The Chaotic Nature of Human Experience: An Alternative Approach to Determinacy in Understanding Emotions and Experience

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Key Conference Theme: Emotion and Experience

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Abstract

The emphasis on human experience and experience in the Design Research literature is growing along with the importance of human-centered approaches to design. However, the fundamental connection between emotions and experience is not well understood mostly due to the lack of research in the nature of human experience in the design research literature. Many approaches tend to determine the “rules” or “laws” that govern the emergence of emotions. These approaches are limited by their deterministic nature in evaluating the outcomes of experience and emotional responses to design.

In this paper, we present an alternative stance to the deterministic approach in explaining emotions and human experience. We attempt to explain the emergence of emotions as a part of an indeterministic system of experiences. Additionally, we present an indeterministic framework that formalizes the nature of human experience, and a set of guiding principles suggesting directions for design practice.

Keywords

Experience, emotion, time, complexity, chaos, indeterminism, events, probability, systems, human-centered design

Introduction

Understanding human experience is a continuing effort for all human-centered fields. The field of design in particular is interested in a better understanding of such an integral part of its discourse. In particular, emotion is a topic of great interest. The philosopher John Dewey defined emotions as the moving and cementing force for various parts of human experience (Dewey, 1934). However, the fundamental connection between emotions and experience is not well understood. Some attempts to understand this relationship have taken an analytical stance about human experience and its related emotions.

In this paper, we present an alternative view to these deterministic approaches. We speculate that human experience is indeterminate and highly chaotic. To support this hypothesis, we present an event-based model for experience. The model maps experiences to time and differentiates goals and actual experiences with the notion of events. Additionally, we formulate a set of guiding principles for designing to support the chaotic nature of human experience and emotion.

An Event-Based Framework for Human Experience

Dewey's Views on Human Experience

Among all literature on human experience, John Dewey's "Art as Experience" has been the greatly influential to design researchers. Dewey's views shed light on how experience unfolds as an internal process, shaping the quality of human experience. His ideas are particularly important to understand the relationship between human experience and emotions. For Dewey, the experiencer and what is experienced are a part of the experience, and both contribute to shape the quality of the experience. The object of the experience contributes the quality of the experience with its intrinsic material to shape the experience into an intellectual, emotional, or practical form. According to Dewey, *intellectual experiences* involve drawing intellectual conclusions from *signs and symbols* that have no intrinsic quality of their own but stand for things that may in another experience be qualitatively experienced. An art piece with political references could be an example to an experience with intellectual conclusions. *Practical experiences* involve consistent, overt doings with an anticipated final outcome. Concrete actions, such as driving a car to get form point A to point B, are considered as practical experiences. *Emotional experiences* bear subjective evaluations of objectively expressed esthetic content. Experiencing a personal attachment to an esthetic quality could create an emotional experience. An experience integrates these different forms in an intact form with an overall experiential quality (Dewey, 1934). Figure 2.1 is an iconic representation of Dewey's model of the different forms of experience and their qualitative integration as an overall experience.

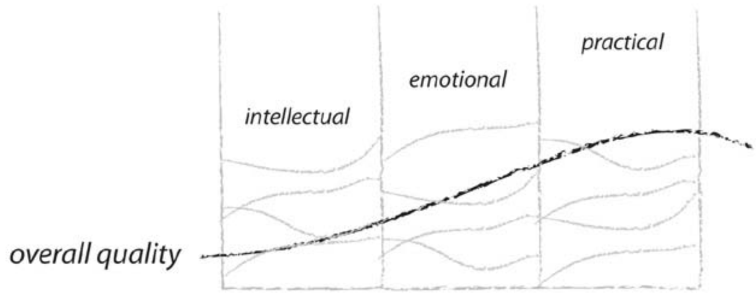

Figure 2.1, Different forms of experience as they create an overall experiential quality.

