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Creativity and the Nurturing of Innovation

This is a very complex area and includes contributions from most aspects of the business culture and management style [C-1]. Of the many factors, which can have an influence on the existence of a creative environment, and the nurturing of innovation, the most important is the climate or atmosphere within the company. Is it a company that fosters new ideas and is willing to act on them when they arise? Is it a company that encourages individuality, allowing creative people to express themselves with some freedom of thought? Does it encourage innovation to proceed in the various pathways to the market? If the answer is yes to these questions then it is in the hands of a Manager to deliver the rewards for the company.

1.1
Definitions

Creativity represents the birth of ideas, innovation the process by which those ideas reach fruition.

The words creativity and innovation are often confused, or used interchangeably, so it is worthwhile spending a little time clarifying the nature of and differences between these two activities.

In the Oxford English Dictionary, definitions of the verb *"to create"* include, "to bring into being" or to "form out of nothing". In a term more appropriate to R&D these could be redefined as *"making something new out of previously unconnected ideas or observations"*. Creativity is therefore the process by which a genuinely new idea is produced.

This definition of creativity shows that it is an active process. It may appear that creation happens by chance, but in the context of R&D it is usually a product of much prior knowledge and thinking. It is difficult to plan for the production of creative ideas. It is recognised that some people and organisations are more creative than others, but the reasons why this is the case are not easily defined. It is the job of R&D Managers to bring their group into this highly creative bracket. The chances of this happening can be greatly improved by a judicious study of the process by which creative ideas arise.

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In the same dictionary, *"innovation"* is defined as "the introduction of novelties; the alteration of what is established" and "something newly introduced; a novel practice or method". We can re-interpret this for the industrial environment as *"the introduction of new products, application processes or services to the market based on prior knowledge"*. Thus, innovation in R&D is the generation of new ideas, which can then be used to produce these new products, processes and services. It should be obvious that this is an activity that does respond directly to planning. Certainly, at the development end of the innovation chain, rigorous planning is a prerequisite and this is covered in Section D on Project Management.

This black and white separation of creativity and innovation is fine in theory, but in practice is false. Creativity is required at all stages in the innovation chain leading to the development and introduction of new products processes and services. Creativity represents the birth of ideas, innovation the process by which those ideas reach fruition.

1.2
Total Creativity Management

Everybody can contribute to the creative process.

All functions within any successful business need to be innovative, but it is only R&D where this is paramount. R&D is the engine room for creativity and innovation within the company and this is its sole reason for existing. Consequently, if the right conditions for encouraging and exploiting creativity and innovation are not in place then the whole exercise will eventually be doomed to failure. Thus an understanding of the creative environment in which the competencies of the company are developed and exploited for its commercial well being is an essential for all managers having a technological role within an organisation.

For many years creativity and innovation was achieved in a rather ad hoc manner, only engaging those parts of the organisation as they were required, often in a linear way as this was seen as a logical progression. The more successful companies realised that this was inefficient. Blocks in the innovation pathway were only cleared as they appeared and often this lead to a resistance to change, particularly from those not involved from the start in the process of innovation.

Total Quality Management (TQM, see Section B, 3.4) is used by most companies to develop systems which can deal with the organisational problems related to the performance of the company,, but this is inadequate when dealing with the generation of new and unusual ideas which need to be commercialised as rapidly as possible. A parallel activity is required on creativity. DuPont became the leading light in this area devising what is known as Total Creativity Management (TCM) [C-2]. This originated within the R&D functions but was so successful that they set up a Centre for Creativity and Innovation covering the whole company. The thinking behind this was that, unlike proprietary "hard" technology only available to the expert practitioner, creative thinking was a "soft" technology and hence could be shared between non-

