IT METRICS STRATEGIES
Helping Management Measure Software and Processes and their Business Value

Metrics, Mainframes, E-Business, and You

by Michael Mah

Over the past year, Cutter Consortium has conducted research surveys on mainframe computing, e-business, and outsourcing. The mainframe computing survey asked questions such as: What roles do large mainframes play in mission-critical applications? What will be their role in the future? How will companies maintain staffing for mainframe support? What other platforms will play a key role? In this analysis, more than 35 large, worldwide IT organizations were queried to gauge the future of their mainframe architectures.

Next came the question of e-business architectures, which tend toward distributed computing environments. The rotation of IT from mainframe processing to e-business distributed computing gives us an understanding of the driving forces behind trends in computing architectures. Cutter's metrics research then turned to this area to understand what directions companies are moving in and at what rate.

Finally, questions emerged about how these architectures would be supported. Inhouse? Outsourced? How will they be managed, and what are

Continued on page 2.

Case Study: The Story of a CMM[1] Project — A Process Improvement Production, Part 1

by James Perry, James Heires, and Carol Wickey

Cast of Characters

The Company

The company at center stage is a sizable manufacturing organization and is the largest employer in the area. It employs approximately 16,000 people worldwide and develops products for commercial, military, and government markets. Two of the company's product development business units have recently been assessed according to the Capability Maturity Model (CMM) for Software at Level 3.

Information Technology

The company employs several hundred IT professionals who deliver applications development: configuration control services and help desk, hardware, database, and network support. These IT functions are closely associated with the software development activities in

Continued on page 10.

may 2001 vol. VII, no. 5

executive summary

In this issue of ***ITMS***, I'm pleased to share the results of the latest Cutter Consortium research on computing platform trends, e-business, and outsourcing.

We present metrics findings on these trends with respect to snapshots taken over a two-year period from 50 major international organizations within the *Fortune* 1000. The findings provide profiles that illustrate the interrelationship of computing trends with the management, people, and infrastructure issues of today's business revolution (or "e-volution"). Where applicable, I've offered my perspective on the research results. These ideas might spark some reflection on how you choose to tackle these issues in your organization, with the metrics and trends hopefully providing you with a valuable frame of reference.

The second article is a remarkable case study from a trio of respected authors, James Perry, James Heires, and Carol Wickey, describing one company's experience on its Capability Maturity Model-based process improvement initiative.

The authors discuss the goals, challenges, and execution of a process improvement initiative, complete with behind-the-scenes descriptions of what went on for all of the stakeholders: management, development, and end users. The authors reveal the organizational and process dynamics of a business adapting itself to provide world-class customer satisfaction at the lowest cost. But just *saying* that you're doing things better is not enough. *Proving* that you are with metrics is what management ultimately wants. For this, the company conducted a productivity benchmark, gauging cost performance of projects against an industry database that provided the vital comparisons, thereby legitimizing the company's work efforts.

All in all, these two articles illustrate how metrics can tell a story. Using measures intelligently will help you understand patterns both inside and outside your organization.

Michael Mah, Editor

CUTTER CONSORTIUM

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the predominant metrics that people use to manage outsourcing suppliers?

The answers to these three areas of research tell an interesting story that we believe will help you assess your own IT directions and trends.

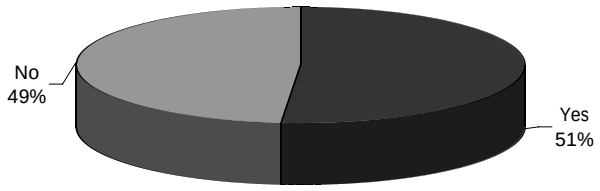

Figure 1 — Are major applications running on IBM mainframe computers?

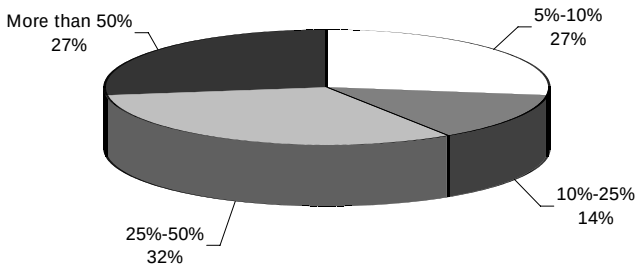

Figure 2 — Percentage of mission-critical applications on mainframes.

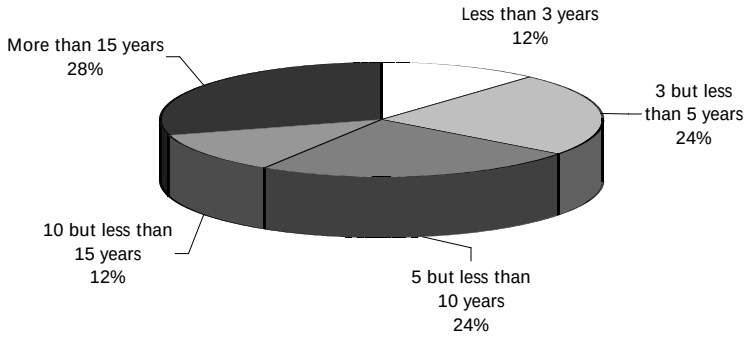

Figure 3 — Perceived long-term viability of mainframe market.

Current and Future Mainframe Plans

Interestingly, a slim majority — 51% — of organizations reported that major applications currently run on mainframe platforms (see Figure 1). When you look at the percentage of mission-critical applications residing on mainframes, shown in Figure 2, 27% of the respondents reported that half or more of their applications reside on the mainframe, with an additional 32% of the respondents saying that one-quarter to one-half of their mission-critical applications are on the mainframe. Other architectures seem to be filling a major part of hosting mission-critical applications.

