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REDUCE OPTIMISM BIAS
INTRODUCTION TO REFERENCE CLASS FORECASTING

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ABSTRACT

Project planning often contains several elements of optimism bias. Even when project planners are aware of the potential to do so, overly optimistic cost estimates and schedules are produced. Also, all too often, risks tend to be overlooked or downplayed during the planning process. The tendency to "bake in" overly optimistic outcomes into project planning, per several well-known, analytical studies, is simply human nature. Information, supporting this tendency is presented within this paper.

Several different approaches and guidance have been developed and deployed by different professional organizations and government agencies to help alleviate overly optimistic project planning. This paper introduces the concept of Reference Class Forecasting (RCF) which, when properly implemented, can improve project planning and more accurately predict final project outcomes. To implement RCF it is important to identify relevant past projects, or applicable elements of past projects, that can be used as reference points or benchmarks. Once these relevant benchmarks have been established and converted into a meaningful reference class distribution, project planners can use these known, external elements, for comparison to help alleviate optimism bias in their project plans. Recognition and treatment of project risk is also improved through this process. This methodology can produce a project plan that is more likely to approximate a project's outcome.

INTRODUCTION

One might consider that optimism lies at the very core of human nature and the primary factor contributing to the survival of the species. Without this common characteristic, the human species might have disappeared. It is inherent in everything we do, the way we think, and in every venture planned and pursued. Therefore, before entering a discussion of reference class forecasting (RCF) to improve project planning and forecasting, it is important to understand this tendency.

When considering Maslow's Hierarchy of Needs, which states that people are motivated to achieve certain needs and that some needs take precedence over others. The basic physical survival needs for food, water, shelter, for example, are not likely to have been achieved without optimism first providing the motivation to achieve. The philosopher, Aristotle, is credited with the statement that "courage is the first of human qualities because it is the quality that guarantees the others". However, courage might be considered as the successor to optimism. There are normally failures, large and small, in most human pursuits, but optimism prevails as the driving force to continue against all odds.

As one delves deeper into the relationship between optimism bias and overly optimistic project planning and forecasting, several bodies of work have been published in this regard. To better understand how optimism can skew project planning and forecasting, the reader might consider the work of Princeton psychologist, Daniel Kahneman, who won the Nobel Prize in economics in 2002 for theories of decision making under uncertainty. Other more recent publications by Daniel Kahneman, Philip Tetlock and Dan Gardner, and Bent Flyvbjerg provide further insights for consideration when performing project planning and forecasting. Another interesting phenomenon put forth by Dan Lovallo and Daniel Kahneman in the Harvard Business Review, is that executives routinely exaggerate the benefits and discount the costs when planning major initiatives. Also, risks are often downplayed or ignored. A myriad of social influences oppose the project planner and RCF is a tool that can help provide more realistic project plans and outcomes.

REFERENCE CLASS FORECASTING

As previously discussed, humans are eternal optimists. Unfortunately, this tendency often skews even the most diligent project planning and forecasting efforts. When considering project planning failures, one cannot expect a successful outcome without consideration of past lessons learned and implementation of measures such as RCF to help reduce the inherent optimism that is "baked-into" the human psyche.

RCF can be described or defined as a method of predicting the future by looking at similar past situations and their outcomes. When this approach is taken, the past outcomes provide more reasonable expectations for planning and forecasting. A quote often attributed to Albert Einstein defines insanity as "doing the same think over and over and expecting different results".

To be useful, the application of RCF requires much preparation that planners and forecasters may not understand, and, to an even greater extent, have time to fulfil. Another difficulty encountered when developing a viable RCF database and cost model, is the lack of project information and sharing of information between entities. For example, the historical cost and time required to excavate a cubic meter of contaminated soil, package, transport and dispose will be dependent on several variables including topography and location. However, other variables might also include the cost of craft labour, equipment rental costs, and costs for packaging that will meet the project technical specifications. Therefore, while a unit cost might be developed and available at a higher level of the work breakdown structure (WBS), cost norms developed at lower levels of the WBS often involve proprietary information not shared between contractors or entities involved in competition for the same work scope.

