Why we have failed in extracting this full concept of Egypt status quo? How we could match these discrete conceptions which often lead to antagonistic conclusions? Social interactions occur in a complex context, albeit defining complex as dynamic, limited information, cofounding variables and ambiguity. In this context, eliciting and mapping the participators mental model, while necessary is far from being sufficient. The temporal and spatial boundaries of our mental models tend to be narrow. They are dynamically deficient, omitting feedbacks, time delays, accumulations, and nonlinearities (Sterman 2000). However, most of the outside problems, yield precise inclusion of these factors. Since complexity of our mental models vastly exceeds our capacity to understand their implication, Simulation is the only way to contribute the many parameters of the complex world to these mental models and to test them. In this way emerges the System Dynamics methodology, designed to tackle with complex problems in real world.

It is well established that system dynamics modeling is a process (Sterman 2000). The process as depicted in Figure 1 consists of problem definition, identification of model structure, model formulation, model testing, policy design, and implementation.

The first and most important step in system dynamics modeling is problem definition. Problem definition makes the process of modeling purposeful and a clear purpose is the most important determinant of success of a modeling process (Sterman 2000). It is noted that, if possible and database is available the author should demonstrate the dynamic behavior of the main variables of problem over some period of time named, Reference Mode. An initial explanation of the causes of the reference mode is called Dynamic Hypothesis. The explanation of the underlying causes should be endogenous.
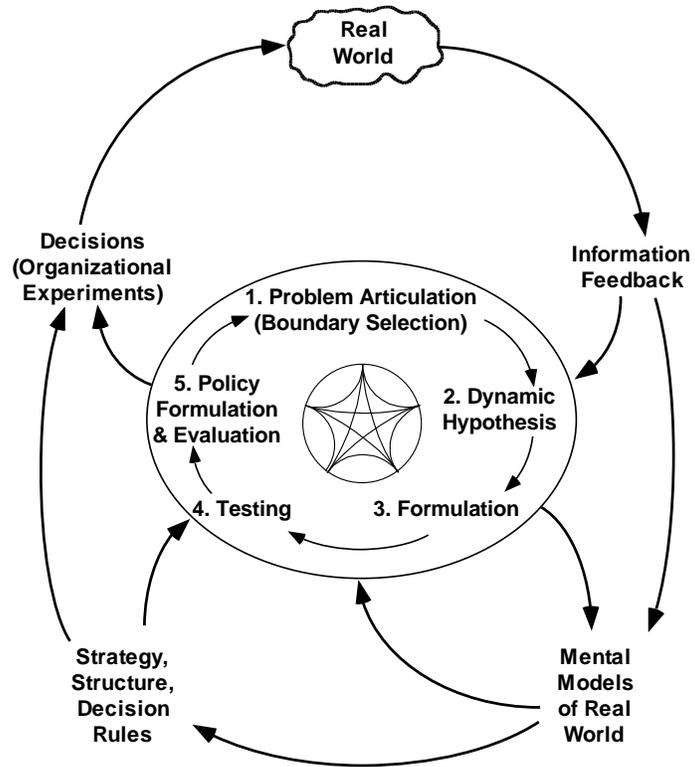
Figure 1 - Effective modeling involves constant iteration between experiments and learning in the virtual world and experiments and learning in the real world.
*© Courtesy to Sterman (2000).*
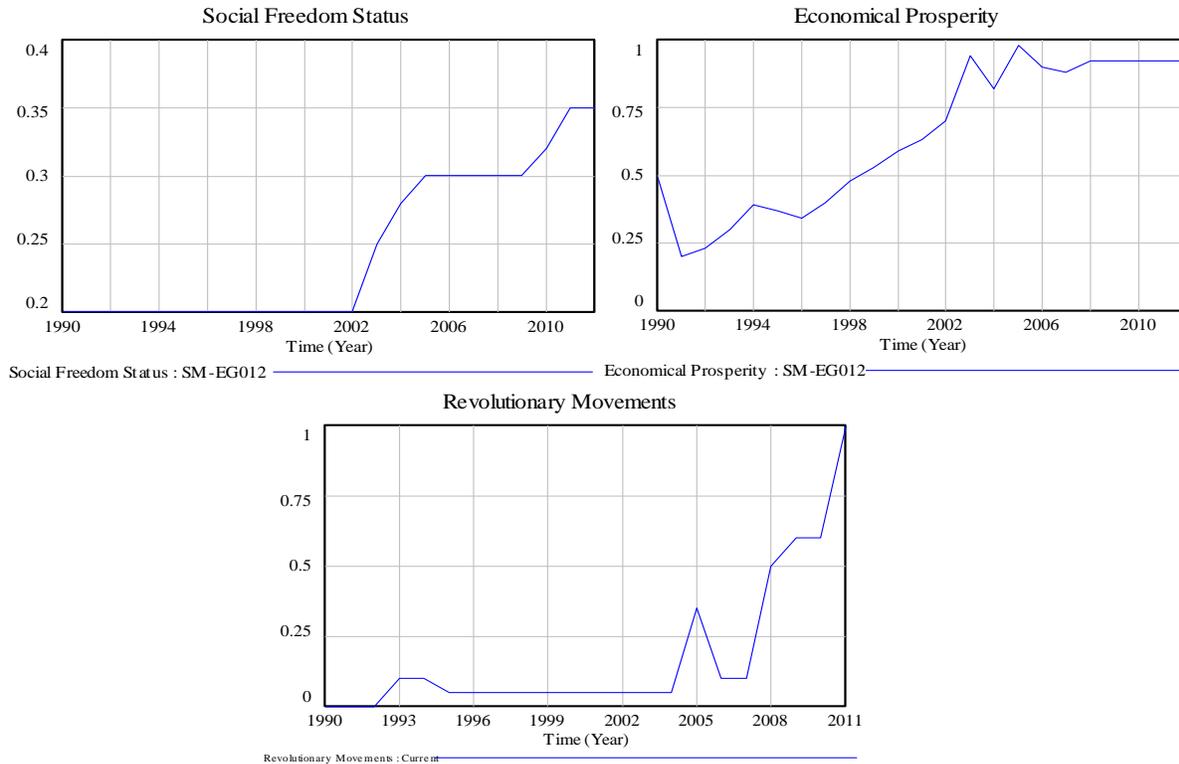
Figure 2 - Reference modes for Dynamic Hypothesis.

