TASSC

technical paper

Software Estimating – A Return On Investment

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Making a small initial investment (a tiny fraction of the overall cost of a software project) in a measurable, repeatable and reliable method of estimating duration and cost at the outset of a project can provide a potentially large return.

Despite the readily identified attractions and benefits of an accurate method of estimating, it is recognised that all investment in information systems infrastructure needs to be cost-justified and must demonstrate a tangible return on investment.

In this paper, we examine and discuss key issues facing major companies as they assess their current approach to software project estimating. We explore various scenarios for Circa – a software estimating and planning application – and present a framework for prospective customers to model their own business benefits using their own productivity metrics and cost base.

Our Mission

real project experience

Managing software projects and delivering high quality software systems on time and within budget is central to our business.

a standard approach to software estimating

As part of our mission to share that knowledge and experience, we have developed a number of cost-benefit models, which can be accurately quantified to give a precise measure on the return on investment of adopting a standard approach to software estimating.

Measuring Return on Investment

tangible benefits

Establishing a measurable, reliable and repeatable method of estimating duration and cost of software projects can bring a range of quantifiable benefits to any organisation:

- speed and efficiency of producing project estimates
- confidence in constructing a viable bid for carrying out a software project
- increasing accuracy of estimates over time based on actual metrics gathered
- assessing the impact of change during the project
- reliable estimates based on a standard formalised method

intangible benefits

As well as providing quantifiable benefits, a formal approach to software estimation also provides a number of less obvious, intangible advantages, which are harder to quantify but can represent a significant improvement to the way in which an organisation operates.

These intangibles are especially important for software development organisations where there is a drive to improve the overall process, to enhance quality and to develop systems in line with business needs and user expectations.

Circa provides organisations with an opportunity to encourage end-user involvement in the development process. By producing instant forecasts to take account of changes in the project, such as new requirements, Circa provides end-users with a direct appreciation of the impact of their change requests. Involving end-users in this process increases their understanding and fosters an atmosphere of co-operation and trust.

The Cost of Estimating

software estimating takes time and costs money

Software project managers are becoming more attuned to business realities and face increasing pressure to consistently deliver productivity improvements and cost savings. Many are required to produce bids and justify, in detail, project costs, delivery dates and resource requirements.

Feedback from many companies indicates that typically it can take 2 people up to 3 days to calculate the resources, timescales and costs for a medium-to-large size software project and to organise this information into a practical set of tasks. Re-forecasting when changes occur during the project (for example, requests for additional functionality or personnel changes within the team) can take at least as long again.

This means that potentially 12 man-days could be consumed in estimating and re-forecasting during a project. At an internal cost of, say £400 per day; this can amount to as much as £4,800.

Circa reduces the cost of estimating

Because Circa calculates estimates rapidly, there is an immediate benefit in terms of saving time and reducing the cost of producing project estimates.

Even if only half the effort required to produce estimates is saved (given the need to capture the variables for calculation) then it still represents a saving of £2,400 per project just in terms of raw project management time.

Bid Accuracy and Project Profitability

Every organisation needs to assess the size and scope of a proposed software project in order to understand the financial implications of doing the work, particularly if it is necessary to construct a proposal or bid in order to win the business.

This is critical for a commercial software house or systems integrator, and is becoming increasingly important for internal development organisations as companies continue to move toward devolved business units and cost centres.

constructing a viable bid

Accuracy of the bid is essential if the business is to be profitable. Constructing a viable bid is perhaps one of the most difficult and delicate exercises faced by software project management. Project managers, being responsible for the development of a proposed system, need to satisfy the conflicting requirements of those who will use the system, and those who are paying for it.

An under-estimated bid will inevitably lead to a combination of time and cost overruns, to an unhappy customer, and possibly to financial penalties. This in turn will impact the profitability of the project, and indeed the entire company.

An over-estimated, cautious bid may cover all the costs with a contingency margin to spare, but with too many contingencies the bid will not be competitive and the business will be lost.

open and honest negotiating

Circa has been designed as a cost-effective tool for use in competitive bid situations to demonstrate how a particular duration and cost has been reached (and to highlight where competitors may be undercutting unprofitably, so putting the customer and their project at risk).

This transparency allows both the software supplier and the consumer to determine, with confidence, whether it is cost-effective to proceed, and by how much. Moreover, Circa allows the software supplier to openly negotiate and re-negotiate the functionality, time, resources and cost implications of the changes that inevitably occur as the project unfolds.

Controlling Project Costs

the impact of project overruns

According to The Standish Group in The Chaos Report, the average cost of a software development project for a large company is $2,322,000; for a medium company, it is $1,331,000; and for a small company, it is $434,000.

In this context, making a small investment (a tiny fraction of the overall cost of a software project) in Circa as a reliable method of estimating is a very small, not to say insignificant amount. This is especially true when compared to the cost of delay due to poor initial estimation, and the difficulty of re-forecasting during a project.

The Standish Group discovered that the average cost overrun on software projects is a staggering 189% of the original cost estimate, and the average time overrun is an unbelievable 222% of the original time estimate.

If a project is delayed by as little as 10% due to poor initial estimation, or to the lack of re-forecasting during a project, then the duration and cost ‘surprises’ (for the customer and for senior IS management) are potentially disastrous.

