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A SOCIOCYBERNETIC MODEL OF SUSTAINABLE SOCIAL SYSTEMS

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ABSTRACT

The ongoing economic crisis world around has asked for a theoretical understanding and deep analysis of what have been wrong in our economic system in specific and social system as whole. Discussions in many forums and mass media have mostly focused on a level of first order casual-effects such as bank and credit system in relation to house loans and car industries, and where and how much the stimulating packages should be distributed, etc. This is what I called a liveability level problem. A second order understanding of fundamental systems structure and social subsystems relationships however, have not been much addressed properly. This is what I called the sustainability problem.

This paper will propose an epistemological model based on cybernetic feedback principle and the Activity Theory to interpret the second order problems that deeply embed in our social-economic system structure. So the liveability and sustainability are coherently discussed within a socio-cybernetic system.

The first part of the paper introduces shortly principles of feedbacks from cybernetics, especially understanding the behaviours of positive and negative feedbacks. Then, the Activity Theory and related concepts from social autopoietic theory are introduced. The aim of introducing those concepts is to provide the basic elements/components to the construction of a double-loops feedback model in the second part. In the last, the current economic crisis is interpreted based on the constructed model, to verify the usability of the proposed model.

Key Words:

Feedback; Social Activities; liveability; Sustainability; Autopoiesis.

INTRODUCTION

We are facing with great challenges of globalization related to our thinking of world social-economic system. Cybernetics as one of the most important part of system paradigm, such as feedback, purpose behaviour, intelligent control, etc. can offer great knowledge to our understanding of current challenges and problems. Early in 1950s, Churchman proposed the essential understanding of the cybernetics in sociology, and warned of the risk of the two becoming separated:

The psychologist and social scientist are aware of the complexities of phenomena in their own field and may look upon the metaphors and analogies of the cyberneticians with skepticism. The danger is that eventually some cybernetician goes astray and makes proposals which to the psychologist and social scientist are completely outrageous. The end point of the process may come when each field returns to its own work and ignores the potential contribution of other disciplines. The real danger is the complete loss of integration which at the present time seems essential in the study of purposive behaviour. (p33)

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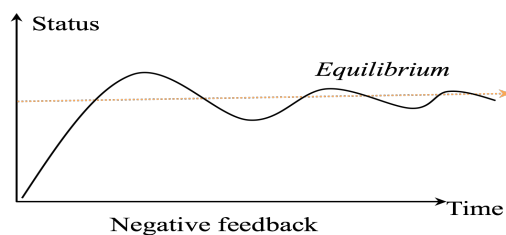
I am fully aware of this risk warned by Churchman, and no less bravely to propose a meta-model based on Cybernetics to the understanding of current world problems. In doing this, I integrate the concepts from socio-psychology and cybernetics feedback principle into a sociocybernetic model. The model has coherently integrated the liveability and survivability of human activity systems, and also provides with a systemic interpretation to the current economic crisis and future faced problems.

FEEDBACK, FEED-FORWARD, AND HUMAN PURPOSEFUL BEHAVIOURS

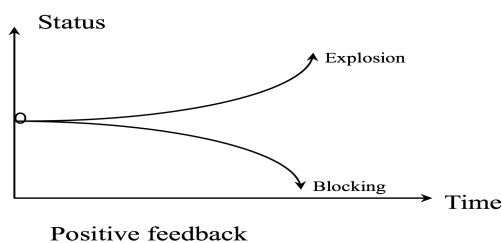
Feedback and feed forward are important embodiments of purposeful behaviour in cybernetic systems. In the control theory, there are three fundamental different types of control mechanisms, namely, negative feedback, positive feedback, and feed forward (Skyttner, 2000).

Negative feedback: It is the most common type of control for system to maintain equilibrium – a status of a system in which competing forces are balanced. Negative feedback works only when there is a goal/status (such as equilibrium) for the system and deviations of the actual output from the goal/status are identified or measured, i.e., it works against a deviation. All tracking systems, speed control systems, thermostat are all based on the negative feedback. Classical economists such as Adam Smith claimed that free market would tend towards economic equilibrium through the price mechanism, in which demand and supply are negative forces against each other to equilibrium price. This view now is questioned from current practices such as problem of unemployment, bank credit system, bonus class, monopoly market.

Positive feedback: Positive feedback amplifies a deviation so the end result of a positive feedback is often "explosive" or 'blocked'. So this kind feedback works normally as a temporary control in some dynamic system, such as nuclear fission based explosives, world population system, stock market, bank run and bankruptcy, economic recession or expansion.



A system with negative feedback will eventually approach to a predefined status - an equilibrium state.
Negative feedback can be used for system sustainability.