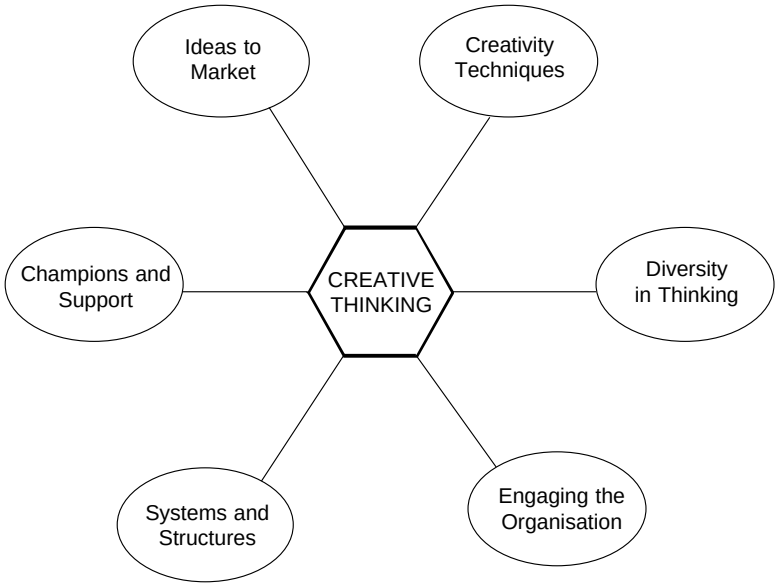


Figure C1. Six Dimensions of Creative Thinking

experts; everybody could contribute to the process, often in a challenging and unusual way.

TCM requires attention to six dimensions in the field of creative thinking. These six dimensions, illustrated in Figure C1, involve the following:

1. Learning and applying creative thinking techniques that provide new ideas that seed creative thinking.
2. Capitalising on the value of diversity in thinking preferences and styles in building successful teams and task forces.
3. Engaging the organisation so that people will surface who have a clear idea of the values and of the initiative and want to take part.
4. Setting up structures and systems to sustain momentum in the initiative.
5. Recognising and rewarding emerging champions and supports.
6. Taking the best ideas to market, applying key components of the innovative process.

It is possible to draw up a matrix of the main factors that stimulate creativity and innovation [C-1]. Those factors affecting creativity centre on the individual and the environment whilst those influencing innovation are more concerned with teamwork and organisation. There is a strong overlap in many areas, represented by the top right hand box in Figure C2. The themes of this section will cover many of these factors, whilst others will be covered in the other sections.

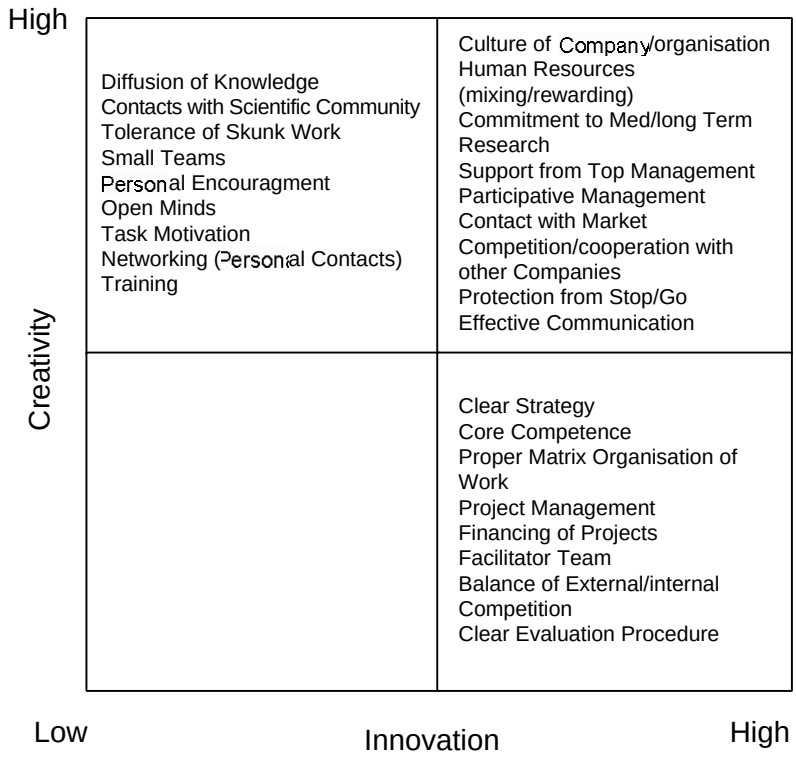


Figure C2. Factors Stimulating Creativity and Innovation

1.3
The Creative Climate

Creative thinking and the generation of ideas need to be stimulated at both the individual and company level.

Truly creative acts in science, as in life, are mostly unplanned but the provision of the "right" environment and climate are a great help in the process. The right environment does not necessarily involve a cosy and relaxed atmosphere. External forces posing a threat are often a stimulus to creative thinking, as has been experienced during the world wars of the twentieth century, when many of the great inventions influencing life in the latter half of the century were made or envisaged. It is also amazing how a group under threat of being disbanded suddenly start producing a raft of new ideas. The need for change to survive is expressed in the proverb, "necessity is the mother of invention". The arrival of a challenging technology that could threaten the survival of a whole industry is a great spur to creativity, as was experienced by the Swiss watch industry with the arrival of digital technology, and a similar effect was experienced by the photographic industry at the turn of the century.

