

ON CREATIVITY

By Rod Fountain and Peter Childs

Rod: We need to capture something about what creativity is. At a very basic level I think we are all inherently creative and we are all capable of having amazing ideas. In fact I read somewhere the average person has ten original ideas a day.

Peter: That's true. Our languages, values, expression of aesthetic forms, scientific and technical understanding are all examples of attributes that set us apart from other life forms. All of these attributes are enhanced by creativity. Creativity enriches our culture and thereby the quality of society and our day to day lives.

Rod: And yet we still face the most incredible challenges so perhaps we have not been creative enough. What makes us believe we will solve the issues of global warming, pollution, energy and poverty and their interrelationships?

Peter: These great societal challenges can only be solved when a great deal of effort and thinking is applied to them. Many years of hard work and difficult calculations can be vindicated by a burst of new knowledge or new avenue for exploration as a result of a task and subject area carefully explored. The excitement of an artist in a studio realising a new approach and scientist in the lab gaining insight from data provide examples of the 'kicks' and sense of satisfaction and fulfilment many people aspire to. Creative insight is the stuff that makes our spirits sing.

Rod: This all sounds a bit random: we conduct experiments and we make some breakthroughs, but there are no guarantees we will come up with anything worthwhile and no guarantees we will solve the big problems. My good friend Johnnie Moore, who works in the world of open space thinking and learning, gets quite upset when I start a conversation about creativity. He thinks we have built this big cathedral around the subject, with everyone trying to understand creativity and foster it and then manage the innovation process, when really we should just leave it alone and let the people who want to be creative be creative, in whatever way that may be.

Peter: I don't agree that creativity must necessarily be a random process. If you think of it in terms of its impact on business, business is not random and companies don't just become successful as a result of luck. They may have been lucky to begin with or at some point, but great companies would have to be very lucky every single day to account for their growth and success – and this is implausible. For sustained business success it is absolutely essential to nurture ideas and to embrace creativity directly or surround yourself with people who do. On its own creativity is not enough to sustain a business. We are all familiar with bright, able and creative individuals who are endlessly generating new ideas but are seemingly unable to turn these ideas into reality or even if they do, to make a living out of it. The effective exploitation of an idea is the realm of business and the skill sets for creativity and commerce are often at odds with each other. Creativity or ideas on their own are not enough. Without an appropriate business strategy to exploit the idea and turn it into a revenue stream that is sufficient to pay for the development of the product or process

concerned combined with the on-going business costs for its marketing, production, distribution and future developments then the ideas will fail to benefit the originators, employers or sponsors.

Rod: This is a sensible, logical argument and that is why I don't think it is relevant to a conversation about creativity. I am struggling with your use of words like 'effective', 'exploitation', and 'appropriate'. These terms are associated with conventional business strategy. Surely creativity does its own thing? Surely it is possible – even desirable – to come up with something that does not fulfil any current definition of 'effective', that does not 'exploit' anything, and is highly inappropriate. Shouldn't we be celebrating that kind of thinking in the name of creativity?

Peter: You are an entrepreneur Rod, and I have spent the last 20 years or so as an academic. That is why we hope to bring some insight to the topic of commercivity. It is interesting that I appear to be taking the pragmatic ground and you the challenging academic position? I'm sure this is something to do with the way we spin off each other – challenging and engaging in positive ways. I'm sure this is somewhere at the heart of what we are hoping to define as commercivity.

Rod: In a way this is not a good place to start because we are encouraging those that believe creativity is the fluffy front-end of serious business where nobody has to take any responsibility for the outcomes. Whereas in commercivity we are saying the two elements are intrinsically linked and have to be understood together. Fluffy thinking and serious intent are actually good bedfellows.

Peter: We are agreeing with each other! It is the blend of methods, work practices, culture and infrastructure that makes an organisation succeed. IDEO, the design and innovation consultancy, expound the importance of understanding, observing, visualising, evaluating, refining and implementation. We are all familiar with the phrase that a picture tells a thousand words. In idea generation it is important to not just use pictures but also to get physical and explore ideas in three dimensions where appropriate. In idea generation it is helpful to leave our performance anxieties behind and as well as using words and symbols, expand into imagery and three-dimensional prototyping. This is embodied in the IDEO process of ideation: generating, developing and communicating an idea. As part of this process the production of prototypes is emphasised. These may be crude representations of the idea but they provoke discussion and engagement in design and this can lead to significant iterative and step improvements in its implementation. In the case of IDEO this is combined with capacity, expertise and experience of innovation enabling the fast development and trialling of ideas. Observation is important. If you ask someone what they think of a product or service they may say its fine or very good. Part of the reason for the response is that they lack the vocabulary to express their opinion. Most of us in response to a question on a meal might say that it was very good. If we are enthusiastic cooks at home then we may be able to express our opinion more specifically. In comparison to a food critique though the information being stated is limited. It is for this reason that surveys and market based information needs to be carefully assessed as significant information is lost or never accumulated in such processes. Observation provides key insights into the way that customers actually use a product and can reveal particular issues that surveys miss. Observation is a key activity in user based design and astute observers tend to produce ideas as a result of

their observations because they identify the needs and are able to suggest methods to overcome these.

Rod: Are you saying that design is basically the same as creativity, and user based design is the best creativity of all? Dieter Rams said that great design is making something meaningful and worthwhile, whereas André Breton thought it was the solution that best adapted to necessity, but very superior to it. I am not particularly happy with either of these because they both imply some kind of scoring system: your creativity is better than my creativity, and also that because we ‘need’ something then we should have it and the person who comes up with the way of giving it to us is branded a creative hero.