Emotion and Experience

Dewey suggests that an experience has two major components; the object [1] that is being experienced, and the experiencer. For him, the experienced object does not have emotion for its significant content. He argues that emotion is "*to* or *from* or *about* something objective." Therefore, emotion is integral to the latter component, the experiencer, while the experienced content is a medium for esthetic qualities to evoke emotions. Dewey emphasizes emotions as the moving force to all experiences [2]. For him, it is emotion that "*evokes, assembles, accepts, and rejects memories, images, observations, and works them into a whole toned throughout by the same immediate emotional feeling*" (Dewey, 1934). Hence, emotion steers the experience to lead the experiencer to a satisfying emotional experience.

The Idea of Events

We extend Dewey's ideas on human experience and introduce the concept of events as an aspect of experience. We borrow the idea of events from theories of time and change, particularly probabilistic reasoning, and apply to human experience [3]. Events are breakpoints in an experience, often "initiating," "directing," "maintaining," or "terminating" a specific experience. They take place with or without conscious action of the experiencer. Moreover, events are often nodes that connect experiences of different experiencers to form shared experiences. Events have no subjective experiential quality inherent to them, but they evoke emotions to produce emotional conclusions.

Events as They Map to Time

Theoretically, the existence of an event comes from its realization. Therefore, we can talk about “actualized” and “not yet actualized” events, which if mapped to time, resemble to “past” and “future” events [4]. Figure 2.2 is an abstract representation of events as they map to time. This twofold nature of events explicitly maps to human experience in a way that “experiences” in human life are reminiscences of past events, while intended experiences or “goals” are cognitive constructions of future events. Here, we suggest a twofold model for human experience, based on the actualization of the events that make the experience. Dewey’s (1934) views on the form of experience also support the idea that experience is associated only with the past [5]. Dewey draws a line between a complete, unique experience, which “terminates itself,” and interrupted, “inchoate” experiences. This introduces the idea that experience is an unbreakable, unstoppable unique whole, which doesn’t have a unique “form” until it terminates itself. Therefore, all (unique) experiences relate to the past, thus associated with recollections what is experienced and the quality of the experience, in other words, the form of the experience.

Figure 2.2, Events as they are mapped to time.

The connection between events and experiences becomes clearer when future events are considered. As noted previously, the existence of future events is often free from thought. However, humans cognitively construct the realization of a certain set of future events, which then become "expected" events. These expected events have a similar, yet more flexible structure to that of an experience. Richard Carlson defines these constructed experiences as goals. For him, a goal is a cognitive construction of the structure and quality of experience that one intends to realize (Carlson, 1997). Therefore, goals, like experiences, possess a certain form. Figure 2.3 uses an oversimplified set of events to illustrate how events take place in the cognitive construction of intended and realized experiences.

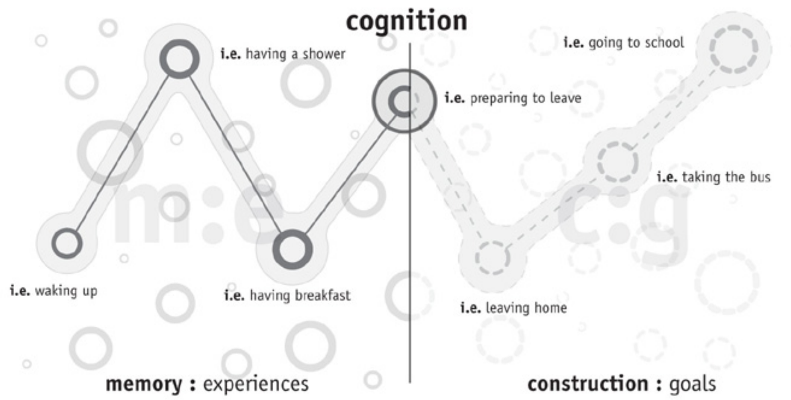

Figure 2.3, An oversimplified set of events that illustrates how events take place in the cognitive construction of intended and realized experiences.

Marc Hassenzahl (2003) argues that there are two different modes associated with the realization of goals. In the “goal mode,” there is an overall goal that is expected to be fulfilled in the future. This overall goal predetermines all foreseen actions related to the expectation. Once the experiencer starts realizing this goal, the goal is no longer a unique whole. He calls this the “action mode,” in which smaller goals that are needed in order to achieve the overall goal are determined by the action “on the fly.” He suggests that these smaller goals have a “volatile” nature. Figure 2.4 is Hassenzahl’s illustration of these two modes in the realization of goals.

