Thinking Through Systems Thinking

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Preface

In 1929, Emmanuel Levinas wrote of meeting a German student on the Berlin–Basel express heading for Freiburg: 'When asked where he was going, he answered without batting an eye: "I am going to the home of the greatest philosopher in the world".' This sounds almost quaint in today's world where the mass production and mass marketing of education promote an impersonal choice of university and even course of study. At the most one goes (or aspires to go) to a particular university because of its institutional fame; less often do we hear from a student that the choice was based on the fame of particular faculty members. I was lucky to have experienced something like the German student's fortune. I was accepted at a prestigious university, and my choice was reinforced by a desire to study under one particular faculty member. The initial awe of the first lecture was soon replaced with something permanent: a lifelong motivation which propels one to continue to learn, to write, to exchange the most intangible human product of them all and yet one with profoundly tangible consequences: ideas.

I studied what is, for some, an apparently much less known, if not less royal, subject than the queen of the sciences. I came to discover, however, that philosophy penetrated everything that I read. My studies were intensively concerned with human behaviour, with human choices, with human motives and consequences, and most of all with the uncertainty that human beings generate for themselves. Yet there seemed to be a greater tendency to control these human issues within a mathematical paradigm than any real attempt to deal with them in accordance with their all too human dimensions. Although initially attracted to the former paradigm, I increasingly felt pulled to pay attention to what was missing in such reductionist ways. In my own field, I kept encountering attempts to forge a new understanding based on philosophy and the social sciences. At the time I regarded such attempts as strewn with eclecticism. In retrospect, I regret the force of this summary judgement, though not its substance, for I have come to appreciate how difficult it really is to develop, justify and defend each and every corner of an interdisciplinary argument. All I knew for certain was that I wanted to be part of this game; I wanted to learn its rules and forge new ones, and most

of all I wanted to contribute. My choice was not to rely on the philosophers who had been so far applied, in whatever manner, to my field. And if I had, for some reason, to incorporate them, I was not to rely on my own field's interpretations of them. I was, in a sense, to start from square one.

Square one appeared in unexpected form, although it opened the door to everything which followed: the essays of James Baldwin collected under the title *Nobody Knows My Name.* It would take a whole book to trace the distinct, yet interconnected, conceptual developments which followed and which grew exponentially in my mind. Basically, I journeyed into system theory, becoming acquainted with such key thinkers as Ludwig von Bertalanffy, Peter Checkland and Robert Flood. I soon discovered, however, that key contributions were available from particular philosophers such as Jean-Paul Sartre, Maurice Merleau-Ponty, Emmanuel Levinas and, most significantly, Edmund Husserl. For those already familiar with thinkers such as these, the absence of Martin Heidegger appears striking. For them also, the inclusion of thinkers such as these in a book on systems thinking may appear surprising. Both of these questions will, of course, be answered in the pages which follow.

Of these thinkers, Sartre appeared to me to be the most dynamic and the most encouraging. Reading Sartre was exciting and I was convinced that I had found a potentially profound synthesis between systems thinking and phenomenological philosophy. The more I read Sartre, however, and in part owing to his genius, the more I felt Husserl tugging at my sleeve. And this was very worrying. Where Sartre's eloquence illuminated the essence of what I wanted to contribute, Husserl wrote philosophy as a 'rigorous science'. Reading Husserl, in other words, was much more challenging, requiring much greater expenditures of effort for each marginal gain in understanding. It was my earlier training in advanced engineering mathematics which, I appreciated much later, proved invaluable in preparing me to mentally face Husserl. And, ultimately, it was Husserl who trained me in disciplined, careful analysis of concepts and ideas.

This book is certainly about System Theory, and especially about how it informs systems thinking. It is also, however, the product of Husserlian discipline, whose seed was sown by a renowned lyrical essayist, and of the writers I read in between. To them I am indebted, as is all of humanity. At times we hesitate to appreciate their greatness and, perhaps because we fear the effort they demand of us, we allow ourselves to be fascinated by their faults for too long.

