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Designing Clocks to Sustain Synergy

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In challenging prevailing assumptions behind our profligate culture of economic growth, this paper explores the idea of 'throughput'. In other words, it will acknowledge the way that designers increase the net flow of materials, energy, products, and other things.[1] In so doing, it also highlights certain popular fallacies surrounding clocks and the way they are assumed to work. In asking whether clock-time could be re-designed in the quest for a less damaging, more convivial world order, it will provide some intellectual terms of reference by which this might be achieved. In particular, it will be argued that clocks exemplify the least helpful aspects of mechanical systems. For example, although they are used to orchestrate events within particular contexts they are designed to behave as though they existed nowhere.

The Challenge

Could designers re-design 'clocks' in such a way that they would operate more symbiotically and organically? Not only would this would require us to design them using a radically different premise, but it would also require us to

evolve a different, more ethical discourse of time. Compared with their mechanical counterparts, organisms function within a larger number of dimensions, are more adaptable, and are also better integrated with their environment. As such, they are remarkably synergistic. In exploring this idea, we need to ask what conditions might pertain to a synergistic, flow-based logic of actions[2] and whether this might help to inform the future design of clocks, computers, legal and currency systems.

The Ethical Context

Today's capitalist system is based predominantly on western principles that espouse a humanist, rights-centred ideology. One of its implicit assumptions is that, by enabling every individual consumer to become materially satisfied we will achieve an evenly distributed state of well being. Ecologically speaking, this is a unidirectional ethic that does not add up.[3] For example, our lack of a popular concept of 'consumer responsibilities' with which to balance 'consumer rights' goes unnoticed because our technology shields us from much of the experience and outcomes of our actions. A homogeneous world order is emerging that ultimately seeks to dispense 'convenience', 'comfort', 'speed', and 'mobility' to everyone, everywhere, at anytime.[4]

The Role of the Clock

As we know, designers play a central role in this quest. They may, for example, be called upon to help open up new markets or to stimulate existing ones. Broadly speaking, their actions may also be understood as part of a debt-oriented monetary system that is intended to accentuate the variety, reproducibility, and pace of market activities. Ours is a complex system that may offer many alternatives for helpful intervention or remedial action. Nevertheless, for the purposes of this paper we shall restrict our discussion to the clock and its practical potential,[5] for its status as an originary technological paradigm and for the mechanistic belief system that it subsequently engendered. This project poses a cultural challenge as well as providing a tangible agenda for the practising designer.

The Clock's Mechanical Nature

It is interesting to note that the simple mechanistic principle of the clock has little changed since its original introduction many thousands of years ago. However, as it spread its way into the 19th and 20th centuries, it evolved into the 'time-and-motion' regime of Henry Ford's factories. These, and subsequent developments, such as JIT ('just-in-time-management') were inspired by the 'scientific management of Frederick Winslow Taylor[6], the theories of Charles Babbage and others. Babbage is famous for his legacy of the digital computer. Today, his invention is no longer confined to

factories and offices, but is becoming equally ubiquitous, pervasive, and influential in our homes and places of leisure. In short, we have unwittingly permitted his mechanistic and instrumentalist mindset to penetrate our lives at almost every level. This may include the bedroom, nightclub, hospital, school or Presidential Office. In virtually all of these developments, the clock has been our teacher.

Clock Time Accelerated Our Lives

Over the last six hundred years or so, the mindset of clock-time has introduced an increasingly tyrannical regime of management to the workplace. This has been well documented. In 14th century Europe, instead of depending on sunrise, church bells were used to summon peasants to their work. Later refinements, such as the division of clock time into hours, minutes and seconds almost certainly played a key role in the accelerating pace of modern industrialised societies.[7] We may remember how clock-time became more socially intrusive when the first minute hands were added to clock faces in 1577. Subsequently, the display of time as a digital read-out took the clock's rhetoric still further, by establishing numerical categories for minutes and seconds.

