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# COULD BRAIN COGNITIVE PREDICTIONS LEAD TO STRATEGIC VISIONS?

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## I. THE PROBLEM

The cognitive functions of the brain are compelling. They allow individuals to receive, select, store, transform, develop, and recover information induced by an external stimuli. They also allow individuals to understand and to relate to the task and global environments surrounding them. They manage the perception, attention and memory dimensions of the human brain. And they may allow premonitions. They, however, depend on sensory stimuli drawn from visual, auditory, olfactory, gustatory, and somatosensory systems. Stimuli that may relate to the past or the present and, occasionally, the future. And here lies the problem: could stimuli induce a predictive pulse? Put differently can the brain, in response to stimuli, predict events? And could this anticipation, projection and premonition induce business visions?

This will be the focus of the following article.

The article starts with a review of the cognitive functions of the brain. It proceeds to relate those functions to time including future events. The observation is then placed within the context of business visioning. Some guarded conclusions are then drawn.

The article draws on contemporary research on cognition, artificial intelligence and visioning within a business context. It is qualitative in approach. It is also eclectic drawing upon elements of neurology, management and strategy.

Outcome of this research could support strategic thinking within contemporary disruptive environments. And could lead to further research on artificial intelligence as a trigger of business visions.

## II. COGNITIVE FUNCTIONS OF THE BRAIN

Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses. Cognitive functions are brain-based skills one needs in order to carry out any task from the simplest to the most complex. Human cognition can be conscious and unconscious, concrete or abstract, as well as intuitive (like knowledge of a language) and conceptual (like a model of a language). It encompasses many aspects of intellectual functions and processes such as attention, the formation of knowledge, memory and

working memory, judgment and evaluation, reasoning and computation, problem solving and decision making, comprehension and production of language. Traditionally, emotion was not thought of as a cognitive process, but now much research is being undertaken to examine the cognitive psychology of emotion; research is also focused on one's awareness of one's own strategies and methods of cognition, which is called metacognition. Cognitive processes use existing knowledge and generate new knowledge.

Many AI efforts aim at simulating the cognitive functions of the brain.. AI has started trying to recreates some of these cognitive functions of the brain. Attention or the ability to focus on a specific task and ignore the rest of the environment, is one of those. Resort to episodic memories to remember autobiographical events is yet another. Continual learning or the ability to learn new tasks without forgetting previous knowledge is yet another. There is also the ability of humans to forecast and think about the future and imagine and plan for that future. And there is, finally, inference or the ability to learn new concepts by drawing inspiration from previous knowledge through inductive inferences (Rodrigues, 2020).

## III. STIMULI AND SENSORY RECEPTORS

As we stated above, cognitive competencies of the brain depend on stimuli. A stimulus is a trigger that evokes a specific functional reaction in an object or provokes an action or response. In physiology, a stimulus is a detectable change in the physical or chemical structure of an organism's internal or external environment. An organism's ability to detect an external stimulus is called sensitivity. The human brain has sensory receptors that can receive information and elicit a reflex via stimulus transduction (Biga et al, 2019)

Sensory receptors are primarily classified as chemoreceptor, thermo-receptors, mechanoreceptors, or photoreceptors. Chemoreceptors detect the presence of chemicals. Thermo-receptors detect changes in temperature. Mechanoreceptors detect mechanical forces. Photoreceptors detect light during vision. These sensory receptors perform countless functions. During vision, rod and cone photoreceptors respond to light intensity and color. During hearing, mechanoreceptors in hair cells of the inner ear detect vibrations conducted from the eardrum. During taste, sensory neurons in our taste buds detect chemical qualities of our foods including sweetness, bitterness, sourness, saltiness, and umami (savory taste). During smell, olfactory receptors recognize molecular features of wafting odors. During touch, mechanoreceptors in the skin and other tissues respond to variations in pressure.

Taken together those receptors can induce a predictive function based on imagination, planning and forecasting.

