An Institutional Dynamics Approach to the Study of Peace and World Order

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Abstract

Although computer simulation modeling has long been used to study issues in peace and world order, it has not resolved the controversy surrounding peace research. The problem is the lack of a well-defined methodological rudder to guide the modeling process. In this paper, a new methodological approach to the study of peace and world order is proposed, and its merits discussed. This approach is a synthesis or marriage of institutional economics, system dynamics computer simulation modeling, and peace and world order studies.

> Meanwhile, I had become an institutional economist....From then on more definitely I came to see that there are no economic, sociological, or psychological problems, but just problems, and they are all mixed and composite. In research, the only permissible demarcation is between relevant and irrelevant conditions. The problems are regularly also political and, moreover, must be seen in a historical perspective.[1]

Introduction

If humankind is to reside in a more peaceful, economically stable, and environmentally safe global system, a new approach to policy formulation and implementation must be developed. Conceptually, due to the vastness, complexity and diversity of the global system and its problems, such an approach must be holistic and interdisciplinary in nature and able to contribute to consensus-building among people and nations. In short, it must be able to focus the talents of people from a variety of scholarly areas onto a problem, facilitate the derivation of integrated policy choices, and then assist in the process of convincing citizens and government officials of the merits of pursuing them.

Due to the natural abundance of trained scholars, a logical place for the interdisciplinary study of the threats to global peace and stability and for the determination of integrated policy choices aimed at their alleviation, is the university. Indeed, over the last four decades, interdisciplinary programs in peace and world order studies have been started on campuses throughout the world.[2] If programs of this type are to be successful in influencing the global policy process, however, they must be able to attract a diverse mix of students and researchers from across the university community and then integrate them into the study of social conflict. Unfortunately, in actual practice, this is sometimes not an easy task.

Several authors have called attention to what has been labeled the "two-cultures problem" of peace studies (e.g., Vasquez 1976, pp. 710-711; Lopez 1985, pp. 117-118; see also: Smoker 1985a, pp. 101-102). This problem concerns the tension that exists between those that approach the study of conflict from a "scientific" or "quantitative" perspective and those that approach it from a "humanistic" or

[1] Gunnar Myrdal (1978, p. 772)

[2] George Lopez (1985), for example, lists 55 active programs in American and Canadian universities and colleges alone.

"values" or "traditional" perspective. Thus, ironically, one of the main barriers to the formulation of integrated peace proposals is the conflict that exists between the scholarly approaches of the participants.

The Simulation Approach to Peace and World Order

In 1985, Paul Smoker (1985a, p. 113) published a paper in which he argued that computer simulation modeling is the "new frontier" in holistic conflict analysis. In fact, he went so far as to write that

> It can be argued that simulation now provides the only approach to the types of realistic models that are necessary....it is hard to dispute the assertion that models of global systems should be complex, cybernetic constructions, and that simulation is required to explore their properties.

Of course, it is no secret that computer simulation modeling has long been used to study issues of peace and world order. From the early Guetzkow models to the GLOBUS and DEVELOPING NATION projects, computer simulation technologies have allowed researchers to map-out the multitude of interactions that exist within and between complex social systems, keep track of their dynamic consequences, and test alternative policy choices (see: Guetzkow 1959, Choucri and Bousfield 1978, Barney 1980, Meadows et al. 1982, Fraser and Hipel 1984, Alker 1985, Bremer 1985, Saeed 1986, McLeod and McLeod 1987).

Unfortunately, as with the two cultures problem, no general agreement exists as to the "proper" or "preferred" approach researchers are to take when constructing simulation models of situations involving conflict.[3] Although these disagreements sometimes involve technical issues (e.g., the merits of discrete event versus continuous simulation), the majority of the time they center around the content of a particular model and the implicit world view it represents. Thus, the simulation approach to the study of peace and world order seems to be missing a well-defined methodological rudder to guide the modeling process.