Clock Time Seems Natural to Us

Today's wealthier cultures are so accustomed to technological innovation that recent developments such as 'International Time' do not seem too unnatural to us. Indeed, we trust machines more emphatically than our own (human) judgement. Most of us are more willing to believe in the 'naturalness' or authenticity of clock-time, than to trust in our own experience.[8] Why is it that economists seem more interested in encouraging the number and rate of transactions than in enhancing the richness of well being and bio-diversity? In the UK, for example, many people work so hard that they get over-tired and ill. When this happens, they may find it difficult to enjoy or value their own efforts.

Clock Time Is One-Dimensional

Broadly speaking, despite recent technological refinements such as atomic counters, or radio-frequency transmission, modern clocks still function as closed-order cybernetic systems in which a micro-local spatio-temporal event-horizon is used to reference the pace of many surrounding events in separate and different systems. Clocks invoke a mechanical and unidirectional regime of temporality. We could therefore think of them as offering a culture of 'one-dimensional' time, in this sense – in contrast with organic systems. The 'ideal' Newtonian clock can be seen as an artificial, closed-order cybernetic system whose efficacy partly depends on the degree of isolation from its surroundings. Ecologically, this resembles a condition of death.

A Relativistic Model of Time

There are other models of time that are also deeply embedded within what was – historically speaking – a distinctively western mode of thought. Although Einstein is famous for developing his profound idea of relativity, Newton had previously acknowledged the existence of a rudimentary 'relativistic time'. If we adopt Newton's idea of relativistic time, we may regard many everyday physical, chemical, biological, or ecological systems as 'clocks'. Indeed, any action that becomes coupled with another establishes a temporal relation in which one could be used as a reference point to measure the other. This is a helpful basis on which to reflect upon the way we might design clocks in the future.

Clock Time Led to Overproduction

It is since the 17th century that we have begun to invite clocks into the more intimate regions of our daily lives. The mathematician Blaise Pascal (1623–1672) is said to have prefigured the modern wristwatch by walking around with a small clock tied to his sleeve. Mass-produced wristwatches were later issued to soldiers (1901) as a replacement for the fob watch, because it would be more immediately accessible in emergencies. Synchronised wristwatches henceforth became facilitators of co-ordinated military action. It is easy to see how this must have inspired the advocates of 'speed'. The tendency for overproduction and inequity was also driven by larger and increasingly synchronised and networked time zones in developed regions around the world. We may criticise and admire a number of features of clock-time, but perhaps it is the reductive nature of its basic concept that has been the most effective, technologically, and the most damaging, ecologically speaking.

When Everything Became a Fashion

In a sense, the whole market system has become a shared clock, or calendar. Several decades ago, where only clothes wardrobes were policed by the accelerating calendars and clocks of the fashion industry, today we are assailed with images of the latest interior design, cuisine, and other international lifestyle fads. Similarly, we may feel obliged to update our computer software, hardware and network providers by disposing of 'out-of-date' products. In other words, they are designed to become, or to appear obsolete before they wear out. In ecological terms, this process often proves to be very wasteful – not only are many products deliberately 'de-futured' but they (along with their systems of production, promotion and distribution) also become agents of 'de-futuring'.[9]

The Fallacy of Capitalism without Friction

There are few signs that this trend will soon abate. Indeed, the contrary seems more probable. For example, networked clock-time looks set to become even more aggressive in its

methods for accelerating the throughput of products and services. Global Positioning Satellites using one-dimensional (i.e. Cartesian) co-ordinates of space and time are harnessed within technologies such as G3 and G4 mobiles. These make it possible to run individually targeted advertising pitches that acknowledge your purchasing status and match this with your current geographical location. Similarly, product tagging and location monitoring systems are at an advanced stage of development. Product tagging means that virtually every manufactured item in the world would have a unique identifying code that provides digital evidence of its origin, style, batch number, quality, the machine operator's name, destination, type, etc.

