Abstract: In this paper, the relevance of system theory for modeling and investigating problem in human science and human centered systems as well as the mutual relationship between systems theory and human science are explored. It is not a completed research but rather ideas and thoughts which need further investigations. The cause and purpose myths and their impact in several fields are discussed through the use of the variational principle. The feasibility of phenomenalistic models and the potential and limitations of qualitative and quantitative results are discussed through examples of human learning, and human conformity behavior and a typical dictatorial political system. The need for combined application of scientific approach along with basic principles of ethics and religion to human centered systems is demonstrated. It is shown that the non-technical forces in terms of fairness and justice are rather essential in governing human centered systems and stabilizing their equilibria while avoiding conflicting situations.

Keywords: system science, theory of systems, human science, ethics, religion.

1. INTRODUCTION

For a number of years, since the early developments of Cybernetics (Ashby, 1956), there are in the literature numerous endeavors to apply the science of systems and control to non-technical systems and, in particular, to human and society centered system. Ever since, it remained one of the challenging areas of scientific research. For, if any class of system can be termed 'complex' then these system certainly are the first candidates, and so is the case of the very attempt to apply Systems Theory in Human Sciences. This invited paper presents one such attempt. It is an advanced extension of author's paper presented as a plenary lecture at World Automation Congress 1998 (Mansour, 1998) as well as a follow-up work since the 1999 IFAC World Congress in Beijing and an interesting discussion with Prof. Dimirovski, who was kind enough to elaborate on the ideas in my plenary lecture (Mansour, 2000) and help get it to this form. It should be noted, however, this is not a completed research study, but rather some findings and thoughts that need further investigations. To the author's belief, systems issues involved in human centered system, indeed do require the employment of a specific combination of system theory and human sciences. This fact has to be observed in the area of investigating supplemental ways for improving international stability (Chestnut, 1995; Coales and Seaman, 1995), because delicate problems involved cannot be regarded and tackled the same way as in technical systems. Yet, it is shown that nevertheless system theory is certainly useful for problems concerning the human science.
In exploring the issues of this topic, we have found that this theme needs to be approached from several points of departure, and so is this paper organized. In the first place, we discuss the issues of the underlying system theory concepts and models, that is System Science. Then, once more we revisit the Cause and Purpose Myths, first explored by H.H. Rosenbrock (1977, 1990), within the prospect related to variational principle in various fields of science. Thereafter we analyze and discuss two relevant examples: on human learning, and on human behavior. Then we proceed further in exploring the related aspects of Ethics and Religion that also are relevant in connection with the Scientific Approach to natural and engineering sciences, in general, and to systems science, in particular. Having done these exploratory discussions, for the sake of demonstrating the universality of systems theory, we address a delicate political example which is important in contemporary world for its human dimension. In the sequel, we summarize our conclusions on the grounds of the present understanding and knowledge.

2. A DISCUSSION ON SYSTEM CONCEPTS AND MODELS

The whole development of systems theory is based on models, and even more so are its applications. However, in the case of human centered systems there are a number of essential difficulties which, in turn, exemplify the aspects of model description, of structure, of experiments, and of certainty-uncertainty and deterministic/stochastic features. Hence, in our investigations on the mutual relation of Systems Theory and Human Science and the impact of the former on the latter (Mansour, 1998), we follow a specific view-pattern on Systems Science that allows for both phenomenalistic models as well as mathematically rigorous models on systemic problems in human centered, non-technical systems. A similar idea of considering a real-world system as a ternary tuple of a conceivable conceptual model, a feasible mathematical model and an analytical representation as in Dimirovski (1999; also see these proceedings), where some of the authors' findings and ideas materialized in further results, seems to be an appropriate approach for non-technical systems as well.

In system science and its engineering applications, traditionally, models are drawn on the grounds of either first-principles modeling according to physical laws or of cause-effects analysis, modeling and identification (Zadeh, 1956, 1962). The concept of causality and technique of cause-effects analysis are the fundamental ones in systems and control theory, and are used in all its applications. The theory of general systems also makes use of these concepts (Mesarovic and Takahara, 1975).

