

Handling Indeterminism – Key to Improved Software Project Management

H. Sarojadevi

Professor and Course Manager,
Embedded System Design Centre
M. S. Ramaiah School of Advanced Studies, Bangalore

Abstract:

Uncertainty in project management is widely recognized problem in lot of software industries. Strictly “deterministic” estimation of time and effort, in addition to overseeing risk factors, are the main causes. With good vision, and closer analysis of the project, majority of the uncertainty factors can be identified. Proper measures and best practices must be adopted to prevent problems due to indeterminism rather than cure it later. Care should be taken from all perspectives – such as people, processes and tools.

Key Words: Software Project management, Indeterminism, Estimation, Sizing, Project risks

1. INTRODUCTION

Visualize a flock of sheep enclosed by five hurdles. By removing one hurdle or loosening it, the sheep run amok. Analogous is a situation in project management. Indeterminism creeps in the moment we neglect any of the factors affecting estimation and planning. In this paper we see how to break the barriers of indeterminism and bring in predictability to project management. Key requirements in such an endeavor are – accurate estimation, skilful leadership, Innovation and learning, practicing effective and efficient ways, and efficient risk handling. Equipping ourselves this way helps us easily juggle quantity, quality, cost, and time, thereby manage the projects in significantly better way.

2. REASONS FOR UNCERTAINTY

Key reasons for uncertainty are as follows. Appropriate strategies as addressed below, must be made to overcome uncertainty.

2.1 Estimation Inaccuracy

Any inaccuracy in understanding the problem with reference to four critical aspects such as, Complexity, Size, Capability and risks, can lead to estimation errors, thereby uncertainty. Accepting the fact that estimation is an uncertain process, it is always done within upper and lower limits. If the final outcome is within $\pm 10\%$ of the actuals, such an estimate is treated as 100% accurate.

Precise sizing and interpolation of data from the past helps arrive at an accurate estimation. Function point (FP) technique is the most efficient way of software sizing [1]. Being a functional measure, it can be directly applied to structured or object oriented methodology. Using FP we can derive *Lines Of Code* (LOC) measurement. However deriving function point from mere LOC – termed “backfiring” - is not advisable, since this may lead to high levels of error. Feature point technique needs to be used

for sizing an algorithmically intensive project or R&D project.

Key factors affecting software estimation are shown in Figure 1. This data is based on an expert study [2]. Factors shown in the figure are largely correlated to each other. Requirements, from the point of sizing, scoping, clarity, and stability, constrain estimation accuracy to more than 50%. Design aspects such as architecting, coding, along with testing estimates affect overall accuracy to 20%. Timelines with dependencies and complexities take a large share of 80%. Internal and external risks are really risky, affecting more than 80%. Not being process compliant means poor or unpredictable ways of preparing the software. This can adversely affect the estimates. Basically, we need to follow the best practices of - properly architecting the software (needed even for enhancements, if there is an influence on overall architecture), best designing, conducting code review process¹, early unit testing (during development), and thorough system testing. Rework, though not encouraged by an architect, needs to be taken into account in the context of detection and correction of defects.

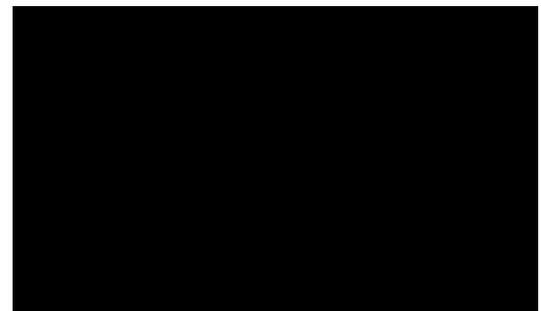


Fig. 1 Factors Influencing Estimation Accuracy

¹ Code reviews are often considered cheaper ways of testing - bring out 60-80% defects.

