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A MISSING LINK: PROJECT MANAGEMENT IN THE TESTING ORGANIZATION

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The Missing Link

Project Management in the Testing Organization

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Introduction

The testing environment of many corporations is all too often comprised of young employees thrust into the technical world fresh out of college. They are eager and completely overwhelmed with their new environment. Managers are called upon to teach these employees the ways of their company testing. The result is predictable. Managers with limited skills wind up with a work group that reflects these limitations. [Patnaik and Ravikumar]. Even skilled managers with seasoned workers are facing significant problems. It is estimated that over 85% of all IT projects are delayed or delivered without meeting the predefined specifications by those authorizing the work. [Crispin 2001]. A review of published articles [Kit (1985), Hendrickson (2000), Cook (2000)] on the subject of testing indicates that little money and even less planning is brought into the testing environment. In addition, managers do not typically receive training in newer management methodologies such as project management.

One organization that faced just such a dilemma was Software Engineering Services, Worldwide Revenue Capture Systems, Information Technology Division within Federal Express Services. Over a period of eighteen months, this department went from not meeting project load dates to an organization that delivered software on-time with fewer software defects. It is the purpose of this paper to provide a blueprint for other organizations looking to reengineer their testing processes based on this experience by:

- reviewing the tenets of project management that were most effectively incorporated into the testing organization
- providing the roadmap used to adopt industry standard testware
- presenting the lessons learned associated with bringing a large client/server testing group from CMM level 2 to CMM level 3

Background

Organizational Structure

The FedEx family of companies, headquartered in Memphis, TN, represents a \$20-billion corporation that offers the broadest array of transportation, e-commerce and supply chain solutions in the world. At FedEx, more than 200,000 employees and contractors are personally dedicated to doing absolutely, positively whatever it takes to deliver for our customers every day. The FedEx family of companies is comprised of the following:

- **FedEx Express-** Reliable express delivery, usually in one to two business days, delivering to 211 countries
- **FedEx Ground-** Dependable, small-package ground service, including FedEx Home Delivery
- **FedEx Freight-** Regional, less-than-truckload transportation for heavyweight freight
- **FedEx Custom Critical-** Non-stop, door-to-door delivery of time-critical shipments whether it's parts to keep a vital production line running, emergency generators to restore power after a storm, or a priceless piece of art that needs special handling. As North America's largest time-specific, critical-shipment carrier, FedEx Custom Critical provides pickup and delivery services throughout the U.S. and Canada and within Europe — 24 hours a day, 365 days a year.
- **FedEx Trade Networks-** High-tech customs clearance solutions
- **FedEx Services-** Information technology, sales and marketing services for the FedEx companies.

Figure 1- Corporate structure of Information Technology Division of FedEx Services depicts the organizational reporting structure of Software Engineering Services which is comprised of 100+ professionals.

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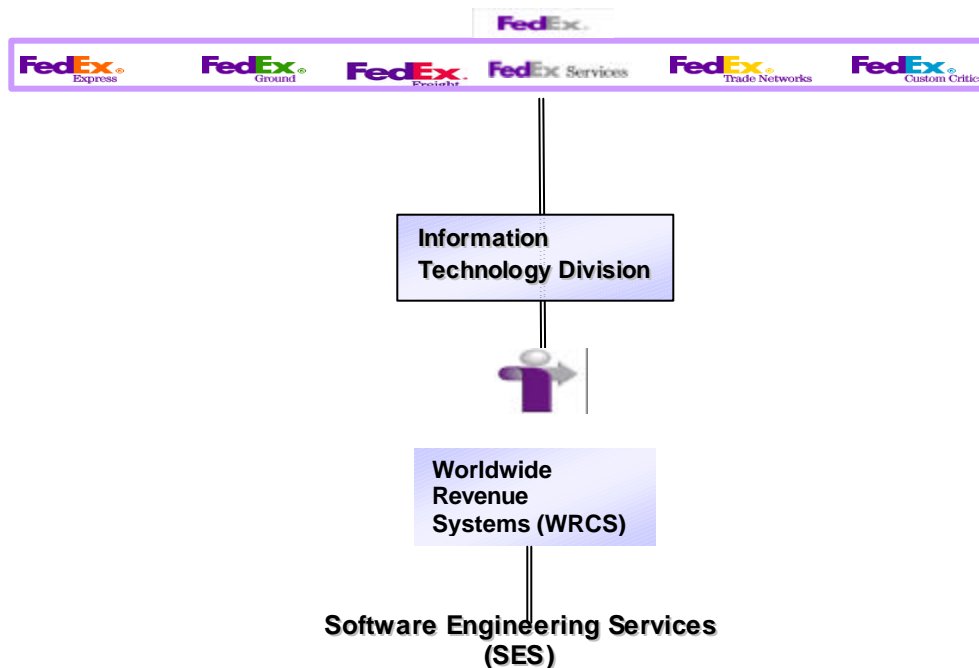