Peter: I am saying that design is very important and that creativity by design is indeed the most useful type of creativity because it is more likely to lead us quickly to real value – by which I mean value as perceived by other people. Creativity can occur in our daily lives and moment by moment activity whether in the work place, at home or in our social interactions. We can be creative in the way we dress, do our make-up, sing, write our poems, arrange our homes and decorate. We can be creative in our meetings, our writing, production of images and processes. But in commerce it is necessary to think differently about creativity. Too often in business an initial evaluation of an opportunity reveals that it is not viable when considered in a traditional form of implementation. An alternative business model approaching the implementation of the business activity in a different way may produce a much more attractive commercial opportunity. It is in this arena that creativity, creative methods, and design have a particular role to play. We live in a world where we can look at any area and realise the need for improvement. Creative approaches can be used to help implement this.

Rod: I am intrigued by the extent to which deliberate creative approaches could lead to really big breakthrough ideas. Boden, in 1998, stated that it is impossible for people to explain what creativity is, because according to the dictionary definition, creativity means to bring into being or form out of nothing.

Peter: To generate ideas from ‘nothing’ is the most difficult part of a design process. It is, however, generally agreed that the use of creative techniques, such as brainstorming, brainwriting and checklists, is useful in helping identify possibilities and generate solutions. We will discuss some of these in more detail in the book. Creativity has been the subject of extensive research including Henri Poincaré’s (1854-1912) description of the incubation or discovery process and Wallas’s (1926) four-step formulation of a creative process model.

Rod: I am still struggling with this. I’m still trying to fight the notion that creativity can be explained away as some kind of process. Author Alan Bennett wrote that ordinary people can be instruments of the sublime when a situation arises which they must confront and engage with. And Bob Geldof made a similar point when he said innovation happens naturally in response to strong need, linking Ireland’s dire poverty to its subsequent reputation for innovation. This is a real hobbyhorse for Johnnie Moore as well. He says that many innovation processes are simply toxic to creating conditions in which people feel moved to acknowledge real needs. Bureaucracies flourish by subordinating spontaneous human responses and awareness to

standardised systems. Organisational hierarchy means we are going to be guarding our status before we share anything resembling our vulnerability. For Johnnie, the very phrase ‘innovation process’ verges on oxymoronic; innovation goes with disruption and disruption is what processes, typically, endeavour to eliminate.

Peter: This is one of the many tensions in commercivity and it is critically important we don’t get dogmatic about right and wrong here. What we can say is the need for robust ideas that have been appropriately developed is important. If there is a flaw in a product or a service offered by a business, then it is possible that a customer will accept it for a while. The product martyr is the dream of the warranty department and we have all put up with inadequate devices, products and processes in our lives. In a competitive world however, it is a matter of time until we are wooed by a competitor whose products appear more reliable and fulfil the function to a higher standard. Remember that for every unit of currency spent on marketing to attract a customer for the first time, it can take ten times that sum to win back a customer who has become dissatisfied with the quality of a brand. So in business it is not enough to just hope that creativity comes along.

Rod: OK, I’m certainly happy to accept there is a context for how creativity can be regarded in business, and also to learn from how the subject has been explored in the past. I’m hoping this isn’t going to involve the regurgitation of the great creative moments in history.

Peter: Our understanding of creativity stems not just from the insights from successful companies but from the endeavours of individuals through history, research specifically into creative processes and people and the conditions that have enabled or stymied activity. Examples of creativity abound in the archaeological record, ranging from the ancient civilisations of Mesopotamia, Egypt, the Aegean and China. Creativity has also been associated with the prerogative of supreme or superior beings with gods or God defined as the source of all creation and all ideas. Indeed Christianity with the creation of humans in God’s image encourages us to take on the character of God, and therefore be creative ourselves. Recent focal centres of creativity include renaissance Florence, Industrial Revolution Britain, Luxury and Power USA. A wealth of knowledge can be derived from consideration of creativity from a historical perspective by looking at people and the associated conditions.

Rod: Take one of these examples – say renaissance Florence – and explain to me what we learn about creativity.

Peter: This is a particularly important period associated with understanding of conditions supportive of creativity, the so called golden years of the Renaissance in Florence, ca. 1400-1425. By the early 1400s, Florence (Firenze) had become one of the richest cities in Europe through trading, manufacture of wool and other textile and through the financial activities of its merchants. Florence was beset with inequality between property holders and the have nots, and surrounded by competitors in the form of the city states of Siena, Pisa and Arezzo. It was within this atmosphere of wealth and uncertainty that the leaders of Florence decided to make their city the most beautiful in Christendom, the ‘new Athens’. The merchants, bankers and churchmen not only provided funds but became intensively involved in the process. They encouraged, evaluated and selected works and were so interested in the outcome that

this environment served to push artists and sculptors to perform beyond their previous limits. In essence the urban leaders, and popular movement, served to cultivate creativity by goal setting.

Rod: Yes, I see it as a context in which creative people can blossom, and yet they are not being directed in any particular way to be creative, they just follow their instincts given the current circumstances they find themselves in.

