Embracing the science behind innovative thinking

If R&D focused organisations encourage their individual team members to foster new ways of thinking, their overall innovation agenda could benefit. Here, Dr. Liz Dallimore, a Director in KPMG Australia's R&D Incentives team and an expert in neuroplasticity, discusses how lessons from the world of neuroscience can help people become innovative in their work.

As companies increasingly engage in research and development (R&D) to remain competitive and productive in an era of disruption and globalisation, the need to generate novel ideas, think 'outside the box' and be innovative is essential. While many have active research and development strategies, an innovation agenda and a culture that encourages idea generation, they can fail to ensure individual team members are equipped to think creatively.

Without this skill, the chance to do things differently from other organisations in the same sector, or to seize on the unique experiences and knowledge of people within the business, can be lost.

The individual within the innovation lifecycle

A six stage model for innovation

1. **Ideas and opportunities**
2. **Exploring commercial validity**
3. **Developing a prototype**
4. **Funding and investment**
5. **Developing a pilot**
6. **Launching the new product or service**

The emergence of 'NeuroLeadership' and 'Creative Ideation' has seen the corporate world develop an appetite for neuroscience.

A six stage model for an innovation lifecycle in a R&D-focused organisation begins with ideas and opportunities. At this early point, individuals within a business need to feel capable and welcome to think creatively, suggest concepts and discuss them with colleagues or leaders.

Optimal creative thinking can springboard the next two stages in the cycle – exploring the commercial validity of the concept, and developing a rapid 'safe to fail' prototype and testing it.

If all is going to plan, the next stages are funding and investment, followed by developing a pilot and finally, launching the new product or service.

Helping team members to think creatively can maximise the potential of this process for the business. This is where foundations from the world of neuroscience can help, as they can shake up how people brainstorm, collaborate, and undertake daily tasks, as well as inspiring employees to be high-performance thinkers.

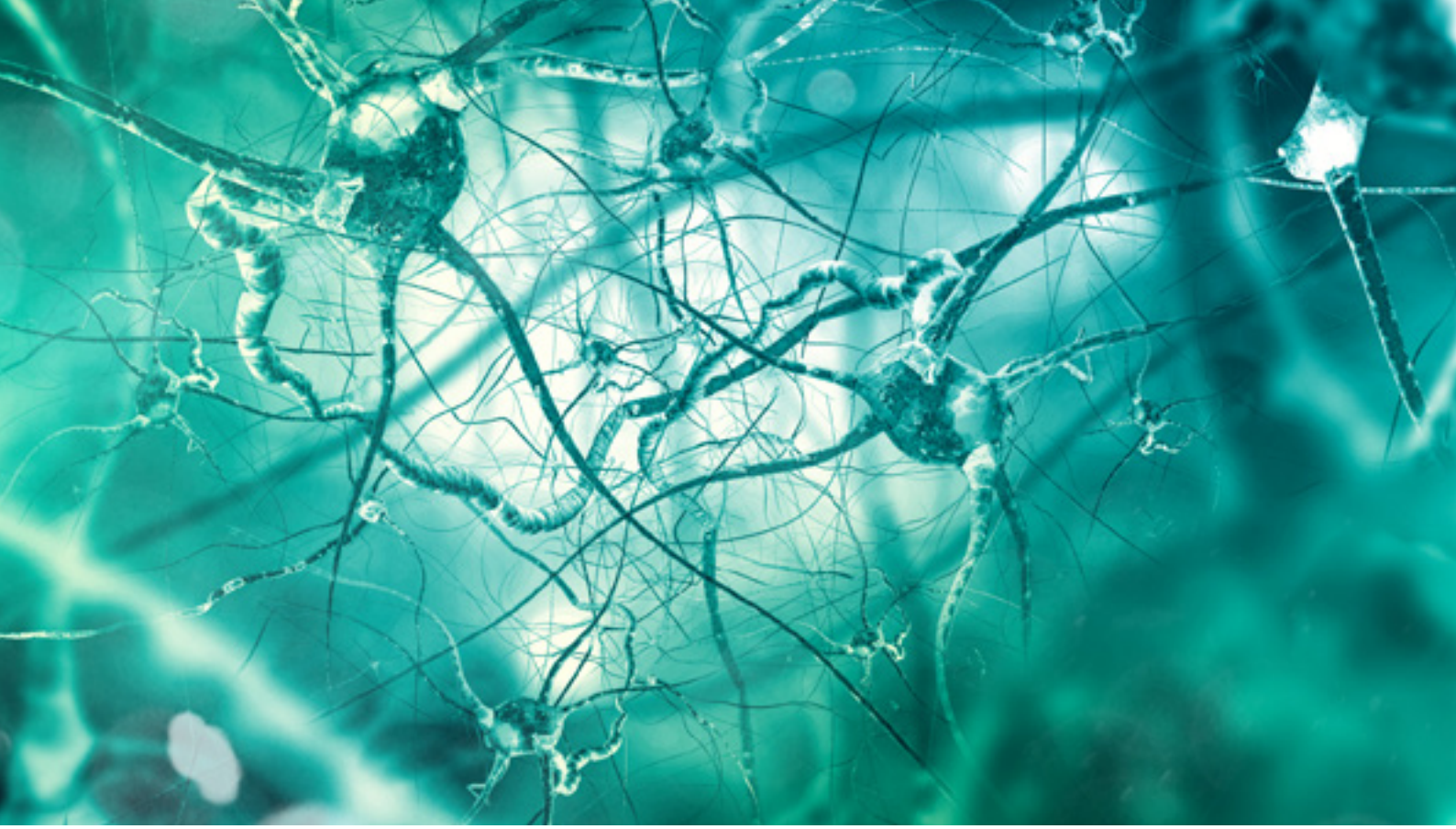
What does neuroscience tell us?