Figure 1 – Corporate structure of Information Technology Division of FedEx Services

Project Management Tenets

Change can be a good thing, flexibility is a must, but a lack of standardization is a blueprint for chaos. Project Management provides standardization through the application of knowledge, skill, tools, and techniques to project activities in order to meet or exceed stakeholders' needs and expectations. [PMBOK, 1996]. A more basic definition for project management is achieving project objectives within the allotted timeframes and within cost. Project management, as the name implies, applies a support infrastructure to a specific project. In contrast, functional management oversees a specific group of employees for on-going operations.

According to the Project Management Book of Knowledge (PMBOK, 1996), there are nine knowledge areas that a team utilizing project management should possess. They are:

- **“Scope Management-** the process required to ensure that the various elements of the project include all the work required to complete the project successfully
- **Time Management-** the process required to ensure timely completion
- **Cost Management-**the process required to ensure the project is completed with the allotted budget
- **Quality Management-** the process required to ensure the project will satisfy the needs for which it was undertaken
- **Human Resource Management-** the process required to make the most effective use of people
- **Communication Management** – the process required to ensure timely and appropriate generation and collection, dissemination, storage, and disposal of project information
- **Procurement Management-** the process required to acquire goods and services from outside performing organizations
- **Integration Management-** the process of understanding how each of the knowledge areas interact with each other during the various phase of the project lifecycle” [PMBOK, 1996].

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Reengineering a Testing Organization

Retooling the Software Engineering Service's testing department of FedEx Services began approximately two years ago with the hiring of a new Managing Director. The department, at that time, routinely missed deadlines, had no standardized testing methodology, had numerous software defects loaded into production, and user confidence was at an all time low. Management planning in the department, both long-term and short-term, did not exist beyond the basic premise of "fire fighting". To make matters worse, this organization's managers did not possess the necessary technical and project management skills required to meet these challenges and turn the department around to being a reliable and trusted business partner with application development areas and the myriad of user communities.

To address these departmental deficiencies, the new Managing Director began revamping the management team and reengineering the department's testing processes to perform quality control and quality assurance activities. With a significant development background and training in newer management techniques, the new MD understood the value and power an organization obtains by successfully implementing project management. Project management (PM) provides an organization with the skill set that delivers a specific product or service on-time and within budget. Based upon this understanding, one of the first corrective measures initiated was to acquire a Project Management Professional (PMP) as an advisor and mentor to staff within the testing organization. The immediate objective of this professional was to assess the organizations' testing processes to facilitate the integration project management. The PMP performed an internal assessment and found the following:

1. Poor project management processes were in place to determine accurate project status, communicate issues inter/intra departmentally, utilize resources properly and determine project risk
2. A non-industry standard testing methodology was used to plan testing activities, measure quality, and complete test execution

Roadmap – Project Management Integration

To provide the testing group with focus and obtain the necessary buy-in for reengineering activities, special projects were launched and off-site planning sessions were held. The overall direction provided to the teams was that the testing methodology must be based on the Institute of Electrical and Electronic Engineering (IEEE 610.12-1990) standards. Out of these efforts the following areas were addressed:

- Status Reporting
- Scheduling
- Testing Methodology
- Training

Status reporting:

In order to manage any project, the first step is generally to get your arms around how to determine whether your project is on-schedule, what has been completed and what is in scope for the project. The SES testing organization implemented various status reports targeted at different audiences to facilitate the tracking and communication of scope, status, and risks for a project. These status reports have been extremely valuable tools used to identify problems at their earliest possible moment, making rectification less cumbersome and minimize rework.

