

Rerum cognoscere causas: Part II— Opportunities generated by the agency/structure debate and suggestions for clarifying the social theoretic position of system dynamics[†]

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Abstract

This is the second half of a two-part paper dealing with the social theoretic assumptions underlying system dynamics. In the first half it was concluded that analysing system dynamics using traditional, paradigm-based social theories is highly problematic. An innovative and potentially fruitful resolution is now proposed to these problems. In the first section it is argued that in order to find an appropriate social theoretic home for system dynamics it is necessary to look to a key exchange in contemporary social science: the agency/structure debate. This debate aims to move beyond both the theories based only on the actions of individual human agents, and those theories that emphasise only structural influences. Emerging from this debate are various theories that instead aim to unite the human agent view of the social realm with views that concentrate solely on system structure. It is argued that system dynamics is best viewed as being implicitly grounded in such theories. The main conclusion is therefore that system dynamics can contribute to an important part of social thinking by providing a formal approach for explicating social mechanisms. This conclusion is of general significance for system dynamics. However, the over-arching aim of the two-part paper is to increase the understanding of system dynamics in related disciplines. Four suggestions are therefore offered for how the system dynamics method might be extended further into the social sciences. It is argued that, presented in the right way, the formal yet contingent feedback causality thinking of system dynamics should diffuse widely in the social sciences and make a distinctive and important contribution to them.

Felix qui potuit rerum cognoscere causas
“Happy is he who comes to know the causes of things”
Virgil—*Georgics*, Book II, line 490. 29 BCE

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Recapitulation—the structure and aims of this paper

This is the second half of a two-part paper dealing with the social theoretic assumptions of system dynamics. Two issues were considered in Part I.¹ Firstly, the implicit but underlying social theory of the field was probed. This was done by relating the range of system dynamics practice to a framework—widely used in both operational research (OR) and systems science—which organises the assumptions behind traditional social theoretic paradigms (Burrell and

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[†] Editor's note: To preserve the integrity of the author's argument whilst holding to the standard paper length for articles in *System Dynamics Review*, this paper has been split into two parts. The first part appeared in volume 17, number 2.

Morgan 1979). The aim was to answer the question: How do the ideas of system dynamics relate to traditional social theory?² Distinct and surprisingly varied groupings of practice were identified, arguably making it difficult to relate system dynamics to any one paradigm with any certainty. The difficulties of establishing a social theoretic home for system dynamics were then exemplified by considering a second issue, crystallised by the question: Is system dynamics deterministic? It was shown that system dynamics simply did not fit well with either pole of a dichotomous voluntarism/determinism axis. Part I therefore concluded that definitively placing system dynamics with respect to traditional social theories is highly problematic.³ In this present Part II a resolution is offered to these problems.⁴

The first main section considers some recent social theories, which seek to integrate the “agency” and “structure” paradigms that have traditionally been employed in social theory. Hence, the third issue discussed across the two parts of this paper is whether system dynamics relates best to those theories that seek to integrate views based on the actions of individual human agents with those views that emphasise structural influences. The question being considered is: The agency/structure debate—opportunity for system dynamics? A description is given of these theories and what was formerly proposed as “a bold conjecture” (Lane 1999b: 521) is advanced here as a firm thesis: that the implicit social theory of system dynamics is consistent with such integrative theories.

Across its two parts, the over-arching aim of this paper is to use social theory to enable system dynamics to be extended further into the social sciences. The second main section therefore draws on all of the previous analysis to make four suggestions for clarifying and innovating the social theory of system dynamics in ways that improve communication between system dynamicists and mainstream social scientists. A conclusion section closes the paper.

The agency/structure debate—opportunity for system dynamics?

This section draws on two previous findings. First, that system dynamics is difficult to place in terms of traditional social theories. Second, that system dynamics challenges the dichotomy of the determinism/voluntarism debate. The second point begins to explain the first: if system dynamics appears not to have a social theoretic home, then it must be different from the traditional ones considered so far.

Such a home may be found in those theories emerging from the “agency/structure debate”, one of the most important innovations in social theory (Layder 1994; Ritzer 1996). Below, the first three sub-sections outline theories that have emerged from this debate. In the subsequent two sub-sections,

it is first argued that system dynamics would fit naturally with such theories. Then the difficulties and opportunities of achieving that fit are considered.

