



Getting Business Requirements Right

Fixing the highest-leverage stages in the System Development
Life Cycle

EXECUTIVE SUMMARY

The later in the system development life-cycle that major errors are discovered the more expensive it is to fix them: defects found in released software are 80 times more expensive to fix than defects found in the specification stage. But the earliest stages of the systems development life cycle (SDLC) are most often the least consistently executed. “Defining Project Scope” and “Eliciting Requirements” are, in the terms of the Capability Maturity Model Integration (CMMI), neither repeatable, defined, nor managed well - let alone optimized.

This paper describes a methodology that brings the early stages of the SDLC up to a high level of maturity: consistent, proven, and optimized for success. This drastically reduces the downstream problems that plague many IT projects, and substantially enhances the predictability of cost and timelines. The larger the project, the higher the risk, therefore a sound business and software elicitation and definition methodology is an essential element in the selection of an ERP system, or in contemplating an enterprise-class application.

The methodology focuses on two intertwined steps, defining project scope, and eliciting requirements, solving the problems that account for 98% of the errors in these two stages:

- How do you know if the requirements are complete?
- How do you know if the requirements have been correctly and unambiguously identified?

This paper provides the answer to these questions, and how to get this answer this in a highly compressed timetable, putting a project on a stable foundation, and engaging stakeholders to secure their buy-in and enthusiasm.

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THE EXECUTIVE VIEWPOINT ON INVESTMENT IN TECHNOLOGY

Large-scale systems projects fail with alarming regularity. The predictability of schedule and budget is shockingly low. The Standish Group reported that the typical project over-ran its budget 189%, and over-ran its schedule by 222%. With this kind of industry track record it's no wonder that CIO credibility is at an all-time low.

A combination of technology improvements (e.g., software development kits, configuration management systems, and automated regression testing) and process improvements (e.g., CMMI and ISO 9000 standards) has been proven to make a big difference. Research from a number of sources shows that an investment in software productivity improvement can yield as much as:

- 67% reduction in rework costs.
- 30% to 40% reduction in schedule lengths
- 90% reduction in defects.
- 350% increase in productivity gain.

But the time needed execute these large-scale change programs, and achieve benefits, is likely to be from four to six years. In the meantime, following the 80:20 rule, one can gain substantial, tangible, and immediate impact by focusing on the few really critical processes.

The dominant reason for failure in any systems development / implementation project is the same as it always has been: poor execution of the early stages in the project: Defining Project Scope, and Eliciting Requirements. A NASA study reports:

The seeds of problems are laid down early. Initial planning is the most vital part of a project. The review of most failed projects or project problems indicates the disasters were well planned to happen from the start.

And a controlled study by Carnegie Mellon's Software Engineering Institute (SEI) found that the most important factor in improving software development was the way a company did its "requirements elicitation and management."

GETTING BETTER AT REQUIREMENTS ELICITATION AND MANAGEMENT

Two basic principles underlie an effective approach to the first steps of system development or implementation:

- Project scope cannot be known until requirements are fully elicited (indeed, available research shows that the typical project scope expands over the life of the project by 50%).
- Proper requirements elicitation has to be conducted at the task level of process flow, data flow and business rules for scope to be properly assessed.

These two principles dictate that the first two stages in the SDLC are completely intertwined: the so-called waterfall method has to give way to an iterative method. And this method has to be repeatable, defined, and managed.

The starting point for most projects is a high-level description. The description of the Mouse Management System in the sidebar is very typical. It provides:

- basic information on the intended functionality
- a list of the stakeholders involved
- desired next steps

The Mouse Management system...

One mission of *[our company]* is to provide resources to the scientific community in the form of research mice, knowledge, and related services. The focus of this project is on related services. We provide custom breeding, dedicated supply, mouse testing, cryo-preservation of mouse embryos and sperm and other services for colonies of mice provided by the customer or ordered from our inventory of 2500+ different strains of mice.

