Carnegie Mellon University
Research Showcase @ CMU

Software Engineering Institute

10-2009

Insights on Program Success

Software Engineering Institute

Systems and Software Consortium, Inc.

Follow this and additional works at: http://repository.cmu.edu/sei

Recommended Citation
.

This Technical Report is brought to you for free and open access by Research Showcase @ CMU. It has been accepted for inclusion in Software Engineering Institute by an authorized administrator of Research Showcase @ CMU. For more information, please contact research-showcase@andrew.cmu.edu.

Insights on Program Success

A Joint Publication of the Software Engineering Institute
and the Systems and Software Consortium, Inc.

October 2009

SPECIAL REPORT
CMU/SEI-2009-SR-023

Unlimited distribution subject to the copyright.

http://www.sei.cmu.edu
http://www.software.org

SYSTEMS AND SOFTWARE CONSORTIUM
BUILDING BETTER SOLUTIONS TOGETHER

Software Engineering Institute | Carnegie Mellon

The Software Engineering Institute is a federally funded research and development center sponsored by the U.S. Department of Defense.

Copyright 2009 Carnegie Mellon University.

NO WARRANTY

THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN "AS-IS" BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

Use of any trademarks in this report is not intended in any way to infringe on the rights of the trademark holder.

Internal use. Permission to reproduce this document and to prepare derivative works from this document for internal use is granted, provided the copyright and "No Warranty" statements are included with all reproductions and derivative works.

External use. This document may be reproduced in its entirety, without modification, and freely distributed in written or electronic form without requesting formal permission. Permission is required for any other external and/or commercial use. Requests for permission should be directed to the Software Engineering Institute at permission@sei.cmu.edu.

This work was created in the performance of Federal Government Contract Number FA8721-05-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center. The Government of the United States has a royalty-free government-purpose license to use, duplicate, or disclose the work, in whole or in part and in any manner, and to have or permit others to do so, for government purposes pursuant to the copyright license under the clause at 252.227-7013.

Table of Contents

Acknowledgments **iii**

Abstract **v**

Insights on Program Success **1**
The External Environment and Relationship to Processes 2
Integrating Good Processes and Good Decision Making 3

Acknowledgments

The Systems and Software Consortium, Inc. (SSCI) and the Software Engineering Institute (SEI) wish to acknowledge contributions to this report from the following people:

- From the SSCI: James Kane, Susan Rose, and Mark Blackburn
- From the SEI: Jeannine Siviy, William Peterson, Michael Bandor, Bill Thomas, John Goodenough, Timothy Chick, Carol Woody, Lawrence Jones, Scott Hissam, David Carney, and Sriram Balasubramaniam

Abstract

Why do some programs fail? What are the factors that lead to program success? Two organizations, the Systems and Software Consortium, Inc. (SSCI) and the Software Engineering Institute (SEI), recently examined the reasons, and concluded that while many are technical reasons, the greatest influence is people and the things they do individually and in teams that lead to program success or failure.

Insights on Program Success

Why do some programs fail? What are the factors that lead to program success? Two organizations, the Systems and Software Consortium, Inc. (SSCI) and the Software Engineering Institute (SEI), recently examined the reasons, and concluded that while many are technical reasons, the greatest influence is people and the things they do individually and in teams that lead to program success or failure. Whether they know when and how to make key decisions; whether they candidly and openly share information with one another; whether teams have the necessary experience and coaching; and whether they understand why the program exists and what it is meant to accomplish. Overriding all these considerations are two key elements:

1. Effective leadership and objective governance for the program
2. Willingness and ability of program personnel to think through problems and tailor the prescribed process to the needs of the program

SSCI and the SEI each have a unique perspective. The SSCI staff has front-line access to its members' programs and operations, and has observed the common elements that make programs successful. The SEI staff has knowledge and expertise in engineering processes and systems development, and access primarily to "problem" programs when called upon by government agencies. While both these organizations have a strong legacy of emphasizing engineering processes, they increasingly see the need to complement mature processes with equally mature organizations and teams.

Most notably, the SEI and SSCI found that successful programs are a combination of effective leadership, timely decision making, strong teaming and teamwork, and good processes supported by strong underlying practices. In contrast, less successful programs exhibit a state of confusion at best and a state of denial at worst among individuals, program teams, and the organization of which they are a part. In lieu of confusion and denial, the common characteristic of successful program is not opting for the easy path. Both SSCI and the SEI have observed this tendency in many facets of program work.

From a process perspective we have observed that successful program teams don't:

- confuse process compliance with making good decisions
- confuse process compliance with program performance
- confuse good processes with good behaviors
- confuse current processes with required processes
- confuse following processes with thinking critically
- confuse process maturity with team and organizational maturity
- confuse bureaucracy with effective processes

From the perspective of relationships and communication, successful program teams don't:

- confuse program management with customer/supplier relationship management
- confuse formal reviews with honest dialogue

- confuse teams with teamwork
- confuse managing with coaching
- confuse management with leadership

Additionally, from the technical perspective, successful program teams don't:

- confuse systems design with systems thinking
- confuse the product development life cycle with the program life cycle

Process frameworks are sometimes criticized for not contributing to program success. We believe this is a red herring. What's really required for program success goes well beyond process frameworks to include a variety of "soft" issues, which leaders and teams frequently sweep into the "hard-to-do" pile.

The External Environment and Relationship to Processes

Today's environment—the rapid pace, the ever-increasing demand for features and functions, and a changing workforce— creates new demands on programs. Program managers predominantly focus on three basic factors: schedule, performance, and cost. This is true whether the program resides at a commercial company or the federal government. While some external environmental forces are largely beyond what process frameworks traditionally have addressed, process improvement remains one of the best ways to manage and control the negative impact of schedule, cost, and requirements pressure.