In all classes of non-technical systems and in human centered ones, in particular, in the first place, there are no physical laws in general, and therefore we can only assume a system structure and then try to resolve the system modeling task (Mansour, 1998). As for the aspect of possibility for data gathering and model identification, we found out that these are rather difficult to be accomplished to a satisfactory degree. In principle, we can rely either on conceptual and phenomenalistic models or at best on stochastic models only. Though, as in natural sciences, a-posteriori we can make these models deterministic through averaging.

It appeared, it is more tangible to exploit fundamental concepts of systems and control theory such as the most fundamental one of the 'feedback'. Namely, it is feasible and fairly easy to observe and define where and how to make use of concepts and notions of controllability, observability, and stability in principle but not via analytical model results. These author's findings are largely supported by contributions in the proceedings. Moreover, it is reasonably intuitive and therefore feasible to relate our observations to the concepts of optimality and adaptation as well as to the idea of optimal control, though it has to be along the features of stochastic optimal control. There may be found in the literature considerably successful related uses of concepts of fuzzy systems, catastrophe theory and of bifurcation and chaos during the past developments.
What is pointed above, however, may well be a guidance only. For, it may lead to viewing the investigated topic in a mode that is by far dominantly mechanistic, although it has its justifying roots in Kant's Enlightenment (18th century) and Darwin's Evolution (19th century). The former gives rise to exemplified use of human perception and own ego, the latter justifies the survival of the fittest and strongest. Indeed, it seems the nowadays trend of prevailing view coming from natural sciences, somehow, is driving these views into making a new kind of religion out of Natural Sciences, like philosophies on Imperialism, Marxism, etc. We have to admit, this is the predominantly Scientific World view on human centered systems, although these cannot be regarded from the perspective of these two paradigms only. Likewise, the basic scientific approach has led to scientific management as well as to gene-manipulation, to the current advanced technologies, etc., but also to degradation of the environment, to misuse of information, misuse of biochemicals, etc...

In a few words, it should be noted that the scientific approach precisely has also led to exploitation of humans and nature beyond acceptable limits as well as caused on a planet scale pollution and global warming.

3. THE CAUSE AND PURPOSE MYTHS

In his thorough study, Rosenbrock (1990) has argued that there are two equivalent fundamental concepts to understand nature that imply two different consequences, and therefore neither of them should be overweighed / underweighed. However, these have become a kind of myths. The word is about 'cause myth' and 'purpose myth' that implicitly we associated with the following entirely different consequences, from the point of view of Human Science. On the one extreme, the cause myth does not care about the whole and in this way it implies inhuman consequences, and, on the other, the purpose myth implies emphasizing the whole via an overall purpose with subordinate purposes taking into consideration the purpose of the individuum.

The cause and purpose myths have many facets that vary with the particular field of science. In the sequel, we overview these briefly. In Physics (Heisenberg, 1930; Lanczos, 1949; Landau and Lifshitz, 1987; Whittaker, 1937), for instance, we encounter these through Hamilton principle in classical mechanics, generalized Hamilton Principle in special relativity theory, as variational principle in general relativity, and as variational principle in quantum mechanics. In Biology and Chemistry (Beck and co-authors, 1991; Lerihan and Fletcher, 1977; Stryer, 1981; Suzuki and co-authors, 1986), we encounter similar extensions to the living organisms. On the other hand, it is well known that system theory is used in optimal control of systems (Anderson and Moore, 1971; Kwakernaak and Sivan, 1972) as well as in process optimization (Frank, 1969; Pontryagin and co-authors, 1961).

It is of paramount importance to observe that the main consequence of the cause myth is, in fact, the very creation of the standard approach in Basic Sciences, which is referred to as the Scientific Approach. Hence, it appears, humans are to be machines (Rosenbrock, 1990) should we follow it strictly. Then apparently we end up in a mental conflict, because machines are not (at least not yet) capable of responding to outside stimuli in a pattern mode like "... Novel contingencies generate novel forms of behavior..." (Skinner, 1953). Furthermore, should they be treated as machines, then for human centered systems too the fundamental system problem of stability should be amenable to successful investigation by means of the available system theoretic knowledge (Mansour, 1999). By and large, however, this is not true by the virtue of mankind's empirical experience. Thus, there must be 'something else' within human centered systems, and this is what we tried to explore in more detail.