After contracts are signed, base information about the contract and associated projects need to be captured. If mice come from the customer, they must be "imported" (re-derived) or quarantined to safeguard the other mice we maintain. Initial information about the mice is captured here as well as inventory information. Contracts specify particular deliverables associated with various activities we would perform with the mice. These activities as well as the inventory need to be tracked. Reporting to the customer on the status of the project and deliverables is a requirement. Mouse colony management requires access to all of this information. Interfaces for this application would include inventory data collection, various applications for testing (ex. Lab Animal Health and Genotyping), order processing, Importation, possibly Cryo-preservation, a LIMS (Laboratory Information Management System, Cost Accounting in the future.

An 'elicitation-based' method like IAG's Requirements Discovery Process™ is a highly predictable way to move, in one step, from an ambiguous description (as illustrated to the right) into the activity and task level detail needed to actually describe scope.

The key to an effective methodology is to use a common unit of analysis as the basis for both the project scope and the detailed requirements. The most effective unit is the *business activity*. In the Mouse Management case, a few examples from the text are:

- Receiving a mouse from a customer
- Recording a contract

So it is that, even from a simple description, you can begin to identify the 50 or 60 activities that constitute the system. **A key underlying issue: with the right techniques the analyst does not need to be a subject matter expert in 'mouse management' to begin scoping and decomposing the system. The expertise required to be successful resides in being able to proactively ask the right questions – based on a solid, methodical foundation.**

The importance of the business activity is that the scope of the project can best be defined by the activities it includes. In addition, in the process of requirements elicitation, you can achieve sufficient detail that it becomes much easier to establish whether an activity is in-scope or out-of-scope (e.g. from above: is transport and customs brokering part of the above system?). In other words, the business activity stands as the mediating mechanism between Scope Definition and Requirements Elicitation.

The difference in approach is shown in the figure to the right. The use of business activities both firms the scope and assures that requirements are more measurably complete.

The upper part depicts what happens if you start with fluffy scope definition, and then hand it off in a waterfall approach to a poorly-defined requirements elicitation process: you end up with a set of requirements that are blurred and ambiguous, and the project scope is left unchanged. The lower part depicts a different approach, where the project scope definition and requirements elicitation steps interact through the common unit of analysis, to attain a clear project scope, and a complete set of unambiguous requirements that can be mapped against it.

THE POWER OF THE BUSINESS ACTIVITY AS A UNIT OF ANALYSIS

The power of the business activity is also that it is easily understood by users, and translates nicely into statements of required functionality that can be included in an RFP, or further defined for development. Further, activities provide an ideal unit of analysis for organizations that wish to adopt use-case-like or UML standards. The importance of this is that:

Every activity has a set of stakeholders that “own” that activity and who must reach consensus and signoff on requirements. When our team is organizing 30 to 300 stakeholders through elicitation and sign-off, this relationship is critical to setting up the facilitation sessions and performing validation and acceptance.

These stakeholders, and others who enact the process today, can describe what they want, and what they do, in non-technical terms (e.g., describe the process and data flows), and communicate with business analysts very efficiently.

It therefore takes a predictable amount of time to work with stakeholders to elicit and document this information.

In addition to these user-friendly aspects, a focus on business activities ensures that the right information is captured for the downstream development and implementation stages. The kind of information that can be organized by business activity includes:

- The stakeholders
- Detailed descriptions of each activity, its steps for primary flow and the variations that occur (at essence, this is a use case)
- The information requirements to support the process that must be captured, processed, or used to support the business activity
- Exceptions to the primary flow and other business rules
- The context in terms of process and organization, interdependencies, and a degree of change from the existing process.

Once you have captured these information elements for an agreed list of in-scope business activities you have 92% to 95% of the project scope identified. This empirically derived statistic supports the first principle, that project scope cannot be fully known until requirements are completely elicited.

In practice, and using activities to define scope we’ve found that the overall number of activities and estimate of project magnitude will stay approximately the

same as a client proceeds through further stages of discovering and clarifying requirements. However, the names of the activities will shift as the meaning and intent is clarified. This clarification will mean removing some activities where the stakeholders realize there is redundancy (e.g., two stakeholders using different words to describe the same process), and adding others that were not at first apparent (e.g., finding a piece of interdependent functionality that must be included). Keep this in mind: scoping a project using activities is excellent for quickly sizing a project, but, the focus must be to drive out thorough business requirements if the organization expects to control the project effectively through the development process.

