



Fractals and What They May Offer Project Management

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For many, a simple mention of the word “fractal” is sufficient to induce dread; a hideous throwback to all the worst feelings of inadequacy that high level mathematics that can induce. However, readers who move beyond any initial aversion are rewarded with a deeper understanding of some of the most beautiful shapes, patterns and series that nature can offer and how such infinitely complex shapes can be defined in the most simple of ways. River networks, mountain ranges, snowflakes lightning bolts, coastlines are all examples of structures that conform to the concept of fractals.

A fractal is a pattern that repeats itself at every level of scale.

Consider a tree. It consists of a central stem (the trunk) with a number of major branches emerging from it. Take just one of those major branches, however, and the pattern repeats. At this next level of scale the major branch replaces the trunk and the previous place of the major branches are taken by minor branches. Take each of these minor branches in isolation and again, the pattern repeats. In the case of true fractals this pattern repeats ad infinitum regardless of scale and whether you are using a telescope or a microscope.

Many readers will be familiar with the work of creative artists who have used this principle to create fantastic computerised and animated art. They give the sensation of continuously “zooming in” on an image but at each and every scale of inspection, the same pattern repeats. The attraction to mathematicians lies in the fact that once the simple repeating pattern is understood, it can be used to describe something that is either infinitely big, or infinitely small. The attraction to Project Managers lies in the fact that projects may also conform to the concept of fractals.

Consider a Work Breakdown Structure. Project Managers use these to decompose the scope of their projects through three or four levels to create Work Packages. These are then handed over to a Work Package Owner. In practice each of these Work Packages is a sub-project and the Work Package Owner the manager of the sub-project. They then decompose their sub-project into Work Packages which in turn become sub-sub-projects.

The pattern repeats. Applying this to a very large project such as the 2012 Olympics and initially taking the perspective of LOCOG then a work package for the project may be the construction of the main stadium. Responsibility for this will be handed over to a construction company who in turn will see themselves as the managers of the Main Stadium "project". They may identify the steel structure as "Work Package" that is handed over to a specialist company who in turn see themselves as the managers of the steel structure "project". For a project as large as this we can see the same repeating pattern cascade through very many levels of the procurement chain.

Alternatively, readers may wish to consider the "Plan-Do Check-Act" Cycle. This pattern is at the core of the iterative model of project evolution, but it is, of course, a fractal; it can be applied at any level of a project. For instance consider the Crossrail project. At the highest strategic level of the project, perhaps twenty years ago, someone grappled with the problem of overcrowded public transport in the city. Having considered their options within the "Plan" stage and they decided to "Act" by constructing the enormous Crossrail facility over the next ten years. At some point in the future, say twenty years after the new tunnels are operational, someone may well "Check" to see if the overcrowding problem still persists and if it does they may well "Act" to commission another, similar project. In this interpretation it has taken us approximately 50 years to complete one trip around the cycle but consider the same project but at another scale. Consider just one member of the enormous project workforce, perhaps a person fitting a PA tannoy at one of the stations. In the morning they will "Plan" what they are to do that day before "Acting" to complete it. Towards the end of the day they may "Check" whether they had achieved what was expected and "Act" by either accelerating the pace of work or else bringing forward tomorrow's work. It's the same project and the same cycle as earlier but this time navigated in an 8 hour shift rather than the 50 years described earlier. Whether we are looking at this enormous project on the macro or micro scale, or indeed at any scale in-between, we are seeing a very, very simple pattern repeating itself.

How then this does help us manage projects? Two areas are of interest.

Firstly it provides for describing projects and their sub-elements. Consider the appearance of both an oak tree and a fir tree. They are very different yet they both conform to the earlier description of the tree using fractals. The differentiation is achieved by specifying aspects such as the number of major branches per trunk and the angle of the major branches to the trunk. These dimensionless ratios are constants and are sufficient to describe, and hence contrast between different trees. It holds out the prospect of describing and hence comparing projects by reference to simple ratios such as the number of "children" to each "parent" within Work Breakdown Structures projects; or the ratio of time spent "Planning" to that spent "Acting". Empirical research may even be able to point to optimum values of these ratios for different types of project.

The second area of interest relates to control. If the pattern established at the macro scale, i.e. at the highest levels of the project, is indeed repeated at each and every level of reducing scale then it holds out the prospect of being to exert influence over the entirety of the project by just focusing on the top level. A simple pattern of appropriate behaviour established here will determine the pattern to be followed by everyone working on the project. Such a massive impact for such a modest effort is a tantalising prospect for any project manager, and indeed for the topic of project management.

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