

# Complexity principles essay samples

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## **The Body as a Complex Problem**

The body harbours all the characteristics of a complex problem. For example, it is a complex system made up of many interconnected components; the legs, the arms, the ears, eyes, the head, the mouth and the waist are some of the distinct parts of the body. The enormity of body parts creates the idea of chaos; all these parts perform different functions, and it is difficult to determine the long-term behaviour of each one of them. However, it is puzzling to note that with so many parts performing different functions, the body appears well-coordinated unless problems arise within any of the major systems. In addition, the interdependence of the body organs creates a seamless entity capable of operating without external controls.

For example, the body cells of each body part need energy. The digestive system breaks down food into usable forms, while the circulatory system avails food to all the body cells. For the circulatory system to take the food to all the body cells, coordination is required, which calls for the assistance of the nervous system. All these processes take place simultaneously such that people are not conscious of them as they take place. However, the seamless functioning of the body is lost when any of the vital system malfunctions. For example, when the brain is in a state of coma, the central nervous system will not be well-coordinated, and this may result into death unless quick intervention is made to save the patient.

Complexity Principles within the Problem SpaceAs stated earlier, the body has the capacity to organize itself without any external assistance. This capacity is inherent within the system itself, and it does not need to be ‘ jump-started.’ This capacity to self-explore the possibilities within the

problem space is one of distinguishing characteristics of the body as a complex problem.

For any complex entity to survive and thrive, it needs to explore its space of possibilities and generate a variety of solutions. This is the same principle that the body uses to operate. This facilitates the dynamism of the body to react to changes in the environment and adapt accordingly. For example, when a person gets injured, the body self-explores the possibilities of healing that person and responds. If the injury is a cut, the body will coordinate clotting and coagulation of blood around the injured spot to avoid further loss of blood. Clotting avoids entry of germs into the spot while coagulation ensures that the spot gets healed within a few days.

The simple process outlines how the complex entity (in this case the body) searches for a single optimum strategy to self-regulate. However, sometimes the optimum strategy may not be enough or the conditions may change such that the conditional is not optimal. Nonetheless, this does not stop the body from having in place micro-strategies to back the single optimum strategy. Like a complex system, the body has many possibilities to a solution, and this avoids the commitment of all the major resources to a single strategy. This enables the body to avoid committing all the resources in the early stages, which may backfire anytime. For example, in the case of an injured person, the decisions keep on changing depending on the environment. For instance, if the person develops a second cut before the first one heals, the immune system has to respond to new injury while taking care of the old one. In this case, the decision made is dynamic in that new developments have to be considered vis a vis the earlier developments.

Another principle exhibited by the body is the capacity to give feedback. The feedback may either be positive or negative. In a complex system, the purpose of feedback is to either reinforce or balance. Positive reinforcement drives change while negative feedback maintains stability. To expound on this principle, regulation of body temperature (thermoregulation) would be an appropriate example.

In an unregulated system, if a person goes to a cold area, the body temperature would be bound to fall. However, this does not happen because the body has an excellent feedback system. When someone goes to a cold place, thermo-receptors found within the body notice the new development. The thermo-sensors then relay this information through the nervous systems to the brain. The brain (hypothalamus) then decodes the message. After understanding the message, the brain relays another set of information to various parts of the body involved in thermoregulation. The parts are instructed to promote gaining of heat and avoid heat loss. The action taken includes restricting blood vessels, closing the hair follicles and involuntary shivering of the muscles to generate heat. The feedback system inherent within the body facilitates execution of the required response. Similarly, when the body experiences above normal temperatures, the feedback system operates to maintain body temperature within the optimum range. In conclusion, the body is a complex entity harbouring all the characteristic of a complex problem. It consists of different parts performing different functions but with all the parts being interdependent and performing complementary functions. The body is also very dynamic, and changes with the environment. The excellent feedback system inherent in the body

enables it to carry out its functions flawlessly without any outside assistance. All these characteristics have something in common with the complexity principles exhibited by complex problems thus making the body a complex problem.