GETTING THIS INFORMATION

The way to produce unambiguous, correct requirements is to organize the process of eliciting requirements intelligently. The best defense against incorrect facts or inconsistencies is to improve the way stakeholders are engaged and brought to consensus on a requirements specification. Success factors include:

Pitfalls in a common alternative

A common alternative to involving all relevant stakeholders in a joint requirements session is sequential interviewing. This suffers from serious pitfalls:

- Requirements elicitation takes four times as long
 - The probability of reaching full consensus amongst all stakeholders is low.
 - The likelihood of missed functionality is high.
 - The repeatability of the process between project teams is low.
- Having a disciplined and repeatable method for controlling requirements sessions, led by a skilled facilitator
 - Having all stakeholder groups represented when discussing an element of functionality they use or require
 - Using a modular approach that enables these stakeholders to discuss a manageable amount of system functionality in business terms
 - Having tools to document requirements quickly enough that participants can readily validate them
 - Using a sign-off approach designed to confirm that consensus was gained amongst the stakeholders on the process and data flows of each functional aspect of the system.

We use Use Cases and process/data modeling to describe each business activity. Candidly, we find that this format communicates extremely well to both business and technology stakeholders because it is easy for users to visualize,

and it is effective at pulling out the processes and business rules in unambiguous terms. Additionally, it ensures that requirements are elicited at a sufficiently detailed level that the group can discuss the precise process flow, data, and business rules associated with activities within the scope of the system. The biggest gap we see – consistently – at companies is that requirements teams are either:

- ***Too technology focused:*** starting with the functionality of a software package or other technology and trying to retro-fit the business need onto the technology seldom works well for larger cross-functional initiatives. Similarly, projects that are seen as purely 'IT initiatives' tend to fail if there is any potential that the project impacts workflow in the organization.
- ***Do not capture information flow:*** a process description which does not include the information elements needed to support the process at its various steps is just insufficiently clear for an IT shop to build the application.

Only in a carefully controlled session at this level of detail will group dynamics take over to drive out inconsistencies in requirements. Only at this level of detail can individual participants be challenged by others on their assertions about how a particular process works. When stakeholders then reach consensus at a task level, the risk of factual errors and inconsistencies is minimized.

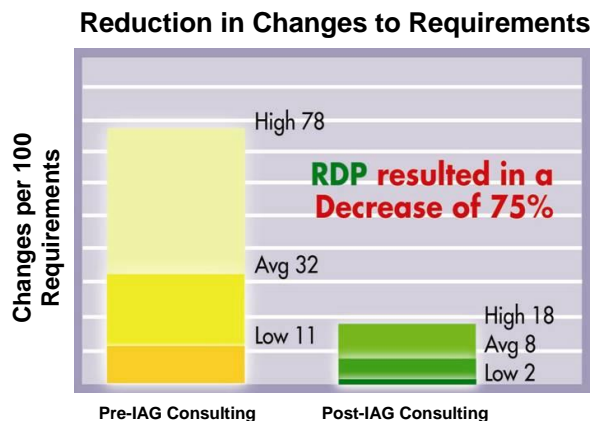
IMPACT OF HIGHER QUALITY REQUIREMENTS ON COST AND QUALITY

Those who haven't attempted requirements elicitation at this level of detail may feel that the added layers of detail come at a significant cost in time. This is not true. In our studies with clients and in over 1,000 engagements, we've found that better quality requirements will significantly reduce the time and cost of systems development and implementation. These findings will occur regardless of the approach to implementation – outsourcing, off-shoring, package selection/integration, or in-house development. Candidly, as an organization looks toward outside vendors for either a package or outsource solution it is simply in the best interest of the client to create a clear, unambiguous, enforceable contract for services. This type of contract cannot be created in the absence of unambiguous requirements.

Every executive knows: change requests cost money... In fact, the average project has about 30% rework. This means – for every \$1 million in project

expenditure, \$300,000 is spent redoing something that was thought to be complete. **Make a candid assessment of your own development efforts – especially the larger ones and ask – “is rework on these projects extremely high (>30%) in our organization”?**

IAG set out to prove that rework could be substantially reduced through the implementation of a more disciplined requirements elicitation and documentation methodology. The findings show that the average organization working with IAG was able to reduce the number of changes to requirements by 75%. For the average organization that has 30% or so rework on projects, this translates into a direct cost savings of over 20% on the project budget. For organizations that have poorer requirements definition and control practices, clearly, the numbers become significantly higher.



