The Value of being Unmanageable: Variety and Creativity in CyberSpace

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Abstract

Complexity is examined in the context of Ashby's Law of Requisite Variety, and systems are shown to rapidly reach transcomputability, at which point they become uncontrollable. The circular notion of control is introduced, where control occurs "between". Systems that are in principle beyond control are defined as unmanageable. Unmanageability is examined and shown to be potentially enrichening, offering possibilities of enhancing creativity. The InterNET is such a system. The CyberSpace of the InterNET exists "between" and is interactive.

Thought for the Day

In cybernetics, as in the world in general, it seems we think we need to control.

(In cybernetics, it seems we need to control. Why?)

Prelude

Others write about the physical and the practical. I am interested in the ephemeral, writing ephemerally, dreaming, but with what I hope is a certain aphoristic precision. I am concerned with architecture IN the computer, as evidenced by our creativity. I see this as an approach by adopting which I can develop ideas: a way of considering. This is in contrast to those who are concerned with the supremacy of the utilitarian. In this paper, I am not interested in the utilitarian.

So I do not write about all I spoke about at the Conference, or in a similar vein to how I spoke there. I make no reference to how we can discuss creativity (how could we?)—and the difficulties associated with this—more obvious and literal architectural applications of current Information Technology (such as the Virtual House), or the characteristics of computers (and why they are better thought of as attributes). Instead, I focus on the central theme represented in the title: the Value of Being Unmanageable.

Complexity

Systems rapidly become so complex—so rich in variety—that they are no longer realistically computable (they are transcomputable). Thus, questions concerning their controllability are raised.

Ashby's (1956) cybernetic measure, variety, is used to measure the number of distinct states a system may find itself in.

The variety of states in systems (both potentially and actually attained) rapidly becomes very large, with the systems becoming extremely complex.

For instance, the number of potential states an array of lights 20 cells by 20 cells can have is 2^{400} ($=10^{120}$) (Ashby, 1964). It takes very little to generate enormous complexity. The infinity of the English language is composed of combinations of a system that has a variety of 26 letters.

This number takes on meaning when we consider some theoretical limits. Bremmerman (1962) calculated that a gram of matter might compute 10^{47} bits per second. If the earth were a solid computer for all its known history, it could have computed a total of 10^{73} bits. If the universe were a computer it could have computed about 10^{100} bits. (These are rough figures, used to indicate orders of magnitude: they must not be taken literally.)

It follows that at a certain size, ie 10^{100}, numbers become what is called transcomputable and therefore impracticably big. That is, it is inconceivable that there could be any (physical) computing device powerful enough to compute their values. As Ashby says, "Everything material stops at 10^{100}."

(Complexity, as shown by Rauterberg (1997) has two further degrees: infinite, and therefore non-computable, and non-computable in principal.)

On the basis of these figures, the number of possible combinations of elements that might provide merely five building materials is transcomputable, and therefore the choice of such materials is, in principle, beyond practicable computation (Glanville, 1995).

It should be clear that complexity—to the extent that it is non-computable—is rather common: the rule rather than the exception.

The question is, what can we do about this?

The Law of Requisite Variety

The variety needed for effective control is the same in the controlled and the controlling systems: but when this is not possible we have to find a way of responding.

Ashby (1956) developed the Law of Requisite Variety. This law requires that a controlling system must have at least as much variety as the system it is to control. Recent extensions in

second order cybernetics have shown it must, in fact, have exactly the same variety (eg Glanville, 1987). Put another way, the effectively controllable variety of a system made of two systems in a control relationship is the variety of the system with the least variety.

In transcomputable systems, it is inconceivable that enough variety can (realistically) exist in the control system in order for the conditions of the Law of Requisite Variety to be satisfied.

Under such circumstances we must consider what we might hope for when we try to control another system.

This has been beautifully illustrated by Robinson (1979) for the case of the classroom.

Let us assume that all human brains have about as many states as eachother. The teacher finds him/herself faced with a class of students who have the number of states his brain has, exponentially raised to the power of the number of students in the class. It doesn't need many students with much brain power for this to become transcomputable.