Figure 3 reveals that 88% see the mainframe market being viable for more than 3 years, with 40% seeing the market as viable for 10 or more years. For many, mainframes are not going away any time soon. In addition, 86% think the major constraint on supporting mainframe architecture is the lack of availability of knowledgeable programmers (more so than availability of hardware and software vendor support). This is evident in Figure 4.

Where will companies seek to obtain these staff skills? The answer seems to be from outsourcers (see Figure 5). A full 77% of the organizations surveyed will look to contract out their mainframe personnel needs (compared to 32% who plan to fill the need with new hires). Another interesting result: 14% reported that they'd look to retirees to fill their skill needs.

Figure 6 (on page 4) shows that 76% of respondents have less than 5% (an amazingly small percentage) of Web-based applications currently running on mainframes.

What is interesting is that for the remaining applications, 61% have a long-term plan to

Editorial Office: Clocktower Business Park, 75 South Church Street, Suite 600, Pittsfield, MA 01201, USA. Tel: +1 413 499 0988; Fax: +1 413 447 7322; E-mail: mmah@cutter.com.
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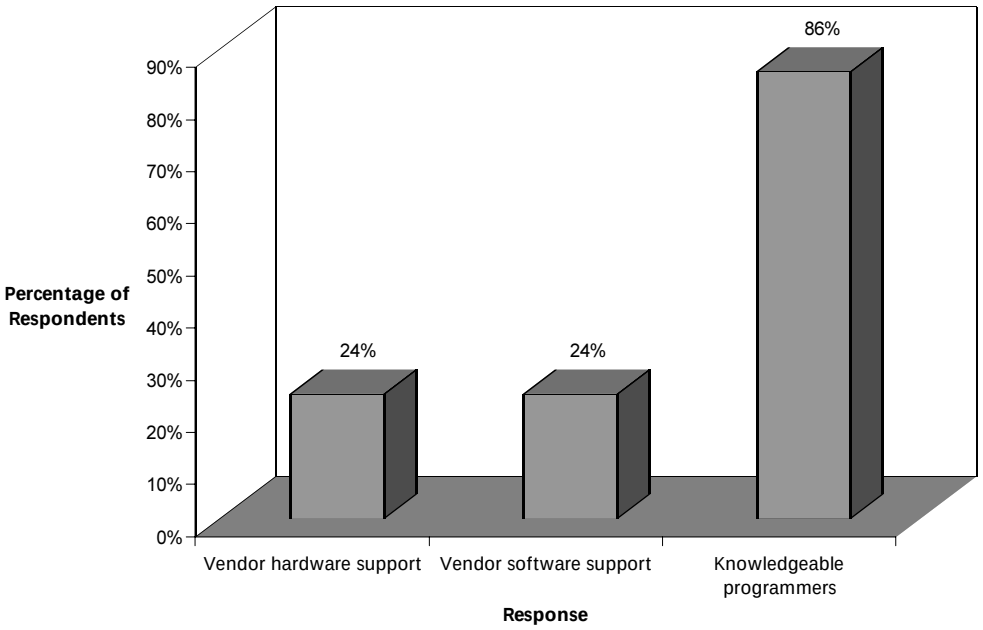

Figure 4 — Perceived obstacles to supporting mainframes. (Respondents able to choose more than one category.)

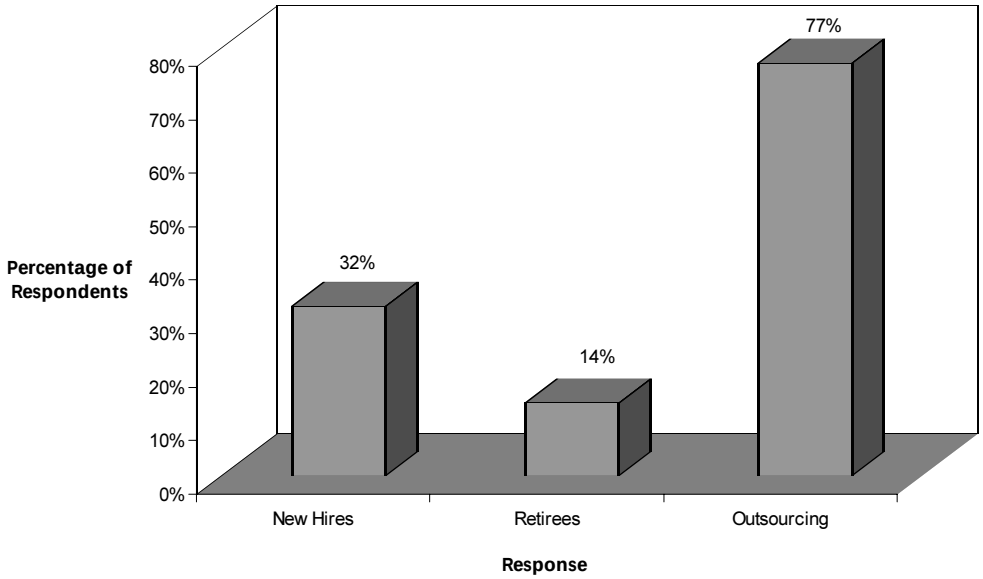

Figure 5 — Sources of skilled mainframe personnel. (Respondents able to choose more than one category.)

migrate their mainframe applications to other platforms (see Figure 7). Of these other platforms, 95% will be about evenly split between Unix and Windows, as shown in Figure 8. Distributed computing is here to stay and will emerge dominant in the long run.

