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Successive cost estimation – successful budgeting of major projects

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Abstract

Project Management and Cost Engineering have made tremendous advances but we still witness all too frequent severe budget overruns and delays. A solution to this mega problem of budget overruns actually exists. Use of the Successive Principle has demonstrated this during the later decennials. It has demonstrated in tough practice that it is possible to make accurate, unbiased statistical prognoses of the factual project cost or other important key figures. The results reported here may be surprising, given the well-known history of cost overrun. In Scandinavia these principles have been widely accepted by top management and authorities. It has improved professional project management. A proper documentation is recently available in the form of two independent datasets of major public projects. This documentation and the key principles are summarised in this paper.

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Keywords: Cost estimation; Estimation methodology; Major projects; Risk management; Scheduling

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1. Introduction

Project Management (PM) and Cost Engineering (CE) have made tremendous advances during many decades. Nevertheless, we still witness all too frequent severe budget overruns and delays, especially among larger projects. Many authors have documented this. This introduction does not grant room to give a complete overview of this theme, but gives a brief overview as background for presenting successful recent results from Scandinavia.

Internationally the most referred source for claiming project cost overrun is the famous Standish Group (2004) "Chaos report". It shows depressing results in a large sample of ICT-projects, and this source is not alone in claiming most projects go wrong. Other credible sources include Flyvbjerg, Holm & Buhl (2002, 2003). Their result of a large analysis was that 90% of an international set of large projects had cost overruns, generally of a significant size. They also found significant overestimations of project benefit. They further documented that no improvement could be seen over many decades. This dataset is dominated by public megaprojects. Merrow (2011) documents that the situation is not much better in private sector: 65-75% of industrial megaprojects fail on business targets. Based on 318 industrial megaprojects his analysis indicates that there are seven recurring reasons for failure, among these are cutting corners and spending too little time and effort in the front end. The projects in the analyses above are generally large and complex. This makes the question of size interesting – does size matter? Odeck (2004) studied this by analyzing a complete sample of all public road projects in Norway for a 3 year period (1992-1995) – a total of 620 projects. His results indicate that small projects have even worse results than large projects – the cost overrun was even more frequent and relatively larger in small projects. On the positive side, he also documented that the total share of projects having cost overrun and the average size of overrun was less than indicated in international studies. To summarize this; we know for a fact that historically projects have had a strong tendency for cost overrun – large or small, private or public – and over time.

Similarly, the studies on cost overrun also look for reasons behind the cost overrun (and corresponding benefit underperformance). Flyvbjerg et al. (2002, 2003) argues that a main problem is that planners and promoters often deliberately underestimate costs and risks and overestimate the benefits in order to increase the likelihood that their project gets approval and funding. This view is supported by other studies as well – there are political or strategic reasons for cost overrun. Similar reasons are identified by Merrow (2011) in business projects, and in addition he point to inadequate cost estimation and risk assessments. We know that there are strategic and tactical reasons for projects to experience cost overrun and benefits underperformance. These reasons need to be understood and handled well to improve PM performance.

Another set of reasons for cost overrun are known to stem from human judgment, as documented by Kahneman & Tversky (1979) and later excellently explained by Kahneman (2011). Lange (1985) disclosed this reason in a master's thesis: Subjective expert evaluations are typically biased by several psychological pitfalls. A well-known scientific paradigm is typical for engineering culture; to focus only upon documentary matters, and avoid dealing with subjective, non-documentary matters. Consequently, subjective matters were considered only superficial if at all included. Despite scientific methods for cost estimation did exist, a still larger part of a budget or schedule rested upon subjective expert evaluations. Inspired by this observation Lange identified from psychological literature more than 20 pitfalls when making such quantitative evaluations. This was an eye-opener in Scandinavia and initiated a different way of thinking about how cost estimation should be done in practice.

Traditional tools and techniques for project planning and management were based on deterministic logic, although leading scholars early realized this was not sufficient. When theory tried to cope with uncertainty in these traditional methods, it became very complicated. The tools became increasingly challenging, especially for small organizations. Uncertainty was seen as almost impossible to handle, while using the classical statistical theories towards planning and estimating the fuzzy future. The existing procedures were either too primitive or too difficult to operate. This realization sparked a development in Denmark in the early 1970's that initiated the story reported in the next section of this paper.

2. Untraditional research efforts during the 70s and 80s

Successful results in scheduling during the 1960s came from the use of the Program Evaluation Review Technique, PERT, one of the well-known Critical Path Methods. It introduced the triple estimate to measure