Reduction of Subjective and Objective System Complexity

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Occam's razor is often used in science to define the minimum criteria to establish a physical or philosophical idea or relationship. Albert Einstein is attributed the saying "everything should be made as simple as possible, but not simpler". These heuristic ideas are based on a belief that there is a minimum state or set of states for a given system or phenomena. In looking at system complexity, these heuristics point us to an idea that complexity can be reduced to a minimum. How then, do we approach a reduction in complexity?

Complexity has been described as a subjective concept and an objective measure of a system. Subjective complexity is based on human cognitive comprehension of the functions and inter relationships of a system. Subjective complexity is defined by the ability to fully comprehend the system. Simplifying complexity, in a subjective sense, is thus gaining a deeper understanding of the system. As Apple's Jonathon Ive has stated," It's not just minimalism or the absence of clutter. It involves digging through the depth of complexity. To be truly simple, you have to go really deep". Simplicity is not the absence of complexity but a deeper understanding of complexity. Subjective complexity, based on this human comprehension, cannot then be discerned from the sociological concept of ignorance. The inability to comprehend a system can be either a lack of knowledge, an inability to understand the intricacies of a system, or both. Reduction in this sense is based purely on a cognitive ability to understand the system and no system then may be truly complex. From this view, education and experience seem to be the keys to reduction or eliminating complexity.

Objective complexity, is the measure of the systems functions and interrelationships which exist independent of human comprehension. Jonathon Ive's statement does not say that complexity is removed, only that the complexity is understood. From this standpoint, reduction of complexity can be approached in finding the optimal or 'best balance' of the system functions and interrelationships. This is achievable following von Bertalanffy's approach of describing systems as a set of equations representing both the system functions and the system interrelationships. Reduction is found based on an objective function defining the system output given variations in the system inputs and the system operating environment. By minimizing the objective function with respect to these inputs and environments, a reduced system can be found. Thus, a reduction of the system complexity is feasible.