Towards the integration of agency and structure

The tradition of Comte has sought to explain how objectively describable structures influence human action. This contrasts with the tradition of Hegel, Husserl and Schutz, which has sought to explain how individuals act as voluntaristic human agents, continually creating the social world by ascribing subjective meaning to their actions. However, these views—“structure” and “agency”—are not dichotomous but co-existing. The traditional distinction made between these “objective” and “subjective” approaches is increasingly seen as describing extremes of a dialectical activity. The means by which the two can be integrated is at the heart of the “agency and structure debate” in social theory (Layder 1994; Ritzer 1996).⁵

The insight that there is such a dialectical relationship is not new. Durkheim, and later Marx and Parsons, certainly concentrated on understanding the objective, factual nature with which the social world presented itself. However, in different ways they acknowledged the dualistic nature of agency and structure, even though they ultimately gave priority to the latter. Weber’s integrative view shows much more clearly since he attempted to bring subjective understanding within his analysis of structure.

This background aside, social theories explicitly built on the idea of integration are an innovation. A seminal post-war attempt to unite agency and structure is the “Social Construction of Reality” thesis (Berger and Luckmann 1966). These authors propose that “Social order is ... an ongoing human production” (p. 52). They describe a cycle of activities that form this production. Social structure manifests itself via the fact that “Institutions ... control human conduct by setting up predefined patterns of conduct, which channel in one direction as against the many other directions that would theoretically be possible” (p. 55). This takes place because individuals apprehend the world using certain values and roles, the internalised form of the above channeling. When humans act they externalise their subjective interpretations of the world and in doing so they re-vivify the patterns of conduct, or “typificatory schemes”. Over time these therefore take on objective characteristics. As a result, “The reality of everyday life contains typificatory schemes in terms of which others are apprehended and ‘dealt with’ in face-to-face encounters” (p. 30–31) and so the cycle continues.

This book is one of the most influential modern forms of the dualistic approach. Today, social thinkers offer a number of innovative theories, which attempt to synthesise agent-based and structure-based approaches in different ways. Some of these are outlined in the sub-section below. This is then followed by a more detailed account of another such theory.

Some contemporary integrative theories

The ubiquity (and commonality) of modern integrative theories may be emphasised by touching briefly on some examples of this important development in social enquiry.

MORPHOGENETIC SYSTEMS THEORY

A form of systems theory based on morphogenesis is used by Archer to present an integrative treatment of agency and culture. Defining culture as beliefs and values, she aims to understand how cultural conditioning influences action and interaction. The cyclic process at the heart of the theory involves structural conditioning, social interaction and structural elaboration. In combination, a strong attachment to the idea of the causal influence of culture on actions and the morphogenetic element together allow the theory to probe how action produces emergent properties and structural elaborations that shape future actions (Archer 1988; 1995).

CONSTRUCTIVIST STRUCTURALISM

The “constructivist structuralism”, or “genetic structuralism” of Pierre Bourdieu centres around his use of the two concepts *Habitus* and *Field*. The *Habitus* is the stock of knowledge that a person has in consequence of living in a particular culture (e.g., attitudes to work, speech patterns, etc.). *Habitus* then shapes human anticipation and interaction. *Field* is a network of relationships between individual and institutional agents that governs how they deploy various kinds of resources (e.g., economic or cultural capital). It is practice that mediates between the two; *Field* conditions *Habitus*, which in turn renders *Field* intersubjectively meaningful (Bourdieu 1977).

AUTOPOIETIC SYSTEMS THEORY

Systems theory is also used by Niklas Luhmann to describe the relationship between processes of communication (his social system) and individual consciousness (“psychic systems”). He uses the concepts of Maturana and Varela’s autopoiesis theory to describe how elements and phenomena reproduce themselves (Luhmann 1984; Mingers 1995).

COMMUNICATIVE ACTION

The “theory of communicative action” of Jürgen Habermas attempts to hold in balance an objective systems theory akin to that of Parsons and an account of language and meaning in the style of Mead (Habermas 1981a; 1981b). This extensive theory re-casts ideas from Marx, Weber and early Critical Theory to describe the complex, evolving interaction between the (social) system and the Lifeworld, or *Lebenswelt*, the world of everyday experiences and actions in society. It is one of the most influential of modern social theories (Ritzer 1996).