The Hidden Clocks that Orchestrate Industries

At the centre of this vast techno-industrial maelstrom, we may clearly discern the watchful and relentless eye of the clock, whether it is visible in shops, hospitals, schools, and wristwatches, or whether it is concealed inside digital networks and half-forgotten computer chips. Arguably, these processes to which we attune our minds and bodies still seem to operate more like industrial mechanisms than as mirrors of our own presence. Both of the above innovations rely upon a one-dimensional mode of clock-time as part of their management system. In short, we might say that the whole world is turning into a kind of semi-voluntary treadmill. How did we get to this point and what might designers do about it?

Aristotle's Role in the Clock Culture

The above conditions stem, in part, from an enduring Aristotelian mindset. As we know, Aristotle's influence on our idea of design has been formative in that he characterised design as the 'final cause' that guides and validates the necessary actions that lead to their ultimate realisation. This purpose-centred explanation of the temporal nature of design reflects a strongly teleological emphasis within Aristotle's thinking. Another persuasive factor is the scale of Aristotle's claim. It is probably the awesome generality of his idea of 'astronomical' time that inspired Newton's idea of a 'universal' time that is ubiquitous and constant. These factors give clock time a powerful and significant role within the way we regard what we do as designers.

Clocks Are Closed-Order Cybernetic Systems

Let us delve a little further into how this works. From Newton's theory of universal time, it follows that if temporality is the same everywhere, then any arbitrary single point in space-time is equivalent to any other. This upholds the principle of what we may now call the 'one-dimensional' clock, and may help to explain why it still seems credible to us. However, in cybernetic terms, an ideal clock

represents an artificial, closed-order system.[10] Its technological efficacy depends, ultimately, on a high degree of functional isolation from its surroundings. This seems an odd idea, but never mind. Many people erroneously assume that clocks somehow 'measure' time; so presumably, it is not strange to them.

Clocks Are Ignorant

From where did this strangeness originate? Whereas his predecessor Heraclites believed that everything changed on all levels, all the time, Aristotle developed an epistemology that pretends that it is remote from the ontological realm that it frames. In this respect, he paved the way for Newton's claim that there is a universal time that exists as an independent, supreme, and quantifiable feature of the physical world. Not only did Aristotle deny the existence of space and encourage an improvident faith in the solidity of the world, but he also ignored the semantic context and significance of things to see them simply as 'bodies in motion'. This tendency is clear in Galileo's ballistics and lives in the Newtonian paradigm. It continues to validate the acceptance of mechanical limitations that we find in the clock.

Clocks Are Alienating

Why is this a problem? In a word, it is alienating. For example, the idea of the deadline is dangerous when it serves to over-emphasise one dimension of the intention or plan, rather than the quality of its actual outcome.[11] This problem is compounded because deadlines can also overshadow the positive experiences and qualities of the co-operative act itself. Often, the tendency is therefore to minimise quality in order to meet the deadline, and to seek what satisfaction is due in the celebration of the time saved, rather than in quality achieved. This is symptomatic of Aristotle's strategic method that tends to distance us – as purposeful and affective agents – from the world in which we live.

Organic Clocks Are Open-Order Cybernetic Systems

If we visualise a simple pendulum swinging from one side to the other, we may begin to understand the conventional clock's strengths and weaknesses. Here we may assume that the swing path is entirely symmetrical. However, in the reductionist model this is of little importance. As long as its periodicity remains constant, the way the clock delivers its timing does not matter. Ideally, it is regarded as a 'closed system' that sustains its stability through the careful application of a negative feedback loop that compensates for inconsistencies and interruptions. If we choose a more organic model for our clock, we will find that there are many differences. Organic clocks are complex and coherent sets of 'open systems' that use their variety to facilitate a dynamic mode of equilibrium, in the context of their whole surroundings.