Endogenous explanation contains feedback loops or circular causations and interactions between factors that create the reference mode. Endogenous explanation does not explain the changes of the variables in terms of factors that are not affected by those changes. Endogenous explanation is in accordance with the feedback view of the world that is the main pillar of system dynamics philosophy and methodology. Many people correctly consider the feedback perspective as the philosophical foundation of system dynamics (Forrester 1994).

In studying Egypt's status quo, the first problem is to obtain a coherent holistic view, so that deepens our comprehension of the case. It is predicted that as we go forward, coming upon with new ambiguities—especially contemplating policies—the problem definition and purpose of the model will evolve too.

Investigating Egypt's social and governance sphere, there are three classes of data available that could be utilized by our model, one of these include the rich detailed demographical time series of economical condition, gathered by large amount of studies in this field. The other one is the descriptive scrutiny of the nation's freedom and political status. Most of the data in this area are in form of descriptive static information evoked by grounded theory, while our method needed dynamic time series which narrowed our choices for selection. And the

third group of information, which is merely descriptive, reported by the observers, we quantitated this information and used them to validate the model's output.

Figure 2 represents three reference modes, each emanating from one of mentioned classes. The variable *Economical Prosperity* was designed and formulated particularly for this model. Indeed, as we needed a concept to cover influence of all aspects of economical wellbeing on the way people form their expectations and perceptions, usual detailed and specified indexes wouldn't do the trick.
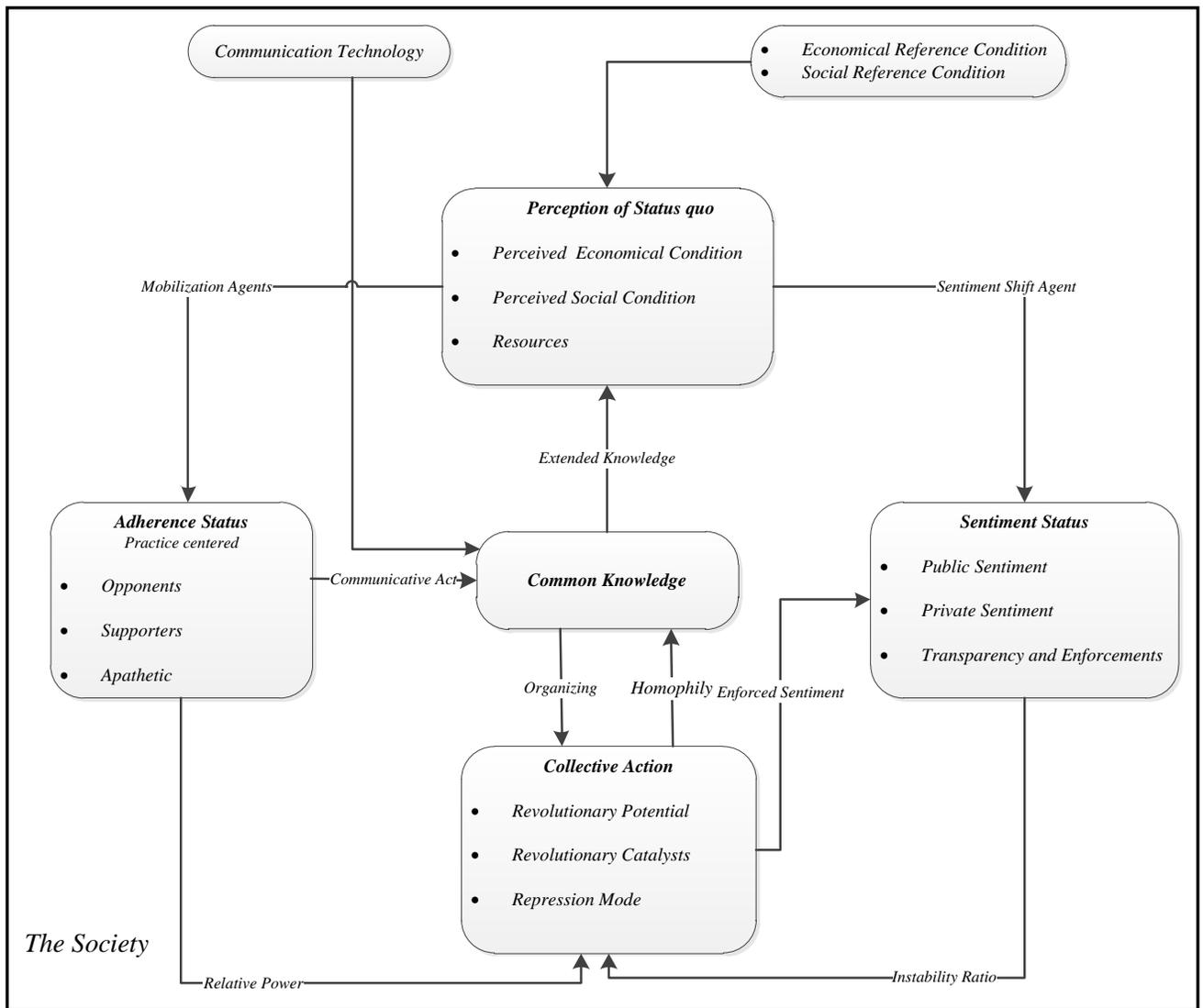

Figure 3- Sector map of the phenomena.

Using *Legatum Institute's* prosperity index formulation, but more simplified based on purpose of the model , the formula was basically a weighted function of variables such as GDP growth rate , Unemployment and Gini coefficient which was rescaled to fit into a logical interval regarding other variables of the model. The function fell in the interval [0, 2] which constructs a spectrum of impoverished to flourishing social economy; the data for Egypt lay in the interval [0, 1] indicating an impoverished to an average economy.