E-Business Computing Trends

The next series of charts shows two sets of data from Cutter's research over the past year, demonstrating the changing role of e-business and Internet computing from one year to the next (2000 versus 1999); 50 companies took part in this study.

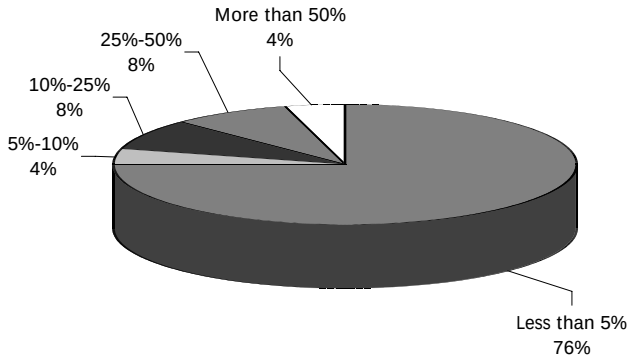

Figure 6 — Percentage of Web-based applications on mainframes.

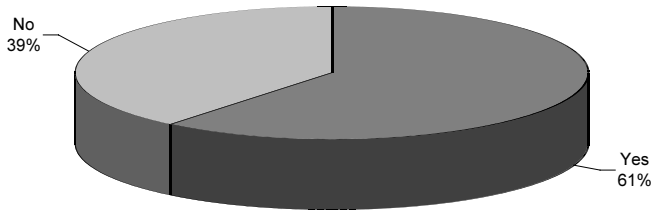

Figure 7 — Is there a long-term plan to migrate mainframe applications to other platforms?

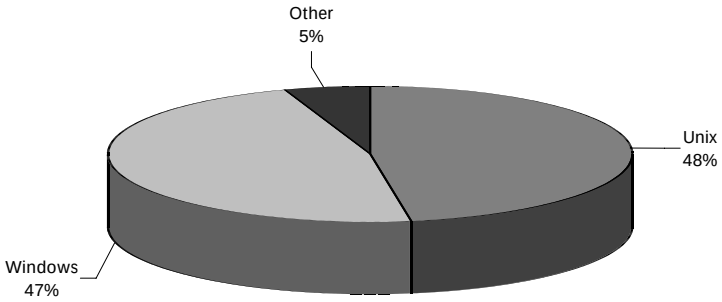

Figure 8 — Anticipated target platform for migrated applications.

As shown in Figure 9 (on page 5), 96% of companies in 2000 were committed to an e-business strategy leveraging the Internet. This is up from 80% the previous year. The new economy architecture is being fully realized in spite of the unstable financial markets (at least for now).

Also interesting is the evolving purpose for these Internet applications, as shown in Figure 10. In 1999, the main purpose of these applications was to provide information to a company's customers (36%) and to its own people (33%), for a combined total of 69%. In 2000, this combined percentage dropped to 52%, as the purpose shifted slightly away from pure information and toward targeting business and people in the space of developing e-commerce. Making money began to take a more direct role over distributing information. Supply chain development stayed at 7%-8%.

Figure 11 (on page 6) shows that 96% of respondents in 2000 had or were evolving an e-business architecture, up from 92% the previous year. As shown in Figure 12, business process reengineering (BPR) efforts are also up, with 56% of respondents involved in BPR in 2000, as compared to 44% in 1999.

Metrics in Managing Outsource Providers

Budget and effort metrics rank at the top with regard to managing outsourcing supplier resources and cost performance (see Figure 13 on page 7). Interestingly, 24% of organizations explicitly track productivity, but another way of viewing this is that 76% do not. Perhaps this is due to the lack of meaningful frameworks for productivity measurement. Many have had understandable difficulty with traditional "factory" productivity metrics of output in function points or lines of code per work-month, which omit schedule and quality.

Indications about the role of other dimensions being factored in are revealed in Figures 14 and 15. These show that product quality and schedule are being included by some organizations to track vendor performance above and beyond cost and effort. For product quality, the number of new, open, and closed problem reports is tracked by 51% of respondents. Frankly, I'm surprised that it's not higher, and I'm curious why the rest of the respondents do not track defects and problem reports during development.

Another interesting result: 12% of respondents track "time between failures." I asked myself why the other 88% of client organizations don't keep records on system up-time to gauge vendor performance. With the

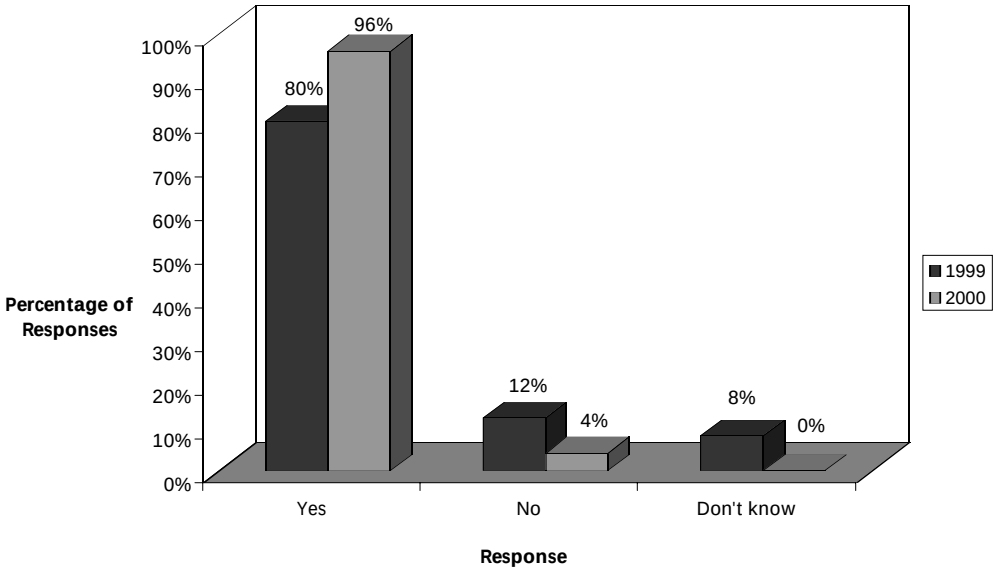

Figure 9 — Is your company committed to e-business?