A system with positive feedback will eventually run away, or block to death.
Positive feedback can be used only for temporary liveability.

Figure 1. Two kinds of Feedbacks Related to System Status Liveability & Sustainability

Feed-forward: Differently from the above two kinds of feedbacks in which output of the system is always measured against a predefined status in order to decide next input, feed-forward works only on its own pre-defined way without responding to how the output reacts.

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Two prerequisites are needed for a reliable feed-forward: the external environment must remain predictable, and the effect of the output of the system should be known. Apparently the two prerequisites can hardly be met in real world situation. Therefore feed-forward is normally used as a complementary to feedback.

Goal seeking is embedded in all the above three kinds of controls, and is an important purposive behavior which defined by Churchman (1950) as intensive function of a system. A system has intensive function if it consists of objects that accomplish their goals by changing their behaviour if the environment changes. This accomplishment requires the system can measure the changes in the environment and compare the changes with its goal. In many social studies, however, this requirement is either impossible, or undesirable. Therefore the intensive function is primarily studied by the so called first order cyberneticians. The second order cybernetics/sociocybernetics is more interested in studying higher level purposeful behaviour, namely purpose. A system has purpose if it accomplishes its objectives by exhibiting different types of behaviour, even though the environment remains constant or unknown. Human perform various kinds of activities purposefully even under the environment. For example, the executives of American International Group (AIG) still claimed about \$165 million in bonuses even the economic environment has changed dramatically. An opposite example, a person who looks after a job can demonstrate different strategies and actions even under the same environment.

THE ACTIVITY THEORY

Activity Theory is a philosophical and cross-disciplinary framework for studying various forms of human behaviours and social practices. It uses the category 'activity' as 'a system of its own structure' or the minimal unit (Leontèv 1981, p46) to approach the relationship of subjective minds with the social context. Some important concepts and models of the Activity Theory, most of which originated from the work of (Davydov, 1982), (Vygotsky, 1978), (Leontèv, 1981), and (Engeström, 1987), are summarised in the following.

Activity as the Most Basic Unit of Social System

An activity is a basic process that a human being or a collective carries on or participates in by virtue of being alive, and it is also the most basic unit for any human or collective performing a specific function or obligation. No one can survive without participating in various social activities, such as production and distribution activities, political and democratic activities, scientific and educational activities, religious activities, sports and various entertainment activities. Activity is 'the nonadditive, molar unit of life' (Leontèv, 1981, p 46).

For much current sociology, in certain sense only individuals exist: the individual human being is the ontologically given starting point from which everything else can be deduced. Consequently, socialisation, norms, values and culture are popular means for explaining why individuals unite into something called society (Qvortrup, 1996). Activity theory, however, takes the Activity - interactions between people and their social cultures, norms, values as a basic unit of a social system. Activity is an emergent property and synergy of 'collective intentionality'. This collective intentionality is not the sum of singular intentionality, but a new emergent property of collectives (Searle, 1995).

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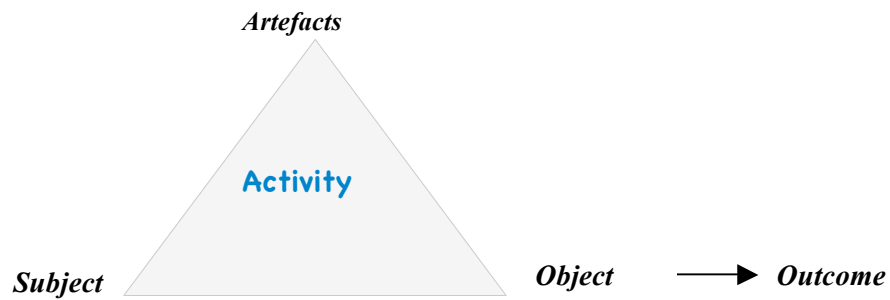


Figure 2. An Individual Activity Based on Leontèv (1981)

Leontèv (1981) proposed a triangle model which includes three fundamental elements and relationships in an activity (figure 2). In this model an activity is defined as the ‘middle link’ in a three-part scheme that subject interacts with an object via artefacts. A subject in an activity is a conscious actor or a group of conscious actors. An object is some part of the real world that the subject acts upon. ‘If I act, there is something in front of me, an object (Schwarz 1997, p 24).’ The object manifests itself only if there is an interaction with a subject. There is non-separability between object and subject. Activity theory takes social, historical, and cultural properties to be as objective as physical and biological properties, and maintains that consciousness is located in everyday objective practice: you are what you do. And what you do is firmly and inextricably embedded in the social matrix of which every person is an organic part (Nardi, 1996). An object (objective) is always held by a subject, a person or a group of persons who is or are engaged in an activity, provides motives for the activity, and gives the activity specific direction. ‘Behind the object, there always stands a need or a desire, to which the activity always answers (Leontèv 1981, p46) ’.