Worth of considering is that the model uses differential values of these variables. As a result it is not the absolute values, but the trend of the diagram which should be emphasized.

The social freedom status variable was constructed to represent the permeation of democratic legislation and constitution in the governing regime and also an index for human right factors. The policy IV database (Marshal & Jaggers 2008) served the best regarding this variable. We applied only a slight rescaling over polity IV database on Egypt.

The third diagram is very representative for a kind of data Forrester calls them mental data base or observation experience. We formed the graph and invoked political and social experts' opinion, to quantify and rate the social mobilizations in Egypt relative to 2011 revolution. The criterions were number of citizens involved, constitutional effect and the impression on public opinion —national and international. As seen, the graph sharply reflects major protests like 2005 Alkifaya movements, protest against Israel-Gaza issues, 2008-2009 workers strike and also crises leading to the revolution.

After we identified our main reference modes, a dynamic hypothesis was needed to explain and link the behavior of them. Utilizing system thinking skills (Richmond 1993) in the study of the case and related literature a primary map of the phenomena, called sector map—figure 3—was formed which will be explained in detail in proceeding lines: The first sector which to some extent is the milestone of the model and feeds other parts, is *Perception of Status quo*. In general, three rather complementary theories have been advanced in order to explain why and how mass mobilization becomes possible, but the most compatible theory with behavioral analysis is the one that regards mass mobilization as a rare and exceptional psychosocial or existential condition which results from the development of an intolerable gap between popular expectations and the possibility of meeting them. From this psychosocial perspective, for example, persistent poverty or persistent prosperity do not lead to mass action; rather it is going from prosperity to poverty or from poverty to prosperity that creates the gap between expectations and the possibility of meeting them. According to this famous Davies J-Curve theory, collective action may take place at the point where the gap is most intolerable (Bashiriye 2009).

Figure 4- Casual loop diagram.
Positive feedbacks dominating the case generate a domino effect pattern with low leverage points for policy making.

All decisions depend on the mental models. Expectations about future behavior of the system forms critical component of these mental models. Expectations are usually modeled in system dynamic as adaptive learning processes such as exponential smoothing (Sterman 2000). The function we applied here was result of a behavioral theory of how people form expectations, and took into account the time required for people to collect and analyze data, the historic time horizons they use, and the time required to react changes. This function generated the expected rate of change in the input variable, expressed as a fraction of the input variable per time unit. The input to this function was the gap between desired and actual state of the system formed in mental models.

In the sector *Sentiment Status* we represented a feature, shared by certain major revolutions, that they were not anticipated. This explanation was hinged on the observation that people which come to dislike their government are apt to hide their desire for change as long as the opposition seems weak. Because of this preference, a government that appears unshakeable might see its support crumbling, following a slight surge in the opposition's apparent size, caused by events signification and of themselves. Unlikely thought the revolution may have appeared in foresight, it will in hindsight appear inevitable because its occurrence exposes panoply of previously hidden conflicts (Kuran 1989).

Though we modeled the idea using two stocks of *Public and Private Sentiment*, which distinguished between individuals' privately held political preferences and those they espouse in public. These two stocks were related two each other with a rate, called *Transparency Rate* representing the society's freedom in expressing their beliefs. The central argument goes as follows: A privately hated regime may enjoy widespread public support because of people's reluctance to take the lead in publicizing their opposition to change of the Private Sentiment (Kuran 1989) which probably ensues from the intrinsic repression structure of the regime.

The shift in *Private Sentiment* is governed by the extent to which the expectations formed in mental models fail to be fulfilled and this is how the sector *Perception of Status quo* affects *Sentiment Status*.