Peter: Yes, and the circumstances here are very important. Without the motivation of the momentum generated by the people around them, much of this creativity would not have occurred. In a similar way the creativity of some individuals can lead to a burst of new knowledge or ways of approaching an issue that sets the behaviour and trend in a domain that others then occupy and follow for a while. If you look at my list of examples of acclaimed creative people you can get a sense of this – individuals inspire others to be creative in their own way, but driven from a given starting point. The study of creativity reveals patterns to this type of creative burst. It is not necessarily that there is a certain kind of person who is pre-destined to be creative although factors such as access to a domain, a culture, people who can assess and understand an idea, recognise its contribution and then take it forward, all help.

Peter's Table of Examples of Creative People

Abu Abdullah Mohammad Ibn Musa al-Khwarizmi	Persian mathematician who developed the domain of algebra, explained the concept of zero and developed the decimal number system.
Albert Einstein	Probably the best known scientist responsible for the theories of general and special relativity.
Arundhati Roy	The Indian novelist and activist whose work has won a Booker prize.
Barbara Hepworth	Artist and sculptor whose work helped to develop modern art and sculpture.
Barbara McClintock	Geneticist who was responsible for insight on sequences of DNA that can move around to different positions within the genome of a single cell and won a Nobel prize.
Barbra Streisand	The multi-talented singer, songwriter, actress, director and political activist.
Carole Ann Duffy	Poet and playwright and Britain's first female poet laureate.
Elsa Schiaparelli	The Italian fashion designer who greatly influenced trends between the 1 st and 2 nd World wars and was responsible for popularising shoulder pads.
Gabriel García Márquez	The Columbian author and Nobel prize winner for literature. Author of the seminal books One hundred years of solitude and Love in the time of cholera.
George Stephenson	The railway pioneer and first president of the Institution of Mechanical Engineers.
Han Suyin	Chinese author and physician whose novels and poetry focus on modern China and East and West cultural and political conflicts.
Isaac Newton	The scientist who laid the foundations of classical

	mechanics including the principle of universal gravitation and the three laws of motion.
Isambard Kingdom Brunel	A prolific engineer responsible for several railways, steamships, tunnels and bridges, many of which are still in use 150 years on.
Jane Austin	English novelist whose realism, irony and social commentary delighted readers in the early 19 th century.
John Bardeen	2 physics Nobel prizes: transistor, superconductivity
John Lennon	Singer song-writer and one of the founding members of the Beatles.
Leonardo da Vinci	The Renaissance scientist, mathematician, engineer, inventor, anatomist, painter, sculptor, architect and writer and acclaimed as one of the most diversely talented people to have ever lived.
Ludwig van Beethoven	A prolific composer who has been highly influential in Western music and famously continued composing despite the onset of deafness.
Marie Curie	Pioneering radioactivity scientist and winner of two Nobel prizes.
Michaelangelo	Renaissance architect, artist, sculptor, poet and engineer whose works include scenes from Genesis and the Last Judgement in the Sistine chapel and the sculptures Pieta and David.
Pablo Picasso	The Spanish painter and sculptor who co-founded the cubist movement.
Thomas Edison	The American inventor and scientist and entrepreneur who developed the phonograph, a movie camera and a practical electric light bulb.
Vincent van Gogh	The Dutch impressionist painter whose best known work was produced in the last two years of his life while suffering bouts of mental illness which led up to his suicide aged 37.
Wassily Kandinsky	Painter credited with producing some of the first abstract works in modern art and teacher at the Bauhaus school of art and architecture from 1922 until its closure in 1933.

Rod: It is impossible to deny that the people on your list have made a fantastically creative contribution to the world. They are all breakthrough innovators I guess, what you might call superstar mavericks. They are easy to quote but it is not easy for ordinary folk to learn much from them because they are way out on a pedestal of their own.

Peter: On the contrary. It is because they were so successful and made such an impact that we know so much about them and it is easy to see the many links between them. Ultimately creativity is always grounded in the minds of individuals and of course they all bring their own personal take on the world, with unique and often quirky elements that we might not fully understand or be able to explain. Nonetheless we can dig deep into any of these examples and take lots of useful information to help us understand creativity and use this to aid our own lives.

Rod: Peter in this section we are trying to get to the heart of what creativity is and I am still not clear that we have an explanation, or a definition, and I am wondering if we can get to an agreement on this. Do you think it would be helpful to agree on a definition?

Peter: There is no definitive statement for what creativity is. There are many different definitions given in academic literature and most involve a new idea, or combination of old ideas, that are useful. Koestler, in 1964, said creativity can be described as the act of making new relationships from old ideas. I tend to think of it as creating something new and of value, but you can look at the list and decide for yourself which definition works for you.

Peter's selected list of definitions for Creativity

- *'Creativity is the process of change, of development, of evolution, in the organization of subjective life.'* (Ghiselin (1952)).
- *'Creativity is the forming of associative elements into new combinations which either meet requirements or are in some way useful.'* (Mednick (1962))
- *'Creativity denotes a person's capacity to produce new or original ideas, insights, inventions, or artistic products, which are accepted by experts as being of scientific, aesthetic, social, or technical value.'* (Vernon (1989)).
An invention in this context is the design of something that has not existed before.
- *'Creativity is some sort of mental activity, an insight that occurs inside the heads of some special people.'* (Csikszentmihalyi (1996)).
- *'Creativity is the ability to challenge assumptions, break boundaries, recognise patterns, see in new ways, make new connections, take risks, and seize upon chance when dealing with a problem.'* (Herrmann (1996)).
- *'Creativity provides a workable approach to an unsolved problem or a previously unrecognized opportunity.'* (Bogen and Bogen (2003)).
- *'Creativity is an intuitive process for discovery that sometimes ends in a product, a process, an idea or just a new experience.'* (Vidal (2006)).
- *'Creativity is a captivating and stimulating aspect of human thinking.'* (Casakin (2007)).
- *'Creativity is imagination with responsibility.'* (Sae Ra Kung (2009))

Rod: I wish I hadn't asked! Once again we have a lot of different perspectives and no clear path. I guess we are going to have to get used to this in our exploration of creativity.