Let us proceed with this discussion now by reconsidering a couple of examples according to the scientific approach.
Fig. 1. Schematic of the motion of the stone in mechanics

Model and concepts involved in motion of the stone (Classical Mechanics). Referring to the schematic diagram in Figure 1, we can write:

\[ L(x, v) = \text{Lagrangean} = \text{kinetic energy} - \text{potential energy} \]
\[ = T - V = \frac{1}{2}mv^2 - gmx. \]  

Now, we make use of Hamilton principle - the purpose:

\[ \delta \int_{t_1}^{t_2} L(x, v) dt \delta t = \delta \int_{t_1}^{t_2} \left( \frac{1}{2}mv^2 - gmx \right) dt = 0 \]  

Changing to policy by using the principle of optimality of dynamic programming, i.e. Bellman's equation, we can obtain Newton's equations:

\[ \frac{d}{dt}mv_1 = 0, \]
\[ \frac{d}{dt}mv_2 = -mg. \]  

Note, however, these themselves represent causal relations. In addition, it is in here where we introduce the notion of force.

Special relativity applied to motion of the stone. Moving slightly away from classical mechanics, we may use the variation principle as presented below. Namely, starting from

Variational Principle: \( \delta \int_{x}^{x_1} L(x, v) dx = 0 \)

we may derive:

\[ L = -(mc^2 + V)(1 - \frac{v^2}{c^2})^{1/2} \]
\[ = \frac{1}{2}mv^2 - V - mc^2 + \frac{1}{2} \frac{Vv^2}{c^2} \left( \frac{v}{c} \text{ small} \right) \]
\[ = \frac{1}{2}mv^2 - V - mc^2 \left( \frac{v}{c} \text{ very small} \right), \]

moreover "-mc^2" is constant and does not affect the variation. Hence, we have:

\[ Ldt = -(mc + \frac{V}{c})[c^2(dt)^2 - \sum_{j=1}^{3} v_j^2(dt)^2]^{1/2} \]
\[ = -(mc + \frac{V}{c})[c^2(dt)^2 - \sum_{j=1}^{3} (dx_j)^2]^{1/2} \]  

Using the four dimensional space of generalized coordinates \( q_0 = ct, q_j = x_j, j = 1, 2, 3 \), and defining an arc \( ds \) as follows

\[ ds = \left[ \sum_{v=0}^{3} (dq_v)^2 \right]^{1/2} \]
\[ = \left[ c^2(dt)^2 - \sum_{j=1}^{3} (dx_j)^2 \right]^{1/2}, \]

we have the variational principle in the form:

\[ \delta \int_{x}^{x_1} -(mc + \frac{V}{c})ds = 0. \]

Hence, for a particle moving freely, that is \( V = 0 \), we obtain:

\[ \delta \int ds = 0. \]

Consequently, the particle takes a path of stationary length through the four-dimensional space, defined by means of the above introduced generalized coordinates.

Now, should we re-consider this example with regard to the general relativity a similar variational principle is obtained via considering a curved space. In the case of quantum mechanics, in much similar way, one may obtain a variational principle that implies a complex space and random disturbances.
At the end of this section, by referring to Rosenbrock's study (1990), we may summarize the following synthetic observations:

- In Science, man is a machine, but in real-world this is not true.

- Early reactions against a rigid system of thought took place in the middle ages - Galileo, Newton, and by far more should be the case nowadays.

- There is still systematic denial of the equality of purpose and causal interpretation of the nature, which cannot be justified.

- In a world without purpose, there can be no ethics, and human centered systems do have a purpose and therefore ethics must be observed as well.

- It is wrong for a technical system to be designed in such a way that the purpose of men and women is subordinated to the purpose of machines with which they work.

In addition, at this point, we cite a couple of observations that are rather supportive to these findings and shed additional light to issues involved, which are given below.

Smith (1904): "In the progress of division of labor, the employment of fare greater part of those who live by labor, that is, of the great body of the people, comes to be confined to a few very simple operations; frequently to one or two. But the understanding of the greater part of men are necessarily formed by their ordinary employments. The man whose life is spent performing a few simple operations ... has no occasion to exert his understanding. ... He naturally looses, therefore, the habit of such exertion, and generally becomes as stupid and ignorant as it is possible for a human creature to become."