We find that pressure to show progress against the schedule often trumps the other factors and creates an incentive to delay important decisions until later in the development cycle, implementing the easy things first to show a quick "win," often to the detriment of long-term program success. Successful program teams are willing to ask the tough questions, do the hard things and make the difficult decisions up front—even if it means failing hard and fast— rather than waiting until the end, when program failure is almost guaranteed and the cost overrun has been substantial.

Meanwhile, the demand for higher performance with more features and functions has led to vastly more complex systems than we saw even 10 years ago. This rising technical complexity results in lower risk tolerance—in fact, people often fear that their jobs depend on total elimination of risk. This leads to paralysis in making decisions, as truly risk-free engineering programs are impossible to achieve.

The increasing specialization of our society contributes to the problem. Students today may graduate with in-depth knowledge in programming languages, but with little knowledge in design, testing, and analysis, leaving them ill-equipped to make critical decisions, or for far-reaching discussions about how a program should proceed. Program success relies on coaching and mentoring less experienced engineers so that they understand the impacts of their decisions within a greater system context.

The environment will only become more challenging. Times have not only changed; the rate of change is accelerating, while at the same time organizations—government, contractors, program teams—have not generally demonstrated an ability to keep pace. The criticism of process frame-

works and a lack of relationship to program success stems in part from an inability to manage and adapt to the increasing rate of change and in part from unwarranted expectations on the part of organizations that process maturity alone will provide sufficient operational performance regardless of the program environment.

Integrating Good Processes and Good Decision Making

Effective program teams drive success through the integration of good processes and good decision making. Successful programs don't confuse one with the other or try to do one without the other. Rather, successful program teams have the discipline to think through hard problems using processes, as appropriate, to reach the best decisions at the time those decisions need to be made. An organization's processes can provide a framework and basis for decision making, but critical thinking combined with a culture that celebrates calculated risk acceptance is the secret sauce for making effective decisions.

The timeliness and quality of decisions at major decision points are effective indicators of program success. Successful programs make decisions in a timely, well-thought-out manner and avoid delaying hard decisions. Many decisions must be made as a program is developed: whether the product is built, how to proceed, who are the right people to put on the team, and what are the ways to ensure effective implementation? How often are decisions or requirements deferred to a later date or release? Are the action items completed within the time assigned or are they left open for longer periods of time? What is the staffing level, by roles or functions over time within the program? What about the key positions and the staffing levels?

Effective communication mechanisms and a culture that encourages open, honest dialog enable the information sharing needed for effective decision making. In successful programs, teams exhibit a collaborative culture that fosters an attitude of collective responsibility. They work to support each other and the program as a whole. Decisions are based on a more complete understanding of the issues and possible implications and are "owned" by the team. The team's sense of responsibility and commitment provide the "can-do" attitude that drives the program towards success.

But making timely decisions is only part of program success. Good decisions often mean making hard choices that are uncomfortable for the decision maker. When decisions are made, successful programs communicate the decisions and potential impacts not only to the development team, but also to all of the major stakeholders, especially the customer. Effectively communicating difficult decisions can help to build trust within the organization and between the customer and contractor. A mistake is not necessarily a bad thing if an organization learns from it and willingly shares the information.

Careful consideration of the following questions will increase the likelihood of program success:

- What are the most important decisions that will affect the overall success of the program for all major stakeholders including the customer and the contractor?
- When do those decisions have to be made?
- Have working relationships been established —internally and externally—to support and implement those decisions?

- To what extent do current processes increase the confidence in the quality and timeliness of decisions that have to be made?
- Do all parties have the insight and perspective to interpret and assess the information available in making key decisions?

Both SSCI and the SEI were created to increase the ability of government and industry to successfully execute large, complex, software-intensive programs. And while both organizations have made major commitments to developing best practices and effective processes, it is increasingly apparent that effective processes are necessary but not sufficient for program success. It's when those processes are integrated with effective leadership, strong teaming, and timely decision making that programs succeed.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. **AGENCY USE ONLY** (Leave Blank)	2. **REPORT DATE** October 2009	3. **REPORT TYPE AND DATES COVERED** special report, Oct. 2009
4. **TITLE AND SUBTITLE** Insights on Program Success		5. **FUNDING NUMBERS** FA8721-05-C-0003
6. **AUTHOR(S)** Software Engineering Institute, Systems and Software Consortium, Inc.		
7. **PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)** Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213		8. **PERFORMING ORGANIZATION REPORT NUMBER** CMU/SEI-2009-SR-023
9. **SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)** HQ ESC/XPK 5 Eglin Street Hanscom AFB, MA 01731-2116		10. **SPONSORING/MONITORING AGENCY REPORT NUMBER**
11. **SUPPLEMENTARY NOTES**		
12A **DISTRIBUTION/AVAILABILITY STATEMENT** Unclassified/Unlimited, DTIC, NTIS		12B **DISTRIBUTION CODE**
13. **ABSTRACT (MAXIMUM 200 WORDS)** Why do some programs fail? What are the factors that lead to program success? Two organizations, the Systems and Software Consortium, Inc. (SSCI) and the Software Engineering Institute (SEI), recently examined the reasons, and concluded that while many are technical reasons, the greatest influence is people and the things they do individually and in teams that lead to program success or failure.		
14. **SUBJECT TERMS** management, projects, software, systems		15. **NUMBER OF PAGES** 13
16. **PRICE CODE**		

17. **SECURITY CLASSIFICATION OF REPORT** Unclassified	18. **SECURITY CLASSIFICATION OF THIS PAGE** Unclassified	19. **SECURITY CLASSIFICATION OF ABSTRACT** Unclassified	20. **LIMITATION OF ABSTRACT** UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89) Prescribed by ANSI Std. Z39-18
298-102