But a subject can act on an object only through artefacts as a mediator. The introduction of artefacts as a mediator in mediating the very classical ‘mind-body’ paradox or contradiction is a major contribution of Activity Theory. ‘Mediator objects connect humans not only with objects, but also with other people (Leontèv, 1981).’ In particular, mediator objects are understood as objective transmitters for the internalisation process and externalisation process. The internalisation process is the process in an activity transforming the object in focus into its subjective form or image (mental models, theories, skills, consciousness, etc.) that is ‘generalised, verbalised, abbreviated, and most importantly, becomes susceptible to further development that exceeds the possibility of external activity (Leontèv, 1981)’. The externalisation process is the process that internal process manifests itself in external actions performed by persons, and is converted into objective results and products (Davydov, 1982; Vygotsky, 1978; Leontèv, 1981).

Community Based Activity System

Based on the first activity model from Leontèv, Engeström (1987) introduced three more components, namely Community; Rules (including laws, norms and cultural traditions); and labour divisions into a triangle model (figure 3). He expanded the concept of contradiction and mediating principle into community level which was not visualised just like a hidden bottom of an iceberg in Leontèv’s model.

Contradiction is an important concept in Activity Theory that used to interpret the start point of a development process. Contradictions manifest themselves as problems, ruptures,

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breakdowns, and clashes. Activity Theory sees contradictions as sources of development (Bai & Lindberg, 1998, Turner P. & S. Turner 2001). Activities are virtually always in the process of working through contradictions (Kuutti, 1996). To resolve a contradiction which normally involves two mutual opposite parts, there needs always a mediator. In figure 3, together with the classical contradiction of 'subject-object' mediated by artefact, two new contradictions are identified after the introduction of community, the contradiction 'subject-community', and the contradiction 'object-community'. In a similar manner as the instrument/artefact is introduced as the mediator of the contradiction 'subject-object', Engeström introduces 'norms, rules' as the mediator of the contradiction 'subject-community', and introduces 'division of labour' as the mediator of the contradiction 'object-community'. Based on Marx's terminology of social production, exchange, distribution, and consumption, he further maps those four human fundamental activities as four sub-triangles. In the next, those fundamental activities will be applied as components to the sociocybernetic model of feedback economic-subsystem.

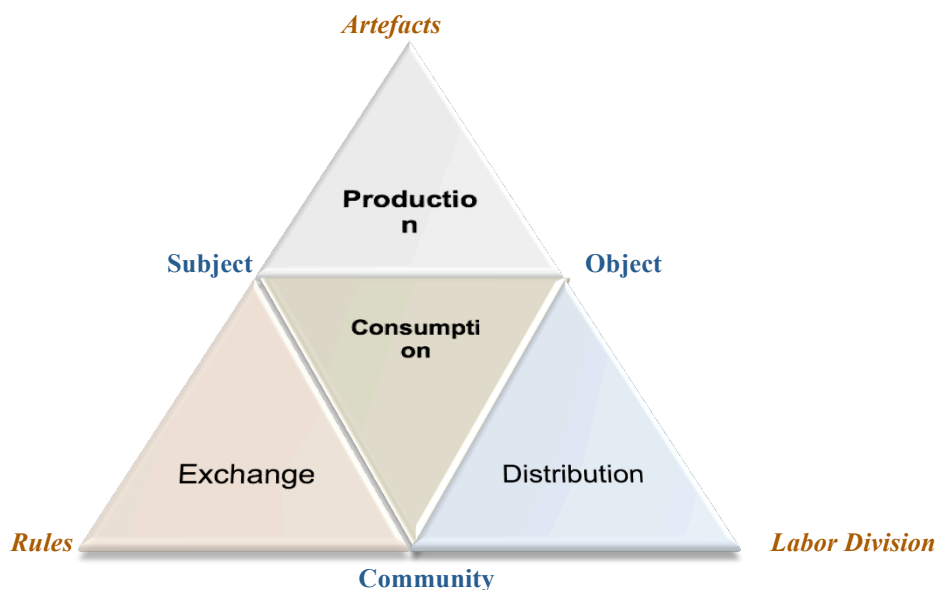


Figure 3. Community Based Activity on Engeström Y. 1987)