Monod (1975): "The choice of scientific practice ... has launched the evolution of culture on a one-way path; onto a track which the nineteenth-century scientists saw leading infallibly to a vast blossoming for Mankind whereas what we see before us today is an abyss of darkness".

4. EXAMPLE OF HUMAN LEARNING

In this section we consider the problem of lifelong learning and knowledge usage in working for living by humans, before going into detail on the issues in Behavior Science. In particular, we refer to the work by von Weizsäcker (1967) on human learning and technical progress. We make use of his model and explore the answer that may be obtained via optimal control theory using the Maximum Principle (Pontryagin and co-authors, 1961; Rank, 1969).

In modeling the knowledge acquiring and loosing, von Weizsäcker considered there an age that is allowable to beginning to work for living, e.g. age of 15 years, and that all the time \( u(t) \) prior to this moment in life is used for learning. Also a total time span for work is up to an age of \( T \) years, e.g. an average of 50 years. The outcome of the learning is the level of education attained is a function of time \( y = y(t) \), and a decay of the value of previously acquired knowledge and forgetting parts of it is also assumed with a certain time-constant, say \( s \). Then, the time span normally used for learning and not for working should the time be denoted by \( u, 0 \leq u \leq 1 \), the part of time for working to make own living may be denoted by "1-\( u \)". Hence, von Weizsäcker's model is represented by the following simple dynamical system:

\[
\frac{d}{dt} y(t) = -sy(t) + u(t).
\] (6)

Furthermore, the mean value of work can be represented by a time function \( \Phi(t) \) that is exponentially proportional to an in general non-linear function of the acquired knowledge as follows:

\[
\Phi(t) = e^{kt} f(y(t)),
\] (7)

where \( k \) denotes the factor of increasing the value of the work due to technological development. Further
reasonable assumptions on function $f(\cdot)$ adopted are
that it is a monotonically increasing function but such
that its relative increase is decreasing. In
mathematical formulation this means that function
$f(\cdot)$ has to fulfill the following conditions:

$$
f(y) > 0, \quad \forall y;
$$

$$
f(y_0) < f(y) \quad \text{for} \quad y_0 < y;
$$

$$
\frac{f'(y_0)}{f(y_0)} > \frac{f'(y)}{f(y)} \quad \text{for} \quad y_0 < y, \quad f'(y) = \frac{df}{dy}.
$$

(8)

Such an increasing function with decreasing relative
increase $f(\cdot)$, for instance, may be given either of:

$$
f(y) = a + by;
$$

$$
f(y) = a + by^{1/2}.
$$

Now, the time evolution of the value of human's
work can be expressed by using a specific value of
the work (say in US $) denoted by $q$, and a constant
of the interest (average) rate denoted by $r$. Namely, it
can be expressed in terms of the following induced
function:

$$
v(t) = q\Phi(t)(1 - u(t))e^{-rt},
$$

(9)

and hence the total value of human's work over the
time span of work assumed can be calculated as

$$
v(T) = q\int_0^T \Phi(t)(1 - u(t))e^{-rt} dt.
$$

It is natural, of course, that every human as well as
family (group, society, etc.) strives to make the best
possible education and training and creation and its
best possible use for producing value. Thus the
problem of knowledge acquisition, knowledge decay
and forgetting, and its usage in work and producing
values can be formulated as an optimization problem
as follows:

$$
\text{Maximise } PI = \int_0^T e^{(k-r)t} f(y)(1 - u(t))dt
$$

under the constraints

$$
\frac{dy(t)}{dt} = -sy(t) + u(t),
$$

$$
v(0) = 0, \quad r + s - k > 0, \quad 0 \leq u(t) \leq 1.
$$

Typically, the solution is found by using Maximum
Principle and it is depicted in Figure 2. This figure
completes the discussion on the optimal learning by
humans, where optimal control of systems was
instrumental. However, the optimization criterion
was only materialistic. The solution can be modified
according to individual objectives.