The *Adherence Status* depicts three different groups of citizens which were considered to have different practical behavior in the model, supporters, opponents and those who are apathetic. As the history of mass mobilization shows, the phenomenon is not a mechanical one, resulting from some "objectively" undesirable socio-economic and political conditions per se; it is the "subjective" channeling of those objective conditions which is the key element. In a word it is a behavioral process. This behavioral structure was modeled in the form of a three cascade chained stocks assigned with rational initial values regarding Egypt case in the start of the simulation -1990- and the change of the entry and exiting rate of these stocks was determined by the same pattern mentioned in the *Sentiment Status* sector. It should be mentioned that, although both adherence and sentiment status, assemble similar process to form their rates for change, but still there is a major difference between them. *Sentiment Status* bodes for a completely conceptual process in the minds of every individual in society while *Adherence Status* is a merely practice oriented sector which determines, i.e. if all of other structures of the model were suited for a revolutionary movement what would be the potential number, for each of these three groups, albeit there exists a coupled correlation.

The next sector was named *Common knowledge* which with no exaggeration could be identified as the most vital structure throughout the whole phenomena. I would like to elaborate it with an illustration called "*Two General's Paradox*"; Two armies, each led by a general, are preparing to attack a fortified city. The armies are encamped near the city, each on its own hill. A valley separates the two hills, and the only way for the two generals to communicate is by

sending messengers through the valley. Unfortunately, the valley is occupied by the city's defenders and there's a chance that any given messenger sent through the valley will be captured. Note that while the two generals have agreed that they will attack, they haven't agreed upon a time for attack before taking up their positions on their respective hills. The two generals must have their armies attack the city at the same time in order to succeed. Thus they must communicate with each other to decide on a time to attack and to agree to attack at that time, and each general must know that the other general knows that they have agreed to the attack plan. Because acknowledgement of message receipt can be lost as easily as the original message, a potentially infinite series of messages is required to come to consensus. Note that it is quite simple for the generals to come to an agreement on the time to attack. One successful message with a successful acknowledgement suffices for that. The subtlety of the Two Generals' Problem is in the impossibility of designing algorithms for the generals to use to safely agree to the above statement (Gray 1978); but if these two generals had some kind of bilateral communication mean per say a radio telephony , victory was imminent.

The same works for social forces too, considering every individual as a general; a short inquiry indicates that recent revolutions are along with new communication technologies—out of government restricting control. For "color revolutions" of the former communist states it was mobile phones, for saffron revolution in Burma was YouTube and for the Green movement of Iran was Twitter and Facebook (Deibert & Rohozinski 2010).

Multilateral communication tools are crucial to organize grassroots movement. Also these communication tools provide possibilities for pluralizing the flow of information and widening the scope of commentary, debate and dissent, altering expectation formation process caused by the ability to contact with a larger public sphere all over the world (Diamond 2010). In addition revolutionary movements themselves could serve very well to enhance the common knowledge of those parts of the society which don't have access to these tools. Briefly, common knowledge aims the crucial pillar of authoritarian rule which is control of information.

Based on personal experience and observation of Green Movement's acts in Iran; so far opposition has intended to organize many demonstrations but only a fraction of them—precisely 54 percent—faced massive public response and participation, studying the patterns of these successful calls and unsuccessful ones, we reached an structure explaining the behavior, by identifying and distinguishing two concepts: *Revolutionary Potential and Catalysts*.

These two concepts, though correlated, represented extremely different behavior. *Revolutionary Potential*, mostly seen as the only driver of collective action in the scholars, is the persistent flow of dissent formed by citizens, as an abstract concept, which in turn emanates from the instability generated in the *Sentiment Status* sector; though *Revolutionary Potential* is necessary for collective action but is not sufficient, and high levels of revolutionary potential doesn't entail a collective or insurgent action considering factors like, falsified preferences, fear , repression, organization and etc.