A major role of sensory receptors is to help learn about the task and the general environments of the individual. A variety of stimuli originating from varying sources are received and converted into nervous system electrochemical signals through sensory transduction. The process starts with a detection of a stimulus by a receptor which generates a graded potential in a sensory neuron. If strong enough, the graded potential causes the sensory neuron to produce an action potential that is relayed into the central nervous system (CNS), where it is integrated

with other sensory information—and sometimes higher cognitive functions—to become a conscious perception of that stimulus.

## IV. THE COGNITIVE PREDICTIVE FUNCTIONS OF THE BRAIN?

Several works have hypnotized that the brain could indulge into a process of cognitive future event prediction.

There exists a view that events are predictable by the brain if they occur in a non-random fashion, allowing the brain to extract either deterministic or probabilistic regularity of the relationship between different events. Those predictive formulations can be basedon knowledge gained through long-term experience (Bar, 2007) or learning triggered by short-term exposure to non-random patterns (Schubotz, 2007). Predictions generated within non-random contexts could be, however, the outcome of learning and identified associations, especially temporal dependencies between events (Butz et al., 2003; Bar, 2007). Evidence supports, however, the proposition that the brain may still employ similar predictive strategies in an attempt to extract a pattern from random inputs (Schubotz, 2004 ) or relate the novel input to familiar knowledge by generating analogies, thus facilitating the processing of new stimuli (Bar, 2007).

Predictions could cover the short or long "terms". The brain could predict events which are expected to occur within seconds-range in contrast to those which may occur in the distant future. Long-term prediction is usually used "offline" and is not necessarily coupled with any immediately relevant or running process in contrast to short-term prediction which is more likely to be used "online" for regulating the ongoing behavior, It goes without saying that predictions can lead to faster recognition, interpretation and possible response to emerging events within an environment (Bar, 2007) (Llinas (2002)) Anticipatory or predictive processing reflects one of the core, fundamental functions of the brain. Prediction in cognitive and neural processing allows us to direct our behavior towards the future, while remaining well-grounded and guided by the information pertaining to the present and the past.

But where do predictions take place? .There are different approaches to the process of conceptualizing and differentiating the role of different brain areas in prediction. Holistic models as the predictive coding model, allow the brain to operate as a "Bayesian inference machine", (based on Bayes theory or the probability of an event based on prior knowledge of conditions that might be related to the event) constantly building models of the environment and the body, allowing the brain to predict their respective future states (Friston and Stephan, 2007 ). Importantly, such general nature of brain processing can then account for many phenomena across domains and processes, e.g., perception, attention, action or learning (Friston and Stephan, 2007 ).

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## V. FROM COGNITIVE PREDICTIVE COMPETENCIES TO BUSINESS VISION?

Vision is a mental perception of the kind of environment an individual, or an organization, aspires to create or emerge within a broad time horizon and the underlying conditions for the actualization of this perception. And a prospective visualization of the position of the individual or the organization within that emerging environment. 'It could also be a 'concept for a new and desirable future reality. 'A vision belongs to what we may term the process of direction setting, or the identification of a point in the future , often the distant future, and a strategy for getting there. Creating this direction requires challenging conventional wisdom and analytically looking for patterns that answer very basic questions about the future. Individuals perceive their visions and do not ask themselves whether they have one. (El Namaki, 1992)

The key to visioning could be found in the argument that prediction in cognitive and neural processing allows a futuristic behavior guided by present day information and yesterday's knowledge. This prediction can take place on different temporal scales. It can relate to knowledge gained through long-term experience (Bar, 2007) or learning triggered by short-term exposure to non-random patterns (Schubotz, 2007). This could lead to the hypothesis that predictive events could constitute a vision. They could constitute a vision if they project a sense of direction, a disruptive innovation, an ultimate goal, a resource base and a strategy all within a novel distant environment marked by a blurred boundary and disruptive contours. The essence of a vision is the identification of an attribute to each of those variables and the integration of all attributes within a mental view or a most likely scenario And a projection of the position of the individual or the organization within this construed texture.