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Leadership Dashboard- A weekly status report geared toward executive management which graphically depicts the project's progress of testware deliverables at a glance. Each project has a one page summary that is color coded to denote whether a project was on-schedule, behind schedule, ahead of schedule or completed, testware deliverable planned start dates/finish dates and actual start dates/finish dates with any associated variances explained. Refer to: Figure 2- Leadership Dashboard.

Project XX STATUS as of 03November, 2002																							
KEY	Not Started	%	Started, on schedule	%	Risk of missing milestone	%	Behind schedule	R = Revised															
	N/A	Not Applicable	(Planned finish is on or ahead of schedule)			(Planned finish is 1-5 days behind schedule)			(Planned finish is >5 days behind schedule)														
	Complete	% complete indicated in status boxes																					
SES Deliverables	Analyze					Design					Build												
	Release Test Plan			RTP YSD		L2/L3/L4 Test Design Specs			TDS YSD		L2/L3 Test Procedures			TP YSD		L4 T Test Procedures			TP YSD				
	Start	Status	End	Status	End	Start	Status	End	Status	End	Start	Status	End	Status	End	Start	Status	End	Status	End			
SES Test	8/20		5/16R		5/21R																		
Release Test Plan	8/20A	100%	6/3A	-9	6/4A																		
L2/L3						10/2		6/21R		6/26R	4/8		7/12R		7/17R	5/13R		8/26R		8/21R			
COMMENTS												Schedule Maturity Dates			Planned			Actual			Revised		
												Approved Execution Dates			5/16/02			5/15/02					
												Baseline Execution Dates			6/16/02			6/21/02					

Figure 2- Leadership Dashboard

Web Status Report- A daily status report geared toward external stakeholders posted to the intranet to facilitate accessibility of information. This report reflects each subproject's overall progress, problems, and next steps for test execution. Refer to Figure 3- Web Status Report

Project XX Level Test Status from AM (ETD) Testing Huddle
 DATE: Month/Day/2002
 Teleconference - <enter phone>

GENERAL INFORMATION
 Pager Information of Leads/Managers

Test Manager CHRONOS Pager:	IEAT Coordinator -RSE II Pager:	
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- **Environment Setup**
- **Current Watch List**

[Link to Level 3 Planned Schedule](#)

- **Comments**

Subproject 1 Status

• Level nn	Level nn
• Milestones	• Milestones
Next Steps for today:	Next Steps for today:

Figure 3-Web Status Report

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Cycle Status Report- A status report used by the SES organization which is published for each iteration of test execution. Each subproject maintains a detailed status by test procedure that is completed by assigned test analyst. This tool is used to facilitate shift turnover, explain delays in test execution and track progress against planned activities. Refer to Figure 4- Cycle Status Structure

3	Start Date	Finish Date	Flow #	Procedure Name	TP Update ?	Analyst	Start Time	Stop Time	Change Request #	Comments
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Figure 4-Cycle Status Structure

Scheduling

The next step of the process was to build project workplans based upon scheduling rules derived from actual data as a starting point for solidifying project dates inter-departmentally. After the project dates were baselined to support scope of effort, each member of the testing department was assigned activities and required to post their actual hours worked to the activity. As a result it is possible to see how many hours were spent on each activity and provide the basis for establishing estimating models for future use. In addition, scheduling more accurately forecasts project slippage and resource availability for future projects.

Testing methodology

Within any testing organization, it is difficult to get a predictable level of productivity from each testing professional unless you have repeatable and understandable processes in-place. An in-house methodology had previously been used within the SES department to perform quality control which was not based upon industry standards. It became apparent to the organization's leadership that in order for the department to make the quantum leap from CMM level 2 CMM level 3, an industrial strength testing methodology was needed. Due to attrition and the inexperience of workgroup, the knowledge did not exist within SES to provide the necessary technical leadership required to complete this initiative. Therefore, a contractor was brought in to work with a SES team consisting of test leads and a project management professional. The contractor was paired with the project management professional so that knowledge transfer would occur. This team's charter was to revamp the testing methodology to comply with IEEE standards. After accomplishing this project, the team developed necessary training materials and job-aids used for in-house certification of testing professionals.