Peter: Well it is a huge challenge but we do not need to be defeated by it and I do not intend to be. It might be helpful to talk a little about the work of Boden in the early nineties. He identified two types of creativity, psychological creativity - called P-creativity – and historical called H-creativity. A valuable P-creativity idea means that a person has an idea which he/she could not have had before. It does not matter how many times other people have already had the same idea. A valuable H-creativity idea means that it is a P-creativity idea and no one has ever thought about it in all human history. According to these definitions, if creativity is acknowledged, it often results

in H-creativity; however, H-creativity is more difficult to achieve. Examples of H-creativity include Leo Baekeland's substitute material called bakelite for replacing shellac as an electrical insulator and the suggestion for the structure of benzene, comprising a six-member ring of carbon atoms with alternating single and double bonds by Friedrich Kekulé. Boden indicated that, according to the way that creativity occurs, it can be categorised into three types.

1. **'Combinational'** creativity - which involves novel combinations of familiar ideas. An example being the combination of a turbine and drill for dental applications. The combination of vectored thrust and the Orpheus jet engine, under the direction of Stanley Hooker at the Bristol Aero Engine Company, led to the development of the Pegasus engine used in Harrier jump jets.
2. **'Exploratory'** creativity - which involves the generation of novel ideas by the exploration of structured conceptual spaces. These kinds of ideas are often not only novel but also unexpected. Alan Griffith's theory of turbomachinery blade design based on flow past aerofoils rather than through passages enabled new designs to be effectively explored and opened up the field of turbine and compressor design. Virtual testing of gas turbine engine components has enabled new concepts to be tested across a wide range of conditions some of which cannot normally be achieved until very late into an engine development programme.
3. **'Transformational'** creativity - which involves the transformation of some (one or more) dimension of the space, so that new structures can be generated which could not have arisen before. Frank Whittle's and Hans von Ohain's transformational contribution was the combination of centrifugal compressor, combustor, turbine and nozzle technology in a turbojet to high altitude flight where the air density is low in comparison to its sea-level value.

Rod: You can give them different names but in the end they all lead to the same thing, which could be described as a surprise – something happened that noone was expecting.

Peter: It's true that each of these three types of creativity results in surprises, but only the third type of creativity is able to lead to the 'shock' surprises which involve an unusual level of inspiration and may lead to high levels of innovation. It is usually acknowledged that creativity is an essential factor for success in most occupations. In for example aviation and power generation, the safety critical nature of the industry means the need for reliable technology is paramount. Herein lies a tension between reliability on the one hand acting as a retarding factor on exploration in technology and the need for new designs which are more efficient and provide competitive advantage on the other. Such a contradiction and its resolution requires creative solutions. Charles Parsons in his development and implementation of his steam turbines was able to resolve the limited power output of previous steam turbine driven generators by segmenting the turbine into stages thereby reducing the load on any given blade row. The segmentation of compressor stages in dual spool engines provided more efficient and stable high pressure cycles and laid the foundation for modern multi-spool turbofan engines used for the majority of passenger aircraft. Identifying the source of creativity has been addressed by Couger et al. (1993) giving two possible answers to this question. One view is that creativity is origin-oriented, defined by the characteristics of the individual or their surrounding environment. The

other is that creativity is process-oriented because people assume that individuals have the ability to invoke, explore, and direct their cognitive processes toward creative goals.

Rod: This seems to bring us back round full circle to design – people seeking to design improvements into things rather than create from nothing. It's more R&D than anything else. I'm reminded of something Roger Neill said to me when I interviewed him, that although innovation does mean R&D it is so much bigger than R&D. His point is that all knowledge starts with an idea and there is always an idea lurking behind a piece of knowledge. Research is driven by questions and questions are driven by ideas. Neill seems to be saying that just researching something and asking questions about how it could be made better is just the tip of the iceberg of creativity.

Peter: Creativity is an innate human attribute present in all of us. Our very nature is to explore boundaries and see what is possible. The degree to which we do this is different in each of us. Some commentators suggest that some of us are creative and the rest copy. While it is possible to recognise and understand this statement, an alternative view is that we see a good idea and are inspired by it. A common method taught and used in technology disciplines is reverse engineering. In this method a product from a competitor is disassembled and examined. The team then attempts to determine the function of each component and how it was designed. The purpose of reverse engineering is to see if the product can be improved on.

Rod: I can see a lot of potential value in this but it still resonates design and R&D to me.

Peter: OK lets think about this differently using a further classification of 'creativity' with a small c concerning everyday life activity. Examples might include the combination of particular clothing elements, resulting in the comment 'she dresses creatively', or the technique a DIYer develops for removing wallpaper in an awkward location such as behind a radiator. This is exemplified in p creativity, whereby the thought or idea may occur to that individual for the first time in their existence, but at some time in the history of humanity, someone else may have articulated or developed that idea. Small c 'creativity' can also be associated with activity in our daily lives where we may develop a way of performing a function that is useful to us as an individual or pleasing on a personal level, but that is the limit of the experience. The idea is not an advancement within a domain, we are not able or choose not to communicate it and the idea is not recognised as significant by peers.