Data Mining

Companies or organizations involved in an industrial or business sector often have years of project information buried on their servers that can be used for RCF. To use this information, projects and specific tasks must be researched, and, cost data from this research, must be extracted and assembled into a relational database that can be queried according to a set of specific parameters. This might be referred to as data mining. As with all data sets, a more extensive set of data points or cost norms associated with a specific work activity will ultimately yield a higher degree of accuracy when used for project planning and forecasting. However, anomalies or data points that fall far off the plotted cost norms should not be included in the reference data set. An illustration of potential data points that fall outside the norms for a specific activity can be visualized in the table and graph presented below.

Table 1: Cost to Excavate and dispose of one cubic meter (m3) of contaminated soil.

	Labour	Equipment	Materials	Transport 10 km	Disposal Fees	Total
Project A	$75	$7	$50	$15	$15	$162
Project B	$85	$7	$45	$15	$15	$167
Project C	$90	$15	$100	$30	$50	$285

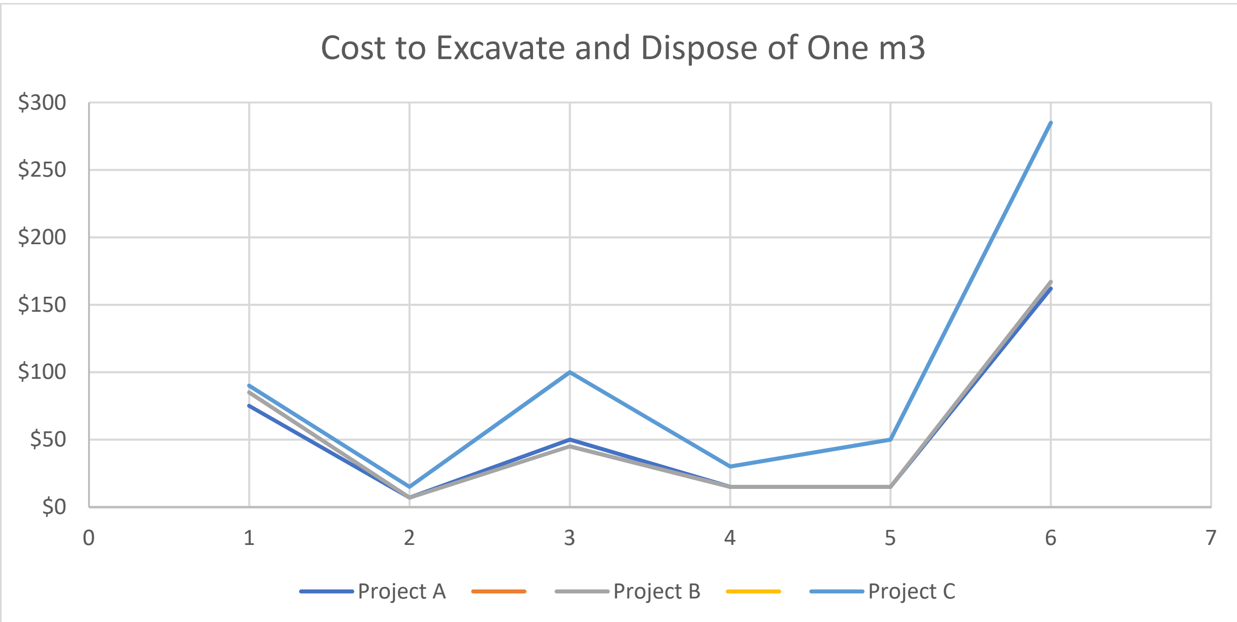

Figure 1: Project C - Data Points Are Far Off the Cost Norms

Per the simple above illustration, cost data from Project C falls too far off the norms encountered in Projects A and B and therefore should be excluded from the reference class of data to be used for forecasting.