Ion Georgiou
São Paulo, June 2006

Acknowledgements

During the course of writing the present work, I published a number of papers or short articles which gave me the opportunity to undertake initial explorations of some of its central aspects or ideas. The full references are as follows:

- (2003) The idea of emergent property. *Journal of the Operational Research Society* 54: 239–247.
- (2001) The ontological status of critique. *Systemic Practice and Action Research* 14: 407–449
- (2000) The ontological constitution of bounding-judging in the phenomenological epistemology of von Bertalanffy's General System Theory. *Systemic Practice and Action Research* 13: 391–424.
- (1999) Groundwork of a Sartrean input towards informing some concerns of critical systems thinking. *Systemic Practice and Action Research* 12: 585–603.
- (1999) A response to Flood, Taket and Valverde. *Journal of the Operational Research Society* 50: 101–103.
- (1999) Furthering the operational research philosophical agenda. *Journal of the Operational Research Society* 50: 97–98.

Although the arguments published in the above references have since been further developed, finding their most recent explication in this work, there are occasional phrases and paragraphs which have been reproduced here. Material published in the *Journal of the Operational Research Society* is reproduced with kind permission of Palgrave Macmillan. Material published in the journal *Systemic Practice and Action Research* is reproduced with kind permission of Springer Science and Business Media.

Part I

Contextual investigations

True opinions are a fine thing and do all sorts of good so long as they stay in their place; but they will not stay long. They run away from a man's mind, so they are not worth much until you tether them by working out the reason. . . . Once they are tied down, they become knowledge, and are stable. That is why knowledge is something more valuable than right opinion. What distinguishes one from the other is the tether.

Socrates (Plato, *Meno*)

1 War

There is an increasing call for holistic approaches to problems. This chapter discusses some contemporary examples of this call in order to highlight some key points of the holistic approach which are rarely, if ever, mentioned or understood. It concludes by arguing for a distinctly epistemological investigation if the idea of a holistic approach is ever to materialize as a practical alternative to problem resolution.

1.1 The holistic/systemic approach

The *holistic approach* is gaining support in tackling problems. It is called upon when the treatment of a problem through the isolation of its constituent parts is rejected. This rejection usually criticizes such treatment not only as reductionist but also as too involved in the short term so that the longer term goals or consequences are detrimentally ignored. In an interview given by the then leader of the UK Liberal Democrats, Charles Kennedy, to the BBC's Peter Sissons on 4 June 2001, Kennedy calls for a holistic approach in exactly this sense:

> Now these things can't all be isolated one from the other. I think it's part of the holistic approach to government which is longer-term and I think more far-seeing than the short-term which has tended to plague successive British administrations.[1]

In this, not only is there expressed a straightforward need for a holistic approach to problems, but it is assumed as obvious that the holistic approach offers broad methodological guidelines – themselves implying underlying epistemological guidelines – for dealing with the longer term future, for coming to know it, in a holistic manner.

The holistic approach ranges from a simple inclusion of as much relevant and related data to a problem as possible, to the formation of interdisciplinary groups with the specific task of tackling a particular problem holistically, that is, by incorporating each group participant's input to the situation. A good

example of the former, including its illustration of how easily what is deemed relevant and related data can increase exponentially, is given by Churchman (1979) in his discussion of the classic approach to inventory management. A good example of the latter is the formation of a think-tank charged with finding a 'holistic' way of improving UK flood defences to prevent a repeat of the 2000/2001 damaging floods which swept the UK.[2] Chaired by the Chartered Institution of Water and Environmental Management, it includes water engineers, house builders, insurers, the Environment Agency and flood victims. Across such a range of application, the holistic approach demands a process of 'sweeping in' – to borrow a term from Churchman (Ulrich, 1988a) – as much related and relevant variety as is manageably possible.

It is notable that the discussion has already referred to one of the leading thinkers in the history of the field known as *system theory* – C.W. Churchman – and to one of his most remembered concepts, the concept of 'sweeping in'. Indeed, there can be no talk of a holistic approach without referring to system theory, for it is this field of thought which has championed the idea of a holistic approach to problems. Given this, any attempt at understanding the holistic approach is necessarily an attempt at understanding system theory, indeed *is* the attempt to understand system theory.

Where holism reigns, therefore, the notion of system follows. Hardly a month goes by without a situation being said to exhibit systemic characteristics. The Inquiry into the 1997 Southall rail disaster in the United Kingdom, for example, found that

> it would be wrong to concentrate on the failings of the driver when there is compelling evidence of serious *systemic* failings within Great Western [Trains].[3]

Following the killing of an African-American youth by a police officer in Cincinnati, Ohio in May 2001, the head of the National Association for the Advancement of Colored People said that he believed:

> the problems in [the police] department are *systemic* and they span the last two decades.[4]

In the autumn of 2000, the Hungarian newspaper *Nepszava* reported its concern over the methods of the country's right-wing government by writing:

> The unrestrained and vulgar hatred-speeches against political rivals now common in parliament . . . degrade and threaten the peaceful *systemic* change based on social consensus.[5]

Setting up an alert on the Google News Internet site for the keyword *systemic* yields, on average, three to four alerts per week.[6] Addressing systemicity is obviously currently fashionable. In the introductory words of the pioneering system theorist, Ludwig von Bertalanffy[7] (1968: 3):

> if someone were to analyse current notions and fashionable catchwords, he would find 'systems' high on the list.