A witty conversationalist, unless they contribute something of lasting significance may be termed as creative in some circles, perhaps with a small c, or alternatively following the suggestion of Csikszentmihalyi we can class them as brilliant rather than creative. People brimming with brilliance can as a result of their interesting lives, live in such a way that hopefully brings joy to them and those around them but in terms of human history leave no recognisable accomplishment save in the memories of their friends, colleagues and fans. In contrast to brilliance Csikszentmihalyi uses the term personally creative for people who experience the world with fresh perceptions and insightful judgements that only they know about. The term creativity could then be reserved, if we chose such a definition, for those whose actions and thoughts change our society or culture in a lasting, meaningful manner.

Rod: I am excited by this way of regarding creativity because it is less rigid and more all encompassing. It points at creativity being a prized human attribute and an essential element in design and R&D. It seems to take the emphasis off creativity as some kind of process that anyone can get to excel at.

Peter: Except that if we say creativity is the most prized human attribute we shouldn't be surprised that for centuries we have attempted to enhance and mimic these powers with training and technology. Some creative ideas are astonishing and brilliant, while others are just simple, good, practical ideas that no one seems to have thought of yet. The history of mature markets reveals the importance of innovative approaches to maintain competitive positions. There are hundreds of creative methods available. Some professionals tend to restrict their attention to less than ten in their careers. The history of mature markets reveals the importance of innovative approaches to maintain competitive positions. The Cox Review for the UK Government in 2005 stated that 75% of company turnover in United Kingdom based industry stems from products developed within the previous five years. This indicates just how critical ideas and the product development that arises from these ideas are to the financial status of industry.

Rod: That is a compelling statistic and it takes us back to commercivity – the commercialisation of creativity – and away from pure creativity. I know you feel strongly that creativity cannot exist in a vacuum and that something can only be recognized as creative if other people decide that it is. Or to put it another way, other people have to see the value in it in order for it to count as worthwhile creativity. So I can't equate the development of new products with pure creativity, no matter how successful these products may be.

Peter: Csikszentmihalyi asserts that creativity cannot be understood by only looking at people who appear to be highly creative with a significant impact on a particular domain, the iconoclasts. While the contribution of an individual to a creative insight is a critical step, the individual is a link in a chain. Without the development of the domain, the ability to communicate an idea and the recognition of peers, an idea will not be sustained. It will therefore be critical for people working in creative disciplines such as design wishing to promote their ideas to become skilled in the communication of these ideas.

Rod: Does this mean that anything can be deemed creative if it gets the appropriate recognition from others? Can we randomly pick two items from our experience, associate them in some way and claim this as creativity? Must we limit our attention to celebrity chefs, Nobel prize winners and best-selling authors? Do we need to rely on the judgement of qualified domain experts and psychologists in order to assess whether a particular contribution is indeed creative? Or can we rely upon respected opinions. 'I know creativity when I see it' is a statement familiar to art critics and in design critiques.

Peter: Defining a creative action as the generation of a new idea of value, then we cannot accept a single person's claim to be creative. Instead it is necessary for this view to be confirmed by domain peers. Confirming this view, Brannigan noted in 1981 that an invention needed to be legitimised by recognised authorities for it to be

seen as valid. Creativity thus occurs in the interaction between our thoughts and a socio-cultural context. A creative act can go completely unnoticed if there is no-one to appreciate it or recognise it. This provides a clue for us in terms of what makes something creative. Why are some acts of generative activity ignored and others acclaimed. It is something to do with the people around us. We have to persuade the domain experts that our contribution is novel and valuable. There are many examples of significant contributions which follow this model including people such as Edison and Einstein. Einstein famously gave the spark, with the fire being generated by a generation of peers recognising the insight and adding their own contributions.

Rod: It's a kind of survival of the fittest then as far as ideas are concerned?

Peter: Yes, the recognition and survival of an idea has an analogue in evolution and survival of the fittest. Random variations in chromozome chemistry can result in the appearance of a new characteristic and if the trait provides advantages to the individual then there is a greater chance that it will be transmitted to that individual's descendents. The subconscious association of elements that go together to form an idea rely upon the host to manifest that idea within a domain, gain acceptance for the idea and if our peers rate it then there is an increased change that it will survive and be deemed as a creative contribution to be passed on within society. The cultural equivalent to a gene is a meme, a unit of information. Examples of memes are languages, theories, songs, recipes and values. We pass these on within society to be remembered. A creative contribution results in a change to a meme in the form of an improvement that is then passed on within the revised meme. Creativity is about new songs, new poems, new machines, it is about new ideas and new memes.

Rod: Creativity does not happen automatically. What effort is required for creativity to occur? What price must be paid?

Peter: In art there is a tradition that we have to master processes of production first before we are able to explore effectively, and when an artist does produce a novel approach, they know that it is novel because of their domain experience and their peers are more likely to respect the contribution because of their knowledge of the originators technical prowess. Is it actually necessary to first master a domain so that we are in a position whereby we can stretch boundaries and so that we have sufficient respect of our peers so that a contribution is accepted? A person will not be able to contribute to or transform a domain without learning and understanding its rules and basic principles and being skilled in its tools and aware of the current state of knowledge. In order to develop the domain of mathematics for example, it will be necessary to learn its rules. This is necessary in order to be able to be confident that the approach is indeed original, in order to be able to converse meaningfully with peers and persuade them that the contribution is significant. Without recognition by teachers, lecturers, curators, journal editors etc, a generative contribution is more than likely to disappear.