According to figure 3, the development of economic production, exchange, distribution, and consumption activities are accordingly driven by four kinds of contradictions. Firstly, production activity is driven by the contradiction 'subject-object'; namely, by using instrument ('tool' in the terminology of Vygotsky, or artefacts in figure 1 by Leontèv) the subject works and produces the objects that correspond to the given need or an outcome. Secondly, the exchange activity is driven by the contradiction 'subject-community', namely, the subject exchanges his/her labour value (exchange value) within the community to obtain his/her needs (use value) according to the community's rules and social law (second mediator). Thirdly, the distribution activity is driven by the contradiction 'object-community'; namely, the outcome of the object is distributed for social re-production among members (organisations, companies) of the community according to the principles of the division of labour (third mediator). Finally, the total social economic activity system (the whole triangle) is driven by a new kind of contradiction: 'production-consumption', namely, by the paradox that we produce output and, simultaneously, we consume the output in order to re-produce it. The contradiction of 'production-consumption' provides an inner and never-ending energy that

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drives an accumulating cycle of consumption and production. 'Were it not for the paradox that consumption necessitates production, and vice versa, activity would not exist (Holt 1993, p99).' However, it is also this contradiction together with political paradigm that led to the crisis that we are living in. This argument will be discussed later based on the sociocybernetic model proposed by this paper.

Activity is an Autopoietic and Self-referential System

Autopoiesis is a concept developed in the 1970s by Maturana and Varela (Maturana and Varela, 1972) in describing cells systems. The basic definition of autopoiesis is that a system self-reproduces the components that produce it (Mingers, 1995). Although no biological system can maintain itself without resources from the environment, only matter and energy, not elements and not unity can be imported from or exported to the environment. A biological system is organisationally closed but communicatively opens. Luhmann (1986) generalised the concept of autopoiesis to cover not only organic systems, but also social systems. However, one question has to be answered then: what elements or units in our social autopoietic system are self produced and not imported from the environment? According to Luhmann (1986, 1995), social systems are autopoietic systems in which only communication is the reproduction unit.

Social systems use communication as their particular mode or autopoietic reproduction. Their elements are communication which are recursively produced and reproduced by a network of communications and which cannot exist outside of such a network

(Luhmann 1986, p.174).

For a theory of autopoietic systems, only communication is a serious candidate for the position of elementary unit of the basic self-referential process of social systems. Only communication is necessarily and inherently social.

(Luhmann 1986, p.177)

The crucial role of communication is no doubt the most significant one in media driven society as today. In fact, any system, if it is called a system, must include the communication channels in order to knit the units or parts together into one coherent whole and to ensure that the units are working together appropriately and contributing to the objectives of the whole. However, communication may not be the only kind of unit that is autopoietic in a social system. In fact, communication is only meaningful when an activity is constructed and by which it is mediated. Activities which include always communication are always socially self-produced and reproduced within its recursive network.

An autopoietic system, while organisationally closed (no elements or units imported outside of the system); nevertheless it must be referred to an environment, background, or context. Obviously, a system cannot distinguish itself if it cannot differentiate itself from something which is not. Also a system can never expand or develop itself without referring its embedded environment. This is especially important when talking about humanity and social system as autopoietic system. For example, it will be very dangerous to talk about autopoiesis of legal subsystem, economic subsystem, and mass media subsystem. The idea of autopoiesis is applicable to society only regarding the social humanity system as whole. This means that social subsystems as units of the whole society must be properly regulated and harmonised. This is because the labour division of modern society has distanced the dependence of

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humanity from its environment far more than we can comprehend. This will be discussed in the following about labour division or functional subsystems.

Labour Division or Functional Subsystems

Societies today are organized into many functional subsystems such as economical system, political system, education system, to which Activity theorists call labour division, and Luhmann calls differentiated function systems. A function system is said to be functional in that it achieves its identity through the fulfilment of a function of the entire system. It has been argued that one of the marked features of the modern world has been the extent of its differentiation or division of labour and therefore to lead to increased collective productivity. Obviously, the more differentiation there is, the more specialised the roles that are played by actors, and therefore the more important became intercellular and inter-divisional communication and control (Corning,1994).

However, according to Luhmann, each functional system is closed and creates its own domain allowing only certain operations. As a consequence of this organizational closeness, it is impossible (without the help of God) to observe - or to handle - society as a whole. As a further consequence it is impossible to talk about what is rational for society as a whole, or what will benefit society as a whole (Thyssen, 1995). A serious consequence of this labours division and closeness of self-organization is more like a self-interested and liveable cancer cell which in the end will destroy the whole system sustainability including itself liveability. The problem of over emphasising the selfness of labour divisions (liveability), such as banks, stock market, and credit system, will eventually lead to system crisis as whole social system (sustainability problem).

