

Four Rs of Software Process Improvement

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Process improvement projects can be difficult to start, keep on track, and assess results. We can use the same requirements gathering and specification techniques that we use on product projects on our process improvement projects. This paper discusses how to define requirements for process improvement projects and how to use reviews and retrospectives to assess the results of process improvement efforts.

Software projects are hard to do correctly; many of us have started process improvement projects to make our projects work better. Process improvement projects are not particularly easy either. I recently saw the following ad on the Web:

There is a bright future ahead on the right road to process improvement. We know the right road and all the steps in it to achieve process improvement success. Our experts will guide you, making sure every step is aligned with your company's goals and everyone in the organization is headed in the same direction.

If only it were that simple. We could call in the experts, hand off our process improvement projects, and live happily ever after. Unfortunately, every process improvement project is different, because each organization has its own culture and problems.

I apply the following standard project questions to discover the motivation behind my process improvement project:

- What outcomes do you expect?
- What are the desired process improvement results?
- What do you need to do to know about those results?
- What are the process improvement requirements?
- How will you know you have achieved those results?
- What techniques will you use to review, test, and measure your process improvement project?

Use Results to Generate Requirements

Process improvement projects are supposed to create new capabilities in an organization—to affect *how* you perform the other projects in your company. What drives your process improvement project? What capabilities are you trying to change? Those new capabilities are your results.

Management does not always clearly

state its desired results. Your managers may think their directives are the desired results. Look beyond the directives to find the real business results. I use context-free questions [1] to get at the results. Context-free questions might be:

Who are the clients of the process improvement project?

What does a highly successful solution look like?

What is that solution worth to you?

Why are these results desirable?

Following is an excerpt of a conversation I had with a senior manager (SM):

SM: We want to reduce cycle time.

JR: Why?

SM: We want to get our products to market faster, so we can improve our return on our product development investment.

JR: What return are you getting now, and what return do you want?

We discussed the total costs of development and support from some previous releases and came up with a specific desired business result:

Reduce cycle time in order to double the return on investment (ROI) from major releases.

This is very optimistic, but at least we understood the context of the changes we would have to consider.

If you receive directives for process improvement, discuss reasons behind the directives. Work with management to discover the business requirements, true desired results, and the context of your process improvement. Create specific and measurable requirements that make sense to everyone involved—management, the product development staff, and the process improvement project team.

All too often, directives for process improvement produce sneers and cynicism from the technical staff. They are cynical because they may not believe the managers are interested in process improvement. Sometimes technical staff perceive process improvement as a fad-of-the-month. Sometimes the technical staff is sure this is some other thing management has decided would be good for workers to accomplish instead of the product development work. When you define specific and measurable business results, you can avoid or minimize much of that cynicism.

Table 1 gives examples of how to convert mandates/directives to business results.

Table 1: From Directives to Results

Directive	Cynical reaction	Possible business reasons for process improvement and specific results
Be at Level x by y	Pass an audit. I wonder if those guys are from the IRS.	Introduce and maintain new project management capabilities. Be able to proactively manage projects, anticipate risks. These new project capabilities would increase our ability to ship product on time, and decrease customer support costs by half.
Reduce cycle time	They think we are wasting time, probably surfing the Web. They just want to make us work harder.	Our customers want us to ship more features faster. If we can get each release out faster, we can sell more products and increase our market share by 30 % in two years.
Ship more features	They want us to put the kitchen sink into every release. They think with process, they can make us put more features into each release.	Our customers want more features, but it is difficult to work on multiple releases in parallel. If we could define appropriate life cycles and development techniques to release more features per year, we could increase revenue by 40 % annually.
Reduce costs	Uh-oh. We know what costs they want to reduce—us!	We spend too much time on rework during each project and after the project ships. If we knew different ways to work, we could avoid generating patches and fixes, and work on new products. We could reduce maintenance costs by at least 50%, and put the money toward new product development.

Define Your Process Improvement Requirements

Once you have specific, measurable business results—the context of your process improvement project—you can determine the rest of the process improvement project's requirements.

