APPENDIX

B Glossary

Introduction to Creativity and Innovation for Engineers presents ideas and information drawn from a variety of disciplines, such as engineering, business, science, art, neurobiology, and medicine. Accordingly, the following glossary offers readers who are primarily engineers and generally not familiar with the other disciplines a means to more effectively work through the book's content. The twenty whole-brain methods included in this text are not included in this glossary; they are clearly featured and defined in the text.

Algorithmic work: Work following a set of rules, routines, and instructions that are mainly functions of the brain's left hemisphere.

Amygdale: Almond-shaped and sized element in the second or middle major part of the human brain that regulates emotions such as fear, rage, pleasure, and memories of the same.

Asymmetry: Refers to the fact that the two sides of the brain, in contrast with lateralization, are specialized with respect to certain capabilities.

Axon: Also called a nerve fiber, this is the portion of a neuron that transmits chemical signals to other neurons.

Billable time: The hours engineers and others work for professional service firms that can be billed to clients in order to generate income, in contrast with those hours that are not billable.

Bionics: The study and use of mechanical/electronic systems that function like living organisms (or parts of them), with the systems being controlled by the organisms.

Brain: Organ of the human body located within the skull and composed of cells, water, chemicals, and blood vessels. The brain is the organ, and the mind is what we do with it.

Brain stem: The third and lowest part of the human brain, the brain stem manages basic body functions such as breathing, heart rate, blood pressure, sleeping, and wakefulness.

Carbohydrates: Organic compound used by the body to make glucose, the fuel that provides energy.

Cerebellum: A major part of the brain stem, or lowest part of the brain, and responsible for involuntary movement.

Civil Engineering Body of Knowledge (CEBOK): The aspirational necessary depth and breadth of knowledge, skills, and attitudes required for an individual entering the practice of civil engineering at the professional level (licensure as a professional engineer) in the twenty-first century.

Clairvoyance: Gathering information about an object or place using abilities beyond our six senses of vision, hearing, smell, taste, touch, and proprioception.

Commissurotomy: Surgery in which the corpus callosum is severed as a last resort to help individuals severely disabled by epileptic seizures involving both hemispheres.

Conscious mind: Where cognitive processing occurs that we are aware of, such as using information from our memories and senses to makes decisions and convert them to actions. We are thinking and we know it.

Corpus callosum: A system of two hundred million nerve fibers that connect the human brain's left and right hemispheres.

Cortex: A sheet of neural tissue on the brain's surface that is folded so that a large area fits within the confines of the human skull. Nerve centers for thinking, voluntary movement, the senses, and personality reside in the cortex.

Create: Originate, make, or cause to come into existence an entirely new concept, principle, outcome, or object.

Culture: The way things really work in an organization, especially when challenges arise.

Decibel: The loudness or volume of sound, with each ten-decibel increase in loudness being twice as loud as the previous level.

Dendrite: Portion of a neuron that detects and receives chemical signals from neighboring neurons.

Design fixation: Unintentionally adhering to a set of ideas or concepts that limit the creativity and innovation of the result. A similar term for this habitual behavior is the *Einstellung Effect.*

Drawing: Converting what you see into a visually recognizable form.

Einstellung Effect: Resolving issues, problems, and opportunities only by using approaches that have worked in similar situations, rather than looking at each situation on its own terms and at least considering new approaches. A similar term for this habitual behavior is *design fixation.*

Engineering Body of Knowledge (EBOK): The aspirational depth and breadth of knowledge, skills, and attitudes necessary to enter practice as a professional engineer in responsible charge of engineering activities that potentially impact public health, safety, and welfare.

Exoskeleton neuroprosthesis: A neural prosthesis that wraps around limbs for use by paraplegics and people with muscular disabilities and that also generally enhances people's physical capabilities.

Glucose: The brain's source of fuel that interacts with oxygen and nutrients to provide energy to brain cells. Also called *blood sugar.*

Habit: An involuntary behavior controlled by the subconscious mind.