To explore these ideas in more detail, attention now turns to an account of one modern integrative theory, the work of Giddens.

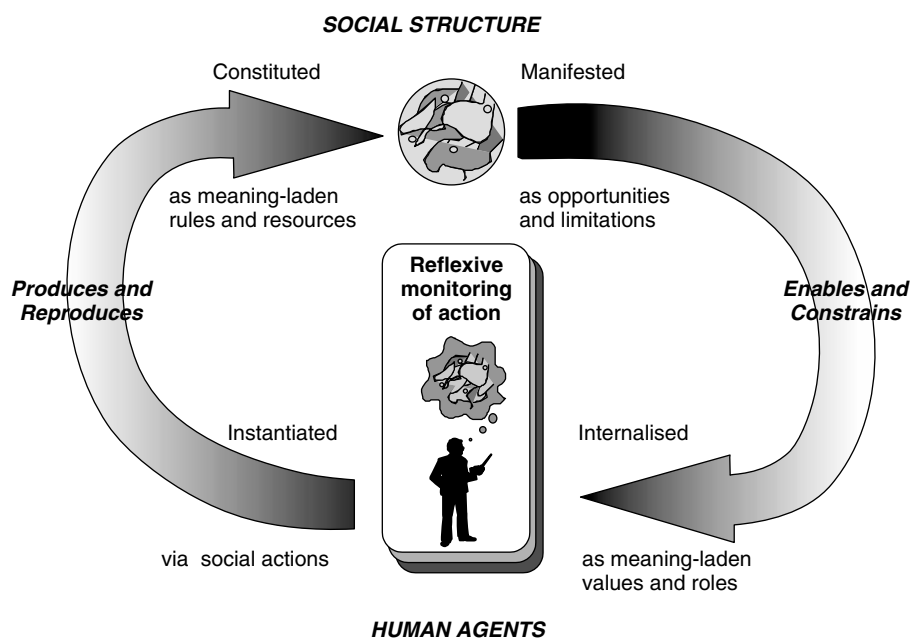
Example of an integrative approach: Giddens’s “structuration theory”

Giddens’s contribution to dissolving the agency/structure dualism is “structuration theory” (Giddens 1976; 1984). This integrative theory is “a hermeneutically informed social theory . . . [which] recognise[s] the need for connecting an adequate account of meaningful ‘action’ . . . with the analysis of its unanticipated conditions and unintended consequence” (Giddens 1982: 7).

In structuration theory, human agency and social structure exist in a reflexive—one might say feedback—relationship to each other; “The structural properties of social systems are both medium and outcome of the practices they recursively organize” (Giddens 1984: 25), and, “The day-to-day activity of social actors draws upon and reproduces structural features of wider social systems” (p. 24). This “dual nature” is central to structuration theory (see Figure 1).⁶

Structure is the term used to describe the rules that shape social actions and the resources that furnish agents with the power that makes it possible (to varying extents) for them to act. For Giddens, structure is not a static, objective entity; “structure is what gives form and shape to social life, but it is not *itself* that form and shape . . . structure only exists in and through the

Fig. 1. Representation of the dualistic, or feedback, relationship between agency and social structure described in Giddens’s structuration theory



activities of human agents” (Giddens 1989: 256). Structure influences actions because it manifests itself via opportunities and limitations for agents. The traditional view of structure is therefore extended to emphasise power and the associated idea that agents are not just constrained by their circumstances but also enabled by them to take certain actions.

The social system is the observable patterns of interaction and sedimented practices that shape the relationships between agents. An interpretivistic view is adopted to describe how agents internalise the influences of structure. Meaning is attributed to the values and roles that are seen to be contained in the enabling or constraining effects of structure. Agents reflexively monitor such thoughts and interpretations, knowingly applying maxims of behaviour with which they develop routines that make them feel secure and help them to deal effectively with the world. This monitoring is externalised—or “instantiated”—via intentional social actions.