The emergence of 'NeuroLeadership' and 'Creative Ideation' has seen the corporate world develop an appetite for neuroscience. But how can R&D-focused businesses use the principles of neuroscience to embed a culture of high performance thinking amongst employees?

Neuroscience is the scientific study of the brain and nervous system. Typically, it differs from related scientific disciplines such as psychology in that neuroscientists are concerned with what is happening at the molecular and cellular level. A neuroscientist will delve into the brain to see how certain environmental cues, changes in behavior and thought processes effect the way neurons function. It is these changes in our neural pathways that neuroscientists are excited about, and it is a phenomenon we term neuroplasticity.

Shaping new thoughts

Until relatively recently, many in the neuroscience community believed that our neural pathways were set in childhood development, and later no new neurons were formed. However, since the concept of neuroplasticity was introduced in the late 1960s (Raisman, 1969), neuroscientists have explored how changes in a person's behaviour can alter the neural pathways in the brain, and improve cognitive performance.



So how does this science have the potential to help innovation?

The development of sophisticated imaging techniques such as functional magnetic resonance imaging (FMRI), positron emission tomography (PET), and electroencephalogram (EEG) has allowed neuroscientists to attribute certain brain regions to creative tasks, letting us get a glimpse inside the brain of people who are more creative. It enables them to devise tasks everyone can do to train those areas of the brain.

The science of neuroplasticity

Neurons are the cells in the brain that transmit messages. Each is made up of an axon, cell body and dendrites, and they are linked by a small space called the synapse. A neuron on its own can't do anything – it needs to 'talk' to many other neurons to elicit an action. It does this by sending electrical signals along its axon, which results in the release of chemicals (neurotransmitter/ neurotrophic factors) into the synapse.

For a nearby neuron to be affected, two things must happen. Firstly, it must be in close enough proximity to take up the chemicals. Secondly, it must have the required receptors on its surface to identify the chemicals. An electrical charge will flow down the axon of the neuron, and that neuron will release chemicals into the next synapse. As neurons continue to activate one another, they strengthen. This is the basis for neuroplasticity and indeed new learning – getting new neural pathways to start firing so that they wire together as humans develop a new skill, new thoughts and behaviours.

Activating new neural pathways

We have a neural pathway for all things we have ever encountered during our lives, every object, person, animal, situation, or task. The more we encounter them, the stronger those neural pathways become. For example, when you see someone you know well unexpectedly on the street, you instantly know who they are. The neural pathway for that person is fired so often in many different contexts.

However, if you see a distant relative at a family event every five years, the neural pathway for that person fires only when you see them in that context. So if you run into that person on the street, the neural pathway for that person does not automatically fire, because you don't immediately associate the context of the street with that person. You'll recognise them, but you might not instantly place who they are.