Such a statement probably rings more true today than in the 1960s when it was first written. Though it might ring more true, however, the notion of system, or holism, is more difficult to grasp than, say, the deterministic, reductionist approach. One reason may be the manner in which the idea of system renders difficult, or even constrains, the identification of *causes* of effects. In the above examples, this translates into the apportionment of blame.

1.2 Blame dynamics

Seven people die and more than a hundred are injured in a train disaster. Emotions run high. Someone must take the blame: the train driver, the signals operator, the rail track company, the train company, the government – anybody, but somebody must take the blame to quench the anger and the suffering. The Inquiry, however, concludes that there is no straightforward guilt, only systemic failings within the train company. What does this mean? Where can the finger be pointed so that the anger is appeased?

An African-American youth is killed by a white police officer in the United States. The officer receives what some perceive as 'a slap on the wrist'. The penalty is not severe enough. Blame has not been given its due. The National Association for the Advancement of Colored People, moreover, the very association to which African-American youth might look for some action in apportioning blame, concludes that the problems in the police department are systemic. How does systemicity help apportion blame? How has this wrong been righted by reverting to systemicity?

The Hungarian newspaper *Nepszava* makes systemic change proportional to, and a function of, consensus. How exactly can this relationship between systemicity and consensus be described, and how would that help to resolve situations which exhibit systemic characteristics? How can consensus be found in situations steeped in conflict?

Appeals to systemicity in such contexts appear irrelevant and perhaps even insulting to the ears of those affected, of those who (believe they) know that, at bottom, someone must take the blame. Blame is a serious issue in such examples. It is not just some short term solution to the respective problem, for if there is a wrong then the source of this wrong must be discoverable – in much the same way as, if in general terms there is an effect, then the source of this effect, the cause, must be discoverable.

The line between blame and scapegoat tactics, however, is very thin. At worst, the blame approach risks throwing society back to the middle ages where a crowd mentality creates the superficial division between innocent spectators and executed guilty, enabling society to wash its hands of the committed evil once the blame has been apportioned. The very notion of consensus, stressed by *Nepszava*, opposes this division and makes it difficult for anyone to wash their hands of the situation. Consensus implies togetherness,

indivisibility. Most of all it implies joint responsibility so that, if there is a wrong, all parties have contributed to this wrong. Consensus does not allow anger and suffering to be quenched at a stroke; it offers only more calls for understanding, more exploration of the situation. Consensus politics is much more demanding on the heart and mind than blame politics. It is also much more fruitful. For the application of systemicity to a situation gives rise to the possibility of *redesigning the situation*, contrary to solely apportioning blame whilst leaving the situation unchanged. There is a very real possibility, in other words, that the situation itself has enabled the problem to arise, and that the fact that someone has done wrong has been enabled more by the situation than by any other factor. The wrong might very well be a secondary product of the primary reason for its occurrence: the situation itself. In effect, blame takes a back seat in systemic problem resolution – if it has any role at all – and the demanding search for systemic causes begins.

1.3 The idea of feedback

The idea of 'feedback' in systems is the prime mover in understanding a problematic situation holistically. This seemingly simple concept opens the door to quite sophisticated understanding. The basic conceptual unit of feedback is the 'feedback loop', that is, a closed chain of causal relationships that feeds back on itself. In general, whenever it is linearly postulated that A causes or affects B, a systemic approach looks for the ways in which B might in turn affect A, as shown in Figure 1.1.

There are two types of feedback. Negative, or controlling, feedback aims towards some steady state. Positive feedback is self-reinforcing, either in terms of growth (regenerative dynamics) or deterioration (degenerative dynamics), both of which, in the absence of negative feedback, ultimately lead to the collapse of the system. Consider the following two examples, the second of which illustrates how a systemic problem-solving approach differs from one reduced to blame, anger appeasement and the linear search for causes.