The existence of such meaningful acts has the property of reproducing current aspects of structure and producing new ones. A significant element here is that reflexive monitoring can nevertheless result in intentional actions that have unintended consequences. The outcome of creative human acts is therefore meaning-laden rules and resources. The cycle is completed when it is noted that, “In reproducing structural properties . . . agents also reproduce the conditions that make such action possible” (Giddens 1984: 26).

Structuration theory involves a rejection of grand theories and Humean accounts of causal laws (Giddens 1976; 1984). In social science, Giddens argues, it is reasons that are causes and reasons are rationalisations of action. However, this rejection of “event causality” (Giddens 1976) does not strand the social researcher with subjective interpretation—*Verstehen*—as the only mode of explanation. Indeed, Giddens pronounces unacceptable “the hermeneutical notion that causal laws have no place in social sciences at all” (Giddens 1982: 15). Structuration theory posits a notion of “agent causality” in which causal relations are an element of the rationalisations and maxims that agents use. Giddens describes “an agent’s reflexive monitoring of his or her intentions in relation to both wants and appreciation of the demands of the ‘outer’ world” (Giddens 1976: 91). Agents take actions because mental processes lead them to expect certain consequences. However, such causal monitoring does not constitute a general law. Giddens is only willing to admit to “generalisations” that “are intrinsically ‘historical’ in character: they [only hold] given specific conditions of ‘boundedness’ of knowledgeably reproduced systems of social interaction” (Giddens 1982: 15). Such causal generalisations will be true in very specific circumstances only and are altered by intentional action. In explanation, Giddens invokes the concept of the “double hermeneutic”, the term for the effect by which social research can lead to knowledge that alters the maxims of intentional agents (Giddens 1976). Structuration theory therefore indicates not only the appropriate location of causal knowledge but also how

that knowledge reflexively re-enters the cyclic relationship between agency and structure.

Agency/structure integrative theories: a natural fit for system dynamics?

Giddens's work and any of the other theories cited above are certainly not in complete harmony with each other. In now considering the opportunities afforded to system dynamics by engaging with agency/structure theories it is therefore vital to note that any such engagement will be variegated, with specific theoretical and empirical tasks being required. The links that these theories have with system dynamics were first identified in Lane (1999b) but the greater depth of treatment in this paper makes it possible to explore this link in more detail. There is a *prima facie* case that system dynamics and all of these integrative theories have much in common. Such links extend down below the surface, however, if the example of structuration theory is taken, a more detailed comparison can be made, though the main themes of the argument will apply more widely.

In structuration theory, social structure can be seen to be providing resources that are drawn on to enable action, or limitations that constrain action; in system dynamics terms, the resources can be thought of as stocks of roles or values, these stocks acting as limiting capacities by standing as the goals of negative feedback loops. In structuration theory, such resources bound human agency; this is what system dynamicists refer to as partial structural control of human behaviour. In structuration theory agents monitor their environment and use maxims to guide their actions; in system dynamics terms, this monitoring is the collection of information feedback, whilst it is mental models that influence actions. In structuration theory these actions reproduce resources or produce new ones; in system dynamics terms, such reproduction is the accumulation of a flow into a stock. Finally, in structuration theory, as the loop of activities is conducted, actors' knowledge about the world changes; to system dynamicists this feels like the updating of mental models, or learning.

So the separate elements offer a natural fit and to system dynamicists this seems to be a very reasonable way to look at the world. There is also fit at the level of the systemic properties. For example, Giddens places considerable importance on the ideas that maxims do not necessarily lead to the intended consequences; indeed, "the further removed the consequences of an act, the less likely those consequences are to be intentional—but this is, of course, influenced [...] by the scope of the knowledgeability that actors have" (Giddens 1984: 11). This feels like a combination of the effects of bounded rationality, delays, accumulation/draining processes and non-linearities, brought together in multiple feedback loops and producing counter-intuitive behaviour. What is more, the field seems to be able to answer some of the questions that structuration theory poses. Question from Giddens: "How . . . does it happen that cycles of unintended consequences feed

back to promote social reproduction across long periods of time?" (Giddens 1984: 14). Answer from system dynamics: limitations in memory and cognitive skills mean that when agents attempt to infer the dynamics of mental models involving feedback, they fail to work out the consequences of their assumptions in a complete and logical way. Furthermore—the answer continues—without formal modelling there is a host of reasons why it is hard to learn that this is happening and put this situation right.