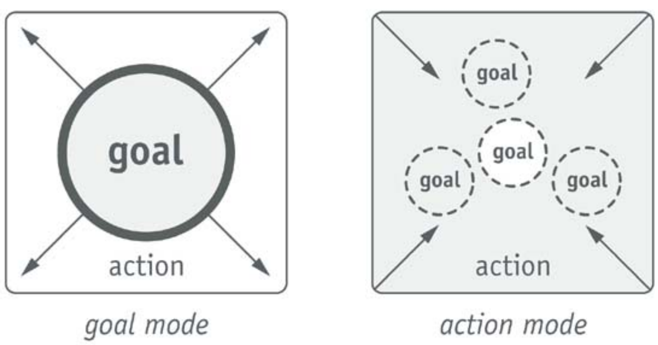

Figure 2.4. Goal and action mode (Hassenzahl, 2003).

Hassenzahl's description of the realization of goals is interestingly similar to Dewey's description of how experiences unfold. However, Hassenzahl's description requires particular attention. His point on the volatility of smaller goals points out the unpredictability and complexity in the nature of goals and experiences and in the interaction between self's internal environment and the external environment. We argue that Hassenzahl's point is fundamental to understanding the complexity inherent to human experience, which we will support in the next section.

Experience as a Complex System

Complexity and Experience

The event-based framework of human experience provides us a new perspective to look at the *nature* of human experience by revealing the "complexity" in the structure of experiences and goals. Herbert Simon (1996) defines a complex system as "*one made up of a large number of parts that have many interactions.*" For Per Bak (1996), systems with large variability could be considered complex. He illustrates his definition as "*the variability may exist on a wide range of length scales…if we zoom in closer and closer, or look out further and further, we find variability in each level of magnification, with more and more new details appearing…in the universe, there is variability in the greatest scale.*"

This is an excellent description of what we see in the set of events that makes an experience. Every significant event in an experience is led by a set of less significant events, and such property repeats itself in an infinite several levels. Experiences and goals integrate a set of events, and therefore inherit a similar complex structure. Dewey (1934) suggests that every unique experience is a stream of smaller experiences. This definition suggests that experiences might have a fractal or hierarchic structure, similar to the description given in Simon [6], in which every experience has sub-experiences, and a similar structure exists in several levels of detail [7]. An abstract representation of this complex structure could be seen in Figure 3.1.

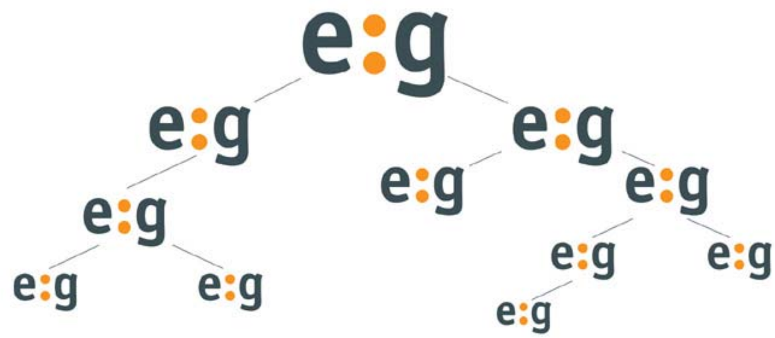

Figure 3.1, An abstract representation of a fraction of the hierarchy in experiences and goals.

For Simon (1996), the complex system as a whole is more than the sum of its parts. He points out the challenge in inferring the properties of the whole system given the properties of the parts and the laws of their interaction. Therefore, the laws applicable to the elementary subsystem at the lowest hierarchy are not relevant to draw conclusions about the whole system. Beyond practicability, this notion highlights the theoretical dilemma of approaching experience as a deterministic phenomenon.