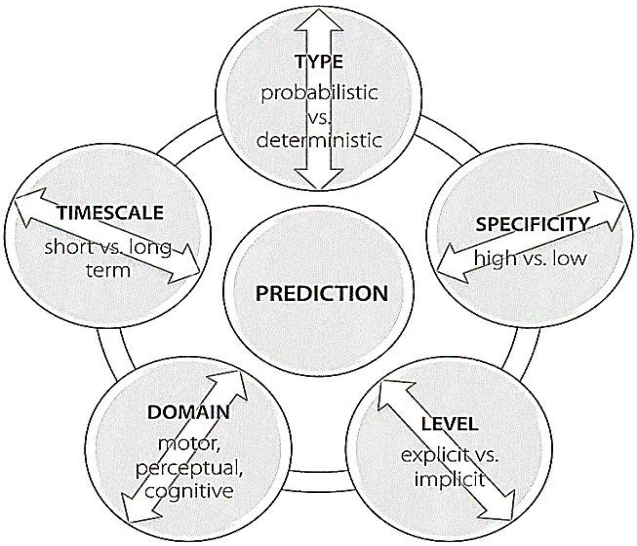


Figure - Main factors which specify the nature of predictive processes across different contexts. Source: Frontiers in human Neuroscience, Prediction, cognition and the brain Front. Hum. Neurosci., 22 March 2010

""The brain does not only receive data from the sensors and organs, it also delivers continuous forecasts to them."" (Muckli, 2018). It is the nearest thing to a prediction mechanism that is

optimizing its own predictions of the environment it is navigating through. (Muckli, 2018). Put differently, the brain is essentially a "prediction machine" that is constantly busy comparing new input from the environment with predictions generated by its own internal models. This is the only way that a human brain is able to adapt to ever new situations and environments. (Neuroscience, March 2, 2018)

## VI. FROM PREDICTIONS TO VISION

Cognitively conceived predictive events will have to meet certain criteria to qualify as "vision". They will have to tie the future to the present and the past, the implicit to explicit memory and the managerially contemplated to strategic intent. The construed "vision" will have to be "reachable"; have a far but close time span and constitute a managerial and technological challenge. It should, form a managerial point of viewable to focus the attention and translate into goals and strategies.

A predicted vision may imply a radical and far reaching change in the capability profile of the organization. The essence of a vision is the identification of an attribute to each of those variables and the integration of all attributes within a mental view or a conceived prediction.

Predicted events may not lead to a vision, however, if aberrations abort conception. Those aberrations could arise from the way individuals approach their environment and react to external stimuli or from their inability to tolerate ambiguity, to incubate, to access areas of imagination and to distinguish reality from fiction (El Namaki, 1992).

**Predicted visions: science fiction**

Science fiction is one of the possible illustrations of brain predictions rooted visions.

Science fiction is "fiction dealing principally with the impact of actual or imagined science on society or individuals …. (Merriam Webster, 2020). The content is imaginative based on brain predictions. It relies heavily on hence untackled boundaries of science in order to configure novel settings, characters, themes, plots and visions. It blends scientific predictions with projected elements of sociology, psychology to philosophy. Hard science fiction predictions rely on prospective change in sciences exploring the workings of the natural world as physics, chemistry and biology while soft science fiction forecasts prospective human behavior, interactions, thoughts, and feelings (Helmenstine, 2019) (El Namaki, 2020).

Predicted visions whether of the hard or soft genre pave the way towards a reflection on prospective human interactions with each other, with technology, with environment and with the future.

## VII. SUMMARY AND CONCLUSIONS

The cognitive functions of the brain are compelling. They allow individuals to receive, select, store, transform, develop, and recover information induced by an external stimuli. They manage the perception, attention and memory dimensions of the human brain. And they may allow premonitions. They, however, depend on sensory stimuli drawn from visual, auditory, olfactory, gustatory, and somatosensory systems. Stimuli that may relate to the past or the present and, occasionally, the future. Could stimuli induce a predictive pulse and could this anticipation, projection and premonition induce business visions?

