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Emergence

This property of emergence is central to Systems Thinking and states:

> *The properties and behaviour of a system cannot be deduced by studying the properties and behaviours of the components in isolation*

An excellent example of this comes from the Open University (Hughes, 2003). It is an everyday object we take for granted and perhaps would not treat as a system. The two pictures below show this system as respectively the components and the system.
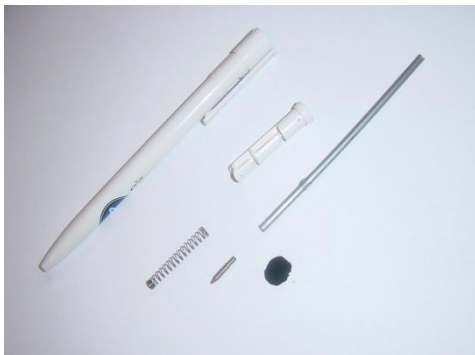
The Components of a System

The System - a Pen!

The properties of the pen as a whole are not found in any of the individual components. Only when the components are assembled in the right sequence and the right place does the desirable behaviour of being able to make marks on paper emerge. At first glance, emergent behaviour or properties can be seen as stating the obvious. Emergence, however, can be undesirable like the lateral oscillations of the Millennium Bridge or the issues of the iPhone4. Just like desirable emergent behaviour, undesirable emergent behaviour cannot be predicted by consideration of the components in isolation.

Emergence is a consequence of bringing together the components of a system (product, process or service). Therefore, to understand and predict emergence we need to consider the whole and how the components interact with each other. When undesirable emergent behaviour appears, hindsight shows the actual cause to be "obvious" – so why were they not spotted earlier? There are several interrelated reasons but complexity lies at the heart of the problem. In order to satisfy customer needs and expectations, organizations are designing increasingly more complex products and services. This complexity increases the opportunity for an error and makes errors more difficult to find. These errors, if undetected, may well result in undesirable emergent behaviour.