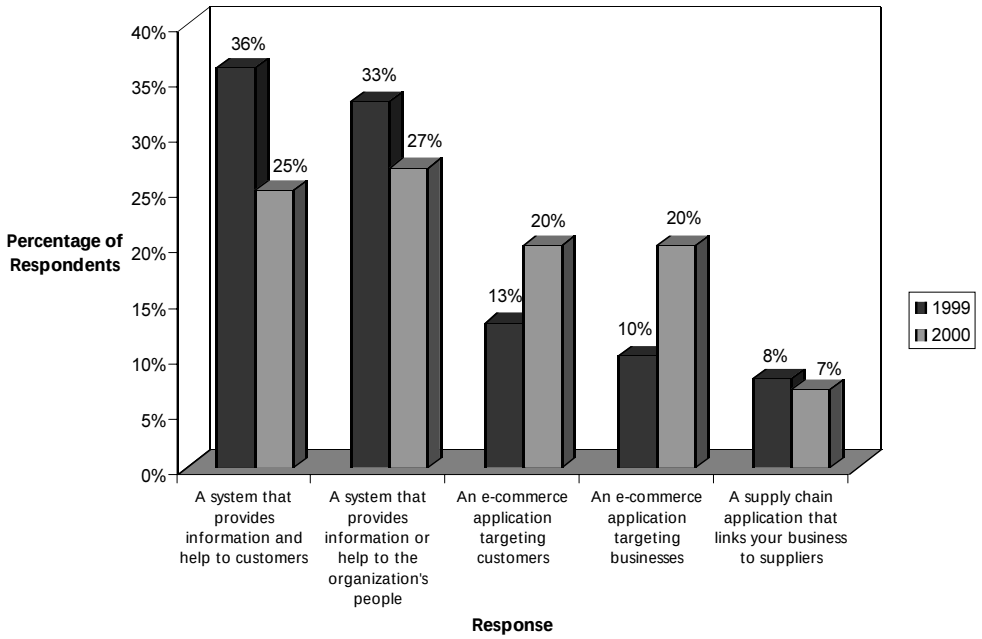

Figure 10 — Predominant classes of Internet applications being developed.

potential business cost of IT outages, you would think that organizations would track metrics on, say, system availability, in the first 30, 60, and 90 days of operation. I'd encourage client organizations to set performance goals for systems once they're deployed. Higher performance levels will reduce production support costs and lower expenses and effort for software "broke/fix" maintenance. (After all, having a system "meet the date" and "meet the budget" is less meaningful if it doesn't work reliably. A good analogy might be buying a new car at a certain price and by a specific delivery date, but having it spend more time in the shop than on the road after you own it.)

With regard to tracking vendor schedules, project milestone dates are the predominant schedule metric, but I'd also encourage organizations to look at elapsed schedules for major phases of development, such as the requirements phase time (in elapsed

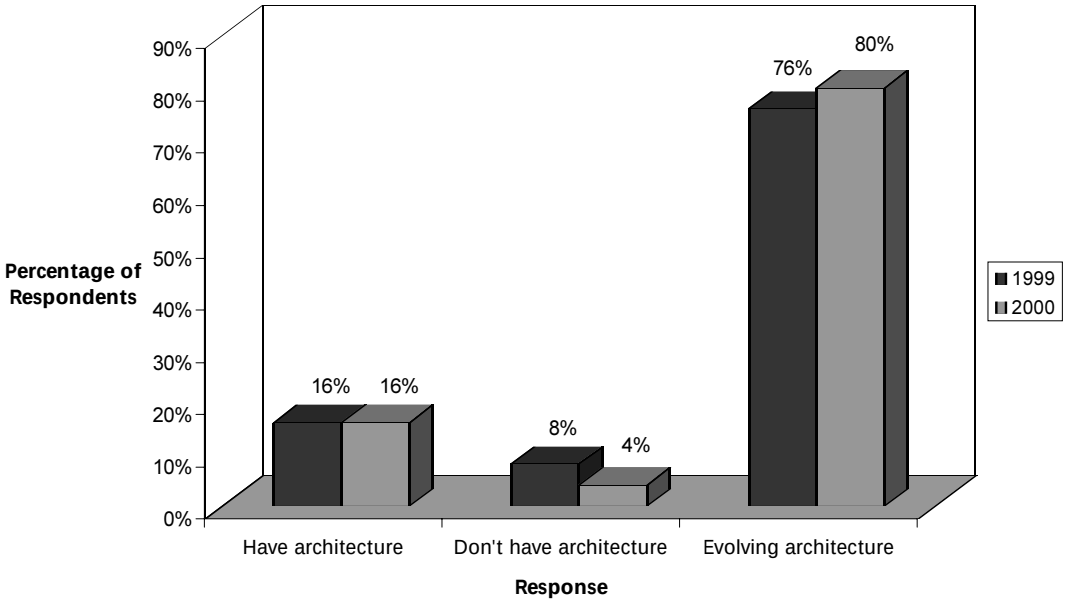

Figure 11 — State of e-business architecture.