The article analyses the cognitive functions of the brain and how those could produce a measure of predictability of events. It further relates the predictability to the conceiving of visions within business contexts. This is followed by conditions for the proper conception of a business vision and the enhancers as well as the barriers to vision conception within a predictive brain framework. Science fiction is given as a possible outcome of the predictive competencies of the human brain.

An extension of this research could be an exploration of the possibility of artificial intelligence technologies to extend to the formulation of business visions.

**REFERENCES**

1. Rodriguez J (2020), "Beyond Neurons: Five cognitive functions of the human brain that we atrying to recreate with AI", TheStartup, July 22, 2020.
2. Muckli L (2018), "Theory of predictive brain as important as evolution" , Horizon, 29 May 2018,
3. El-Namaki M (1992), "Creating a corporate vision",Long Range Planning, Volume 25, Issue 6, December 1992.
4. Biga L et al (2019), Anatomy & Physiology -Simple Book Publishing, open. Oregonstate .education, 2019.
5. Bar M. (2007). The proactive brain: using analogies and associations to generate predictions. Trends Cogn. Sci. 11, 280–28910.1016/j.tics.2007.05.005 [PubMed] [CrossRef] [Google Scholar] 9.
6. Knill D. C., Pouget A. (2004). The Bayesian brain: the role of uncertainty in neural coding and computation. Trends Neuroscience . 27, 712–71910.1016/j.tins.2004.10.007 [PubMed] [CrossRef] [Google Scholar]
7. Schubotz R. I. (2004). Human Premotor Cortex: Beyond Motor Performance. Leipzig: Max Planck Institute for Human Cognitive and Brain Sciences [Google Scholar]
8. Helmenstine A, "What Is the Difference Between Hard and Soft Science?" November 29, 2019
9. Bar M. (2009). The proactive brain: memory for predictions. Philos. Trans. R. Soc. Lond., B, Biol. Sci. 364, 1235–124310.1098/rstb.2008.0310 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
10. Knill D. C., Pouget A. (2004). The Bayesian brain: the role of uncertainty in neural coding and computation. Trends Neurosci. 27, 712–71910.1016/j.tins.2004.10.007 [PubMed] [CrossRef] [Google Scholar]
11. Schubotz R. I. (2007). Prediction of external events with our motor system: towards a new framework. Trends Cogn. Sci. 11, 211–21810.1016/j.tics.2007.02.006 [PubMed] [CrossRef] [Google Scholar]
12. How the Brain Makes Predictions, Neuroscience, and March 2, 2018
13. Associationism and cognition: human contingency learning at 25. Q. J. Exp. Psychol. 60, 291–30910.1080/17470210601000581 [PubMed] [CrossRef] [Google Scholar] 157.
14. Frontiers in human Neuroscience, Prediction, cognition and the brain Front. Hum. Neurosci., 22 March 2010
15. Simmons A., Matthews S. C., Stein M. B., Paulus M. P. (2004). Anticipation of emotionally aversive visual stimuli activates right insula. Neuroreport 15, 2261–226510.1097/00001756-200410050-00024 [PubMed] [CrossRef] [Google Scholar] 158. Soga R., Akaishia R
16. Butz M et al (2003), "Anticipatory Behavior in Adaptive Learning Systems", ,Springer-Verlag Berlin Heidelberg
17. Schultz W., Dayan P., Montague P. R. (1997). A neural substrate of prediction and reward. Science 275, 1593–159910.1126/science.275.5306.1593 [PubMed] [CrossRef] [Google Scholar] 154.
18. Schütz-Bosbach S., Prinz W. (2007). Prospective coding in event representation. Cogn.

Process. 8, 93–10210.1007/s10339-007-0167-x [PubMed] [CrossRef] [Google Scholar] 156. Shanks D. R. (2007).

19. Friston K, Stephan K, (2008) ," Free Energy and the Brain, PubMed
20. El Namaki M, "How an Integration of Artificial Intelligence and Science Fiction Could Change the Premises of Strategic Thinking" , Journal of Knowledge Management Application and Practice, 1 Aug 2020