5. SYSTEM SCIENCE AND BEHAVIOR
SCIENCE

In studying the behavior of humans and human
groups or societies there are no natural laws to begin
with. The feasible models are phenomenological ones
only. Therefore some systemic structure has to be
assumed, and only then the general system
identification scheme (Figure 3) can be applied.
Namely, in the example on Behavior Science
problem, we may proceed with the derivation of
phenomenological model and then its investigation
following several main steps as defined below:

(i) assume that the state and all important factors that
influence the system are (can be made) measurable;

Fig. 2. Maximum-principle optimal control solution
to human's learning problem
(ii) the art of changing the control and the environment variable is assumed to be part of the model;

(iii) qualitative results are more important and are sought, in the first place.

Then the problem can be tackled by using the theory of system identification, and this is depicted in the subsequent Figures 3 and 4.

Namely, in general terms, we can define:

- A discrete-time system state vector with \( k \) state variables at the initial and at an arbitrary finite time
  \[
  x(N = 0) = x_0, \\
  x(N + 1) = f(x(N), u(N), w(N)).
  \]
  \( (10) \)

- A prediction model in the sense of phenomenalistic modeling
  \[
  x^*(N = 0) = x_0, \\
  x^*(N + 1) = f^*(x^*(N), u(N), w(N)).
  \]
  \( (11) \)

- A modeling error function
  \[
  \varepsilon = \sum_{N=1}^{N_f} \sum_{i=1}^{k} e_i^2(N), \quad e_i(N) = x_i^*(N) - x_i(N).
  \]
  \( (12) \)

Now, it is well known that this system identification problem (Eikhoff, 1974; Ljung and Söderström, 1983) can be resolved via iteration process within certain degree of accuracy and significance. This iteration process is depicted in Figure 4, and was applied to the next example. Moreover, to implement this iterative solving we can make use of: the gradient method; approximation step for optimal convergence by Lyapunov based method; and approximate mathematical series \( f^*(t) \) of the \( n \)-th degree.

Fig. 3. The general scheme of system identification for phenomenalistic models

Fig. 4. The iteration process resolving the problem of phenomenalistic model system identification

Example of human conformity behavior in social psychology. Let us consider now the problem of human conformity behavior from a systems theory standpoint, namely, the behavior of an unbiased person in a group situation (Hirzig, 1974). The given
information is in terms of an experiment to measure the ability of human visual discrimination. In an academic environment, often the experiment is performed with the help of students and the participation by students. Typically, it is consisted of solving 20 problems by comparing the length of three reference lines with the length of a test line. Moreover, it is known that every unbiased person can give the correct answer. The individual answer is put in confrontation with the simulated answer of a group of persons, called pressure group.

Now, system input variables and system state variables can be defined as given below.

a) The input variables - controls - of the system model:
- \( u_1 \) is the number of other subjects in the group;
- \( u_2 \) is the percentage of uniformly wrong answers;
- \( u_3 \) is the percentage of other subjects of higher profession esteemed by the student subjects;
- \( u_4 \) is the percentage of other subjects less highly esteemed by the student subjects;
- \( u_5 \) is the percentage of other subjects considered of higher competence.

b) The state variables are defined on the grounds of the following three conceptual states assumed:
- Subject persists in the right answer for more than 3 successive problem - behavior of the type 'opposition'.
- Subject gives the wrong answer of the majority in more than 3 successive problems - behavior of the type 'conformity'.
- Subject neither opposes nor conforms with the majority in more than 3 successive problems - behavior of the type 'conflict'.

In turn, state variables are as follows:
- \( x_1 (N) \) is the relative frequency of conflict after the N-th problem;
- \( x_2 (N) \) is the relative frequency of opposition after the N-th problem;
- \( x_3 (N) \) is the relative frequency of conflict after the N-th problem.

The other presumptions adopted are the following:
(1) two different sequences of pressure groups;
(2) desired limit of tolerance set-up is 2%;
(3) comparison study through simulation of the previous results.