To control the students, the teacher must obviously reduce their variety to his: ie to the variety of one brain.

In old classrooms this was done by means of devices to destroy individuality: uniform, single sex, one age, serried rows of desks facing the front, no talking in class, only the chosen student answering, etc.

The question, now, is whether this is necessary. Does the teacher need to control the students: can the students teach themselves: what is the role of the teacher (surely it is not to know: that is the student's job. The teacher has only to get them to know: but that is the topic of another paper).

The InterNET

The InterNET is transcomputable, beyond control.

At one level, the InterNET is just (like) an enormous classroom: or, rather, it is the classroom rendered beyond the imaginable. Millions of people are busy using it, connecting together, conversing. The number of connections that can be made is inconceivably enormous. It is certainly transcomputable and, according to the definition that has infinity as the product of a set that is a member of itself (von Foerster, 1980) it is literally infinite.

But the InterNET is not just human users. The InterNET also consists of automata (the web sites, the interactive pages, the databanks) that are users, many of which already are of vast complexity.

This is to say that the InterNET is beyond control because of the sheer numbers of the people who use it, the connections between the computers through which they use it, and the complexity of the automata that are also, in some sense, users.

Control

Control is circular, not linear. It exists between the controlling and the controlled systems.

Control, as used here, indicates the ability of one system to direct another in the performance of the wishes of the first. (The wishes of both may co-incide). It is unfortunate that the term has come, through its association with dictators, brain implants, etc, to be so negative. In the technical sense used here it is not emotive. To control is not to limit, as the emotive use would have it.

Control is understood to exist when the behaviour of one system is determined by another. Usually the combination of the two (the controller and the controlled) are also taken to form a system, the control system.

We have learnt that control (like cause) is linear and directional. This is an over-simplification that as has been noted, has been corrected in second-order cybernetics.

Consider, however, one of the simplest of household control systems, the thermostat. Strictly, the thermostat refers to the whole system in which are embedded (for the sake of simplicity) two other systems: the wall switch and the boiler and heat distributors. We will assume an infinite heat sink, and that we are in a cold climate, to simplify the explanation.

Traditionally, we say the wall switch controls the (behaviour of the) boiler and heat distributors, turning them on and off and thus supplying heat to make up for the heat lost to the cold heat sink.

But what controls the switch (behaviour of the)? The boiler and heat distributors.

The system is circular.

It is normal to find this, when control systems are carefully examined, and in the light of contemporary construction. Which system is the controller and which the controlled is a matter of choice or convention. Control is almost always circular, the “linear trace” being the result of the pruning of this circularity.

The control does not exist in one system or the other within the control system: it exists between them. Betweenness is the source of interaction and is also its mode and its site.

(This is why the Law of Requisite Variety must require identical variety from both systems.)

Unmanageability[1]

If systems are of such variety and such complexity that it is inconceivable that we can satisfy the Law of Requisite Variety and thus properly control them, we must consider them unmanageable.

The Law of Requisite Variety requires that a controlling system has as much variety as the

[1] See footnote 5

system it is to control. Many systems, including the InterNET, rapidly increase their variety to the point where it is transcomputable—or worse, infinite.

Under these circumstances, systems cannot (in practice) be controlled. This uncontrollability is indicated by the word “unmanageable”.

Control systems are unmanageable when it is not possible to give the controlling system enough variety to match the variety of controlled system.

It is not essential that the variety of the controlled system is transcomputable for that system to be unmanageable. It is only necessary that the variety of the controlling system cannot conceivably be increased to match that of the controlled system (as in the example of the classroom).

The examples of complexity given above show that being unmanageable is not unusual. Indeed, it is likely that it is so usual that it is familiar, probably even the norm.

Facing Unmanageability

When a system in unmanageable, we have three options: to reduce complexity, to change the organisational structure (how control operates), and to alter our attitude to unmanageability.

What can we do when we are faced by unmanageability?