The Dichotomy in Approaches to Understanding Complexity

Greek philosopher Epicurus was the first to address the fundamental *dilemma of determinism*. Karl Popper explains: "Common sense inclines, on the one hand, to assert that every event is caused by some preceding events, so that every event can be explained or predicted…on the other hand,…common sense attributes to mature and sane human persons…the ability to choose freely between alternative possibilities of acting" (Popper, 1982; Prigogine, 1996). In his "Dilemma of Determinism," William James (1956) argues that the underlying reasoning for determinism is an antipathy to the idea of chance, which relates to the meaning of time. Traditional Western thought, from Aristotelian or Kantian Philosophy to Newtonian Physics, in fact with certain dissimilarities, tends to explain the notion of time with a deterministic approach. In determinism, time is a symmetric (reversible) phenomenon which is determined by a set of causes based on universal laws. Henri Bergson (1910) opposes the deterministic point of view that believes that, given certain antecedents, only one resultant action is possible. He asserts that any action that human performs freely is "equally possible" with some other action. For Poincarè (1921), determinism is "a limitation imposed upon freedom." Along the same lines, Ilya Prigogine (1996) points out the impossibility of conceiving of human creativity or ethics in a deterministic world. Bak (1996) uses the existence of the notion of “surprise” to discuss the deterministic perspective [9]. He uses the analogy of a Chinese box to explain the notion of surprise and the uncertainty inherent to occurrences in the world; “In each box, there are new surprises” (Bak, 1996).

These views on determinism have one idea in common that determinacy fundamentally conflicts with freedom of choice, free will, and human dignity, which supports the fundamental conflict between deterministic Science and human-centered Design thinking. Moreover, they argue on the impossibility of understanding complex systems through a purely deterministic approach, which implies that taking a purely deterministic approach to understanding the subject matter of Design is not tenable. However, some approaches in the design research community attempt to go along the lines of the deterministic perspective using several top-down and bottom-up methods. Tools such as the PrEmo (Desmet, 2003) are used to break particular emotional experiences into their components to define qualities that form the experience and measure the emotional potential of products. While this is one approach to understanding emotional qualities in design practice, it may produce results only for a system of experiences in equilibrium, which consists of a fixed set of events and experiential qualities, and is free from unexpected influences. However, the real world is full of uncertainties. In such uncertainty, presuming that a foreseen set of events would occur to create an expected experiential quality seems highly likely to result in unsatisfactory experiences, product failures, misuses, and so on. Figure 3.2 includes a graphical representation of different sets of events in an intended experience (goal) and a realized experience (experience) with similar experiential qualities.

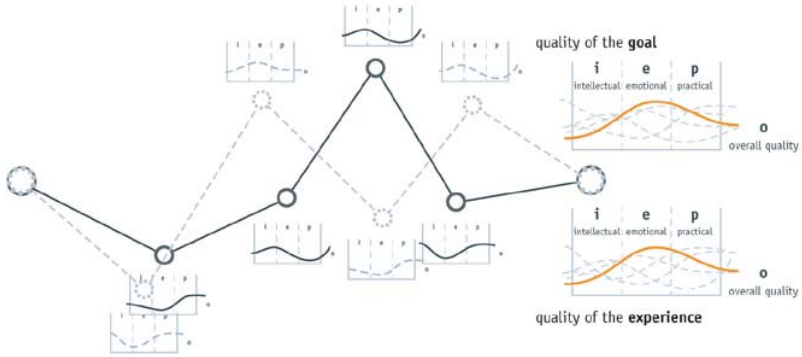

Figure 3.2, Example illustrating a goal matching to an experience in its overall experiential quality but different in its set of events.

Designing for an Indeterministic System of Experiences

The above-mentioned ideas strongly disagree with a deterministic perspective in approaching to a complex subject matter such as that of Design. Buchanan (1992) highlights the impossibility of approaching design problems with the deterministic perspective of Sciences, which he argues is due to the “universal” nature of the subject matter of Design. This opposition brings up an expected question. Then, how could we approach understanding the complexity in human experience?