Purpose

The purpose of this paper is to propose a new interdisciplinary approach to the study of peace and world order. It involves a marriage of institutional economics, system dynamics computer simulation modeling, and peace and world order studies. Each of these fields of inquiry possesses both characteristics that are strikingly similar to those possessed by the others, and individual strengths or "spheres of emphasis" that can be combined to yield a whole greater than the sum of its parts. It will be argued that this synthesized approach has the potential to increase the interdisciplinary participation of scholars in peace studies, reduce the severity of the two cultures problem, facilitate harmony among peace simulationists, and provide a vehicle for conveying policy prescriptions to government officials, the global citizenry, and other researchers. Additionally, it will be argued that young peace scholars trained in this "institutional dynamics" approach will be more likely to examine global problems with a *transdisciplinary* mindset than those trained under more traditional methods.[4]

Institutional Economics[5]

Institutional economics was essentially born when Thorstein Veblen asked his colleagues "why economics was *not* an evolutionary science" (Veblen 1898). Veblen and his modern-day "mainstream

[3] This is true, despite the fact that many of the simulation models that have been built during the past four decades have proven to be quite interesting and provocative.

[4] Johan Galtung (1985) points to the benefits of a peace researcher with a transdisciplinary mindset.

[5] The arguments presented in this section are explained in greater detail in both Allan Gruchy (1977) and Gruchy (1987).

institutionalist"[6] followers can be identified by *both* their dissent from the ahistorical/equilibrium body of theory adhered to by mainstream economists and by their support and development of an alternative evolutionary view of social systems.

Institutional economists view social systems as dynamic, interacting, socio-cultural-political-economic processes. The evolutionary path of a social system is not seen as heading toward any predetermined conclusion (as is true in orthodox Marxism), but is instead seen as being directed towards the goals of people and groups that possess power and force them to the top of the social agenda. The specific goals that are sought are formed from the values, traditions, and incentives (i.e., the social and institutional fabric) that predominate the society. As time progresses, however, the social structure itself (and hence the various values and goals) evolves.

According to the institutionalists, the primary mechanism for change in the goal states of a social system is the *circular and cumulative* effect of technological change (see: Myrdal 1977, 1978).[7] Humans are seen as being both curious and interested in improving their lot in life. As a consequence, they are viewed as continually engaged in the act of advancing the "state of the art of doing things" -- that is, they are viewed as continually advancing technology. One result of this natural inquisitiveness is conflict between the old or traditional way of doing things and the newly discovered or modern way. Indeed, to the institutionalists, conflict is central to the evolutionary behavior of a social system. Conflict is seen to occur when people or groups interact while pursuing incompatible goals.

In the mainstream institutionalist paradigm, most mature capitalistic systems are seen as evolving toward structures consisting of ever-increasing concentrations of political-economic power. The results of this dynamic process are a rising domination of the weak sectors of a social system by the strong, and major conflicts over the society's distribution of income. Because competitive market forces are seen as unable to overpower these evolutionary forces and correct the income inequalities and injustices they generate, institutional economists support the concept of "democratic indicative planning" (see: Gruchy 1982b, 1984). Under such a social management/control scheme, elected representatives would use all available techniques (e.g., opinion polls) to ascertain the collective goals of a society, and then implement policies aimed at mitigating internal conflict and moving the system toward its goals.

One other evolutionary trend that plays a prominent role in the institutionalist paradigm, is the ever-increasing interdependence of sovereign social systems. This compels the institutionalists to extend their analytical framework to the global socioeconomic system and incorporate into their analyses the interrelationships and conflicts that exist between nations.

Pattern Modeling

The primary tool that institutional economists use to study the structural fabric of a society and then arrive at policy recommendations, is the holistic pattern model of explanation (see: Kaplan 1964, Diesing 1971, Wilber and Harrison 1978, Fusfeld 1980, Radzicki 1988). Pattern models are derived from detailed case studies undertaken by socialized participant-observers of socioeconomic systems. Much like a detective piecing together the clues at the scene of a crime or a physician diagnosing a disease, an institutionalist participant-observer attempts to identify the various interacting "themes" that illuminate the oneness and wholeness of a social system.[8] The search for themes is not confined to the traditional price-theoretic boundaries obeyed by mainstream economists, but is instead expanded to include any factor deemed important, regardless of the academic discipline from which it arises.