If your organization fails to define and manage requirements, your process improvement effort will sputter and probably fail. To succeed, you must identify your requirements, verify them against your results, manage them through the project, and test the new process against the requirements. It is not simple, but it is the right way to improve.

Identify Your Process Improvement Requirements

After asking context-free questions, define the users, attributes, and functions [2] to identify the process improvement project's requirements.

Users

Who are the favored and disfavored users?¹ Are there primary or secondary users? Users might be the sponsoring management, potential assessors, the technical product development staff, and the product development management. You might decide that customers are not direct users of the process improvement project. You may decide to prioritize the needs of the primary and the other users. Identify the disfavored users, especially when you rank user needs. If you do not know who your disfavored users are and address their needs, your process improvement effort will fail.

One organization identified its technical staff as its primary users. The potential customer assessors are secondary users. They are creating a process that serves the technical staff first, and serves their assessors second. This organization does not appear to have disfavored users. They do not have coding cowboys, royalty, or busybodies who interfere [3] with the way work is done now.

Attributes

Do you want to be able to better predict how long your projects will take? Is project performance an attribute, such as being able to support a quarterly release? Is cost to market an attribute of your projects? How testable, visible, auditable,

maintainable, controllable do your projects need to be?

Another organization decided that time to market, in the form of a quarterly release, was a crucial attribute for their products. When it planned its process improvement project, the organization knew it could not complete the effort in one quarter. It wanted quarterly deliverables from its process improvement project, in the same way it wanted quarterly deliverables from its product projects. Part of the organization's process improvement was culture change across the organization and across every project, including its process improvement project from long release cycles to repeatedly delivering small chunks of functionality on a quarterly basis.

Functions

What activities does your process improvement project need to perform? Many of those activities will be the same for your product projects as your process improvement projects: meet, communicate, negotiate, design, implement, examine, review, test, etc. Will it be a permanent ongoing project, or will it have an end? Should you bring in the functional groups across the organization, or only across product development?

One organization working on a concurrent engineering life cycle decided that it wanted its process to make certain the right people participated at the right time on the projects. It chose to have a specific design phase in the organization's process improvement project so it could discuss and test how to make design happen concurrently in its product projects.

Another organization made a business decision that it would not have any dedicated process people—the technical managers are responsible for defining and improving its product development processes. One attribute of the organization's process improvement activities is that it chooses to take one area for improvement and work on it for a year. That attribute affects some of the organization's functionality, project retrospectives. Each year, it holds a project retrospective where it reassesses its activities and results and decides on the next area of improvement. (I am not advocating this approach, but it appears to work for this organization.)

After identifying process improvement requirements, you can verify them.

Verify Process Improvement Requirements

If you do not verify your requirements, you will not get the business results you want. Verifying the requirements helps define issues and find defects in them.

Your business requirements define the context of your problem. The user/attribute/function description defines the whole customer or stakeholder problem. Review the process improvement context and problem together. If they align, you are set. If they do not, go back and talk to management and the rest of the people you have worked with so far.

Once you have reviewed the requirements within the process improvement project team, hold a technical requirements review with your management sponsor(s) and your process improvement team. Review the requirements with the technical staff, too, as a way to make the project more real to them, and to dispel any cynicism. Use your process improvement project to show the rest of the organization how early and how often review can improve the entire product.

Manage the Process Improvement Requirements

Process improvement projects are subject to the same kinds of pressures as product projects are. They are frequently under time or resource pressure, particularly if the staff is not dedicated to process improvement. Someone, somewhere, will want to change the requirements. Manage the process improvement project's requirements as you would manage other project change requests. The questions you ask for product projects apply here also:

- What implications does this request have on the users, attributes, and functions?
- What are the schedule implications?
- Will the request change our ability to meet the desired business results?

Test the Process Improvement Requirements

Every time you define or change the process improvement requirements, test them. I prefer to test process improvement requirements in a variety of ways:

- Verify that requirements meet all personnel levels of process improvement

Top Management	Does top management enable the process you are creating? Can it change what it does to make this new process work?
Middle Management	Does this process address how to do the work? Can the work be managed this way?
Technical Leads, First Line Managers, and Supervisors	Can they follow this process to make it work? Can they create a project plan with the process embedded in it?