This should not be surprising. The feedback nature of past social theories has been observed (Richardson 1991), "Interactive SD" has been moving in an integrative direction and "Holon Dynamics" displays some awareness of the range of subjective approaches available in social science. A social constructivist approach similar to that seen in "soft" OR has been proposed (Lane 1992; 1994), as has a grounding within Berger and Luckmann's theory (Vennix 1996; Lane 1999a) and even out-and-out interpretivism (Lane and Oliva 1998). The link to integrative theories is arguably a consummation of these developments and is further supported by the more specific proposal that structuration theory can assist in organisational learning (Senge 1998).

Difficulties and opportunities

The task suggested in this section will not be an easy one, but it could be rewarding. The difficulties and benefits are described below.

A DIFFICULT TASK

Any attempt to ground system dynamics in integrative social theories will encounter at least two significant difficulties. The first concerns the nature of some of the social science literature. The descriptive style of many such social theories has been heavily criticised (Mills 2000; Abell and Reyniers 2000). Certainly much of this work suffers from abstruseness of style and imprecision of terms. As readers may have deduced from the excerpts above, these ideas come from a scholarly approach of descriptive theorising, qualitative reasoning and the extensive creation of neologisms to facilitate abstruse relabelling projects. Reading this literature involves ploughing through pages of what can seem like jargon-laden drivel. In this entire section, not a single one of the social theory references cited contains an equation, or even a "model" worthy of the name. The attraction of this literature is the frequent appearance of plausible and insightful accounts of very subtle social phenomena, which could be the starting points of powerful new theories. However, trawling sources of this nature with a view to extracting these ideas for modelling will be difficult.

The second problem is that, although these theories aspire to be integrative, because they arise from a reaction against Parsonian social system theory they are biased towards the subjective aspects of social theory. Squaring this with the nature of the causal "laws" that underlie system dynamics is problematic.

Compare the system dynamics notion of causal “laws” with Giddens’s work, as outlined above. These do not particularly feel like mere hermeneutical generalisations! As described in the section on determinism (Lane 2001), there is certainly a high degree of contingency in the model assumptions, for example, “The policies are laws of human behaviour, for the circumstances within the model” (Forrester 1980: 16–17). The question really centres on the relevance of the representation scheme being used, on the individual causal links put into a model and on the relevance of the rigorous logical deduction offered by computer simulation. What is at stake here is the source of the causal laws that constitute a model. How well does system dynamics fit with the idea of “agent causality” and the notion that causal laws exist only in that they lead agents to expect certain consequences? Can the field really accept that causal reasoning matters only because a decision maker believes it to be so? These hard questions must be addressed, although some relief may be found in the observation that, “Generalizations about human social conduct . . . may directly reflect maxims of action which are knowingly applied by agents . . . just how far this is the case in any specific set of circumstances has to be one of the main tasks of social research to investigate” (Giddens 1984: 347). It will indeed be a main task to establish the status of causal reasoning for circumstances in which system dynamics is being used in a manner consistent with structuration theory—or other integrative theories.

A TASK WITH MANY BENEFITS

Such difficulties should not hide the benefits of attempting to link system dynamics with agency/structure integrative theories. First, there are benefits for social science. Integrative theories arise from an important debate. Yet critics considering the explanatory aspirations of these theories—their ability to explain social mechanisms—compare them unfavourably with more analytical approaches (Abell 1994; van den Berg 1998). If integrative theories continue only as the poor relations of economics approaches which have mathematical definitions and employ quantitative empirical data, then their rich agency/structure view may be sidelined. This part of social theory is crying out for a formal yet rich approach to theory building that will allow connection with empirical data and the elaboration of theories which results in the accumulation of well-grounded insights. The use of a wide range of data sources and the idea that a model is a “precise”, or clearly stated, theory are but two elements that system dynamics can offer. System dynamics therefore has the potential to preserve the integrative approach whilst responding to the social researchers’ call for a more formal style (Coleman 1990; Hage 1994).

What benefits flow to the system dynamics field? The importance of integrative theories in social science has been emphasised. If system dynamics can contribute to this debate then it will be at the centre of innovative attempts to understand social systems, the claim that the field always makes.