Once the institutionalist is convinced that all of the important themes have been identified, he or

[6] The term "mainstream institutionalist" is taken from Gruchy (1982a). His argument is that all institutional economists are not alike and that four distinct groups can be identified. They are the mainstream institutionalists, the general institutionalists, the applied institutionalists, and the radical institutionalists. According to Gruchy, it is the mainstream institutionalists that share views closest to Veblen's original thinking and offer the best alternative to conventional economics. The mainstream institutionalist view is the one presented in this paper.

[7] Other factors include the circular and cumulative effects of political, geographic, cultural, and demographic forces.

[8] Galtung (1985) has developed a detailed analogy between peace research and medical science.

she assembles them into a pattern explanation of why the people living in the system behave as they do. This procedure has been likened to the assembly of the pieces of a jig-saw puzzle (Fusfeld 1980) or the coordination of the musical instruments in an orchestra. It is this overall picture or pattern of relationships that is meaningful to the institutionalist, not any one theme in isolation.[9]

As a guide in the search for themes, institutionalist participant-observers rely on "real typologies" and on "holistic theories" or "general characteristics of human systems" (Diesing 1971, Wilber and Harrison 1978, Radzicki 1988). Real typologies are the commonalities that have been observed to occur in the pattern models of many different social systems and holistic theories are the (still rarer) commonalities that have been observed to occur in many different real typologies. A list of real types is supplied by Wilber and Harrison (1978) and lists of the general characteristics of human systems are contained in Foster (1981), Tool (1986), and Radzicki (1988). Nevertheless, the development of these guides to pattern modeling is seen by many institutional economists as the research area within their paradigm that needs the most attention (see: Sturgeon 1984 and Gruchy 1982a).

System Dynamics Computer Simulation Modeling

Although the traditional pattern modeling approach of the institutional economists is holistic, descriptively rich and, arguably, appropriate for the study of peace and world order, it does possess certain weaknesses. First, because the participant-observer is inundated with data, it is often difficult for him or her to distinguish between fundamentally important themes and superfluous information. Second, even if the participant-observer were able to identify the important themes with relative ease, he or she has no way of organizing and presenting them except through the spoken and written word. Unfortunately, this can be problematic because written and verbal descriptions often lack precision -- especially when presented across cultures and languages. Finally, even if the participant-observer were able to identify and precisely present with words the myriad of interacting themes that define the structure of a social system, he or she would be unable, by inspection alone, to trace-out the evolutionary behavior they generate.[10]

According to Jay W. Forrester (1975) however, these weaknesses of the traditional pattern modeling approach can be overcome with the aid of the digital computer. Forrester is the founder of a field of inquiry known as system dynamics. System dynamics is a unique synthesis of concepts and techniques emanating from cybernetics, control theory, management science, and computer simulation, and is characterized by the construction of *computerized* or *mathematical* pattern models of explanation (see: Radzicki 1988).

The foundation or building block of system dynamics modeling is the feedback loop. Feedback is the transmission and return of information. In the system dynamics paradigm, flows of information are seen as the forces that motivate people to take actions that eventually alter their various noninformation flows (for example, their production of munitions or their dissipation of fear).

Specifically, the structures of all social systems are seen by system dynamicists as composed of combinations of interacting positive and negative feedback loops. Positive feedback loops define self-reinforcing processes that are responsible for both the growth and precipitous decline of social systems, while negative loops define goal-seeking processes that are responsible for both their stability and fluctuation.[11] These feedback loops are also assumed to accumulate or integrate the flows of information and noninformation they generate. Thus, to a system dynamicist, it is the accumulation of the dynamic flows generated by the feedback of information (i.e., circular and cumulative causation) that is responsible for the evolutionary behavior of any social system.

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[9] Fusfeld (1980) prefers the term "gestalt model" to pattern model because its method of construction reminds him of the fundamental assumption underlying gestalt psychology: individuals learn when they integrate new information into a pattern of relationships they find meaningful. Kaplan (1964) prefers the term "concatenated model" for obvious reasons.

[10] The identification of these weaknesses is attributable to Forrester.