Understanding a complex system of experiences is as challenging as understanding any complex system in nature. Furthermore, as Simon (1996) noted, "understanding" such complexity does not mean that we can make predictions. However, even though research on chaotic systems is still in its early stages, several contributions have been made, such as the development of Catastrophe Theory and the Fractal Geometry (Bak, 1996; Simon, 1996). We feel that there is inherent value in understanding of human experience and related emotions as a chaotic system. One of the more valid approaches is that of Richard Buchanan, who suggests that design problems are "indeterminate," or possessing no definitive conditions or limits (Buchanan, 1992) [10]. Buchanan (1992) sees a problem in asking designers to conceive and plan what does not yet exist, before the final result is known [11].

As Buchanan has noted, every design problem is a journey to the unknown and each problem needs to be considered in its own context. This suggests that it may be impossible to develop a methodology for an indeterministic approach to a design solution. However, what we can do is putting forth a set of guiding principles to help design for complexity. Here, we provide three initial guidelines for designing to support the chaotic nature of emotional experiences:

1. Creating Complexity from Simplicity

Every complex hierarchical system can be expected to be hierarchies that have at one time evolved from simplicity (Simon, 1996). This notion supports the idea of designing root elements and simple rules to create a unique complex whole. An abstract example for this idea is John Conway's Game of Life. Conway mathematically defined a "life simulation game," where he generated "*delightfully simple*" rules to govern the birth, survival, and death of a pseudo single-cell organism (Gardner, 1970). Figure 5.1 represents different states in a dynamic system of pseudo single-cell organisms.

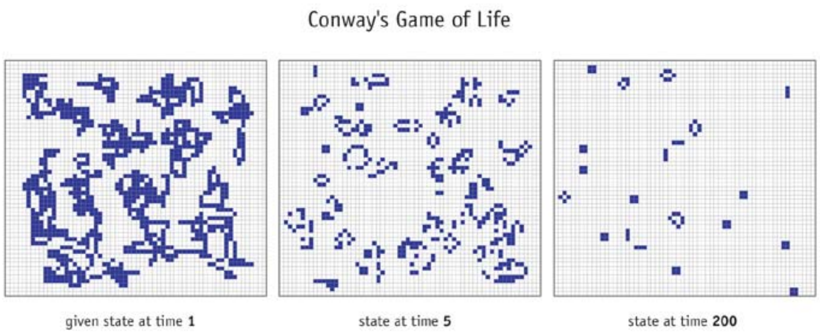

Figure 5.1, A computer simulation of the Game of Life (Gardner, 1970).

An example that supports the idea of offering complexity with simple elements is one from the product world, Apple's iPod portable music player. The iPod player is a very simple but core element of a more complicated business model, in which both Apple and third party companies provide peripheral components to expand the capabilities of the core element such as an adapter to convert the player to a voice recorder, a piece of software to read news on the player, or an expansion pack that lets the user to mount the player on Volkswagen's New Beetle. Today, as a result of the fulfilling experience offered by the product, the player has become an icon for listening to music, which encourages users to purchase music online through the iTunes software that is associated with the iPod player [12].

2. A Probabilistic Approach to Experience

A problem with determinism is that it aims detailed prediction, obtaining specific outcomes of complex systems. Bak (1996) suggests that a theory of complex systems must necessarily be "statistical" or "abstract" [13]. This leads to a *statistical* or *probabilistic* understanding of complexity which leads to alternative scenarios of experience. This idea supports conceiving multiple probable scenarios of experience and designing systems that support all probable scenarios of experience. As an example, Bak (1996) illustrates this idea of with "*a theory of life*" explaining all possible scenarios of evolution. A larger-scale example for this view is the idea of many possible parallel universes.

3. Observing Patterns of Experience

The statistical or probabilistic understanding of complexity also leads to an idea of complex systems to follow simple "patterns" (Bak, 1996). In a complex system of experiences, goals cannot be predicted in detail, but certain patterns of events or experiential qualities can be identified by observing experiences. These simple patterns provide a basis for all possible scenarios of experience. Bak (1996) illustrates the idea of simple patterns in complex systems with an example from the Catastrophe Theory: "*Because of their composite nature, complex systems can exhibit catastrophic behavior…that follows a simple pattern.*" Figure 5.2 illustrates an example of a simple pattern followed by a set of catastrophic events.