Hemisphere, left: The left half (oriented according to your left) of the human brain. It exhibits valuable verbal, logical, literal, temporal, symbolic, and linear processor capabilities.

Hemisphere, right: The right half (oriented according to your right) of the human brain. It exhibits valuable nonverbal, intuitive, emotional, non-temporal, actual, and parallel processor capabilities.

Hertz: The frequency of sound waves expressed as number of cycles per second.

Hippocampus: Located in the second or middle major part of the brain, it aids with learning and converts our short-term memories into long-term forms.

Hormones: Chemicals produced by glands and transported by the body's circulatory system to produce effects on cells and organs remote from the point of origin.

Ideacide: Intentionally or unintentionally killing creativity or innovation within an organization.

Innovate: Make something new by purposefully combining different existing principles, ideas, and knowledge.

Lateralization: Each of the brain's hemispheres interacts with the opposite side of the body.

Mind: The way a human thinks, believes, hopes, wants, and remembers. The mind is what we do with the organ called the *brain*.

Mindfulness: Engaged in the present moment, observing sights, sounds, and other sensations.

Multitasking: Frequently jumping, in grasshopper fashion, from task to task.

Neural prosthesis: A prosthesis that is linked to the brain. Also called a *robotic prosthesis*.

Neurons: Nerve cells that receive and send electrochemical signals stimulated by neurotransmitters.

Neuroplasticity: Refers to the changeability of the human brain; through most of life, new connections can be made among neurons and new neurons can be developed.

Neurotransmitter: A chemical released from a neuron that helps to amplify or modulate a signal that passes from one nerve cell to another or to a muscle.

Osmosis: The spontaneous net passage or diffusion of molecules of a solvent, such as water, through a semipermeable membrane from a place of lower solute concentration to a place of higher concentration while blocking passage of the solutes, until the solute concentration is equal on both sides. See also *reverse osmosis*.

Parapraxis: A misunderstanding that enables your subconscious mind to speak to your conscious mind. Three ways in which this can happen are (1) you say something you didn't mean to say, (2) you hear something incorrectly, or (3) you read or see something incorrectly.

Precision agriculture: An information- and technology-based management system that is site specific and uses soil, crop, nutrients, pest, moisture, yield, and other data for optimum profitability, sustainability, and protection of the environment.

Prefrontal cortex: The brain's CEO, which resides behind our foreheads.

Proprioception: Sensing body position, posture, and movement.

Protein: Complex molecules that are the building blocks of body tissue; they are used for cell growth, repair, and function.

Reduced cognitive filtering: The ability of some individuals to benefit from the cognitive processing that occurs in their subconscious minds, which can lead to more exceptional insights flowing from their subconscious into their conscious minds.

Retinal implant neuroprosthesis: A retinal implant, a camera to capture light, and a processor to convert incoming video signals into electrical signals for transmission to the cortex.

Reverse osmosis: The engineered process by which a solvent-solute system, partitioned by a semipermeable membrane, uses externally imposed pressure to force water from a high-salt-concentration supply to create an acceptably low-salt-concentration supply.

Senses: Sight, hearing, smell, taste, touch, and proprioception; the last item refers to sensing of the body's position, posture, and movement.

Subconscious mind: Where cognitive processing occurs that we are not aware of, such as habitual actions, dreaming, and reacting. We are thinking and we don't know it.

Subconscious thinking: Brain processes that are below the level of awareness.

Telepathy: Mind-to-mind communication.

Thalamus: Egg-shaped element in the second or middle major part of the human brain that receives and processes signals sent from the senses and routes them to various parts of the brain.

Triune Brain Model: Based on function, physiology, and evolutionary development, describes the overall three-part structure of the human brain.

Whole-brain method: A process, approach, attitude, and/or environment used to stimulate you and, more powerfully, your group or team to think more deeply and widely as you generate more ideas, analyze them, explore many and varied options, select from among them, and implement the best choice.