Table 2. *Process improvement levels and definition*

and function [4] as in Table 2. I apply use cases to do this as part of the user-attribute-function matrix development and testing.

- Verify that requirements meet desired business results with technical reviews or walkthroughs with technical staff.
- Inspect the requirements for defects.

Choose the appropriate verification technique for your work products.

Role of Reviews in Process Improvement

All successful process improvement initiatives incorporate reviews. Process improvement is about changing the culture of your organization to achieve certain business results. Reviews reflect the culture of your process improvement project. When you perform walkthroughs, reviews, and inspections, you show the rest of the organization that you are willing to examine your work products. Reviews in your process improvement project will change the culture from where you are now, to one that is closer to an egoless programming culture [5].

Use your requirements verification activities to show how walkthroughs, reviews, and inspections can help product projects, as well as process improvement projects. Gain consensus on the requirements with technical reviews. Inspection is an appropriate technique to discover defects in your requirements, or in any of the other work products. Walkthroughs are excellent for training purposes.

One powerful approach to performing technical reviews on requirements is to ask what is missing and why. When you ask these questions, you send specific messages to the organization:

- You want to know what is not working so you can avoid it in the future.
- You are willing to question your work.
- You want to know problems and differences between the desired state and current state of product development.
- You are open to changing the culture of the organization.

You show you are willing to review your process improvement activities and process improvement project, and that you are open to change (you are not trying to be the process police). As process improvement staff, if you show that not only are you open to change, but that change is expected and desired, the rest of your organization may have less resistance [6]. Changes in results are the reasons for starting a process improvement project.

Results: How Do You Know You Achieved Them?

You have defined and verified your desired results. How do you know when you have achieved them? Are you meeting your users' needs? Are you meeting your defined attributes? Does your process improvement look successful?

Retrospectives

Process improvement projects can benefit from mini retrospectives as you proceed, and from major retrospectives as you achieve major milestones. What can you learn from your progress to date? Are you keeping your business results in mind as you define your requirements? Are you testing the process with the technical staff, to verify it meets your requirements *and* their requirements. Are you working in ways you want to continue, or is there a better way to do your work? What are you having trouble changing and why? Is there something you have missed?

Retrospectives model the behavior you are looking for as part of the process improvement results: to look at what you have done, and improve on the past as you move forward. If you are not afraid to look back at your work and learn from it, the

rest of the organization will be more likely to do so also.

Measurement

Aside from in-project and post-project reviews, you can measure results. If you are not sure how or what to measure, consider the goal-question-metric paradigm [7] to define your measures. The goals here are your business results that you derived from the context-free questions. From your results, ask questions that help you figure out when you have met the goal. Measure the answers to those questions. (See Table 3.)

Changing your process via process improvement is supposed to produce the desired results. Use measurements to track your changes and results, and keep your process improvement project on track.

Summary

Process improvement is all about changing the results our organizations currently have. These results will change our culture, so we have numerous stakeholders for process improvement projects.

Use your requirements elicitation and definition skills to derive desired results and the requirements that drive them. Use reviews as a testing mechanism for requirements and results, then ensure that all your stakeholders' interests intersect with your process improvement results [7].

Where appropriate, use your process improvement project to model product-project behaviors. Test pieces of your process on your project (sometimes called "eating your own dog food"). When you test the pieces, focus on the desired results.

Model the behavior you want your software projects to exhibit, especially the behaviors of requirements identification and management, and reviews. That will help you meet your desired results.

You will find that your right road to process improvement with requirements, reviews, retrospectives, and results.

Table 3. *Example of results management*

Goal	Reduce cycle time to double ROI from major releases.
Questions	For the last few major releases, what are current cycle times and the current ROIs? What size were the releases, and what was the staffing level? How much time did the staff work on these projects? Did the staff have to share time between projects? Is there anything else that affects ROI?
Measures	Track the last few releases of cycle time and ROI. For each release, staff effort by week over the project. (Include other measures for any of the other ROI related questions.)