The traditional classroom arrangements indicate one answer to this question. We reduce the variety of the system to be controlled. This brings the controlled system within the range of control of the controlling system, thus making it manageable.

But it impoverishes the controlled system (effectively ruining it). It is this method of control that is used by dictators. But it is also used by, for instance, musicians. The difference is that in the first case, the variety reduction attempts to be all-pervasive and permanent, while in the second it is temporary and personal variety is voluntarily given up in order to gain something else: the experience. The individual response is left open.

This first option is unethical[2] unless used with the agreement of all participants. In principle, it is not acceptable.

A second answer comes from more modern classroom practice, the use of mutual control within groups. In this case, instead of one system controlling all the others, all participate in shifting coalitions of group self-control. We modify the organisational structure—how control operates.

A third answer is to accept unmanageability and interpret life as “out-of-control”. This entails a profound philosophical change, at least for the Westerner growing up with an over-riding

[2] Ethics is necessarily personal. This is, therefore, a statement by which I hope to live, not one to be forced on others. (See von Foerster 1992.)

belief in control and in rational improvement.

These latter two answers indicate a change that allows that control must exist, insofar as it does exist, between the participants. (That this must hold for the first, as argued above, is less obvious.)

The question, in this case, is what do we get and how do we see it?

Where Unmanageability Lives

Unmanageability lives between the (nominally) controlling and controlled systems as interaction.

In current cybernetic understanding, control exists between the systems within a control system. The act of control is neither action nor reaction: it is interaction.

Unmanageability is a result of hoping to control in circumstances in which the demands of the Law of Requisite Variety cannot be fulfilled.

Therefore, unmanageability exists at the same site where control exists, between the (nominally) controlling system and the (nominally) controlled system: unmanageability lies in interaction.

(The difference between action and reaction, on the one hand, and interaction, on the other, can be traced to their sites and their modes.)

Living with Unmanageability

Unmanageability is unavoidable. In unmanageable systems, the communication needed for control cannot be coded: an alternative form for communication is the conversation, with its personal meanings.

Unmanageability occurs where control is impossible. Control is subject to the Law of Requisite Variety. Control requires the communication (of intention and result): it is not conceptually possible for one system to control another (even in the current cybernetic understanding) without communication between them.

Where the variety of each system is not the same, there must be both compression and expansion in communication. That is, the variety in the system that has more must somehow be compressed to be communicated to the system which has less, and must be expanded in communication back from that system. (Omission is taken to be a form of compression. It is of no significance how the compression and expansion are achieved.)

This compression and expansion means that a 1:1 mapping is not, in principle, possible. Therefore, no means of communication that depends on a 1:1 mapping can be adequately used for control communication between the systems. Communication within a control

system cannot, in the general case, be by coding, which requires a 1:1 mapping.[3]

There is at least one model of communication that is based in this requirement. The model is Pask's Theory of "Conversation" (Pask, 1975). In brief, as I have argued in placing Pask's work within a linguistic framework (Glanville, 1996), a conversation permits us to communicate without assuming parity or identity in what is communicated since it does not depend on communication of a message (meaning), but of the construction in each conversational partner of an "image" that appears to the others to function as do their own images.

Thus, communication is seen, not as of meanings between participants, but as encouraging the making of mental models of what the other presents ("images", meanings), and of representing these back to the original presenter. This circularity is what allows the determination that the model of the other works as yours does. The construction of these "images" or meanings is necessarily personal.

The Value of Being Unmanageable (What does Unmanageability Give Us?)

Unmanageability is not bad. It can give us many options and opens up possibilities for us, if we listen carefully and keep an open mind.

In our culture it is often thought that loss of control is bad.[4]

However, there are benefits in the loss of control: and these benefits strengthen our ability to believe in the centrality of our humanity. Some of these benefits are:

> The requirement that we take responsibility for our (inter)actions, including our own meanings and their making.
>
> The requirement that we accept that there are possibilities beyond those we can imagine.
>
> > Therefore, the requirement that we may be surprised.
> >
> > > And that this surprise may lead to opportunities we did not imagine, enhancing our creativity by increasing the variety available to us. (We borrow from others.)