The analysis of the actual human behavior through this investigation via system simulation was performed with regard to the influence of a single control variable on the whole system. For the present purpose in here, it is interesting to note some results with respect to control variable \( u_5 \) (the percentage of other subjects of higher profession esteemed by the student subjects) representing the social status. Namely, the two most important findings were:

- Firstly, subjects show a strong tendency to conform with the majority of the pressure group if the latter includes a small number of with high social status.
- Secondly, subjects tend to oppose the majority if the number of persons with high social status is increased.

This sheds considerable light on human behavior in a community or a society system, which is important in all human centered systems.

6. THE ISSUES OF ETHICS

In any human centered system, the issues of spiritual origin are bound to be unavoidable. For, they have had a considerable impact always throughout the history of the mankind, and moreover often a decisive impact on individual, group and society behaviors. It may well be observed that the situation
is largely similar within contemporary societies, at
times of present generations, despite the
unprecedented advances in science and technology
during the second half of the twentieth century. We
focus our investigation on modeling the individuum
by using system and control theory.

Before proposing some systemic structures modeling
the human behavior which also involve issues of
ethics, we find appropriate to cite some philosophical
formalism in terms of 'Kategorische Imperative' by
Immanuel Kant (1783, 1787): "... handle so als ob
die Maxime deiner Handlung durch deiner Willen
zum algemeinen Naturgesetz werden sollte." This
statement puts forward up to the level of a first
principle that the behavior, which can cancel main
objectives and values of a society system, is non-
ethical and therefore not acceptable. Namely,
consider the delicate human activity of borrowing
and lending money. Suppose someone wants to
borrow money and that he knows he shall not be able
to return it, but nevertheless he wants to promise his
friend to return it. If this mode of behavior would be
made, say, a general mode of the kind: "When you
want to borrow money and you cannot return it, give
a false promise.", then nobody will lend money.
In consequence, this will cancel the objective of those
individuals who do behave with dignity and honor
and do respect common value patterns and principles
within the society, and therefore that kind of behavior
is a non-ethical one.

Now, let us tackle modeling of humans by using sys-
tem theory and taking into consideration the main
sources of behavior: mind, emotions, tradition, and
religion. The model that may be derived again is a
phenomenalistic one, and resulted out of a long
observed cause-effects analysis.

In Figure 5 there are presented two simplified sys-
temic structures that represent models of typical
human behavior. Model in Fig. 5a corresponds to the
case when he/she is accepting some external signal,
say, from religion or society tradition. In contrast,
the model in Fig. 5b represents the case when no such
signal is accepted and effectively present. These
tems involve both feedback and feedforward paths.
However, from the systems theory point of view, it is
apparent that the reference modes of behavior
generated in these two systems are bound to be very
different, and often dramatically different. In terms of
some measuring index, the behavior without external
signal may even have a harsh or explosive tendency,
which eventually implies instability of the system
itself causing serious conflicts with other individuals
and society as a whole.

7. RELIGION AND SCIENTIFIC APPROACH

It is well known from the system theory point of view
that at least one asymptotically stable, operational
equilibrium of all system states is prerequisite in all
systemic structures for their sustainable operation.
And, this applies to human centered systems too. It is
in this regard that we can obtain some useful
observations regarding the mutual relation of the
impacts of religion and scientific approach. (Note
that in this research study it is entirely irrelevant
about which particular religion is concerned, in
general, as long as the basic principles are respected.)

Let us now turn again to the scientific approach and
recall certain fundamental finding about equilibria in
the physical world. In the field of Mechanics is,
perhaps, most apparent that the operational equi-
librium will be closer to the bigger/stronger force
always (Figure 6). And this is the case in general
Fig. 6. Forces and equilibrium point in mechanical systems, and the impact of the stronger force

about the balance of forces within the technical systems. Although often this situation is observed within human centered systems too, despite that it originates from the scientific approach, it cannot be justified entirely. Moreover, it is easily shown that it is very dangerous whenever allowed to dominate human and society behavior. Though in Biology of the nature, in general, the dominance of the powerful applies as a rule and it is the basis of Darwin’s theory.