All software projects have some form of business justification or economic return in that they will either save money or make money for the end customer. For every week that a project is delayed, the business is not able to realise that potential economic benefit. This can be calculated in precise terms that the business can justify.

If the economic return from the new application is £25,000 per month, then the cost of delay will be £25,000 for each month that the project is 'late' (or just under-estimated).

Ensuring deadlines are realistic and achievable has a critical financial impact for the end user. Similarly, for the software producer, who has to continue to devote precious resources beyond the expected delivery date, there is also a significant cost.

Resource Justification

people are the single biggest cost on a project

One of the key duties of a project manager, and often of the business sponsor of a project, is to demonstrate the financial justification for a particular investment in new systems development. On a software project, it is almost always the people who represent the single largest cost factor.

Obtaining and justifying appropriate personnel levels is a continuing source of frustration for many project managers. It is the project manager who needs to ensure that the number of personnel on a project is kept small (to minimise costs), but is sufficient to meet delivery dates and functional requirements.

Circa provides a common basis for determining what resources are required by the project in order to satisfy a given set of requirements, and to present this information coherently to executive management, both textually and graphically.

As the project progresses, and the inevitable changes occur (the business requires earlier completion or the users ask for more features) the impact of those changes can be rapidly assessed and the need for more resources or more time can be clearly demonstrated.

Balancing System Requirements, Cost, Timescales and Resources

achieving cost/functionality balance

The amount of time and effort in any given project can be fine-tuned by using the powerful forecasting capabilities of Circa. The duration of the project, the number of people, the mix of skills and experience, and the resulting staff costs can all be modelled against the system requirements.

Sitting with a prospective customer, the project manager can organise the system scope in such a way that only the mandatory requirements are developed first. The essential system features can be identified and estimated, and then lower priority features can be incorporated into the calculation incrementally until the optimum cost/functionality balance is achieved.

Proven Metrics

a metrics knowledge base from hundreds of projects

The provision of a set of productivity and technology metrics embedded within Circa gives a head start to any organisation, but especially those in the early stages of adopting object, component or web-based development.

These metrics have been derived from actual data captured from hundreds of software projects. Organisations will benefit immediately from this existing knowledge base, whilst those with some experience can easily substitute their own metrics.

improve accuracy with custom metrics

The benefit to an organisation of gathering and using actual metric data, tailored to their personnel, technology and processes, is the ability to produce more and more accurate and reliable estimates over time.

From Confrontation to Co-operation

an open process encourages understanding

One of the goals of software process improvement is to provide a co-operative framework in which users and the IS delivery organisation can work effectively. This is unlike the adversarial situation where users express their frustration at the lack of business understanding and knowledge in their IS colleagues, and the IS department are equally frustrated by users asking if extra functionality can be 'squeezed in' without any impact on project cost or delivery date.

Circa encourages a co-operative approach to discussing and agreeing the various dimensions of system functionality, development personnel, project costs and delivery dates. It offers an open process, demonstrating the impact of changes to the different variables and allowing users and IS to discuss collaboratively the optimum way to meet both their objectives.

Reducing Risk

new tools and techniques introduce risk

Moving to a new way of working, such as the introduction of objects or components, means the introduction of an element of risk. New development techniques need to be learned (such as UML for analysis and design), external skills may need to be brought in, new tools and technologies understood, and new management techniques adopted (for example iterative development and incremental delivery).

The process of estimating and forecasting for this new approach is also different, and many organisations have yet to establish a track record of experience on which to base software estimates. Allowance must be made for the relative inexperience of team members on the early projects (and then adjusted later as their experience increases) and the impact of new technology must be assessed.

The accuracy and reliability of the estimates that can be consistently produced by Circa helps to reduce the risk on software projects. Circa encapsulates experience drawn from hundreds of software projects that can be drawn upon immediately, giving the project manager and his business sponsor a high level of confidence – in even the early estimates.

Circa allows project managers to profile the experience and skill of individual developers in each development activity, and takes account of this in the estimation algorithms. Circa also encourages risk assessment, allowing project managers to identify risks and assess their impact and probability of firing. This data is then used in algorithms to calculate a sensible level of contingency to be applied to estimates of project duration and cost.

Introducing a Standard Approach

the value of standards

The introduction of Circa allows organisations to adopt a standard approach to estimating software projects. The template facilities give a common start point for the estimation process across all software projects. They allow managers to share common metrics and technologies, process structure, resources and team structures, standard production activities and project risk profiles.

This means a lower learning curve for new project managers leading their first development projects, and eliminates the need to re-invent the wheel for each new project. The overall benefit is realised in time saved and a consistent, reliable and rigorous approach across the whole organisation.

Conclusion

deliver quality software on time and within budget

Circa injects realism into the project estimating process for object, component and web-based software projects. The underlying knowledge base, compiled from the experience of hundreds of commercial software projects, provides unparalleled accuracy and consistency.

The intuitive user interface and speed of calculation means that the viability of software projects can be quickly and easily assessed and, for the first time, proposed software projects can become demonstrably quantifiable at the outset.

The ease and transparency of producing estimates with Circa allows all project stakeholders to participate and so forms the basis for meaningful dialogue.

For a growing number of organisations Circa has helped to inspire confidence in the project planning process, and has increased the likelihood of delivering quality software systems, on time and to budget.