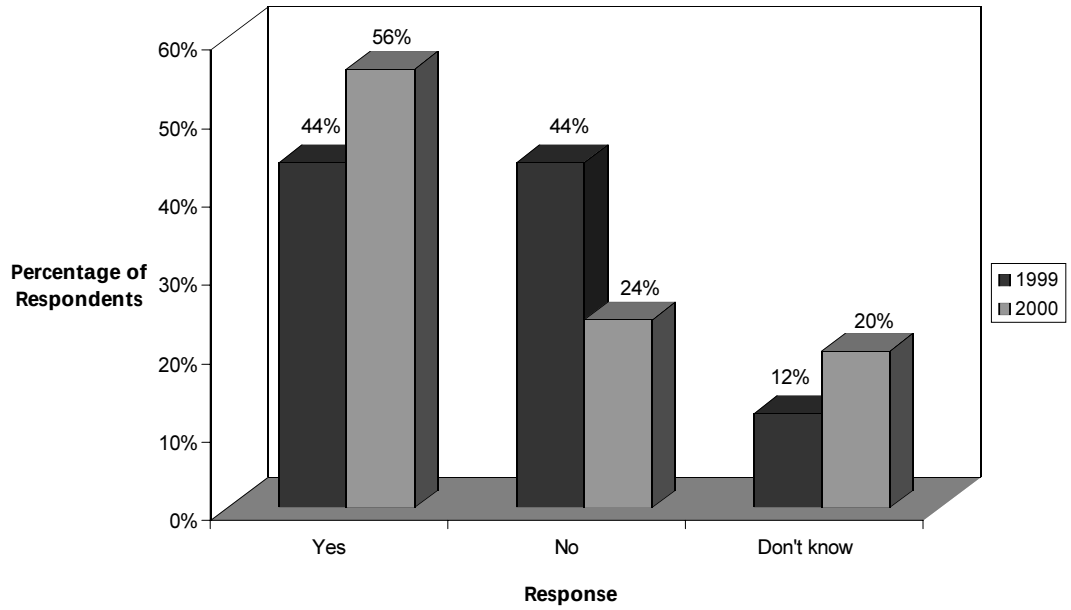

Figure 12 — Are business process reengineering efforts under way?

weeks or months), and the design/code/test phase time.

Tracking the elapsed time in weeks or months as a function of project scope and size will give an organization insight into how fast it can create applications as a function of the project size and complexity. This will give the organization vital information on how to set reasonable deadlines when estimating projects in the future, or for "reverse estimating" — determining how much functionality can be built within a predetermined schedule (i.e., how much e-business functionality can we design and build in six months?).

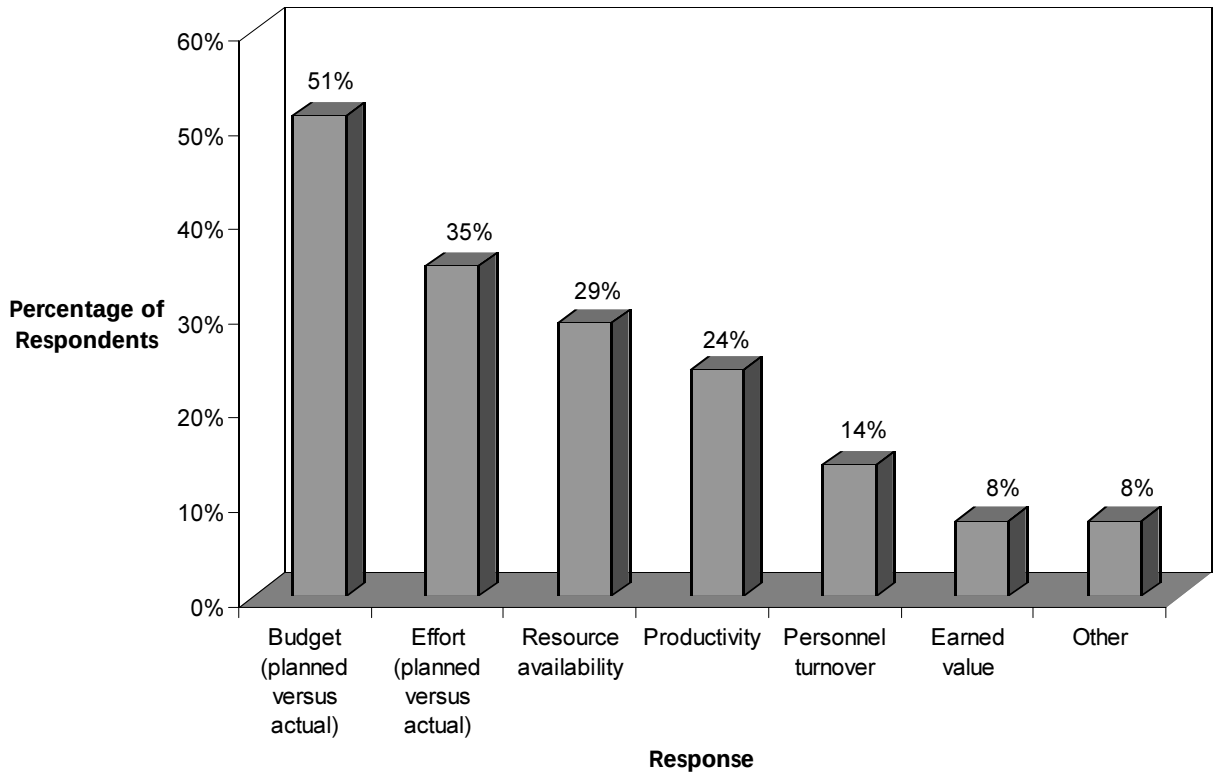

Figure 13 — Metrics to track vendor resources and cost performance. (Respondents able to choose more than one category.)