The Smart Clock

Today we talk about 'smart gadgets' or 'connected' products but the clock is not one of them. Why don't we ask a clock "Will I be in time for my appointment?" We know it would be futile because we are accustomed to its ignorance. In a sense, clocks are exemplars of ignorance. There is probably no other household gadget or device whose working was expressly designed to be so independent from its surroundings. In classical engineering terms, the more connected to the world a clock becomes, the less effective it will be. This is because clocks are supposed to maintain the same boring routine without taking the slightest notice of anything else.

The Dinner Party Is a Clock

I have argued that clock time began to break down in the late nineteen eighties with the advent of networked communication systems that allow users, for example, to re-schedule meetings on a continuous basis, right up to the time at which the parties involved reach the same destination.[12] How could we take this idea further? One starting point is to understand clocks as facilitators of active consensus, rather than as instruments of measurement. For the 'slow-food' movement, the act of cooking can be seen as a kind of shared-time.[13] In the 19th century, strolling voyeurs called 'Flaneurs' would use giant turtles as companions for their visits to public places. These would help them to walk very slowly as protest against the mechanical pace of the industrial revolution.

Clocks Should Engage Us in Meaningful Discourse

Perhaps our organic clocks would resemble the pet turtles used as pacesetters. This may remind us of the Tamagotchi toys that were fashionable a few years ago, because they functioned like the 'turtle-clocks' of the Flaneurs. For one thing, like all clocks, they demand our attention and therefore synchronise our temporality with their own. All pets have this capability. This is why some doctors recommend that heart patients acquire a cat or dog. An important difference with organic pets, however, is that Tamagotchi gadgets have no pineal gland. Therefore, they are oblivious of solar or any other stellar or planetary temporalities.

St. Augustine's Concept of 'Lived-Time'

In our studies of time, we have confined our discussion to two modes of temporality. As we have seen, neither proved very useful in trying to think about the way we co-exist with clocks and the world at large. A crucially important development was St. Augustine's concept of 'lived time', as it was different from either 'universal time' or 'relativistic time'. Importantly, it puts human subjective experience – rather than physical events – at centre stage.[14] Here, we may note an important difference between organisms and

machines and, therefore, the way that they regulate themselves internally and interact with their respective surroundings.[15]

The Importance of Synergy

Reconciling the mechanical and the organic domains may remind us that living organisms are more synergistic than machines. Synergy occurs in situations where the whole exceeds the sum of its individual parts. In living organisms, the quality of synergistics means that their connection to the environment is extraordinarily rich. The cellular and wave-coupled coherence of (biological) organisms ensures that their internal processes are also synergistic. In technological and ecological terms, synergy is an attractive idea because it embraces many levels and modes of efficacy that are far beyond anything that is possible using what we currently know as machines.[16]

Designing Dumb Creatures to Assist the Wise

In its remote, austere mode of operation, the clock typifies what is wrong with machines. By contrast, successful organisms demonstrate a high level of synergy that integrates them comprehensively with their whole environment. Humans, for example, are able to integrate themselves within an environment that includes clock-time. However, the inverse is not the case. Using the mechanistic language of digital logic (i.e. the number of 'logic gates' in the human brain), Mike Cooley said: "Why do we deliberately design equipment to enhance the 10^3 machine and diminish the 10^{14} intellect?"[17] One reason is that because we found machines glamorous we integrated them within the cultural discourse. Another is that we unwittingly fell into the self-fulfilling logic of technological development.

Designing for the Heart, Mind and Soul

Our complex dependency on machines (e.g., encompassing both the structural and the emotional) makes us blind to their effects. Indeed, although it underpins the industrialised society, clock-time erodes the synergy of our organic wisdom. Blaise Pascal is a key figure on both sides of this debate. Not only is he famous for elevating the status of the 'wrist-watch', but also for his insights into the emergent and manifold nature of human thought. He is quoted as saying "The heart has its reasons of which reason is unaware" (1670). Here, he repudiates attempts to explain intuition in terms of formal mathematics. As he observed: "The mind does it tacitly, naturally, and without technical rules."