This savings is typically realized either as direct project cost reduction – or in avoiding overruns. Remember, the average project that overruns, will do so by 222%, so the savings are extreme for any company running projects in excess of \$500,000. Saving 1 project from overrunning has a \$1 million benefit. All of this is achievable by maintaining an iterative approach to requirements development – but – requires that project teams be more thorough in the first phase.

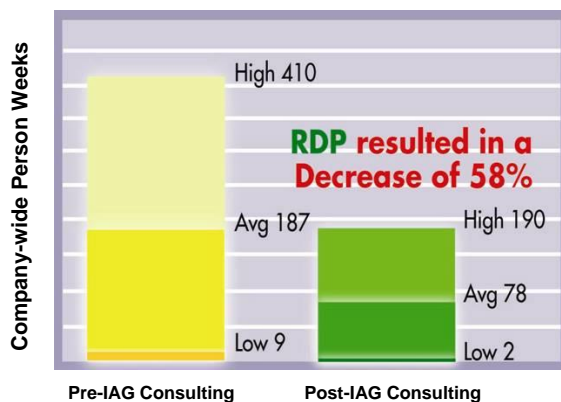
Ours is an iterative process. However, with excellent elicitation of requirements and a more thorough process, stakeholders simply have less need or desire to make changes to requirements as the project progresses through development.

IMPACT OF HIGHER QUALITY REQUIREMENTS ON STAKEHOLDER TIME TO DO REQUIREMENTS

We strongly suggest companies push for higher quality analysis of needs very early in the project life cycle. Sometimes, stakeholders will push back suggesting that they cannot take the time to do the business and software requirements using a more disciplined approach. Our findings, again measured over 36

projects show that organizations which do not adopt a more disciplined approach to requirements extraction are actually expending 140% more person weeks of effort than they could have expended had they simply chosen to expend the effort up front defining business and software requirements in a more systematic way. In monetary terms this means: Even if a nominal opportunity cost of \$1,500 per person per week is assigned to those projects from the study illustrated to the left, the average project which does not use a structured requirements extraction approach will consume approximately \$163,000 more in staff costs than the comparably-sized project that does use a structured approach to requirements gathering.

Reduction in Total Requirements Cost



Think of projects that overran time and budget overall. Ask yourself, did that project also overrun the expected or budgeted time allocated for stakeholders and analysts assigned to the project? Overwhelmingly, the answer is “Yes”. This anecdotal exercise reinforces that poorly controlled elicitation of needs from stakeholders is tightly correlated to projects that overrun budgets.

CONCLUSION

For many IT departments it has been easier to focus on technology solutions such as integrated development environments and configuration management systems, than to grapple with the “non-technical” solutions that drive project success. Yet there is no pay-off to building an incorrectly specified system efficiently. The essential, high-payoff step in the SDLC is to execute scope definition and requirements elicitation in a controlled manner, relying on proven tools and methods. Consider this, the findings from our own research, and these other studies presented show that it is possible for an organization to drive in excess of 20% of its cost out of the IT organization if that organization is doing an average or poorer job on defining its business and software requirements. Very few areas – even full systems outsourcing or off-shoring – offer such significant savings opportunity within the technology department.

The benefits from taking this step are immediate, in terms of increased momentum and consensus from system sponsors, and lasting, in terms of substantially lower costs and risk across the whole systems development life-cycle.

ABOUT IAG CONSULTING

IAG specializes in business and software requirements. Since 1997, our company has worked with 300 of the Fortune 1000 companies, completed over 1,300 requirements projects, and trained more than 100,000 business analysis professionals. Our organization focuses on a practical and practiced approach that is efficient for all stakeholders in both business professional and information technology departments. We bring measurable gains to our clients:

- Reducing time needed to complete requirements
- Ensuring completeness in documentation and reducing change requests
- Issuing RFPs where vendors can bid accurately and clients get better terms
- Reducing costs in systems development
- Salvaging troubled projects

CONTACTING AN IAG CONSULTING SPECIALIST

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