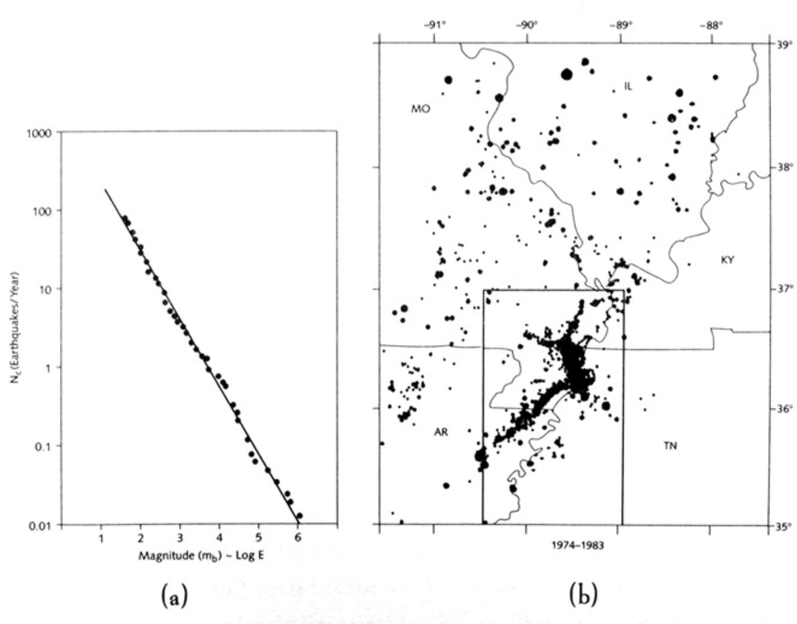

Figure 5.2, An example of events natural complex systems to follow a simple pattern (a) Distribution of earthquake magnitude in the New Madrid zone in the southeastern United States during the period 1974-1983. The points show the number of earthquakes with magnitude larger than a given magnitude *m*. The straight line indicates a power law distribution of earthquakes that follows a simple pattern. (b) Locations of the earthquakes used in the plot. The size of the dots represents the magnitudes of the earthquakes (Bak, 1996).

These guidelines may not seem applicable to design practice at first. However, our suggestions are limited to providing directions to developing practicable methodology based on the idea of considering human experience as a complex system. These guidelines can also become rules of thumb for existing design methodology. We believe that such efforts are fruitful for a better understanding of the complexity in human experience. Therefore, we plan to bring further our exploration to a more applicable level.

Conclusion

A better understanding of the *nature* of human experience and emotions is essential to all practices of design. However, this understanding should take into consideration the applicability and ethics of using determinative approaches. In this paper, we presented an alternative approach to the deterministic view based on understanding the complex nature of human experience and the unpredictable emergence of emotions, and follow a set of guiding principles for the practice of design. To explain our approach, we built connections between theories of experience, complexity, and design. Therefore, some references or examples might seem irrelevant. However, we believe in the necessity of broadening the research space in order to address such fundamental issues. We hope to bring further our research in the future, specifically by developing the proposed guiding principles to a more applicable extent for practicing designers.

Acknowledgements

We would like to thank Richard Buchanan of Carnegie Mellon University, John Rheinfrank and Shelley Evenson of SeeSpace Inc., and Hugh Dubbery of Dubberly Design Office and Stanford University for their valuable and constructive comments on our research.

Footnotes

[1] Here, we use the term object as an object of the act of experiencing, which could represent an artifact, an environment, an event, or a system of these.

[2] Henri Bergson (1910) associates this internally-driven conscious moving force with free will. He discusses that it is nothing but free will that underlies the decisions that human make among equally possible choices, which corresponds to Dewey's explanation of an objective content. This idea of equally possible choices leads us to look at probabilistic reasoning to explain the nature of experiences.