Designing for Synergies of Action

Pascal's idea of 'tacit knowledge' is especially pertinent to designers in that it makes a functional distinction between 'procedural' and 'declarative' knowledge. In other words, 'knowing how' is shown

to be distinct from 'knowing that'[18] and neither can be represented adequately by the other. For example, although the ability to ride a bicycle can be 'written about', it cannot be 'written'. According to Polanyi, all human knowledge can be considered to be tacit knowledge if it rests on our subsidiary awareness of particulars in terms of a comprehensive unity.[19]

Designing Clocks for the Non-Linear Living World

We may agree that this provides an excellent description of a synergistic system. What can we learn from this? Does it accord with the way that machines might be made to work? Where organisms achieve a high level of enfranchisement and integration with their habitat, they demonstrate the importance of variety very well. On the other hand, where Newton's mechanical paradigm proved invaluable for ballistics technology it was not rich enough to apply to observations of complex temporal orders at the organic level.[20] Perhaps children should learn about quantum physics and ecology before they are introduced to the hard world of Newtonian ballistics. At least it might enable them to realise that Nature works in balance and consensus, rather than using linear predictive rules.

A Rudimentary Consensual Clock

'The Lovers' Clock' (©Wood)[21] was a playful, ironic and conceptual artwork built and exhibited by the author. Functioning as a conventional (digital) clock, it was constructed in two physically separate halves that were linked by radio. In short, an ideal 'Lovers' Clock' would tell the same time in both halves, irrespective of where they were in respect to each other. Clearly, such a system poses intrinsic limits within conditions described by Einstein. To attain a reasonably good median value required each half of the clock to calculate its own estimate of the time reading of its other half. These values were transmitted, along with the primary clocking pulse, so that a mean value could be 'summed' from the four values.

Adding an Anticipatory Mechanism

In theory, and compared to a standard clock, the Lovers' Clock would run slower, the further apart its halves were placed.

i.e. $R = \frac{2}{2D} + M1 + M2$

Where:	R	=	clock rate
	C	=	velocity of transmission medium
	D	=	distance between clock halves
	M1	=	delay period of clock half 'A'
	M2	=	delay period of clock half 'B'

According to Einstein if their time were to be monitored whilst travelling away from each other, this effect would increase until their combined speeds attained the velocity of light at which point both clocks, and the rest of the universe, would stop.

$$R = \frac{C - U}{2D} + M1 + M2$$

Where: U = velocity of light

Conversely, on the return journey the clock's running fast would reverse this effect.

$$R = \frac{C + U}{2D} + M1 + M2$$

With the system described, the clock faces would nevertheless be perpetually moving in and out of synchronisation because of the time taken to send and receive prompt signals across the link medium. Monitoring the 'delay period' for one clock half and the 'waiting period' for the other could ameliorate this effect. Unless the distance between the clock halves is increasing or decreasing, the midpoints of their cycles would coincide exactly. They could be used as a reference marker for an estimated command signal to each clock half's own display mechanism.

The Lullaby as the Perfect Clock

Perhaps the perfect example of an organic clock system is that of the mother's lullaby sung to her child. Interestingly, if compared with a CD player used to play pre-recorded songs it works in a different way. For one thing, the 'live' lullaby probably serves to pacify the mother at the same time that the child is made to feel comfortable, safe, and sleepy. Clearly, this becomes a reciprocal action in which the two parties are a little like the two halves of the 'Lovers' Clock'. This is a consensual system that can also serve to strengthen the quality of the parent-child relationship. It may even engage other parties in the pleasurable experience. Perhaps with more clocks designed like the lullaby, our culture would grow out of its current phase as an 'information society' and begin to resemble what we might describe as a 'wisdom society'.

Notes

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