The bridge - Part 4

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Dynamic Systems Theory (DST) is useful to describe processes in which an increase (or decrease) in one of the system parameters leads to a reorganisation of the entire system. For example, a (linear) continuous increase in the horse's speed leads to a discontinuous (non-linear) transition from walk to trot, and then from trot to canter. In pre-adolescence, an increase in certain hormones can lead to the development of a pronounced sexual interest. Examples are everywhere, both in the physical and the organic world, at the micro-scale (metabolic processes, getting hungry/thirsty) and at the macro-scale (e.g. monthly and annual cycles). Causal (linear) reasoning does not contribute to understanding the transitions from ice to water, from trot to canter, ride to traffic jam, or from diligent schoolchild to rebellious teenager. In fact, it is impossible to make "causal" predictions until we have observed these transitions; we can only "predict" based on experience.

Human thinking is largely based on causal reasoning, where entities or processes are held causally responsible for the perceived change and discontinuous phase transitions. However, DST has taught us that phase transitions are based on self-organization and that they are not predictable a priori. They can be described, but not explained. This is well established in physics, but not at all in the social sciences and everyday life. It also takes a lot of practice to learn to see dynamic systems in everyday life. A great book about “seeing the S-curve in everything” is *The Physics of Life: The Evolution of Everything* by the Romanian-American academic Adrian Bejan (2016).

In last week’s column we looked at DST on a psychological level, this time an example on a political/social level. I ask my partner what’s on her mind, and as a director of a construction company she starts complaining about political procurement rules. In the past, a construction company could enter into a long-term partnership with a private or public party. There were some serious drawbacks and politicians came up with rules to avoid them: above a certain amount a contract must be tendered out. This should give all parties a fair chance. Thinking linearly, hoping for a faster walk by increasing speed, but finding that the system has come to trot. What happened?

Less work is done on the relationship than before and an enormous amount of labour and money is invested in advance (making quotations, designing entire districts), while only large enough companies can “dive”, that is drop in price far enough to both win tenders and generate realistic revenues by continuing to invoice during construction. Small businesses also need orders to survive and are also tempted to bid below realistic price. As a result, the big ones get bigger and the small ones either go bankrupt, or remain involved as subcontractors (or as freelancers, with big companies getting the profits not the burdens). At best, investing in the relationship has become an important side issue; the most important thing is to win as many tenders as possible without going bankrupt due to pre-investment requirements. In DST terms, the walk has transformed into a trot, and completely different dynamic processes have come into play. Self-employed without staff start to flourish, big players are rewarded for getting bigger so they can dive. A similar phenomenon can be observed in politics, where populism-driven political parties and politicians have to "tender" their policies in terms of recognisability to Joe Public. At best, working on the long-term relationship and sustainability becomes an important side issue.

In relation to our survival on the planet, we cannot afford that. For example, we don't know what the phase transition will look like if the earth warms by two degrees. The system may stabilise in a new configuration, for example in an uninhabitable planet, or in a new ice age! We cannot causally indicate when and how the climate will change, but DST teaches us that this will happen in a discontinuous manner. We cannot predict in advance if and when a bridge will wobble!