To let each labour division associate its own interest with the overall system of humanity has been long time a dilemma for sociologists and system thinkers. The author believes that functional subsystems co-operate not based on consensus or a religious value, but on their mutual benefits and complementary principle (Bai, 1999). The functional benefits of the subsystems are so vital that no society can afford to make social system dependent on consensus (Thyssen, 1995). Even democracy is based on majority principle not consensus. All subsystems must share a vision of the whole system in which its identity is identified by its contributions to the whole, not by itself. Therefore the paper is contributing a sociocybernetic model of the whole system for achieving such a vision. The model will be later used to describe the sustainability of social system in relation to the current world economic crisis.

A SOCIOCYBERNETIC MODEL

In order to build up a model, we need first to identify the most basic units for the relevant system. Put another way, we have to ask: What exactly the society is being reproduced if the society is an autopoietic or self-reproducing system? What is/are the most basic unit/s for conducting social problem analysis? There have been many possible answers. The unit could be, e.g., the individual (Mingers, 1995, Miller, 1978), the unit of action (Hutchins, 1994; Suchman, 1987; Lave 1988), and communication (Luhmann, 1986). In this paper, however, activity is the recommended unit of social reproduction or social autopoiesis. Human activity systems in this paper are categorised as social economic activities of production, consumption, exchange, distribution, and social political activities of human inquiring of goals and learning, legal control, military action, and democratic movement. Communication such as mass media, reports, and statistics is the link that makes all the social activities as whole. Based on the activity theory, feedback/feed-forward principles, and social autopoietic

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theory, the author constructed a social activity model – a sociocybernetic model as shown in figure 4.

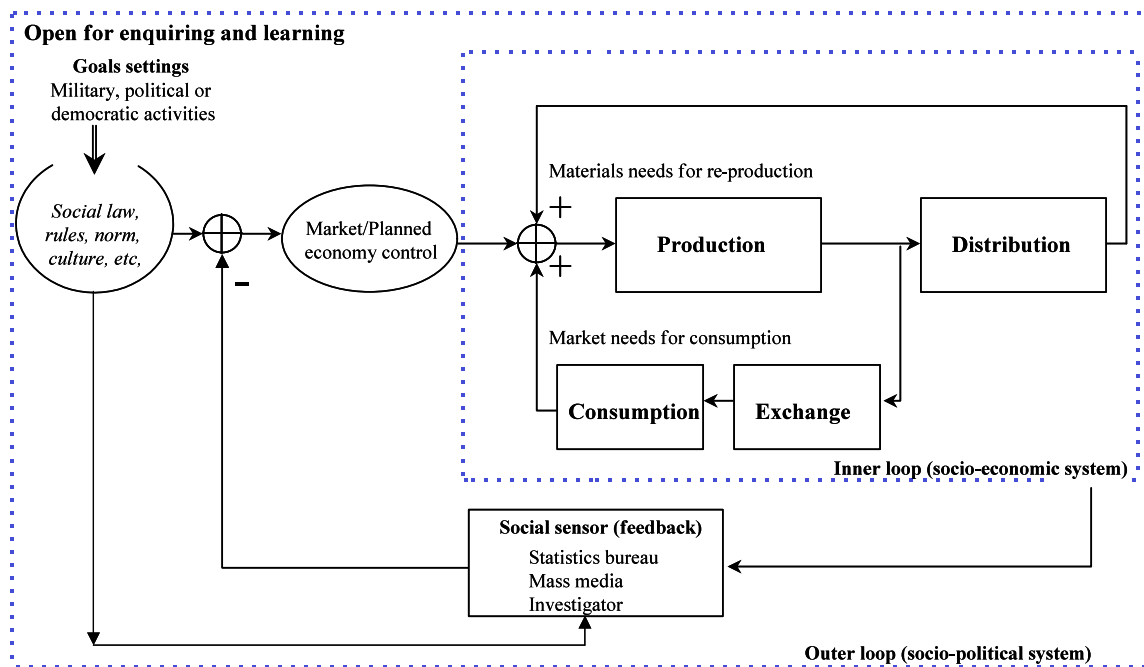


Figure 4. Social Activity System (Double Loop Sociocybernetics)

In figure 4, the sociocybernetic system as whole is constructed as two loops, i.e., the inner-loop of social economy activities and outer-loop of social political activities. The inner-loop refers to the social economic activities of social re-production, consumption, distribution and exchange based on the activity theory model in figure 3 and principle of contradiction (Bai & Lindberg, 1998). The outer-loop refers to the social political activities such as human inquiring of goals and learning, legal control, military action, and democratic movement.