System dynamics could locate itself at the heart of contemporary social science thinking. Furthermore, the field would also discover a vast array of fascinating phenomena and problems to model.⁷

New suggestions for the system dynamics method

It is now possible to bring together the three analyses in this two-part paper to make some over-arching points about how system dynamics could build on this theoretical work to locate itself more firmly within the various social sciences. These are framed as suggestions, each of which has a brief explanation.

Suggestion 1: Communicate better and clarify the social theory

The guiding view in the field when it comes to communicating with other disciplines is that doing good work is the best explanation of what system dynamics is. There is much wisdom in this. However, when good work attracts external enquiries, it is important to be able to take matters forward by describing the basis of the approach. This must be done in terms that are, at best, understandable and exciting and, at least, not confusing and off-putting. However, system dynamics is strongly shaped by its engineering roots (Forrester 1960; 1980; Richardson 1991). As a result, system dynamicists frequently do not to speak a language that communicates well with social scientists.

For example, failing to articulate a clear social theory of system dynamics—treating it merely as a “re-craftable method” in which model building is as “friendly” and socially contingent as is necessary for acceptance—is dangerously ambivalent and rootless. Outhwaite describes how “System theory has slid rather easily from an empirical realist concept of structure to something much more like a loose modelling concept ... The trouble with such a ... laid-back approach to theorizing is that it tends to dodge questions of social ontology ... ‘systems theory with a human face’ ... [is] theoretically unsophisticated but currently favoured ... [in] management studies and organization theory” (Outhwaite 1990: 71). This is a jejune stance for the field and communicating it to others is unlikely to produce interest or respect.

Similarly, this paper cites various descriptions of the field that seem extreme, naive or simply confusing to social scientists. The strength of system dynamics work is probably not conveyed when the concerns of potential co-researchers are not grasped. Using terms in a conventional social scientific way is important; some of the mis-interpretations of system dynamics would not have arisen if the field had been a little more judicious in its use of the loaded word “deterministic”.

Doing good work does matter. But establishing and communicating a clear view of the assumptions underlying system dynamics, and doing

it in a language that can be understood by other social scientists, also matters. An explicit social theoretic grounding provides established terms of communication and a position from which to argue for the advantages of good, practical system dynamics modelling work.

Suggestion 2: Respond confidently to the critiques of traditional social system theory

Many system dynamicists may choose not to engage with agency/structure theories but will opt for the clarity and security of functionalist sociology as the right social theory for the field. This is an option but it too requires sensitivity to the worldview of many social scientists. Why? It is another question of language; we may say “system dynamics”, but what many social scientists hear is “social systems theory”.

Social system theory—that of Parsons in particular—though popular in the 1950s and 1960s, has fallen into dis-favour (Mills 1959). Beyond its grand theoretic stance, the major criticisms concern the practical relevance of its abstract concepts, difficulties of empirical measurement, the emphasis on equilibria and social order, its poor handling of purposeful action and, finally, its assumption of value consensus and lack of conflict. Those wishing to locate system dynamics purely within functionalist sociology must be sure to distance the field from this inherited dis-favour.

However, “Broad SD” can indeed make an excellent job of avoiding such guilt by incorrect association, taking on the above criticism point by point. First, all types of practice stress the practical relevance of a study, how it should lead to increased understanding and actual system improvement. Second, all variables within models are required to be meaningful and measurable (with a catholic view of what constitutes data). Third, the field is centred on dis-equilibrium analyses. Fourth, models do not presume to be a complete representation of human agency, merely a vehicle for rational debate involving a range of criteria and perspectives. Finally, the engaged form of modelling that Forrester advocated means that, although a degree of accommodation regarding what is modelled must exist, a range of judgements can nevertheless be illuminated by the modelling process.

The position that the field might adopt fits well with the observation that, “with the exceptions of economics, the social sciences which have best survived the antipositivist challenge have been those which have thrown off Vienna Circle-style methodological restrictions while going on to build formal models around ‘softer’ data” (Collins and Waller 1994: 22). So, to avoid being seen as merely Parsonian systems theory brought to life on a computer, system dynamics must first be aware that this association will occur and then must offer a confident response, emphasising and maintaining its shift away from objective extremes. It need not be timorous. Indeed, we should explain with confidence how system dynamics goes beyond Parsons’s ideas and solves

many of the problems that his ideas have. But without an awareness of the Parsonian nerve that is hit when the word “system” is used, the field is unlikely to make headway in social science circles.