[11] This statement is not a theorem but rather a heuristic that is *usually* true. To illustrate, consider a *positive* feedback loop with an open-loop gain of less than one. Such a loop will exhibit *goal-seeking* behavior. See George Richardson (1984) for details.

Bounded Rationality and Nonlinear Constraints

The feedback loops in a system dynamics model are identified and linked according to the principle of bounded rationality (see: Simon 1984, Morecroft 1983). This principle states that humans are unable to make decisions in the maximizing-rational manner portrayed in mainstream economic theory (that is, through a comparison of all available options based on perfect and unbiased information). Instead, they are seen to disaggregate their decisionmaking into numerous cognitively manageable subdecision points, each of which monitors a limited number of information flows. Generally, at each of these subpoints, humans are seen to rely more heavily on new information than on old, and to make subdecisions that are subject to nonlinear constraints and are biased toward known reference points. In addition, the flows of information that are received at each subpoint are themselves seen as typically delayed and/or distorted.

Thus a system dynamics model attempts to portray human decisionmaking structures as they actually are (bounded rational), and not as they might be if people were omniscient optimizers. Peace researchers might recognize this as an attempt to formally model the flows of information that are responsible for forming a society's "image" (Boulding 1964) and the nonlinear constraints that define its "taboos" (Boulding 1978).

Institutional Dynamics

The argument that the traditional pattern modeling approach can be strengthened through application of the system dynamics method proceeds as follows. First, the institutionalist's search for relevant themes can become a structured search for relevant positive and negative feedback loops. Second, because the relevant loops are required to be translated into computer source code, the institutionalist is forced to state them in the precise and universal language of mathematics. This ensures that they can be unambiguously examined for logical consistency, shown to others, debated, but not changed without explicit action.[12] Third, because the mathematically stated themes can be simulated, their evolutionary behavior can be revealed. If this behavior is observed to be different from that exhibited by the real social system, the institutionalist immediately learns that his or her pattern explanation is incorrect and that the search for relevant themes must continue.

Fourth, the very fact that the model can be simulated implies that the dynamic consequences of proposed policy changes (additions to and subtractions from system structure) can be traced out, examined, and debated, before they are applied to an actual social system. Fifth, the model can serve as an explicit vehicle for conveying the pattern explanation and policy prescriptions to government officials, other researchers, and the global citizenry. In fact, the source code can be easily supplied to anyone for personal experimentation, and simplified versions of the model can be prepared for presentation to audiences that possess a lesser level of technical sophistication (e.g., high school students). Finally, the fact that all institutional dynamics models would be constructed with the same fundamental building blocks -- positive and negative feedback loops -- means that the task of identifying commonalities and, thus, the task of developing both real typologies and holistic theories, would be made more precise. The development of a mathematical body of evolutionary socioeconomic theory, analogous to that adhered to by mainstream economists, is thus possible.[13]

[12] Excellent presentations of how to translate the feedback loops identified by a participant-observer into a system dynamics model are provided by Richardson and Pugh (1981) and Richmond, Peterson, and Vescuso (1987).

[13] Actually system dynamicists have been developing this body of evolutionary social theory for years. They are constantly identifying and assembling "generic structures" -- that is, combinations of positive and negative feedback loops that explain the evolutionary behavior of a wide variety of individual social systems. Further, they have assembled their own list of the general characteristics of human systems (see: Radzicki 1988 for details).

Peace and World Order Studies

Given its diversity, presenting a legitimate summary of the field of peace and world order studies could be, to say the least, a challenge. Fortunately, an appeal to the writings of experienced peace scholars such as Kenneth Boulding and Johan Galtung can be made to obtain respected opinions on the issue. In fact, appealing to Boulding and Galtung is appropriate for another reason: their agreements and disagreements (their "friendly quarrels") as to what peace studies is and should be are well-defined, well-known and, arguably, representative of the field as a whole.

Boulding's View

Boulding (1977, 1978) sees the field of peace research as being primarily concerned with understanding the dynamic *interactions* between individuals, groups, and nations that lead to conflict, and on the derivation of policies that can eliminate or control it. He defines conflict as "goal-directed activity" (Boulding 1985, p. 451) as do the institutionalists and numerous other researchers (see for example: Harold Chestnut 1986, Niall Fraser and Keith Hipel 1984, Louis Kreisberg 1982, and Christopher Mitchell 1981). The significance of this view of peace research is that, if conflict is goal-directed or goal-seeking behavior, it must also consist of negative feedback structure that can be explicitly modeled and simulated.