The Inner Loop - Positive Feedback of Social Economic Systems

As described in the activity theory, social re-production and consumption are the most basic human activities. The two compose a fundamental contradiction which drives a society forward - a paradox that we produce products and, simultaneously, we consume products in order to re-produce new products. Consumption necessitates production, and vice versa. This indicates that the production and consumption form a positive feedback loop in the sense that the more consumed the more we have to produce or the vice versa. The exchange activity, before the consumption in figure 4, is a marketing process, and it is a media through which a product becomes an object of individual consumption. The marketing process is a value exchange process that individuals (groups) purchase their needs (use value) by the market value (exchange value).

Now let's look at the loop of production-distribution in the inner loop. Some products that are produced in the production process will not be consumed directly by members of a society to which we may call them half-products. Those half-products will send back to re-production. Those half-products must be distributed through distribution activity to each differentiated sub-unit or labour division. The more products produced the more half-products have to be distributed. So production and distribution compose another positive feedback loop in the inner-loop of the sociocybernetic system model in figure 4.

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Generally speaking, the inner-loop of social economic system is an unstable system based on positive feedback. We all experience the wild economic-turbulence and bankruptcy, such as IT bubble and now economic crisis. Therefore the inner-loop cannot be free of control, no matter free marketing system or planned economic system, regulation and control outside the loop must be applied, such as rate adjustment through banks or even political interference by central government, e.g., political interference happened in Argentina and now the USA. This issue about political regulation to economic system will be discussed in the next part of outer-loop below.

Though the sub-systems of production, consumption, exchange, and distribution in the inner loop are social subsystems, they are not, however, autopoietic and closed. Each subsystem is not self-reference in the strict sense. Instead, they are mutually referential.

The Outer Loop - Negative Feedback and Feed-forward of Social Political Systems

Though the social economic system is wild and unstable, it is however harnessed quite well (mostly) through some control mechanism in the outer-loop of socio-political system which applies negative feedback and feed forward mostly.

The feedback function of social sensor: statistic bureau, reporter, investigator, etc. are extremely important for a right political decision of macro regulation for society from any deviation of humanity and institutional laws. This feedback must be objective and without any bias. Therefore it is important that this feedback should be free from economic interest, political interference, and the reporters must have moral obligation. Those criteria are hardly fulfilled today if we just listen to some contradictory reports from television about war in Iraq.

The feed forward is the never-ending human inquiring and learning activities that enable to challenge the contemporary values and social goals, meanwhile to construct new values and social goals for new development of human progress. The continuous constructing of social goals is often manifested as political, democratic even military actions. Therefore the world is not absolutely stable. When such unstable situation occurs, the inner loop of social economic system will not be stable, namely the social production, consumption, exchange and distribution activities will be interrupted, destroyed, and reformed.

It should be clear that the outer loop of socio-political system is self-referential and autopoietic. It is self-referential since the laws, norms, rules are created by human beings (no matter by how and whom) and in turn are applied to regulate humanity themselves. It is autopoietic in the sense that all activities inside the system as whole are reproduced by the network of the activities themselves.

SYSTEM RISK AND MORAL RISK – THE CASE OF GLOBAL ECONOMIC CRISIS

Now let's take the case of ongoing economic crisis as a verification of the model to see if the model can provide with a systemic interpretation of what has gone wrong and why. The facts and view points in the followings are based on the interview and analysis from Frontline (<http://www.pbs.org/wgbh/pages/frontline/meltdown/>).

There have been many detail descriptions, analysis and discussions in the mass media about happenings which caused the ongoing global economic crisis, example in the above mentioned source. Mostly, the mass media focus on facts, details, and reflections. This paper is to interpret and analyse the crisis from macro relationship of social economical system by

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applying the proposed socio-cybernetic model. The systemic perspective is a crucial mentality for policy and decision making to pro-act and to prevent future crisis instead of just passively reacting just like what happened this time.

First, we have to accept a fact that the crisis was created by human factors or decision makers, and it could be avoided or at least reduced its happenings in the future if we can learn from what was wrong this time. A well accepted fact is that the root of the crisis started already in the so called shadow banking system during 2000 to 2007. Unregulated house loans and high risk mortgages encouraged especially by Bush's administration have created a mentality in USA that house price can only go up. Buying a house was a matter of becoming rich and getting a loan, no matter whether you can earn and pay back. Making money is by means of borrowing money. Then the investment banks pack up for example, one billion dollars of subprime loans to support 10 billion worth of structured products. Later they create these 10 billion credit default swaps on top of those, and suddenly that 10 billion that is really based on one billion is actually supporting 100 billion worth of investment elsewhere. The Wall Street took this stuff of bubbles and used it as the building blocks on which their financial empires were built. That means when that one bubble cracked, just huge pillars of the financial system crashed. The whole financial system is like a castle in the air and finally in 2007 the castle collapsed. Due to the unhealthy structure of financial system, USA's economy in 2008 reached to such sensitivity that a small butterfly's wings swept in 10th of March. 2008 in Wall Street - a rumour saying that Bear Stearns was running out of cash, ultimately caused an economical tornado that swept the whole world. We can conclude that in the very beginning of the crisis, there were serious systemic problems or structure problem already embedded as whole. This is a problem of sustainability of the whole economic system. When the crisis was a reality, the Bush's administration had no choice but fighting for liveability.