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[3] There may be special cases in which this need not hold, locally.

[4] The major exception is the appreciation initiated by Alcoholics Anonymous (and since followed by the myriad of "Anonymous" self-help organisations), where it is understood that destructive behaviour comes from a determination to control, and that unmanageability is a consequence of this attempt to control. This is expanded into the notion of life as being inherently unmanageable. The use of the word unmanageable in this context is a tribute to the power and importance this understanding, not just for addicts, but in reclaiming our humanity and in furthering a view of the world we live in as benign, liberating us from the confines imposed on our conception by the materialists. (See the 12 steps of AA, (Anonymous, 1939).)

And the requirement that we keep an open mind.

And the requirement to keep an open eye for whatever opportunities may present themselves.

The requirement that we are generous (in our acceptance of the differences and surprises we receive through conversation in an unmanageable situation).

Therefore the requirement that we do not (unnecessarily) restrict possibilities, do not act as censors.

The requirement that we increase what is possible, and the choices that go with this.

Finally, the requirement that we accept error, and accept its occurrence as inevitable.

These are stated as requirements, but they are also opportunities and they give freedoms.

It is in these requirements that there lies a source for enhancing our creativity.[5]

What the InterNET gives us by being Unmanageable

The InterNET is unmanageable. In a conversation it may be both a medium and a partner. Because of this, we can use it to surprise us and increase our range. But it requires behaviours from us such as the acceptance of responsibility for our actions. We interact with the InterNET in the CyberSpace of between, so long as we let it "tell" us what it has to offer.

The InterNET is so complex, so full of variety, that it is at very least transcomputable and beyond control (see above). The InterNET is unmanageable. That is inescapable, how it is.

How can we envision and envisage the InterNET?

If it is a device for conversation, then we need (at least initially) to treat it as we treat that in and with which we hold a conversation. We hold a conversation in a medium (eg language). And we hold it with a partner. In the InterNET, the computer is a partner, whether because it's "answering" over the InterNET, or providing the means for another human to do so (can we tell the difference: see footnote 8). And it is a medium, because it modifies what we mean: what we get out is not what we put in (in my terms, a tool does what we want, but a medium "kicks back"). But, because what we get out is not what we put in, the medium is, itself, a partner (Glanville, 1995).

If the InterNET (and its computers) is a medium and a partner, we need to treat it in those ways we have found we have to treat other media and partners. The previous section indicates some of what we might expect: the need to respect and to accept responsibility, to

[5] See, also, Glanville 1994, in which I argue for the first time that an increase in variety can enhance creativity in design. I believe architects have already been dealing in Virtual Reality for 5000 years, and that their ability to design for events in space means that they are uniquely equipped to help us discover and enjoy the attributes of CyberSpace: the architecture of CyberSpace—hence my initial statement that I was interested, in this paper, in architecture IN the computer.

accept difference, to listen with an open mind, generously, and so on. And we can anticipate similar benefits to those we normally get from a conversation, including surprise, novelty, and serendipitous shock.

And we can anticipate real interaction (as opposed to the action and reaction that is so often, currently, dressed up as interaction) that will occur in the space of between: the space of CyberSpace and the InterNET, the space where the architect can act in the InterNET as (s)he acts currently in architectural space. A space formed by and forming, as always, action. Space defined but not confined by action, but a thorough interaction.

Architects will make spaces and places for the events of conversation—CyberSpaces. The space is between; the action is interaction; the form is the event; the result is the occasion; the place is the interface—but is not grounded: the place moves with us. All in the between and through interaction.[6]

I believe we will also be able to benefit by behaving according to what we probably accept to be higher principles, ie, we have every reason to behave "better".

But if we wish to benefit from the InterNET, we must not restrict it, at least until we discover see what it has to offer. This is not a matter of freedom and censorship, of material permitted, of politics and fascism. It is a matter of listening and of keeping an open mind. If we tell the InterNET (and the computer) what to be, we stand a very good chance of missing its possibilities by imposing on it our lack of imagination and blindness. Its restrictions will be formed by ours. Its small-minded insistence will be our own.