The first example, that of a negative feedback system, can be illustrated through the workings of a water faucet. A faucet is turned to control the level of water in a glass, as shown in Figure 1.2. The level of water in the glass and the desired level to be reached both determine the faucet position at any one

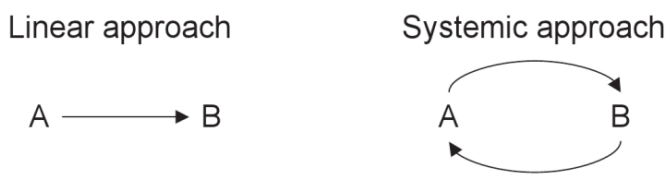

Figure 1.1 Linear causation and systemic feedback

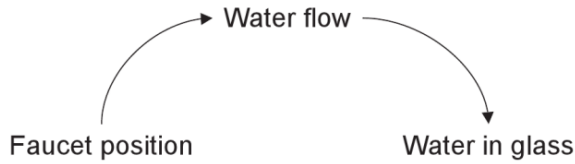

Figure 1.2 Water flowing into a glass

time, so that the water in the glass ultimately reaches the desired level, as shown in Figure 1.3.

In this example, the feedback serves to control the system, enabling it to reach some desired state, some goal. It is a feature of negative feedback loops to be goal-seeking in this way. Negative loops act to adjust systems towards equilibrium points or goals, just as a thermostat loop adjusts room temperature to a desired setting.

A positive feedback system is the kind of system which requires systemic change, or redesign, based upon consensus but which instead easily falls into blame politics. Any arms race illustrates this type of system feedback. A country acquires more armaments to catch up with the competition, as in Figure 1.4. This effectively generates more armaments for the competition, as shown in Figure 1.5.

Positive feedback loops may be seen as vicious circles which reinforce themselves more and more. They may also be seen as growth circles and evolutionary circles. Ultimately, with no negative control mechanism, the system collapses. Of course, most systems are constituted by a multitude of interconnected positive and negative feedback loops and their behaviour is rooted in a complexity which makes it difficult to see what causes what. A number of methodologies, quantitative and qualitative, exist to facilitate the navigation of such complexity (Sterman, 2000; Eden and Ackermann, 1998).[8]

1.4 'We have the war we deserve'

The concept of feedback is useful because it allows the linking of causal structure with dynamic behaviour. For example, the structure of the system, as causes and effects, of *Faucet position – Water flow – Water in glass* is analysed

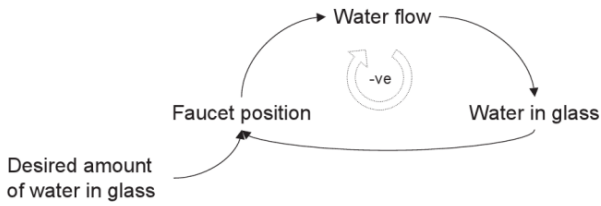

Figure 1.3 Negative feedback loop

which do not match the rate of demand. If this is true, practical application of the approach risks becoming irrelevant as problems change faster than the speed with which the approach can deal with them. Even Checkland's Soft Systems Methodology, one of the better known and more widely applicable system theoretical approaches, and arguably one of the more successful, is prone to this risk, as applications and surveys have shown (Brocklesby, 1995; Mingers and Taylor, 1992).

Might an explanation also lie in that the systems approach still remains the science of and for the future – a future indicated by Ackoff (1979) as far back as the 1970s and yet still not with us? In this respect, the systems approach can be understood as comparable to the state of psychology as it emerged in the second half of the nineteenth century only to end up as a dominant field in the social sciences of the twentieth century. Upon reading Franz Brentano's (1995: 3, 22–25, 28) description of the relatively new science of psychology in 1874, for instance, any systems thinker cannot help but recognize similarities, common views, and critiques: that the field is, for example, misunderstood; that it aspires to being scientific;[12] that its birth is necessarily (and not accidentally) recent; that the need for it is pressing, almost forcing itself upon today's reality; that its importance is gradually but increasingly accepted; and that it holds great promise as the science to which the future belongs, the science which will mould the future, the science to which other sciences will be (some would say, are) subordinate in their practical application, the science most capable of demonstrating all the richness to which the scientific method lends itself, the science which continually adapts itself to successively more and more dependent and complex phenomena – yet the science which is incomplete and requires development.