There were two kinds of risks that the Bush's administration had to deal with in the beginning of the crisis, namely moral risk or moral hazard and systemic risk. When Henry Paulson, the secretary of Treasury decided not to intervene and rescue Bear Stearns, Lehman Brothers for reason of defending the free market principle and avoiding a moral hazard, a systemic risk that melt down the whole economy system became later a payoff. Today when the system risk has become a reality we may wonder why so many experts and talent economists in the white house not stand up and say 'Wait a minute; this is a lot bigger than Bear and Lehman. You let them go, they will drag down Fannie Mae, Freddie Mac, AIG, GM, Ice Land, England, China and the whole world'. The decision made by Bush's administration, and Paulson in special, was based upon a gut believe in that you have to let the market wash itself out, and that the best government is non-government. Believing absolutely in free market system and holding it as a moral principle, Paulson could not see that every corner of Wall Street is now connected to another as a huge web and stretched to the whole world. Hoping that the cases of Bear Stearns, Lehman Brothers, etc. were only a one-off another, Paulson could not see the system risk which can lead to a collapse of the whole financial system. Even though warned by Ben Bernanke (Chairmen of Federal reserve bank), Tim Geithner (Central Bank of New York) that if no government intervention immediately the whole financial system of this country and the world will melt down in a matter of days, the fear of being cross the border of moral principle of free market system finally driven Paulson to series of decisions that eventually led to a global contagion of economic recession.

Hard facts are more convincing than an ideology. After many reacting, instead of acting to the systemic crisis, Paulson forced to agree direct government intervention - the state capital injection and on Oct. 14, 2008 he said 'We regret what we have to take this action. Today's

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action is not whatever we want to do, but today's action is what we must do to restore our confidence of financial system.' Ironically, Paulson the capitalism warrior who spent his life perusing and defending free market is now the biggest interventionist treasury secretary since the great depression 1920s.

A Sociocybernetic Interpretation to the Crisis

Based on the above described case, this part is to apply the proposed model to verify its applicability. From the model in figure 4 we know that economic system (Inner loop) itself (production, consumption, exchange and distribution) is based on positive feedback. A system based on positive feedback is an unstable system that always runs either exponential growing just like house loan leverage in USA 2000 to 2007 or descending just like we are now in an ever deep economic crisis. A system risk is a risk that a nation builds up its economic and financial system without macro regulation or monitoring. Totally free market is equally idealistic and destructive as totally planned economy system. No country in the world could build its economic system as such, neither USA though this time it has gone too far in one direction.

Therefore the socio-economic system (inner loop) must be regulated. The introduction of market/planned economy control in the sociocybernetic model is a regulation mechanism to the inner loop for interacting and smoothing economic turbulence. Normally national treasury, Fed Reserve and Central Banks can serve this purpose. When a case happens like house loans and mortgages (growing) or the Bear Stearns crisis, this regulation must be actively and effectively enforced. An unleashed force of inner loop can be very destructive and delayed actions will result in losing control of the whole system.

We can never over emphasize the role of mass media, investigators, reports, etc. as feedback mechanism of social economic system. CNBC's report of interview Bear Stearns' CEO Alan Schwartz which was intended to restore confidence of public to Bear Stearns, turned out a dead trigger not only to Bear Stearns, also starting the Domino chain reaction of the whole financial system. We are living in a media driven world and somehow the world is connected by media. It is crucial that this feedback should be objective and telling real facts what is going on in our social economic system. An infected feedback by manipulated news, reports, or statistics will lead the decision makers to make wrong decisions. The crucial role of mass media including moral obligation of reporters in our social system must be well recognized beyond the economic and political interest.

From the autopoiesis social system perspective, the self reference of various regulations, such as laws, moral obligations are socially constructed and then used as social reference to reflect what is socially right and wrong. The construction and application of various social regulations is an open learning and inquiring system. The process of building up and executing social regulation is sometimes painful and brutal. Human understanding human is perhaps the most challenge thing. We are in the earth always seeking goals and reasons. In many cases, the problem of searching such a goal becomes a religious approach about finding the wish of the God. I quote here Churchman's words to open the question, and to end my approach.