Rod: The implication here is that only people who are very proficient in their field can hope to be truly creative.

Peter: Our time is limited. There are 8,760 hours in a year. In a developed country with good health, you are likely to live for about 700,000 hours. Put another way our

lifespan is about 840 months. If you are 50 now then you may have about 315 months left. This may sound like lots of time. But life is full of essential tasks such as washing, eating, preparing food, getting dressed, talking to our partner, taking kids to school, travelling and recycling rubbish. All of these take attention if not dominate attention. The brain is a remarkable processor. Nevertheless our capacity to devote attention to subjects is limited. There is so much information available, so many books, paintings etc. In order to survive, and not descend into chaos, a culture needs to eliminate most of the new ideas that its members produce. So we limit our attention. We filter. We select. We would have difficulty in learning chemistry while trying to learn a wind instrument at the same time, although the sequential attention to these might appeal. Attention is a limited resource. In order to become familiar with a particular domain takes time. An undergraduate degree requires about 4,800 hours of attention and yet many professionals would claim that this is just an important step towards being able to contribute within a domain and further experience and skill development is necessary. Gladwell (2008) claims that a characteristic that major contributors within a domain have in common is that at some stage they have spent about 10,000 hours developing and honing their domain specific skills, normally between teenage years and their mid-twenties. Examples cited include the Beatles whose early years of practice combined with their constant touring and residencies before their breakthrough meant that they had explored the domain, developed proficiency and knew within themselves that they were doing something new. Their skill set meant that they were able to convince key people around them of this too.

Rod: We are moving into contradictory territory again. Now we are saying that a busy society dominated by the most intelligent and successful from within it shall decide what counts as creativity. The inherent creativity of the individual is of no great concern or interest. We are saying, in effect, that if you have the right background and connections, and perhaps the right amount of money, you can have the keys to the creative garden. It's a bit like the boss of a company listening to ideas at a brainstorm and then deciding himself what the company is going to do. Creativity is in the eye of the most senior beholder!

Peter: Not quite, although it is true that sponsors have had a significant impact on creativity. Many of the renaissance works of art of recognised importance were sponsored by city merchants, bankers and aristocrats. Some of these works required years of sustained patronage. The Florence model of patronage shows that peers are so important. Because attention is limited sponsors are all the more important – their patronage pays for our cleaning, child care, relieves us from having to teach, enjoyable though that may be, so that at key times in life we are able to concentrate and develop our skills within a domain, experiment and then apply them. The years of sustained patronage in order to develop an idea of value has a resonance today in technology development. The training of competent individuals in technology is hugely expensive requiring practical undergraduate education, expensive laboratory doctoral studies and the funding of research groups that are large enough to promote and provoke disciplinary and interdisciplinary ideas. We need sponsors in order to collect sufficient resources to enable advancements to be explored and promoted.

Rod: You are saying we need a lot of help and support if our creativity is to have a chance to get out and become valuable in the world. We can't just be creative, end of story?

Peter: An environment, spacial and social, physiological and psychological, is required that is supportive and rewarding of creative ideas. We can have all of the internal resources needed to think creatively, but without some environmental support (such as forums for proposing ideas and a culture that encourages this), the creativity that a person has within him or her might never be displayed. Some people let unfavourable forces in the environment block their creative output; others do not. Mutual affirmation in effort and conversation can give confidence to keep pushing in a particular direction.

Rod: But to some extent a person needs to be naturally creative, or have an interest in expressing their creativity in the first place, regardless of the environment they are in.

Peter: I am not sure this is the case Rod. Some people may have the ability to be highly creative and may enjoy being so but that does not necessarily mean they will be creative. Eysenck (1994) showed there is no strong evidence proving that creativity should be related to a certain personality. There are, however, indications that a creative person is often characterised by special traits of personality such as independence in attitude, dominance, self-acceptance, flexibility, radicalism, and wide interests. Generally speaking, diligence, being stubborn, gender, and being eccentric are personality traits associated with creativity. Isaksen et al. (1993) illustrated methods on how to understand creativity in people. Quite distinct from the more traditional focus, they proposed two major questions for understanding this: how creative am I (level)?; how am I creative (style)? From such personal characteristics, people can assess how creative they are by level or degree. An outcome of Csikszentmihalyi's survey of acclaimed creative people (1996) was a set of several diametrically opposed pairings of contrasting personality traits such as intelligence and naivety, playfulness and discipline, a sense of imagination and yet a rooted sense of reality, suggesting that creative people are able to cope well with distinct ways of thinking. A key characteristic of creative people is that they love what they do, whether it be music, art, chemistry, engineering or social reform.

Rod: This makes perfect sense to me. I am particularly taken with the link between playfulness and discipline, which is a characteristic I have and I have always been curious about where this odd combination comes from.

Peter: We are born with contradictory nature. We have a conservative nature compelling us to self-preservation, to conserve effort, to make ourselves wealthy or powerful or look good and an expansive nature that drives us to explore, to enjoy novelty and to take risks. Indeed curiosity and openness are essential elements leading us to be creative. A burning curiosity provides the urge to persevere at an issue and curiosity and drive need to be combined in order to achieve a new development. We need to be both conservative and expansive. However if our expansive nature is not encouraged or does not meet with early success it is possible that we become discouraged and this part of our nature can recede. Curiosity is critical in recognising that an issue is actually interesting and therefore worth exploring.

Rod: This plays back to the individual being the driver of creativity and is less supportive of the idea that creative processes are important in helping us be creative.