Whilst the external climate may be hostile, the internal one within the R&D group must always be supportive for the creative individual.

Some of the most significant inventions, which seem to have happened by chance or serendipity, on closer examination often prove to have been the results of many years of endeavour and the accumulation of large amounts of data. In other words without the researcher having a goal and a chance to experiment, little would have happened. Why some people can work for years, accumulate vast amounts of knowledge, and still not be creative is another matter. Even the creative individual will under use this talent if the climate and stimulus for it to flourish are wrong for that particular person. Never underestimate the importance of the individual in the process of creation and innovation.

How can the Manager stimulate creativity? As in other aspects of management, there are factors that the individual manager can personally change or implement. The negative factors operating at a company level are very difficult to change or even influence, but recognising that they exist is a good start. Those factors external to the company must be taken as given, and Managers must work with these in mind at all times. The management style, to be used by R&D Managers with creative groups, has already been covered in Section A, 3.2. The factors that can stimulate creative thinking and the generation of ideas are as follows.

Stimulation at the individual level

- *Freedom to think*. Pressure must not be applied solely to achieve today's results. There should be sufficient time for the researcher to ask the questions "what if" or "why did that happen". Sitting down and thinking is a genuine research activity.
- *Chance to experiment*. The ability to carry out the unscheduled experiment is essential. Putting an idea to test is an important freedom in creative work. It is this type of experiment that often leads to serendipity, the genuinely unexpected result.
- *Wide contacts*. The putting together of unrelated facts to produce a new idea is aided greatly by discussions with other people. These can be other scientists, marketing colleagues and customers. Keeping creative scientists in an ivory tower is an intellectual imprisonment.

These three stimulating factors all require some "free time". The problem with most project management systems is that this is regarded as unproductive time and therefore something that can be sacrificed to meet other targets, for instance, be removed from the bar chart of a project plan. The Manager of a group, which is expected to be creative, will need to justify and fight for such "free time". This is not an easy task in an economic climate where companies are driven by cost/time considerations, but the arrival of the knowledge company and the ideas behind it, is of great assistance.

Stimulation at the company level

- *Culture*. If the company"s culture is one that has historically valued and rewarded the creative individual, this will clearly be beneficial.
- *Strategy*. The commitment to medium or longer-term research, leading to the exploitation of ideas as new businesses, products, processes and services, is integral to the company"s R&D strategy. This implies management commitment and sup-

port at the highest level. It will instil confidence in the research establishment and gain support for its activities from elsewhere in the organisation.

These elements are seen as specific in helping to create the very special climate that allows creative work to flourish. However, there are several other factors which are common to both the creative and innovative climate, and these are described below.

1.4 The Climate for Innovation

Whilst, as already stated, it is almost impossible to separate creativity from innovation; most R&D work in chemical companies can be described as falling within the innovation process. The characteristics of an innovative climate are somewhat different and more specific than those for the creative one.

- *Clear strategy and targets*. The strategy is integrated into company policy; clear targets are set for R&D down to the individual business level, by a collaborative process. There is continuity of policy, the targets are based on sound business data and are not changed before R&D has time to attain the goal. This involvement of R&D in business policy and the target setting process is a big stimulant to innovation (see also Section D).
- *Correct skills base*. In most companies innovation is geared to improving or modifying an existing product range within an established business area. This means that there must be continuity in the skills base or the core competencies of the R&D community (see also Section A, 1). An intimate knowledge of what the competition is doing is very important if the innovations from the company are not going to be imitative and reactive. This knowledge can be obtained through a variety of means, including an ongoing study of the patent literature, up to date information on the introduction of new products and processes in to the market and knowledge gained at outside meetings.
- *Project management*. The formation of multi-disciplinary teams is very helpful to the innovation process. It brings together people with different strengths and knowledge, which they can then contribute to the process. Working towards a common goal against time constraints helps to produce the many innovative steps that are needed to get the correct product, process or service promptly to the market (see also Section D).
- *Strong interaction with the market*. This is a crucial requirement, especially in a rapidly changing market environment. For example where a new technology is being introduced. Many leads are obtained, by discussion and observation on the customers' premises, which will stimulate innovation to the benefit of the customer and hence the company. These visits by R&D scientists to the customer should not be rare events. They should be integral to the process of innovation.

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