A useful concept in the system dynamics paradigm is dynamic equilibrium. This is said to occur when all of the goals in a system dynamics model have been *simultaneously* attained. Although system dynamicists do not believe that any social system will ever actually enter such a state, its theoretical description does define a useful reference point for peace studies -- namely the absence of conflict. Thus, one can argue that system dynamics modeling can be used to test policies aimed at moving a social system to a dynamic equilibrium or "peaceful" state.

Galtung's View

Galtung (1985, 1987) assigns a much broader and more controversial role to peace research than does Boulding. Specifically, he believes it must seek to identify, understand, and alter all social *structures* that lead to shorter expected lifespans, be they fast-acting and hence attention-grabbing (e.g., war), or slow-acting and hence easily overlooked (e.g., hunger, inadequate medical care, or environmental destruction).

Although he does not belittle the importance of their study, Boulding objects to including Galtung's slow-acting factors under the peace studies umbrella. He takes this position because he feels that their dynamic interactions are quite distinct from those that generate conflict and, as a result, should be studied separately. Galtung, on the other hand, feels that the slow-acting factors are every bit as violent as the fast-acting factors and thus must be included in any study of peace. Indeed Galtung refers to the slow-acting factors as "structural violence" and argues that peace is the absence of *all* violence -- both direct and structural.[14]

Another Friendly Quarrel

Another of the friendly quarrels between Boulding and Galtung specifically concerns Galtung's use of a *structural* approach. Boulding feels that a structural approach to the study of peace will always yield results that are nonevolutionary and hence inappropriate: i.e., either a static picture -- a snapshot of a social system frozen in time -- or a dynamic picture that is *mechanistic*. He takes this position because he believes that social systems evolve only when they undergo structural change. As a result, any dynamic behavior taking place *within a given social structure* must be mechanistic and nonevolutionary.

[14] Of interest is that much of the research done by both institutional economists and system dynamicists is directed toward the factors that Galtung identifies as contributing to structural violence (see for example: Myrdal 1968, Street 1980, Saeed 1985, 1987, 1988).

What is noteworthy is that Boulding's distinction between mechanistic change and evolutionary change has also been acknowledged by the mainstream institutionalists and the system dynamicists. David Hamilton (1953), for example, argues that this is precisely the issue that separates neoclassical economists from institutional economists. Similarly, Lewis Perelman (1980) points out that some of the criticism of system dynamics models can be traced to the fact that are run in Newtonian "machine" time, yet purport to represent the evolution of social systems through "thermodynamic" time. It is clear, therefore, that this issue is seen as relevant to researchers working in each of the fields discussed in this paper and that it must be addressed before they will accept the proposed marriage as valid.

Reconciling Boulding and Galtung

Although, the system dynamicists have developed a list of seventeen tests to help them determine how much confidence they should place in *a particular model*, (i.e., in a particular structure) they claim that the real value of their approach comes from the *modeling process* itself. It is through the iterative process of making a participant-observer's perceptions or "mental model" explicit they say, that improved learning, understanding, and policy formation arises.[15] As a consequence of this view, a system dynamicist will never claim that a particular model is "finished" or "complete," but rather that it's merely "in its latest stage of development." Further, he or she will argue that any time new information comes to the attention of a participant-observer, a system dynamics model can *and should* be revised and rerun.

Given this perspective, a reconciliation between Boulding's interaction approach to peace studies and Galtung's structural approach directly follows. The underlying argument hinges upon the distinction between a system dynamics model whose structure represents *all* of the evolutionary forces that have existed in a system's past and/or will exist in its future, and one that does not.