In the case of humans as individuals, in the first place, and also as groups the behavior is dominated by the performance index expressed in terms of the own’s maximum benefit and regardless the others. These observations, in fact, came out from the pure scientific approach. Should we include religion into this system analysis of individual and group behavior, we can draw further observations that are rather important steps forward for the human centered systems in addition to basic issues of ethics. Within such a context, it becomes apparent that the behavior of nonbelievers in judgement is modulated entirely by performance index of maximum benefit in a limited life. In contrast, we can observe in the behavior of believers in judgement modifications towards a tendency to maximum benefit in both a limited and eternal (future) life, or towards a tendency of maximum benefit in a limited life with more constraints because of ethical and religious reasons.

Hence, we can argue strongly in favor of introducing new forces in human centered systems in terra of Fairness and Justice. Moreover, to the extent to which fairness and justice are fulfilled, to that end a human group or a society, or of an organizational system, can attain and persist certain sustainable development and stable progress.

At this stage the results of Mathematical Theory of Catastrophes (Zeeman, 1977) - the concept of a catastrophe in a rigorous mathematical sense was introduced by Rene’ Thom (theorem on fold and cusp catastrophes in relation to bifurcation, 1972) - can be usefully applied in this consideration too (Mansour, 1986). Insofar this theory has found applications to technical system as well as to economy, biology and behavior science. For the aims of our present discussion, a rather obvious mechanistic illustration is given in Figure 7.

Fig. 7. Illustration related to the mathematical concept of catastrophe in mechanics

Following the catastrophe theory, the shifting of the equilibrium point according to change of the forces can fundamentally change the system operation. Eventually, it may lead to a catastrophic event that may even destroy the system itself. In all society systems, the equilibrium point is shifting according to the power and the money, and similar is the case to all human centered systems. At this point we emphasize that fairness and justice forces cause no large changes of the equilibrium point of a human centered system. Hence, fairness and justice forces can generally provide for the avoidance of catastrophes in human system.

It is an open issue, however, whether their presence can be strong enough in the particular human system of concern. For, apparently they are not strong enough in contemporary societies of the mankind at large. The last example in this paper is one obvious reason for such a situation.
8. EXAMPLE OF A POLITICAL SYSTEM

In any kind of society system as well as in any human centered system in general, policy issues and political aspects are also unavoidable. For, these are essential component of driving forces and the dynamics of human groups and societies themselves. However, they can exhibit dramatically different impact on human societies depending of what is the underlying political system in each particular society. In here we deal with modeling one of the negative cases - dictatorial systems - in the mankind history. Figure 8 describes a typical dictatorial system in terms of its cause effect diagram that links and relates its main features. Note that the state of low level education is a sufficient, not a necessary, condition for a dictatorial political system to take place and to sustain its existence.

It is seen from the cause effect diagram that there operate in the overall structure of dictatorial system two feedback loops. But it is important to note that none of them is corrective and stabilizing, because both are positive feedback loops. Moreover, one of them directly stimulate the increase of state terror and the response to it by terrorist organizations. The other one perpetuates the corruption and deterioration of education. In consequence, there can be no self-recovery in such a system. External interference is necessary for considerable change towards a new development or an explosion of social dissatisfaction, and both have been observed in the most recent history of mankind's societies.

9. CONCLUSIONS

It has been shown in this paper that System Theory is very useful for investigating problems in Human Science. It is also shown that it is rather difficult to obtain mathematical models due to the lack of natural laws. However, phenomenalistic models may be feasible to obtain using the iterative system identification methodology by employing certain system identification techniques. In general, quantitative results are not reliable, but the qualitative ones are correct to a large extent and may well serve their purpose both in scientific and pragmatic sense.

Two examples of successful applications of system theory to human science were closely studied: on human learning, by using theory of optimal control; and on human conformity behavior, by using iterative identification of a phenomenalistic model. Also, a structural model in terms of cause effects diagram of a typical dictatorial political system was presented and discussed within the framework of system theory and human science.

Some of the basic findings of Rosenbrock's study have been confirmed in this investigation. It has been demonstrated that causality myth and purpose myth are equivalent in describing the real world, but with different consequences. The "merely" scientific worldview is dangerous for the humanistic essence of the Mankind. For, Man is not a machine, and must not be treated as if it were so. The novel forces such as fairness and justice as well as the relevant ethical and religion forces are indeed instrumental for the stability and sustainable developmental evolution of human centered systems, and of human societies at large.
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