However, *Revolutionary Catalysts* serving like a spark to gunpowder warehouse, exhibits an impulsive nature with oscillation, which in fact could be the reason for Green Movement's oscillating emergence on streets or the impulsive rise of Arabian people. This behavior rises from the nature of the concept which is an interaction among variables such as social and environmental crisis—that could be internalized in model as regime's policy backfire—opposition's organizing power and mobility; intended to surpass the mind barriers of citizens, compelling them to manifest their defiance more blatantly. This variable lies in five interval in a spectrum of [0, 5] depending on the severity.
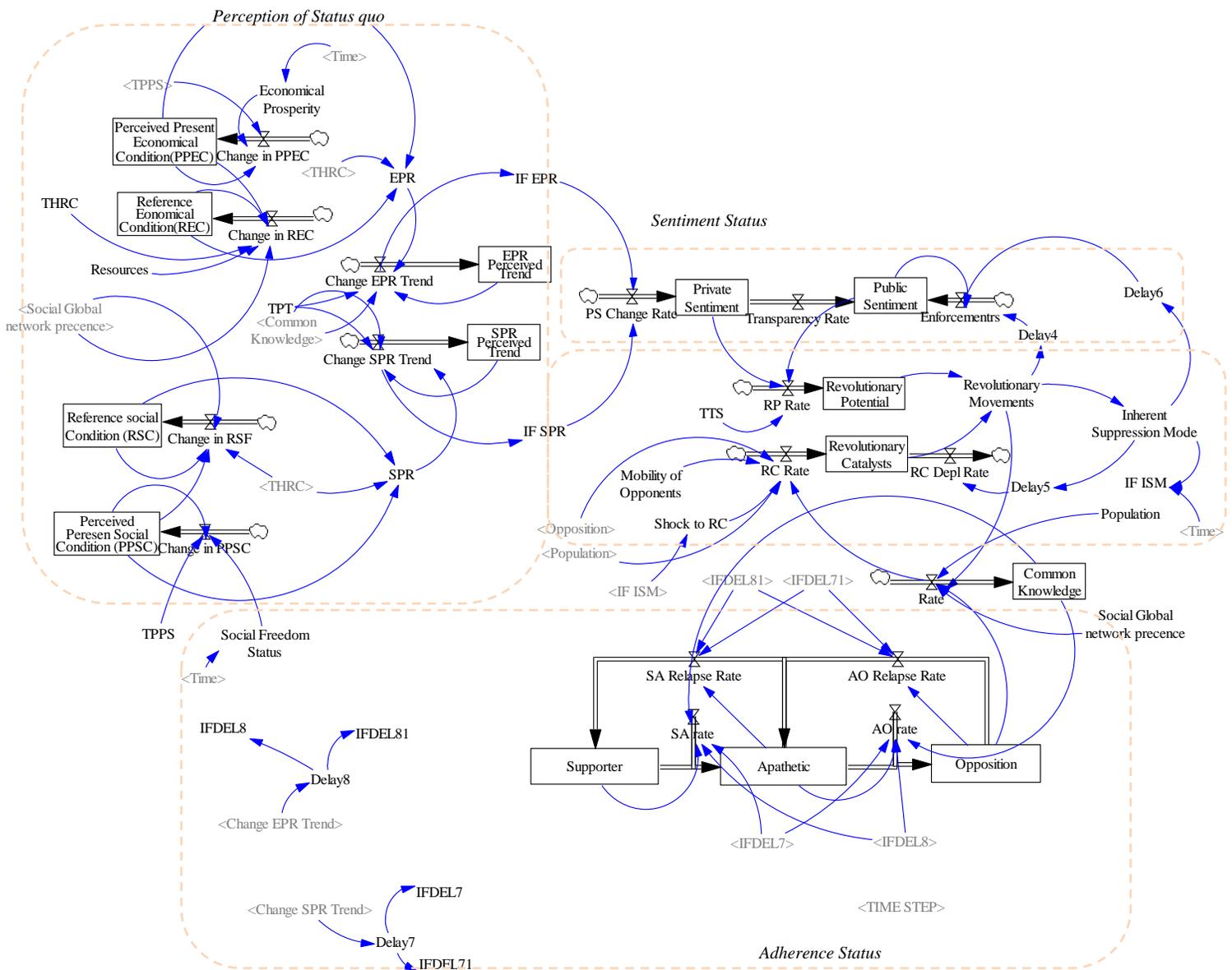
Figure 5 - Stock and Flow diagram.
Main computational model.

Of course in autocratic regimes, where a collective action exists it is followed by repression. Nevertheless the repression structures, sources and severity differ along authoritarian spectrum, and the model should reflect these diversities. Also feedback links of repression to other parts of the model, as mentioned in the preceding lines, plays main role in generating crucial behaviors of the model.