Brentano's description of the state of psychology ends on a cautionary note which speaks across decades to system theory. The new science must be 'more clearly known and more fully developed' if it is to be understood, and so 'there remains much to be done'. This work provides but one contribution to all that remains to be done. This contribution focuses on a perceived primary benefit of system theory: its ability to descriptively explicate how the 'wars we deserve' are inevitable. The literature has yet to provide this substantive descriptive explication, and systems thinkers have yet to show a sustained venture into the polemic arena of ethics. Such description, however, can potentially lay bare behavioural and ethical concerns of the highest import. It is not enough to simply provide examples, such as that of the arms race, claim the obviousness of self-created consequences, and move towards replacement structures and dynamics. Replacing detrimental systems with new systems gives rise to new self-created consequences. Moving from example to example ignores the essential question: are the 'wars we deserve' inevitable and, if so, is there some manner of proving it? Or, can it be shown that human beings can indeed escape self-created consequences and hence alleviate themselves of some responsibility? Sartre (1958) argued for the inevitability of the 'wars' and for inescapable human responsibility. His influence is such

that his arguments have been at once strongly defended, praised, neglected, misunderstood and denigrated. This mix of responses alone would suffice to render Sartre worthy of serious study. It may be, however, that this multifarious reception is due to Sartre's having mixed rigorous philosophical reasoning with rhetoric, lyricism and literary leanings. Clarity demands the provision of rigorous demonstration which is simultaneously as simple and as universally relevant as possible. If the systems movement aspires to be accepted as scientific, this aspiration at least motivates it to provide the demonstration in question. Despite Sartre, and at the systems movement's own insistence, the inevitability of the 'wars' remains to be, and must be, demonstrated. Such a demonstration may provide a means of controlling their occurrence, or at least a means of understanding the phenomenon. Ultimately, if successful, such a demonstration should open doors towards acceptable ethical models which can be translated to political, social and administrative action. Such a demonstration is a core aim of this work.

1.5 Conclusion

The above survey has identified some key points of the holistic approach which deserve to be highlighted. This is done in Table 1.1, wherein the terms *holistic approach*, *systemic approach* and *systems approach* are used interchangeably.[13]

It is worth noting that, especially in the last key point of Table 1.1, the holistic approach appears to be relevant only in situations where it is possible to change the system. The question arises, therefore, of this approach's relevancy in situations where the system cannot be changed. Is it to be understood that, where the system cannot be changed, that is, where those

Table 1.1 Some key points of the holistic approach

A holistic approach, in mapping out the interrelationships of a situation, attempts to account for medium to longer term goals and consequences and does not focus only on the short term.
The process of sweeping in as much relevant and related variety as is manageably possible raises the question of when and where to draw the line in such a process – this is known in the systems literature as the problem of 'boundary judgements'.
Against divisive tactics, systemic problem-solving approaches point out the indivisibility and joint responsibility of those affected by, and those affecting, the system in question.
By focusing on the system in question, a systemic approach invites consensus and demands more of those affected by, and of those affecting, the system.
The systems approach reveals how a system causes its own behaviour and thus points the way towards resolving undesirable consequences stemming from this self-induced cause.
Though it is the system in its structure and in its dynamics, and not those involved within it, which causes certain behaviour, only those involved can change the system and hence they are responsible for the system's self-induced causes.

involved are condemned to a particular system, perhaps not even of their making, those involved *do not* bear the responsibility for the results of this system? Or, given how the holistic approach indicates that 'we have the wars we deserve', is it to be understood that, where the system cannot be changed, that is, where those involved are condemned to a particular system, perhaps not even of their making, those involved *do* bear the responsibility for the results of this system?

This is perhaps one of the most profound questions which system theory needs to address, and this work will make such an attempt. It may be that a general answer is possible or it may be that the answer differs from system to system. If the latter, the theory of systems, or system theory, would need to identify criteria which could be used in particular situations. Whatever is the case, when dealing with any system in which human beings are involved, in any way, system theory should provide some answer.

The idea of the holistic approach implies the taming of blame. It further points to a conclusion that 'we have the wars we deserve'. The poignancy of this assertion demands a more profound investigation in order to verify the manner in which it reflects, describes and explains human reality. Now, the idea of a holistic *approach* to problems implies prior methodological guidelines. Methodology, in turn, implies prior epistemological guidelines. And epistemological guidelines find their roots in an *epistemological theory*. Like the manner in which the epistemology of British empiricism enabled the methodological guidelines of the experimental method which gave rise to the scientific approach, a holistic epistemology is required from which methodological guidelines may be deduced for a holistic approach. Consequently, when a holistic epistemology has been laid out, it will be possible not only to verify the claims and possibilities of a holistic *approach*, but to further provide a better understanding of this approach and, additionally, of the inevitability, or otherwise, of the 'wars we deserve'.

