http://www.watt-works.co.uk/2010/03/day-1-of-7-days-to-systems-thinking-an-overview/

Systems Thinking: Both New *and* Old

Systems thinking is not new. The principles of systems thinking have been known and adopted for hundreds (even thousands) of years. Famous-thinkers through history include Leonardo da Vinci, Isaac Newton, Charles Darwin and Albert Einstein.

The wisdom and knowledge inherent in systems-thinking crosses cultural and language barriers, and is implicit in the teachings of ancient Hindu scriptures, sufis, zen buddhists and Native American culture.

The modern world, however, is only now beginning to understand the relevance of systems-thinking. Now, school children are routinely taught about how complex systems such as climate change work and how small changes in the balance of things can have disproportionate effects and unintended consequences in other areas. Thirty or forty years ago these ideas were simply unthinkable to the mainstream.

You are about to realise that you've been a systems thinker all your life.

Definition of a System

A system is:

"An interconnected set of elements that is coherently organised in a way that achieves something".

- Donella H. Meadows

Many things in your life are systems. Your own body, for example, is a perfect example of a system comprising a digestive system, immune system, temperature regulation system etc. Other systems might include a car, a forest, a school, or an organisation. Systems are all around you.

System "Elements"

A key principle of systems is that they are comprised of "elements" or components. Hence, your car for example has an ignition system, fuel system and braking system.

These components can work alongside each other, or they can be contained or embedded within each other. I remember being fascinated with this embedding of elements as a child and went through a phase of always writing my address as "… United Kingdom, Europe, The World, Solar System, The Milky Way, The Universe".

Elements within an organisation for example, could include specific business units, department or divisions. At a higher level, for example, a group of companies could be composed a set of companies within a group.

System "Interconnections" and "Interrelationships"

The elements that comprise a system are interconnected and are interrelated. These element can effect the other elements within the system in a myriad of ways.

For elements that are embedded within each other within an organisation, for example, a business unit operating within a division will be affected by the actions of the division. In the same way, the division will be affected by the actions of the business unit itself.

Elements operating at the same "level" may also be interconnected. For example, there may be a specific process "flow" at work in a manufacturing organisation … where a particular part is assembled in Department A and then might be passed to Department B where it might be combined with another part and then perhaps operated on in some way (bolted, welded, sprayed, polished or whatever).

The "interconnection" and "interrelationship" within an organisation may also mean that there is a flow of information from one team or department to another. The information that flows across departments is often the "lifeblood" that holds the organisation together.

Within an organisation, the fact that these various elements also operate independently mean that there needs to be a flow of information up and down, as well as across. This also suggests that there needs to be a certain amount of coordination across the elements, as well as overall management and control of each element to ensure that they operate together in some sensible way. This is the unfolding of complexity that takes place in every organisation at every moment. It proliferates and requires management.

"Emergence"

A key principle of systems-thinking is the idea that the "sum is greater than the sum of its parts". This is the principle of emergence, and says that when elements of a system come together and interact in some way, that something else emerges from the interaction of those elements that was not present in the elements themselves.

On Friday night, we went to see the fabulous Justin Adams and Juldeh Camara in at the Bluecoat in Liverpool. This was a perfect example of emergence. The band comprised Justin Adams on guitar, and Juldeh Camara on the ritti (a West African one-stringed fiddle) and Martin Barker on drums. Now, the music from each of these instruments on their own is interesting and unique. Put together and the effect is mesmerising. Something distinctive and unique and very special is emergent from the combination of each unique element. Interestingly, the action and energy of the audience also affect the playing of the band and vice-versa, so there are interactions at this "higher" level too.

So, systems thinking is really a way of understanding the world that emphasises the relationships among a system's parts rather than the parts themselves. When we look at the world in this way, some rather interesting things start to become apparent. We can begin to see, for example, what is happening at several different "levels" of a system and this can give us some very useful information about what is happening and why. This, in turn, can give us clues as to why what we expected to happen didn't happen and what we need to do at the level of the system itself in order to achieve the outcome we want.

http://www.watt-works.co.uk/2010/03/day-2-of-7-days-to-systems-thinking-purpose-and-complexity/

System Purpose

This is a good time to talk about purpose.

What is emergent from a system is not necessarily the same as what we intended.

Think about that for a while. What this means is that our declared intentions for the system have nothing to do with what the system actually does.

So, if your organisation is constantly declaring that "our people are our greatest asset" but actually do nothing to demonstrate this (and absenteeism and staff turnover may be as high as ever, whilst training and development opportunities may continue to be extremely limited. for example)… then what you are hearing in that "declaration" is merely a pipe dream.

Stafford Beer summed this up with his statement that "the purpose of a system is what it does". Again, think about that statement because that has lots of powerful implications.

The purpose of a system has nothing to do with rhetoric, and everything to do with bahaviour.

Going back to elements for a minute. Consider what happens when you have one element nested within another (say a business unit within a division). The purpose of the business unit will be operating within the division, and may be either in harmony or in conflict with the purpose of the division.

Complexity Over Time

When we consider the various combinations of interaction of elements, interrelationships and interconnections … there's quite a lot going on isn't there?

All of this complexity is, as mentioned yesterday, unfolding over time. There are also different kinds of complexity. There is detail complexity if there are lots of different elements. There is dynamic complexity if there are a large number of connections between the elements where each element could have a number of different states.

So how do you know what effect change an element, or a relationship or a purpose is going to have? Whilst the answer is quite possibly (and rather unhelpfully) "an infinite number", there are certain guidelines and principles that are useful to bear in mind when we consider possible changes to system and the effect this might have…

- Changing an element of a system will always have side effects.

- Changing an interconnection is likely to have a disproportionate effect compared to change a part of an element.

- Changing the purpose of a system (for example changing the purpose of a business from “making money” to “making people happy”) is likely to change the system significantly.

- Removing elements or parts of a system (for example, removing the Research and Development function form a Pharmaceutical company) would have a significant impact on the performance of the whole system.

- In the same way, altering the relationship of elements in the system (so a set of parts is first polished and then soldered and then bolted to another part, for example) can have a significant impact, such that the nature of the system itself is radically altered.

- Generally, there is a time delay between cause and effect in systems.