The nature of the human system depends most of all on whether a perfect being exists. ...If it does, then our main attention as systems researchers should be how our planning relates to its existence. If it does not, then we not only have a lot of explaining to do in terms of our values, but we also have to find a whole set of godless values to guide us.

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(Churchman, 1988, P39)

CONCLUSION

This paper constructed a meta-model of social activity system based on cybernetics and the activity theory. The human social activity model can be viewed as an expansion of the individual and collective activity model. It provides an epistemological explanation of social activities and their embedded relationship between social function systems. The economic crisis is used as a case study to verify the usefulness of the model. The author believes that systemic view as proposed in this paper is very crucial to decision makers not only in macro level (national), but also micro level, such as business managers in companies. Sustainability is a systemic property and must be approached from systemic view. Hopefully, this paper has provided with one such a view.

REFERENCES

- Bai, G.H. & L.Å Lindberg (1998). Dialectical Approach to Systems Development, *Systems Research and Behavioral Science*, 15(1): 47-54.
- Bai Guohua (1999). Sociocybernetic Approach to Information Systems Development, *Kybernetes - the International Journal of Systems & Cybernetics*, Vol. 28, No. 6/7, 792-809.
- Churchman, C. W (1988). General Systems, *Yearbook of the international society for the systems sciences*, XXXI, New York.
- Churchman, C. W. and Ackoff, R. L. (1950). Purposive Behavior and Cybernetics, *Social Forces*, 32-39.
- Corning. P. A. (1994). Synergy and Self-Organization in the Evolution of Complex Systems, *Systems Research* 12(2) 89-121.
- Davydov, V., Zinchenko, V., and Talyzina, N. (1982). The problem of Activity in the Works of A.N. Leont'ev, *Soviet Psychology* 21 31-42.
- Engeström, Y. (1987). *Learning By Expanding*. Orienta Konsultit, Helsinki.
- Frontline, *Inside the meltdown*, <http://www.pbs.org/wgbh/pages/frontline/meltdown/2009.05>
- Holt, G. R. and Morris, A. W. (1993). *Activity theory and the analysis of Organizations*, *Human Organization*. 1(52), 97-109 .
- Hutchins, E. (1994). *Cognition in the wild*. MA: MIT press, Cambridge.
- Kuutti, K. (1996). Activity Theory as a potential Framework for Human-Computer Interaction Research, In Bonnie A. Nardi (eds), *Context and Consciousness*, The MIT Press, London, 17-44.
- Lave, J. (1988). *Cognition in Practice*. Cambridge University Press.
- leont'ev, A. N. (1981). The Problem of Activity in Psychology, In: Wertsch, J.V. *The Concept of Activity in Soviet Psychology*. Armonk, NY. Sharpe Inc., 37-71.
- Luhmann, N. (1986). The autopoiesis of social systems, In Geyer, F. And Van der Zouwen, J.(eds.), *Sociocybernetics Paradoxes: Observation, Control and Evolution of Self-steering system*, Sage, London, 172-192.
- Luhmann, N. (1995). *Social System*, Stanford University Press, Stanford..
- Maturana, H & F. Varela (1972). *Autopoiesis and cognition*, D. Reidel publ. Company, Boston.
- Miller, J.G. (1978). *Living Systems*, McGraw-Hill, New York.

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- Mingers, J. (1995). *Self-producing Systems: Implications and Applications of Autopoiesis*, Plenum Press, New York.
- Nardi, B. A. (1996). Studying Context: A Comparison of Activity Theory, Situated Action Model, And Distributed Cognition, in Nardi B. A. (Ed.), *Context and Consciousness*, The MIT press, London, 69-102.
- Qvortrup, L (1996). "How is Society Possible? The Epistemology of Social Constructivism. A comment on John R. Searle's The Construction of Social Reality, *Cybernetic & Human Knowing* 3(4) 27-40.
- Schwarz, E. (1997). Toward a Holistic Cybernetics: From Science Through Epistemology to Being, *Cybernetics & Human Knowing*, Vol.4 No.1, 17-49.
- Searle, J. (1995). *The Construction of Social Reality*, The Free Press, New York.
- Skyttner, L. (2000). *General Systems Theory – Ideas & Applications*. World Scientific, London.
- Suchman, L. (1987). *Plans and situated Actions*, Cambridge University Press, Cambridge.
- Thyssen O. (1995). Some basic notions in the systems theory of Niklas Luhmann, *Cybernetics and Human Knowing* Vol.3, no.2, 1995, 13-22
- Turner P. and S Turner (2001). A Web of Contradictions, *Interacting with Computer*, Vol. 14, 1-14.
- Vygotsky, L. S. (1978). *Mind and Society*. MA: Harvard University Press, Cambridge.