Think of neural pathways firing when we are undertaking a routine task. The brain simply uses the existing neural pathways it has already created. It is easier for the brain to do this and it expends less energy to use existing neural pathways. Neurons have a 'memory' (this is how we learn) for existing, well-trodden, neural pathways, and will revert to these unless trained to do otherwise. Therefore, to get the most out of our brain, we must train the areas of the brain that we use less in our typical activities.

Openness to experience is one of the easiest ways to become more creative.

Leaders must explain the science behind neuroplasticity and creative thinking to their teams, to develop a program of activity around high-performing thinking.

How can individuals change their brains?

As the science of neuroplasticity begins to emerge in the area of creativity, neuroscientists have become fascinated with studying brains of creative people, as well as ordinary people trained to do creative tasks. Researchers tend to agree that creativity is the ability to produce work that is novel (original, unique), useful and generative (Sternberg & Lubart, 1996). Many of these studies look at the creation of novel ideas to open problems, in order to assess which areas of the brain are responsible for creativity. This type of creativity has been termed 'creative ideation' (Paulus & Brown, 2007).

When studying a person's creative ability, or traits, a number of papers point to a trait termed 'openness to experience' as one of the single most consistent traits of creativity ability. This rang true in research contrasting scientists and non-scientists, more and less creative scientists, and artists and non-artists (Feist, 1998).

Openness to experience – the benefits for innovation

Whilst there are a range of things we can do to train our brains to become more creative, openness to experience is one of the easiest to develop. When we think about openness to experience, we can think in terms of neuroplasticity. If we are willing to try new things, we will start to form new neural pathways on a more regular basis. This will allow our brain to commit more tasks to memory and have a greater range of memories on which to draw from when attempting to generate new and novel ideas. This type of thinking with help fuel the innovative ideas in individuals.

How can individuals harness neural plasticity?

The aim of neuroplasticity is to break away from routine task. One of the most effective things we can do is to learn a musical instrument. This engages a whole range of brain functions, given that we need to visualise the music, move our hands and arms, listen to the feedback, and generate an emotional response.

A simpler way to get neural pathways firing is by walking a different way to work each morning, changing the location of staff meetings, working from a different desk or office, or taking regular lunch time walks to different locations and with new scenery.

Pay attention when creating new neural pathways

Attention is a conscious cognitive process that is essential to allow us to form new neural pathways. The more we pay attention to a task, the greater the signal that is being generated throughout the new neural pathway. If our mind begins to wander whilst we are trying to create a new neural pathway, other non-associated areas of the brain will also fire, making it less likely for us to solidify the neural pathway of interest and commit the new task to memory.

Attention is important, however a lot of us struggle to stay focused. This is largely because the brain is highly situational. Our subconscious mind is phenomenal in the amount of information it is able to process, especially from our physical surroundings. When we are in a room our brain is constantly processing stimuli, including lighting, sounds, space, colours, temperature, and even furniture. All of these stimuli can inhibit or promote brain plasticity.

It has been estimated that the subconscious mind can process 11 million pieces of information per second. However, our conscious mind can only process 40 items per second. Interestingly, it is our sense of hearing, not vision, that seems to have a greater impact on our subconscious. The more prevalent the external stimuli, the more energy the subconscious brain requires to distract the conscious brain of its existence, and therefore the less likely new neural pathways will be committed to memory.

How does this science help organisations with R&D?

Generating novel ideas to problems within an organisation is the essences of a good R&D and innovation strategy. However, our brains are programmed to do the same thing the same way, and therefore achieving this can be challenge. Organisations that encourage individuals to develop their creative thinking and idea generation through the principles of neuroplasticity, while also ensuring the company culture and strategy supports that thinking, can be in a stronger position to have a thriving approach to R&D and innovation.

For this approach to be effective, leaders must explain the science behind neuroplasticity and creative thinking to their teams, and develop a program of activity around high-performing thinking. This could take a range of forms, with one example being to encourage individuals to explore new activities that enhance neuroplasticity, through being more open to new experiences and by paying attention when learning new tasks.

This approach could help individuals to think differently, brainstorm effectively, collaborate positively and share innovative concepts that could one day prove a competitive advantage for the broader business.

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