Suggestion 3: Avoid pure subjectivism—but learn from it

The subjective forms of practice earlier called “Agency Dynamics” are probably a blind alley for the field. Without disparaging the theoretical or practical value of social theories or systems approaches based on pure subjectivism, this is no place for system dynamics. The field would have to strip away most of what is distinctive and—more to the point—effective in order to ground itself in such theories. An example of such extreme thinking in the case of interpretivism (Lane and Oliva 1998) reveals a form of validation, an ontological status for models and many other attributes that are probably too alien for most practising system dynamicists. This is why, whilst mapping alone is sufficient for such “soft” approaches, system dynamicists build simulation models. Understanding how agency and structure interact in non-trivial situations requires such formal theory building. System dynamics is not the same as soft systems methodology—nor can it ever be.

This does not mean that these schools have nothing to contribute. It is correct to see the identification of the problem focus as a matter of social negotiation (Lane and Oliva 1998), to try to use an explicit analysis of power in groups (*ibid*), to accept that many modelling judgements are mediated by personal subjectivity (Vennix 2000) and to see that implementation requires both the creation of a meaningful description of the problem (Vennix 1996) and a compelling vision for where the group wants to be (Senge 1990). These insights can be integrated into system dynamics by respectfully considering the critiques offered by more subjective social theories—and by following the final suggestion below.

Suggestion 4: Develop an agency/structure integrative grounding

This last suggestion is, in fact, one way of implementing the previous three. By explaining the range of practices that was unearthed earlier, it offers a social theoretic grounding for system dynamics that does indeed break through the paradigmatic incommensurability arguments traditionally employed (Keys 1988).

Exploring the similarities between system dynamics and any of the agency/structure integrating theories described above, and then studying specific phenomena using that theory, would provide a powerful route for the field into the centre of social science. The idea that system dynamics might be used in a way consistent with any of these innovative theories may be a bold conjecture (Lane 1999a; 1999b), but it does finally credit to the field a social scientific importance that the profoundly different worldview of the feedback

perspective has always deserved. The reasonableness with which many readers will have greeted the descriptions of these theories is an indication of the many similarities between them and system dynamics. In many ways, Forrester proposed an agency/structure integration theory of his own, and before that debate really gathered momentum in social theory.

The creator of structuration theory has said that one of the primary tasks of social analysis is the “explication of the production and reproduction of society as the accomplished outcome of human agency” (Giddens 1976, p. 170). System dynamics is in a unique, privileged position to offer such an explication, using a powerful formal modelling approach that could generate excitement at the heart of social science.

Finally, the project suggested here is in no way a distraction from business strategy. A richer view of large-scale social system effects is of crucial importance to all business strategy since “No matter how successful you are in transforming the behaviour of a single business client, the client is still forced by the larger system into behaviours that are disastrous for society (and ecosystems) as a whole, and therefore, after a lot of long-term feedback loops come home to roost, disastrous for that business as well”.¹² From its beginnings system dynamics has had the ambition to deal with such large-scale issues and, indeed, has done so before.⁸ Integrative theory could help it to continue to do so.

Closing comments

The research reported in the two parts of this paper was initiated by a wish to examine and strengthen the social theoretic grounding of system dynamics. The author’s interest was created by comparisons between system dynamics and the problem structuring methods of “soft” OR (Lane 1994). However, broader recognition of the need for some contribution of this nature is long-standing.⁹ This present author’s research project had produced a number of intermediate findings (Lane 1995; 1999a; 1999b; 2000; Lane and Oliva 1998) but the work presented in this two-part paper is structured around three questions. Conclusions to each of these are now advanced. The paper then closes by reasserting the relevance of social theory to the ambitions of system dynamics.

Conclusions

The first of the three questions concerned the social theoretic assumptions underlying system dynamics. The Burrell and Morgan framework (1979) has been widely employed in both OR and systems science as a means of organising the positions on social theory. It was therefore used in this paper to try to answer the question: How do the ideas of system dynamics relate to traditional social theories? The conclusion might be put as “not very well”. The reasons for this lead on to the second question: Is system dynamics deterministic? The

conclusion was “not really”. The resulting observation at the close of Part I was this: notwithstanding its effective use elsewhere, traditional, paradigm-based analysis does not offer a sound theoretical home for system dynamics.