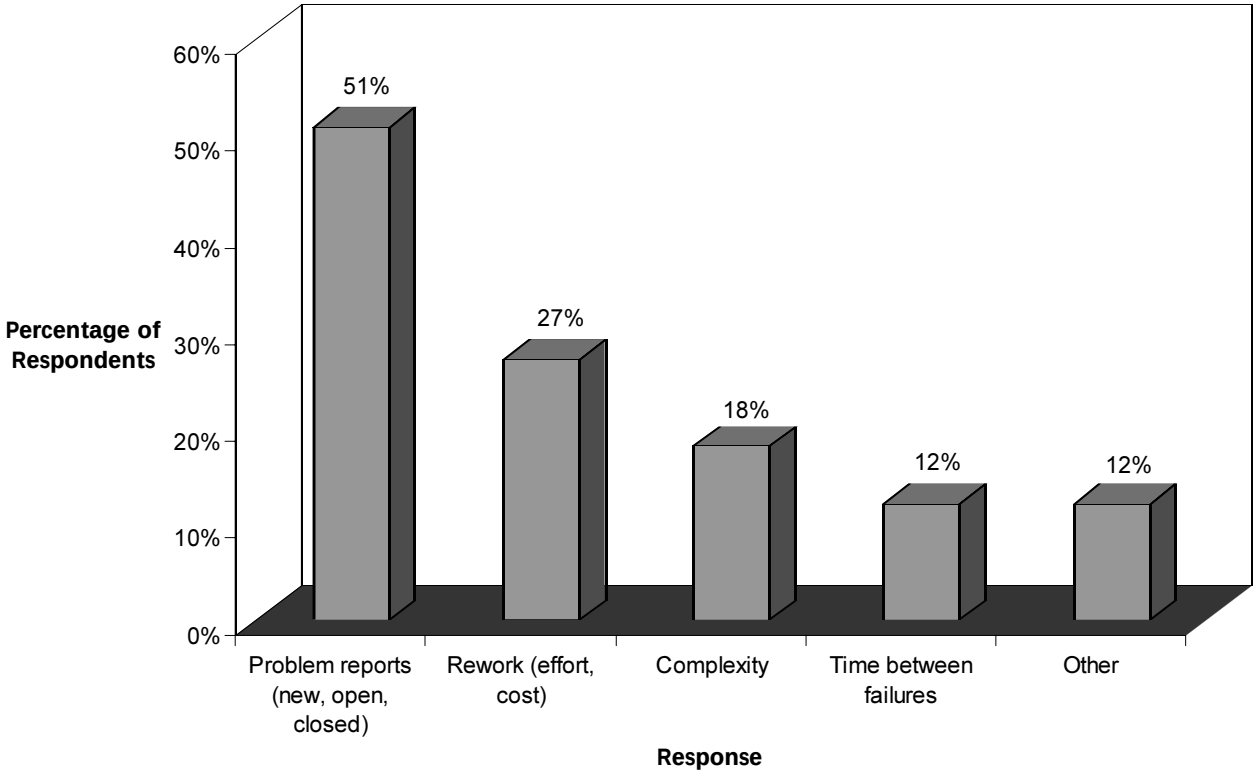

Figure 14 — Metrics to track product quality. (Respondents able to choose more than one category.)