This holds true for me just as it holds for anyone. Metaphorically speaking, what I can see is not even the tip of the iceberg: and it may not, actually, be an iceberg at all.

Postlude

We live at a remarkable moment, when, for the first time, we have made a machine in our own likeness.[7] We live as Gods. We are liberated and we me be able to do anything.

But if we restrict our God-child and do not husband (care for and foster) its development, we will bring it and ourselves back to mortality, to our level in the banal.

We will lose our chance and this remarkable time: when we, for the first time, transcend ourselves and our limits—or when we may. And history, if there is any, will not forgive us, for the first time only happens once (Glanville, 1997).

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[6] See Glanville 1997.

[7] I am aware of the arguments concerning Artificial Intelligence/Life/Souls. I am not interested in them. They are pointless. Turing dismissed them by turning properties and qualities into attributes. That is all that is needed: the assumption of a constructivist mantle. As with many other of the non-central points in this paper, this paper is no place to develop the argument.

We need to be very careful.[8]

Thought for the Day

Our lives have become unmanageable. In that lies the necessity of our freedom and our humility.

“I don’t want knowledge, I want certainty” (Bowie, 1997)—ironically said.

Summary

Systems rapidly become so complex—so rich in variety—that they are no longer realistically computable (they are transcomputable). Thus, questions concerning their controllability are raised..

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The InterNET is transcomputable, beyond control.

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[8] When I was working using the Black Box model, I was accused of mechanistically destroying our humanity by Sir Geoffrey Vickers. It took some work to show him that the opposite was the case. I realise the argument in this paper may be similarly constructed as pro mechanism. My belief is that it, also, is the opposite.

References

Anonymous (1939) “Alcoholics Anonymous” New York, Alcoholics Anonymous World Services

Ashby, R (1956) “An Introduction to Cybernetics” London, Chapman and Hall

Ashby, R (1964) “Introductory Remarks at a Panel Discussion” in Mesarovic, M (ed) “Views in General Systems Theory” Chichester, John Wiley and Sons

Bowie, D (1997) “Law”, from “Earthling”, BMG Records

Bremmermann, H (1962) “Optimisation Through Evolution and Re-Combination” in Yovits, M, Sawbi, G and Goldstein, G (eds) “Self-Organising Systems” Washington DC, Spartan Books

Glanville, R (1987) “The Question of Cybernetics” Cybernetics, an International Journal, vol 18

Glanville, R (1993) “Introduction: Behind the Screen” in Glanville, R and de Zeeuw, G (eds) “Interactive Interfaces and Human Networks” Amsterdam, Thesis

Glanville, R (1994) “Variety in Design” Systems Research vol 11 no 3

Glanville, R (1995) “Architecture and Computing: a Medium Approach” in Kalisperis, L and Kolarevic, B (eds) “Computing in Design: enabling, Capturing and Sharing Ideas—ACADIA ’95” Seattle, University of Washington

Glanville, R (1996) “Communication without Coding: Cybernetics, Meaning and Language (How Language, Becoming a System, Betrays Itself)” Modern Language Notes vol 111 no 3

Glanville, R (1997) “The Value when Cybernetics is Added to CAAD” in Nys, K, Provoost, T, Verbeke, J and Verleye J (eds) “The Added Value of Computer Aided Design” Brussels, HWK Sint-Lucas

Pask, G (1975) “Conversation, Cognition and Learning” London, Hutchinson

Rauterberg, M (1997) “Activity and Perception: an Action Theoretical Approach” presented at the Conference on “Problems of Action and Observation”, Amsterdam 1997 (to appear in the Proceedings edited by Glanville, R and de Zeeuw, G, published by BKS+)

Robinson, M (1979) “Classroom Control: Some Cybernetic Comments on the Possible and the Impossible” Instructional Science vol 8)

von Foerster, H (1980) personal communication

von Foerster, H (1992) “Ethics and Second Order Cybernetics” Cybernetics and Human Knowing vol 1 no 1