Processes are highly unlikely to get us all excited about the possibilities of doing something. That has to come from inside us surely?

Peter: Csikszentmihalyi came to the conclusion that the stereotype of the tortured creative genius is largely a myth created by romantic ideology, supported only by evidence of isolated cases, such as Samuel Coleridge, not the breadth of historical evidence. It is not that creativity leads poets to commit suicide, take drugs and be miserable. Rather that certain artistic scenes provide scant rewards and the work of the vast majority of artists is ignored with consequential misery for the originators. Talent, intelligence and genius overlap with creativity. A talented person is able to do an activity well. One can be talented at football and able to control the ball well. Whether this translates to being creative depends on the novelty associated with the activity.

Rod: I don't think many people would associate footballers with creativity. Surely playing football is just a physical skill demonstrated within strict rules and regulations? Not hard to do. In general footballers tend not to be very bright either, as demonstrated by how few of them manage to do anything interesting after they have retired from playing.

Peter: I think footballers can be creative people even if they are playing within a set of rules. They have to select high quality ideas – for making a pass for example – from a number of options open to them, and sometimes they may have to improvise and experiment in order to get a competitive advantage. Their relative intelligence is not such an issue. Terman (1921) showed that high IQ meant that people 'did well in life' but beyond a limit IQ ceased to correlate with superior performance with later studies showing a cutoff at around 120. The reason often cited for the drop off is that highly intelligent people become complacent and lose curiosity. Donald Campbell notes that many talented people can't think of anything to do that they feel is worth doing. IQ measures convergent thinking skills. Creativity requires both divergent and convergent thinking with the fluency to generate and consider a wide range of ideas and select which to pursue. IQ on its own with a focus on convergent thinking is therefore not a sufficient measure for creativity. It is hard to imagine a highly intelligent person seeing much point in kicking a lump of leather around!

Rod: I suppose the thing about IQ is there is not much you can do about it: you are either very intelligent or you're not. Whereas if you knew what your creativity quotient was you could probably be trained to improve it quite significantly.

Peter: There is not a clear pattern on what type of personality type is creative. Perhaps a genetic predisposition to a given discipline might be helpful. An example might be increased sensitivity to colour or sound. This might certainly provoke and enhance early interest in a particular activity or career. We can wonder whether Beethoven would have been able to have the same impact if he had been deaf from an earlier age. Creative individuals tend to not rush to define the nature of their problem. Instead they look at it from several perspectives exploring the nuances and leaving formulation of opinion open for some time. They also tend to experiment with several alternative solutions. Creative people appear able to operate effectively at the both ends of the following polarities.

- 1) They are characterised by having a great deal of physical energy but are also often quiet and restful.
- 2) They are intelligent but also naïve. You have to be able to assume that something can be done otherwise you won't have the urge to put the effort in.
- 3) They are capable of both playfulness and discipline.
- 4) They have a great sense of imagination and fantasy at one extreme and a rooted sense of reality at the other.
- 5) They tend to exhibit both introvert and extrovert traits – the stereotype of the solitary genius spending hours alone writing, exploring is backed up by analysis of interviews and biographies but this occurs in combination with meeting and listening to other people and becoming familiar with other people's work
- 6) They are humble and proud. This is characterised in Newton's famous quote 'on the shoulders of giants we stand'. Yet an important driver is also ambition and this can lead to aggression and arrogance.
- 7) They are masculine and feminine. In young people tests of creative and talented girls shows that they are more dominant and tough than their peers and creative and talented boys are more sensitive and less aggressive.
- 8) They are rebellious and independent. Traditional and conservative, but also rebellious and iconoclastic.
- 9) Passionate involvement and objective reasoning.
- 10) Long suffering and yet open to enjoyment. Being at the forefront of a discipline can expose you and make you vulnerable.

It should however be noted that it is not possible to assume the mantle of creativity by just adopting or assuming a particular personality style.

Rod: Wow! The mantle of creativity! What is that and can we measure it?

Peter: Creativity is subject to assessment all the time. We do so in our judgement of the relative aesthetic attributes of one product with another or in our appreciation of art and music. In education, the assessment of creativity is undertaken in order to provide an indication of an important human attribute and in order to motivate certain behaviour. The subject is an-going research topic. Several metrics for creativity have been developed with some focussed on the person and others on the product, artefact or system concerned. Progress in the testing of creativity arose from a desire in the US air force to select pilots who would respond well in an emergency to unexpected events such as instrument failure. As traditional IQ tests did not measure originality JP Guilford was commissioned to develop what subsequently became the tests for divergent thinking. Torrence's tests of creative thinking, TTCT, are widely used to assess divergent thinking but criticism remains that high scores on TTCT scales are not a guarantee of a person's chances of behaving creatively. Adjective check lists are also widely used to identify an individual's creative aptitude. If a person can be described with a large number of the 59 adjectives on the adjective check list, then he or she can be thought of as a creative person.

Rod: So there is no definitive or widely accepted method for measuring creativity?

Peter: No. Although the subject of over fifty years of research the assessment of creativity remains an active area of consideration with no definitive metric available.

Rod: Some of the contributors to this book are interested in the search for the perfect metric but I am curious about what use such a metric might be in the cause of commercivity. I think we already agree that companies need a wide variety of different personality types in order to survive and prosper. Roger Neill for example has worked with a lot of companies helping them get balanced teams, with mavericks teamed up with more grounded warrior-types who bring order and discipline to the maverick's creativity.

