shift in the paradigm of the system of Beta itself. Rather than constituting a change in the methodology of decision making, the intervention resulted in a change that effected the basic value structure of Beta itself; it was no longer a cohousing community as that phrase is commonly understood. Rather it was a community of individuals, with individual values sharing the common ownership of some property.

The relationship of the leverage point that is under consideration for change to those leverage points that effect less change or more change needs to be considered to understand the effect such a change will cause. This consideration is one of great subtlety and is deserving of intense study.

Conclusions

While several systems thinkers have pointed out that in every system certain leverage points exist that will achieve the maximum result (either positive or negative) compared with the amount of effort that is expended only Meadows has developed a taxonomy of systems leverage points that can be used in theory and in practice to identify points of leverage in any system. The research that was done in this study supports the conclusion that Meadows' taxonomy has empirical validity and can be a useful tool for both theory and praxis. This research shows that while the communities that were transformed through this change did not deliberately use Meadows' model to design the change initiatives the actions that were taken did all fall into one of her categories and often had unintended consequences. The research described here and the conclusions reached are a useful beginning to the further development of Meadows theory. It is

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suggested that further analysis of various change initiatives be undertaken and the notion of a change design using Meadows model be investigated.

REFERENCES

- Bagheri, A. , Hijorth, P. (2006). Navigating towards sustainable development: a system dynamics approach. *Futures*, 38(1), 74-92.
- Booth, S., Sallis, J., Ritenbaugh, C., Hill, J., Birch, L. Frank, L., et al. (2001). Environmental and societal factors affect food choice and physical activity: rational, influences, and leverage points. *Nutrition reviews*, 59(3), 521-536.
- Card, S., Pirolli, P. (2005). The Sensemaking Process and Leverage Points for Analyst Technology as Identified Through Cognitive Task Analysis. *Proceedings of International Conference on Intelligence Analysis*. (2005), 2-5.
- Fuqua, J., Grzywacz, J. (2000) The Social Ecology of Health: Leverage Points and Linkages. *Behavioral Medicine*, 26(3), 101-115.
- Meadows, D., Meadows, D., Randers, J., Beherens, R. (1974). *The limits of growth*. Falls Church, Va.: Potomac Associates.
- Meadows, D., Meadows, D., Randers, J., (1992). Meadows, D., Meadows, D., Randers, J., *Beyond the limits: confronting global collapse, envisioning a sustainable future*. White River Junction, Vt: Chelsea Green Publishing Company.
- Meadows, D. (1999). *Leverage points places to intervene in a system*. The sustainability institute. Accessed from http://www.sustainabilityinstitute.org/pubs/Leverage_Points.pdf
- Meadows, D., Wright D. (Ed.) (2008). *Thinking in systems, a primer*. White River Junction, Vt: Chelsea Green Publishing Company.
- Proctor, E. (2004). Leverage points for the implementation of evidence-based practice. *Brief treatment and crisis intervention*, 4(3), 227.
- Senge, P.M.,(2006) *The Fifth Discipline: The Art and Practice of the Learning Organization (revised edition)* New York: Doubleday Publishing.
- Vodonick, J. (2014). *A taste for decency: A systems exploration of the dynamics of ethical change in small community organizations* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Dissertation No. 3611226)