[3] The idea of an event-based model aims to go beyond providing a time-based framework for experience. The idea of events incorporates a probabilistic explanation to the emergence of experience. Ilya Prigogine (1996) describes probability as a basic probability of nature. The occurrence of every future event features a certain probability, which is determined by the occurrence (or not occurrence) of other events. In a complex system, the exact probabilities for single events become incomputable due to the complex dependencies among events.

[4] Here the definition of a future event needs particular attention since the existence of an event comes from its actualization. However, human experience also consists of expected events, occasionally expected unexpectedness. Therefore, we prefer to name expected events as possible events.

[5] Time-related concepts such as past, present, and future vary in different cultures and languages. Here we consider time as to bear no beginning, and no ending, and comprise an actualized half, and a not yet actualized half separated from each other by the moment of actualization.

[6] By a hierarchic system, Simon (1996) means a system that is composed of interrelated subsystems, each of the latter being in turn hierarchic in structure until we reach some lowest level of elementary subsystem.

[7] Horst Rittel points out the similar complex structure inherent to design problems. He names this hierarchy of problems as "wicked problems," each of which "is a symptom of another, higher level, "problem" (Rittel and Webber, 1973; 1984).

[8] A formal definition for determinism is “a philosophical theory holding that all events are inevitable consequences of antecedent sufficient causes; often understood as denying the possibility of free will” (WordWeb, 2004).

[9] Bak (1996) writes: “…the world that we observe everyday is full of all kinds of structure and surprises. How does variability emerge out of simple invariable laws? Most phenomena that we observe around us seem rather distant from the basic laws of physics. It is a futile endeavor to try to explain most natural phenomena in detail by starting from particle physics and following the trajectories of all particles. The combined power of all the computers in the world does not even come to close to the capacity needed for such an undertaking” (Bak, 1996).

[10] He makes a clear distinction between indeterminacy and undetermined. For him, indeterminate refers to situations with no definitive conditions or limits. Therefore, we can say that indeterminacy involves determinacy in a certain complexity.

[11] Buchanan uses the phrase “wicked problems” to address the indeterminacy in design problems, all of which inherently have a tacit, ill-defined nature. The phrase is borrowed from Karl Popper and the connection to design problems is developed by Horst Rittel. Rittel’s views are based on the idea that a part of the design process is explicit, teachable, and communicable to others, while the other part embodies tacit information, and “wicked” in nature (Rittel and Webber, 1984). He defines wicked problems as “a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” (Rittel and Webber, 1973).

[12] The iPod example is suggested by John Rheinfrank of SeeSpace Inc. in a private lecture at Carnegie Mellon University in the Spring of 2004.

[13] Bak (1996) highlights the excessive emphasis put on detailed prediction or forecasting in science. He suggests that a theory of complexity must be statistical and therefore cannot produce specific details. This understanding of prediction is along the lines of what Popper (1982) suggests as “our best means of distinguishing science from pseudoscience.” Bak (1996) suggests that “to predict the statistics of actual phenomena rather than the specific outcome is a quite legitimate and ordinary way of confronting theory with observations.”

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Bilge is a former Fulbright Scholar with a background in New Product Development. He holds a BID from Middle East Technical University, an MS in Product Design from Istanbul Technical University, and an MDes in Interaction Design from Carnegie Mellon University. Bilge practiced New Product Development at Arcelik-Beko Corp. in Istanbul, where he worked on designing domestic technology and developing company's in-house product design and development process.

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Jodi Forlizzi is an Assistant Professor of Design and Human-Computer Interaction at Carnegie Mellon University. She is an interaction designer contributing to design research focused on the intersection between assistive, aesthetic, and social products. Her current research relates to inclusive design and the design of new categories of products and services, such as service robots. She is also researching and designing interfaces (small, mobile, and ubiquitous) that support the limits of human attention.

Jodi was trained as an illustrator and communication designer at Philadelphia College of Arts, and as an interaction designer at the School of Design, Carnegie Mellon University. Prior to joining the faculty at CMU, Jodi was an Innovator and Project Manager at E-Lab, LLC. She is a member of the AIGA, UPA, CPSR, and ACM SIG CHI.

Word Count: 3,873 including all sections and footnotes.