Peter: Coming up with new ideas of value is difficult, so anything that helps us get more and better could be of great help. There are also other elements that are important if you are looking to maximise creativity within your organisation. For example training, expectations, resources, recognition, hope, opportunity, reward, and even your surroundings. Some environments provide a greater degree of excitement and stimulation and can prompt individuals to experiment and explore boundaries more readily than a conventional or repressive setting. Being among people who are excited and exploring ideas can generate a hot spot where one set of ideas provokes another thus creating a snow-ball effect. Many companies, educational establishments and facilitators try and simulate such environments in an attempt to stimulate this effect. These often focus on sustenance, which has been long understood as an effective way to get people to mix and collaborate. Google and IDEO offices have embraced the importance of providing an environment that encourages mixing of interdisciplinary personnel by use of common café and eating spaces, and central corridors used by all personnel which provide for the 'accidental' meeting of two people and the associated exchanges that result.

Rod: If you are now saying that interdisciplinary activity yields breakthroughs this seems to go against your earlier comments about creativity requiring a great deal of knowledge of one area or domain. Or are you saying that mixing two or more people with expertise in different areas is what adds the extra creative value?

Peter: An example of a breakthrough occurring when an idea that works well in one discipline is applied to another was the application of quantum theory from physics to chemistry and astronomy. Does this require that we become experts in two domains in order to be able to make the leaps of insight? This sounds like a contradiction. In the past there are examples of individuals who did art, sculpture and architecture. These activities now tend to be the specialism of several people. A specialist who is able to devote their time to a particular domain will normally be able to out-perform the generalist within that domain, and therefore get the promotion, get noticed and get their activities funded. Specialism, however, may not be beneficial in terms of creative output. It can lead to fragmentation and can prevent exploration across the domain. Hence there is a contradiction in the organisation of a domain. We want to encourage interdisciplinary behaviour and yet the domain demands for expertise to act to counter this.

Rod: Many people do not work in interdisciplinary teams within their own organisation let alone across other organisations and industries, so they would probably need a great deal of encouragement to start engaging in this way.

Peter: That is absolutely right and that is one of the compelling reasons for using creative techniques. They provide a means to augment innate generative activity.

Most creative techniques can be used at any stage in a problem solving process and tend to be mainly focused on problem exploration, idea generation, and concept evaluation.

Rod: I know we are going to look in detail at some creative techniques and their practical application later on in this book. But I want to flag up a general concern I have about these techniques which is that many many employees in my experience have been very reluctant to engage in creative techniques and when they do they bring a great deal of cynicism with them, and even contempt. Johnnie Moore talks about ‘coalitions of the willing’ as a way of thinking about how to get things done in a networked world, rather than the coercion that so many companies seem to use as a tactic to get people to deliver their best work and their best ideas. Moore says that how to relate to people without coercion is a question to live in rather than answer. It seems to me that a lot of creative techniques are quite coercive. I accept this is a difficult area, because you could argue that most employment is basically coercive so it is hardly surprising that employers might insist their staff take part in creativity sessions.

Peter: One of my profound hopes for writing this book with you is that we can get some clarity around the point of doing things like brainstorming, mind mapping, or synectics – or indeed any creative exercise. These tools are very powerful if used intelligently but – you are absolutely right – can be highly destructive and demoralising in the wrong hands. Most managers inside companies don’t know how to use these tools and just end up wasting a lot of time and encouraging scorn.

Rod: Does this mean using these tools is actually quite a skilled job and therefore managers might get easily put off?

Peter: Yes and no. Basically all creative techniques attempt to influence the thinker at the time of idea generation. They function by ensuring that a problem can be understood in relatively simple terms, thereby occupying only a fraction of short term memory and supplying cues to make the search of long-term memory more efficient. In short, they are helpful in freeing up as much brain space as possible so people have the maximum chance of digging deep into their databanks of knowledge and previous experience. The Create Project, for example, offers a framework for generative activity developed in association with industry and academia and uses practices readily familiar to the practicing engineer. It is a validated framework within which to undertake the design process. Other creative techniques and design processes such as TRIZ, for example, are extremely useful for many applications but require substantial initial training that can act as a barrier to adoption.

Rod: It strikes me that it is important that we write this book in a very upbeat and entertaining way, so that the joy of being creative and stretching your creative abilities is not lost in a fog of detailed management speak. TRIZ sounds like a particular challenge in this regard!

Peter (laughing): Well yes, but it’s worth the effort! The nature of creativity involves processes that are highly complex and subject to on-going study. Nevertheless significant insights to the process of creativity have been gained enable us to take advantage of previous experience. This is particularly the case with creative methods

that can be used to augment our innate creative and expansive tendencies. Many people explain their success by being lucky and in the right place at the right time. The creativity engine shows the importance of a variety of factors that can lead someone to this view. Many famous scientists in the 20th Century recall that they were amongst the first cohorts to be exposed to quantum theory and were therefore able to explore an open domain. In the world of art exposure is critical to wider acclaim. You may have great talent but unless someone buys your work and displays it enabling you to spend more time doing new works and gaining wider exposure thereby fuelling a loop of public acclaim and new ideas then your efforts may be confined to personal thoughts and limited progress. Instead of being shaped by events in a deterministic manner, the acclaimed creatives seem to have shaped events to suit their purposes and the understanding of the creative process and use of creative techniques can be of immense value in assisting any business or individual.

Rod: Before we get into the techniques I think we should listen to what people in business think about ideas and the commercialisation of them. You can chip in as we go along, but don't frighten them please!