The paper continued here in Part II by considering whether system dynamics relates best to the theories that seek to integrate those views based on the actions of individual human agents with those views that emphasise structural influences. The question being considered is: The agency/structure debate—opportunity for system dynamics? Although many theoretical difficulties remain, a firm conclusion is “yes”, these theories do indeed offer an appropriate home for system dynamics. Furthermore, they have the potential to generate a string of exciting and innovative modelling tasks, tasks that will allow researchers to display the sort of empirically grounded and practically minded approach that is the strong heart of system dynamics.

Taken together, the three questions considered in this paper are of general significance for system dynamicists. However, the main purpose of this two-part paper is to explicate the ideas of system dynamics in ways that are meaningful to social scientists. This leads to a final call to arms.

Encore Bourdieu

To motivate the consideration of social theory in Part I a quotation from Pierre Bourdieu was used. It is now appropriate to reveal that that was only the second half of a more balanced comment; “Theory without empirical research is empty, empirical research without theory is blind” (Bourdieu 1988: 774–775).¹⁰ If the broad thrust of system dynamics work sides strongly with the first clause, then this paper has sought to argue for the second. However, taken as a whole, this comment reveals the balanced stance that system dynamicists should adopt. We should not tumble into too much theorising and word-spinning. Parts of the systems science movement have been caught in this trap, a possible reason why system dynamics seems to us to be more appealing and more influential. We should carry on building great models. Nevertheless, more attention to theoretical issues, in balance with sound simulation modelling, could strengthen our field and help it to move forward.

The present, majority concern of the field may be the dynamics of business strategy. In this respect system dynamics has done well. However, the field has the potential to contribute greatly across a much broader range of problems in the social sciences. Of course, some fine work of this nature has already been done. But contributing to the social sciences in general is the challenge that still substantially waits our field. This has always been the ambition of system dynamics (Forrester 1961; 1993). The discipline of system dynamics should be able to attract increasing numbers of social scientists, to get them interested in modelling and to give them a theory-building approach that will help them do marvelous work. As argued here, some of these researchers are crying out for system dynamics. The four suggestions above are aimed at attracting those

social scientists by spreading the field in a way that has a sound theoretical base as well as a practical, empirical stance.

Presented in the right way, the formal yet contingent feedback causality thinking that system dynamics has to offer should diffuse widely in the social sciences. After all, some of these researchers do live by the motto, *rerum cognoscere causas*.¹¹

Note

1. Although the main ideas of the first paper are recapitulated here, readers are directed to Part I for the detail of these arguments (Lane 2001).
2. This question was first posed in Lane (1994).
3. Supportive material may be found in Lane (1999b) and in Lane (2000).
4. Earlier versions of these papers have appeared as LSEOR Working Paper OR.98.26 and as two papers in the CD-based proceedings of the 2000 International System Dynamics Conference held in Bergen.
5. Note that the usage of “integrative” from here on in the paper refers to the unification of agency theories and structure theories. This is quite different from the earlier usage, based on Burrell and Morgan (1979).
6. The form of this figure has benefited from the illustrations in Mingers (1996).
7. For example, a discussion of the relevance of integrative theories to the processes underlying globalisation may be found in Lane and Husemann (2002).
8. The global modelling work comes most readily to mind. See, for example, Forrester (1971), Meadows, Meadows, Randers and Behrens (1972) and Meadows, Meadows and Randers (1992).
9. Forrester’s observation, quoted in Part I, merits a reprise; “System dynamics needs a broader and deeper debate about its underlying philosophy, the contrast with alternative philosophies, the nature of knowledge, the role of subjective and observational information, and the criteria for judging validity” (Forrester 1980, p. 15).
10. In fact, Bourdieu is self-consciously echoing Kant with this remark.
11. The heraldic motto of the London School of Economics and Political Science, University of London.
12. Meadows D. 10 August 1988. Reply: “ownership in the public sector (system dynamics 1622).” Posting to system dynamics bulletin board.

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