Above all, the rate of software, based on the features offered, technology used, and many more frills that we provide, decide the baseline estimation. Further, cost of change is considered to have an exponential impact on the estimates. Clear understanding of the customer requirements, nearly perfect architecture and design with majority of risks foreseen can help bring down the changes.

2.2 Lack of Effectiveness and Efficiency

Effectiveness is doing correct things; Efficiency is doing it correctly – process comes into picture. We need to adopt correct strategies and take well-judged steps from the introduction stage itself. Product penetration into the market must be made with high quality for high income. The process steps may be imposed in-between growth and maturity stages of a product.

2.3 Waste and Rework

Waste and rework must be reduced to bring down the cost while increasing the quality. Following the best practices, use of templates, automation tools, and correct methodologies helps in achieving this.

2.4 Mismanaging 3 S's - Superiority, Sustainability and Simplicity

We must be competent and visible to be superior in the market; have strategies such as making good promotional offers, to maintain sustainability in the market; adopt simplicity to stand the test of the market.

2.5 Not being Paranoid

“Paranoids only survive” - Being paranoid about risks helps address uncertainties in futuristic manner. All perceived threats need to be diagnosed and properly treated so as to reduce them, and to increase opportunities. Developing high level of risk attitude is necessary. Risk professionals may be employed to reduce project uncertainty.

2.6 Innovation and Learning

Allowing free flow of ideas, knowledge sharing, and innovation, to a great extent, helps avoid uncertainty. Innovation and learning is a 4 step process –

- i. Variation - new ideas are generated by deliberate problem solving, research, or random occurrences
- ii. Selection - new ideas are recognized and selected for reuse
- iii. Retention - new ideas are saved in central data store for use across organization
- iv. Distribution – ideas thus stored are distributed to all those working on projects, be it local or distant, allowing viscosity of information. Thus people become highly skilful, and get a vision that helps reduce uncertainties.

However, due to certain competency traps² such as Fear of failure, Fear of blame, Coupled Projects (change in one

² A competency trap is an established but inefficient way of working.

affecting the other), fear of losing innovation, contracting policies, can contribute to uncertainties. The nature of project management such as rigidity and being *closed* also cause barriers to innovation. Rigid evaluation criteria, rigid resource utilization, and rigid control are detrimental to progress. Creation and nurturing learning is important for maturity, and to avoid uncertainty. Adoption of Nonaka and Takeuchi's (N&T) learning cycle can boost learning [3]. The essence of N&T approach is that organization and individuals need both implicit³ and explicit⁴ knowledge to be competent and such knowledge must be imparted using the learning cycle.

2.7 Leadership

Leadership traits are very important for managers to combat uncertainty. Results of research over last 60 years show that a good leader is more intelligent and competent than the followers. Additionally a leader is task-oriented, person-oriented, directive, and participative. Having characteristics of transformational leaders is essential for managers [4].

A good leader adopts mediation and not negotiation as a policy in conflict resolution [3]. When two parties are in conflict, both of them should be made to understand that they both are on one side and it is the problem that is the root cause of conflict, on the other side.

3. CONCLUSION

Indeterminism at work is challenging and needs treatment at the earliest for successful project management. We need to innovatively strategize to bring in predictability at all levels, considering various factors discussed here. Project plan needs to be prepared efficiently, addressing indeterminism in factors such as time, cost and resources.

REFERENCES

- [1] R. Mell, L. Santillo, “Function Point Estimation Methods: A Comparative Study”, Data Processing Organization, <http://web.tin.it/dpo>
- [2] “Software Estimation and Function Point Analysis”, Workshop by Binary Essentials Consulting Ltd. Bangalore, May 2005
- [3] Tom DeMarco, “The Deadline A Novel about Project management”, Dorset House publishing, 1995
- [4] “Project Manager, Project Leader”, Project Manager Today, April 2005

³ Tacit or ingrained skill that people and project management community have, which they draw subconsciously to do their work.

⁴ Codified knowledge - in the form of best practice and guidelines for that particular project and organization - often written into the project management procedures.