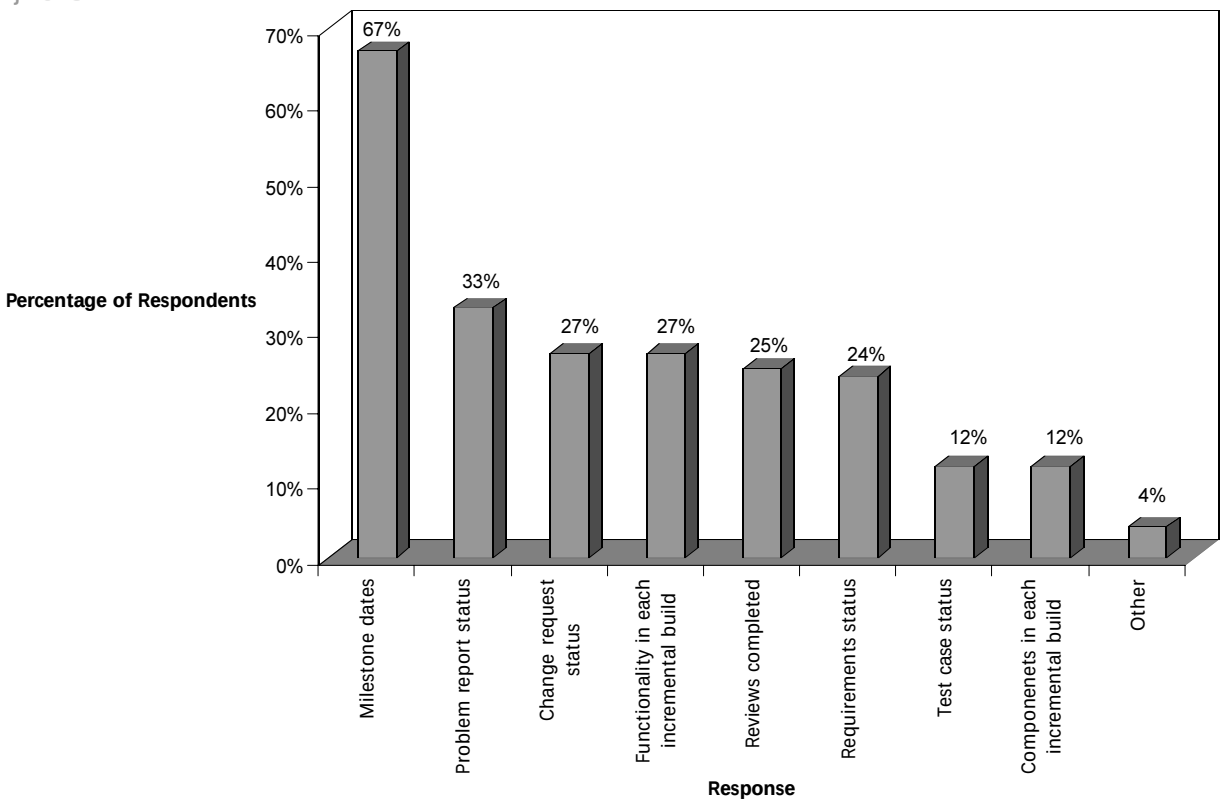

Figure 15 — Metrics to track schedule and progress. (Respondents able to choose more than one category.)

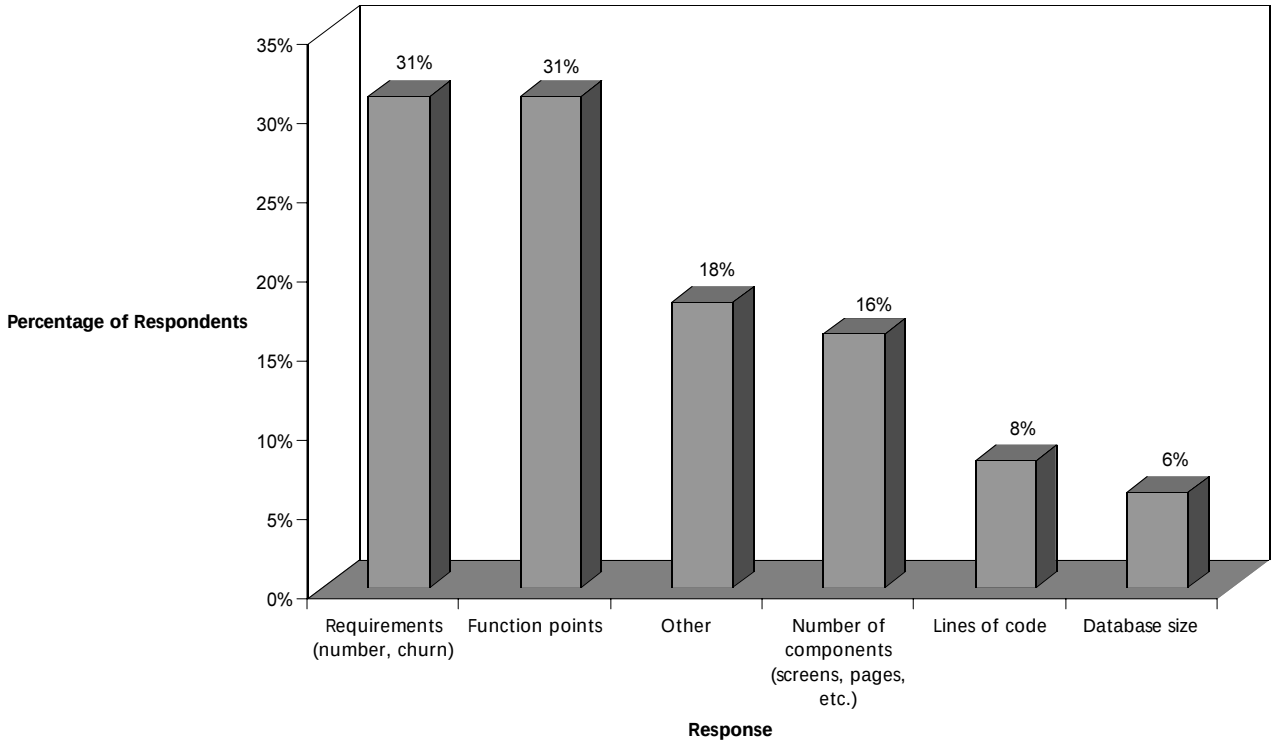

Figure 16 — Metrics to track project size and stability. (Respondents able to choose more than one category.)

Figure 16 (on previous page) shows what metrics are being used to track product size and stability. The predominant metrics are the number of requirements/degree of churn and the number of function points, each with 31%.

One thing I'd like to comment on is that most of the organizations I've consulted with address project size and stability only after the fact. Most are notoriously neglectful of managing scope and size before a project starts, early in the project, and throughout its development. Also, certain size metrics work well at different phases. For example, function points can work well at the beginning and end of a project (depending on the project type), but not in the middle. Code metrics are readily available during coding and are extremely valuable for midstream project tracking (as well as requirements metrics). Other units of abstraction like modules, objects, etc., are also valuable throughout the lifecycle.

If organizations want to reduce the high rate of project overruns and slippages, it would behoove them to address size metrics early on. Effectively managing scope by tracking requirements and code before and during a project can help plot its trajectory and determine early if it's veering off course.