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Note

1. Disfavored users work in a way that is counter to the system. Hackers, coding cowboys, and test gatekeepers are examples of disfavored users.

About the Author



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The Determining Factor

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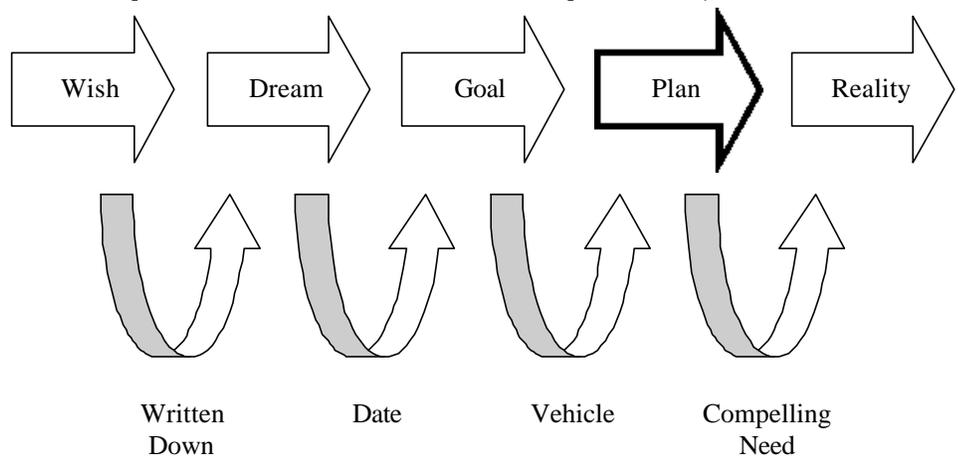
During the past six years in the process improvement consulting world, we have found one common factor in successful organizations. Not surprisingly, organizations that have failed share the same factor, or rather the lack of it. This determining factor is strong senior-level sponsorship. The Software Engineering Institute's Managing Technological Change (MTC) course demonstrates the power of sponsorship during the "roles" section. The course helps organizations identify key barriers to change efforts at any level. The senior-level sponsor is the "authorizing sponsor." This is the one person who can say "yes" to economic or strategic issues when everyone else says "no" and the effort proceeds anyway. This is also the person who can say "no" when everyone else says "yes" and the effort stops.

Throughout the many workshops, courses, and seminars we have given, sponsorship always becomes the main issue. If an organization has strong sponsorship, the chances for success increase exponentially. But a sponsor must do more than bless an effort, give it some funding, and direct the improvement group to make the project happen. A successful improvement effort needs a committed sponsor, not just an involved sponsor. The best way to define the difference between committed and involved is to make a comparison between a chicken and a pig in breakfast. The chicken is involved by giving its eggs and the pig is committed by giving its life. Senior-level sponsors need to exhibit commitment.

Leadership is influence. A strong sponsor has to establish and foster a vision, define the compelling need, establish a management team that turns the vision into reality, and stick with it until the end. A sponsor needs to lead with vision, not manage by it.

Four initial building blocks are needed to start improving an organization: a mission, a vision, goals, and a strategic plan. Only the sponsor can move an organization from the strategic plan to reality. Far too frequently, organizations minimize the importance of a mission, a vision, goals, and strategic planning. Senior-level managers find these tasks to be unrewarding and to be in the way of doing their real work. But this is their real work.

The following model demonstrates a method of bringing an organization from the status quo, or an ad hoc environment, to an improved reality.



The first step in this process is the wish, or the original ideas and thoughts on how an organization can improve. A wish does not become a dream until it is written down. This is critical. Too often, sponsors think their organizations know what the sponsors want. Organizations will never know what their sponsors want until the sponsors tell them.

A dream becomes a goal when a date is given to it. Sponsors need to be leaders who are willing to draw the line in the sand. The organization's goals, coupled with a chosen vehicle, will yield the organization's strategic plan. This vehicle typically is