Training

Concurrently to each of the above initiatives, the project leads and department managers were being retooled. The project leads and managers in the department did not have training in project management and training within quality control and quality assurance which were necessary to perform their job functions. To facilitate the transition of departmental change, trained project managers were teamed with project leads and managers in order to mentor them in the principles of project management and how they applied to testing activities. Some of the specific areas of training and mentoring included understanding project schedules, how to run effective meetings, quality control (spot check testing deliverables), technical reviews, implementing metrics and risk management.

In addition, employees were required to complete in-house certification for each of their various specialties through the successful completion of a curriculum of courses.

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Lessons Learned

The lessons learned listed below are intended to provide practical tips for organizations looking to reengineer their department.

1. **Strong sponsorship-** There must be strong executive support for this change in order to succeed. There will be significant costs, efforts, personnel issues, and growing pains associated with retooling. If upper management is unable or unwilling to work through these issues, there is no sense in starting something that is doomed to failure from the start.
2. **Experienced certified project manager** -It is imperative that the project manager has significant experience in management and project management in order to properly implement the project. Project management methodologies are numerous and detailed. Each is a small piece of a very large puzzle. In order to see the big picture, one must have the skill, education, training, and experience necessary to know each piece of the puzzle. It is recommended that the project manager have certification from the Project Management Institute as a Project Manager Professional (PMP).

In addition, it is recommended that the PMP charged with bringing project management into the organization have a reporting structure at a peer level to managers within the department. This lays the ground work for importance of function, allows easy access to information within the organization, ensures alignment with overall organizational goals.

3. **Focus on status reporting and scheduling** - The first action to introduce to the department should be scheduling. In addition, establish a weekly leadership meeting in which project status and issues are discussed and continuous improvement efforts are approved for analysis. Milestones should be planned in one to two week increments. Actual progress should be tracked against planned milestone dates. Responsible parties need to explain any variances and the action plan to get that part of the project back on schedule.
4. **Revamp reward structure-** Our organization has found that one of the most important professional attributes employees can possess is their ability to work effectively in teams. Therefore, an award system was established for professionals to recognize peers for contributions to the organization.
5. **Train-** Provide both project management basic training and testing methodology to entire testing organization on:
 - How to read a schedule.
 - How to monitor defects and determine severity of risk to software loading into production.
 - How to align staffing with scheduling requirements.
 - How to develop action plans to address risk items.
 - How to effectively communicate status and issues to external organizations and stakeholders.
 - How to spot check testware and provide feedback.
6. **Avoid knee jerk reactions-** Implementing project management into an organization brings about some level of conflict because you are changing the way people do things and communicate with others. Be proactive in dealing with potential conflict and work with the management team to address any issues that arise in an orderly fashion. This will send the message to the troops that the leadership team also practices what they preach when problems surface.
7. **Contractors in leadership should be buddied with employee-** Contract talent as needed to begin the retooling. However, the primary purpose of the contractors brought into help with reengineering effort was to provide knowledge transfer and help architect your organization to ensure processes/deliverables alignment. Contractors should not be

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placed in positions of leadership without an employee paired to them because when they leave so does a lot of the core business knowledge.

8. **Roles and Responsibilities-** Ensure roles/responsibilities do not overlap.

Conclusions

By simply introducing the basics of project management and implementing a testing methodology that was based upon IEEE standards, our organization has found the “Missing Link” to meeting project schedules and improving the quality of software loaded into production. Within the first year, WRCS realized a decrease of 50% in problems reaching production and not detected by the testing organization. After the second year, an additional decrease of 65% in problems reaching production and not detected by the testing organization.

The retooling of the SES testing organization within FedEx Services has been a resounding success. However, the road to success was not a particularly easy or short one. It is hoped that the experiences, both good and bad, can be used by other testing organizations to smooth out some of the bumps along the way.

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