When a system dynamics model is simulated and its information and noninformation flows begin to accumulate, the strength and dominance of each of its feedback loops begin to change. This is due to the various nonlinear constraints that generally govern the linkages between the loops. Further, recent research has shown that system dynamics models can endogenously pass through "bifurcation" or "catastrophe" points that cause their qualitative behavior to change in an enormous way (for summaries see: René Thom 1975, Robert May 1976, Douglas Hofstadter 1981, and James Gleick 1987). Specifically, George Richardson (1984) has shown that this will occur whenever a system dynamics model shifts its loop dominance at an equilibrium point. Ilya Prigogine and Isabelle Stengers (1984), moreover, have demonstrated that a bifurcating model's enormous change in behavior is equivalent to the spontaneous reorganization of its structure (see also: Ervin Laszlo 1987 and Richard Day 1983).[16]

All of these results suggest that, even though a system dynamics model is represented by a defined set of equations, its *active* structure evolves.[17] If this structure accurately portrays that of an actual social system, it then can also legitimately be said to represent its evolutionary or *nonmechanistic* behavior through time.

For models whose structure does not capture all of the relevant evolutionary forces of an actual social system, on the other hand, the situation is just the opposite. A system dynamics model is only as good as the mental model that underlies it. Obviously, if an important evolutionary force has not been identified by a participant-observer, it cannot become part of his or her system dynamics model, and the model will not yield correct results. This is a weakness of the participant-observer's mental model, however, and not the system dynamics method.[18]

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[15] Thus Forrester argues that the real question confronting a participant-observer is not: "should I use a model or not," but rather: "which model should I use -- my mental model or an explicit representation of it."

[16] Prigogine also shows that if a self-reorganizing system is exogenously shocked, the occurrence of a reorganization becomes partly a matter of chance and, if one should occur, it may be irreversible or "thermodynamic."

[17] Boulding (1978, p. 344) argues that Lewis F. Richardson's theory of war moods was "a precursor of catastrophe theory."

[18] It is interesting to note that this viewpoint is analogous to the uniformitarian methodology

If this entire argument is accepted then, it follows that the construction of a simulation model of Boulding's evolutionary interactions is conceptually the same as the construction of a simulation model of Galtung's structures. Whether the factors that underlie structural violence are included or excluded depends solely upon the mental model of the individual peace researcher.[19]

Conclusion: An Improved Approach to the Study of Peace and World Order

As the global system evolves steadily toward the 21st century, issues of peace and world order loom larger than ever. If humankind is to survive indefinitely in a safe and stable state, therefore, a greater integrated effort on the part of scholars and policymakers must be put forth. Institutional dynamics has the potential to be the medium through which this can occur.

Feedback dynamics or circular and cumulative causation is a concept that spans academic disciplines. Through its use, the talents of researchers from virtually any scholarly area can be brought to bear on problems of peace and world order. For example, physicists and electrical engineers have large amounts of experience with dynamic feedback modeling, psychologists study how humans use flows of information to make decisions, and biologists and historians document and interpret the evolution of ecosystems and societies. In a similar way, the feedback concept can be used as a pedagogic device to nurture a transdisciplinary mindset in young peace scholars. This can occur because ideas from different scholarly areas can be integrated through their representation in loop form, and students can be taught to search for the answers to problems anywhere their perceptions (and loops) may take them.

The adoption of an institutional dynamics approach to peace studies can also have the effect of reducing the severity of the two cultures problem. This is because it requires the operationalization of the concept of circular and cumulative causation and hence, it requires that elements of the quantitative study of peace be integrated with elements of the humanistic study. Finally, the catalogs of real typologies, generic structures, and holistic theories that have been developed over the years by institutional economists and system dynamicists, can be used by peace simulationists to guide them in their modeling efforts. The improvement and expansion of these evolutionary catalogs is also a place where important contributions can be made to the field.

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pioneered by Charles Darwin and Sir Charles Lyell (see: Perelman 1980 for details) and that Stephen Jay Gould (1986) has declared it to be Darwin's "finest achievement." Of course, both mainstream institutional economists in general (see: Gruchy 1987) and Kenneth Boulding (1977, p. 77) in particular see their research as Darwinian.

[19] Galtung (1987, p. 202) takes Boulding to task over his use of the terms "structure" and "institution." He argues that Boulding uses them interchangeably when he should reserve the word "structure" to represent *all* structures, not just institutionalized structures.

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