As data is extracted and assembled into a database, new information should be continuously gathered and populated into the database. Also, information from outside sources should be sought through alliances with other companies, entities or already existing within the public domain. Sharing of data can often be beneficial to all involved. This might be accomplished through something as simple as a memorandum of understanding (MOU) which defines how information will be shared amongst the parties along with a non-disclosure agreement (NDA) to restrict sharing of information with other parties.

Building an RCF Cost Model

RCF data and development of a cost model that can quickly access historical costs or documented industry cost norms, based upon well-defined queries, can provide many insights and help assure that some of the inherent optimism bias in project planning and forecasting is alleviated. As the reference class data set is developed, queries should be designed, refined and tested to assure that the intended results are provided.

The expertise to build a relational database and to develop queries will take an additional amount of time to develop but is not difficult. There are likely several people within an organization that are already familiar with this type application or that can learn this within a few hours.

In general, based upon the reference class data set of cost assemblies available, an RCF cost model can be adjusted for use within any industry for planning of demolition or construction along with typical schedule durations. Note that schedule durations are a by-product of labour hours and/or crew size noted in the reference class information. The basic criteria required to query the RCF data set requires two basic sets of information be defined. First, the type of facility or infrastructure must be defined according to either its historical or future intended usage along with a standard of measure (e.g. square meter of surface area) commensurate with the data held within the RCF database. For example, planning for demolition of a nuclear process facility would require that the facility be classified as radiological and that the square meter size of the facility be defined. Also, the major construction characteristics such as framing, or special construction characteristics must be defined. This would be the first look-up query of the database to find a preliminary match. Second, the look-up query must be further refined to amend this basic estimated unit cost per square meter. This refinement should be based upon certain key parameters or known historical usage such as surface contamination or irradiated components or features. All this can be accomplished through a pre-defined set of questionnaires which form the basis of the database query. This automated approach will expedite the look-up. However, a less sophisticated approach would be to manually search the RCF database and find similar unit cost norms and then make parametric adjustments according to size and complexity of the unit. This approach therefore provides a reality or sanity check that exceeds what is often referred to as engineering judgement and helps alleviate some of the inherent optimism bias.

CONCLUSION

Historically, most large or mega projects overrun the original planned costs and schedule duration due to optimism bias, failure to capture, consider, or use historical costs for planning, and failure to implement lessons learned. Forecasting can be greatly improved through RCF and lessons learned.

REFERENCES

Curbing Optimism Bias and Strategic Misrepresentation in Planning: Reference Class Forecasting in Practice, European Planning Studies, Vol. 16, No.1, Bent Flyvbjerg, 2008.

Delusions of Success, How Optimism Undermines Executives' Decisions, Harvard Business Review, July 2003, Lovallo, D. and Kahneman, D., July 2003.

Elements of Critical Thinking: A Fundamental Guide to Effective Decision Making, Deep Analysis, Intelligent Reasoning, and Independent Thinking, 2018, Rutherford, A.

Eliminating Bias through Reference Class Forecasting and Good Governance, Concept Report No 19 Chapter 6, Bent Flyvbjerg, 2007.

Inside the Planning Fallacy: The Causes and Consequences of Optimistic Time Predictions, Buehler, R., Griffin, D., Ross, M., Cambridge, UK: Cambridge University Press, 2002.

Intuitive Prediction: Biases and Corrective Procedures, Kahneman, D. and Tversky, A., TIMS Studies in Management Science, Volume 12, 1979b.

Super Forecasting, The Art and Science of Prediction, Tetlock, P. and Gardner, D., 2015.

The Accuracy of Hybrid Estimating Approaches, Case Study presented at PMI® Research Conference, Washington D.C., Liu, L., Wehbe, G., & Sisovic, J., 2010.

The Green Book, Appraisal and Evaluation in Central Government, HM Treasury, 2011; GAO Cost Estimating and Assessment Guide, Chapters 11-16, 2009.

Thinking Fast and Slow, 2011, Kahneman, D.

Underestimating the Duration of Future Events: Memory Incorrectly Used or Memory Bias? Roy, M., Christenfield, N., McKenzie, C., Psychological Bulletin, Vol. 131, No. 5, 738-756, American Psychology Association, 2005.