Indeed, the ideas of *a holistic approach to problems* and *a holistic approach to knowledge* are interrelated. For in the search for holistic resolutions to problems, the manner of knowing the problems themselves should be holistic. Therefore, the *problem of knowledge* itself must be informed through holistic approaches. In short, a holistic epistemology is required, one which not only enables holistic understanding of problem situations in general but is *holistically structured* itself so that the manner in which knowledge arises (this being the specific problem of knowledge) is holistic and, additionally, can be understood holistically.

It is not unreasonable to conclude, therefore, that, if the holistic approach's most alarming 'wars we deserve' assertion is to find some foundation, an epistemological investigation is unavoidable. Furthermore, as noted earlier, any attempt at understanding the holistic approach must necessarily attempt to understand system theory. Where the next chapter turns to examining epistemology in some detail, therefore, it does so especially through the lens of system theory in order to delineate further the route for the investigations which follow.

Notes

1 See http://news.bbc.co.uk/vote2001/hi/english/programmes/specials/election_call/newsid_1369000/1369845.stm (4 May 2001). It is also worth mentioning that an aspiration to holistic government (known as joined-up government) has, at least in theory, guided Prime Minister Tony Blair's New Labour government in the United Kingdom since 1999 (Pollitt, 2003).

2 See Plans for 'Holistic' Flood Defence, available at http://news.bbc.co.uk/hi/english/uk/newsid_1322000/1322493.stm (10 May 2001).

3 Rail Managers Rebuked Over 'Catalogue of Errors', available at http://news.bbc.co.uk/hi/english/uk/newsid_573000/573740.stm (21 December 1999). Systemic failings were further attributed to the rail industry as a whole by one of the companies prosecuted for the October 2000 Hatfield crash (*Daily Telegraph*, 'Companies fined £13.5m for Hatfield crash', available at http://www.telegraph.co.uk/news/main.jhtml?xml=/news/2005/10/08/nhatfield08.xml (8 October 2005)).

4 Officer Charged Over Cincinnati Killing, available at http://news.bbc.co.uk/hi/english/world/americas/newsid_1318000/1318269.stm (8 May 2001).

5 BBC European Press Review, available at http://news.bbc.co.uk/hi/english/world/europe/newsid_953000/953674.stm (3 October 2000).

6 It is worth noting a couple more examples.

In his 2002 annual review Nick Land, Chairman of Ernst & Young, concluded:

> The root cause of corporate collapse and scandals in companies like Enron and WorldCom was not audit failure. They came about because of systemic failure in the US around corporate governance and transparency, accounting standards and regulation, and, perhaps most importantly, as a result of greed.
>
> Ernst & Young's chairman's review of the year 2002, available at http://www.ey.com/global/content.nsf/UK/UK_Annual_Review_2002_-_Chairmans_review (accessed 23 October 2005)

On 18 October 2005, New York Federal Reserve President Timothy Geithner expressed his concern over a developing paradox: while increased complexity of financial systems reduces the individual vulnerability of firms, it compounds uncertainty as to how the financial system as a whole might function in the context of a systemic shock from hedge funds and other unregulated institutions. See Fed's Geithner: Market changes have altered risk, available at http://today.reuters.com/investing/financeArticle.aspx?type=bondsNews&storyID=2005-10-18T200837Z_01_N18235770_RTRIDST_0_ECONOMY-FED-GEITHNER-UPDATE-1.XML

7 Ludwig von Bertalanffy (1901–1972), biologist, philosopher and acknowledged founder and chief exponent of General System Theory, the foundational theory which gave rise to the systems movement.

8 In particular, Eden et al. (1992) show that the nature of feedback, when modelled according to their cognitive mapping methodology, can be established through the number of negative and positive links within a loop.

9 The 2001 national election in the UK was marred by the increasing use of the 'race card' and the manipulation of the 'immigration problem', with candidates often accused of avoiding the real societal problems.

10 Dubrovsky (2004) indicates, quite rightly, that the first comprehensive attempt at a system theory was Condillac's (1938) *Treatise on Systems*. This work, however, is rarely studied today and von Bertalanffy's work remains the acknowledged foundation for the systems movement, a movement seen as having emerged in the twentieth century.

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Note: page references in **bold** refer to tables or figures; notes are indexed only where subjects will not be found through reference from the main text.