Formal IT Strategies and the Relationship with IT

As shown in Figure 17, 61% of respondents have a formal IT strategy. This number is a little surprising, and I expect it to rise. And finally, a combined 86% describe the relationship with IT as a necessary function, a valued provider, or a close partnership (see Figure 18). However, a combined 11% describe the IT relationship in negative terms. Let's hope that organizations find a way to keep this last metric low.

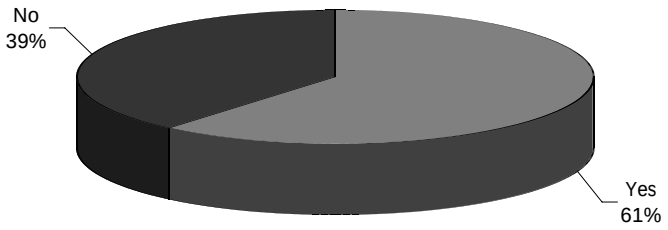

Figure 17 — Does your company have a formal IT strategy?

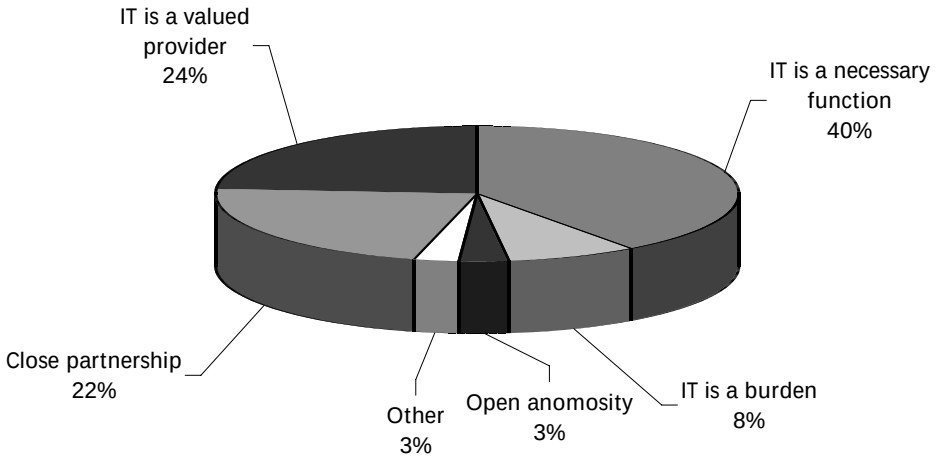

Figure 18 — Relationship between company's IT organization and the rest of the business.

Case Study: The Story of a CMM Project — Part 1

Continued from page 1.

applications development (AD), especially in the early and late phases of the lifecycle. For example, early in an AD project, when estimates of critical computer resources are made, it is important to involve the hardware support group to ensure that servers and disk space resources are available by the time the project is placed into production. Likewise, after an application is placed into production, the production support group has the responsibility for configuration control of the application.

IT provides value to its customers inside the company by leveraging its knowledge of the customer and providing low-cost solutions. Authors Michael Treacy and Fred Wiersema[2] describe three so-called customer value disciplines — operational excellence, product leadership, and customer intimacy — as fundamental to business strategy. These disciplines are critical because they drive every major decision of a successful organization. For example, let's say a new application was being developed and a decision needed to be made on whether to deliver on budget with partial functionality or to deliver full functionality but exceed the budget; the project could not accomplish both. If the organization were a product leader (innovator), the project would choose to deliver full functionality. If, however, the organization were operationally excellent (low-cost provider), the project would choose to stay on budget. Similarly, IT established its business strategy in order to embrace the disciplines of world-class customer satisfaction at the lowest cost.

[2]Treacy, Michael, and Fred Wiersema. *The Discipline of Market Leaders: Choose Your Customers, Narrow Your Focus, Dominate Your Market*. Addison-Wesley, 1995.

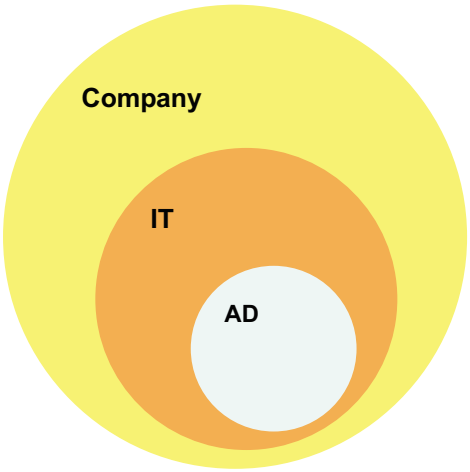

Figure 19 — Applications development (AD) organizational structure.

Applications Development

The AD department develops and maintains traditional business systems to support the company's operations, which include factory floor support, accounting, e-commerce, and various human resources applications. Historically, the 100 or so employees in the AD department were distributed among the business units and were under their direction. The lack of control and visibility that resulted was the primary motivation to create the AD department in the first place. Figure 19 illustrates the organizational structure of the company as it pertains to AD.

A project management office (PMO) was also established at the same time within AD in order to bring some discipline and consistency to the planning, controlling, and status reporting of the projects. Most AD employees work from company headquarters in the US Midwest, but three other locations in North America were also involved.

Technologies employed on AD projects include mainframe and client-server, as well as a growing use of Internet/intranet technologies. This wide range of technologies became important as process design teams considered how the new processes would apply to AD's various technologies. The majority of AD project effort is typically expended on large projects (greater than 1,500 staff-hours of effort). (See Figure 20.)

Other Improvement Initiatives

As one would expect from an enterprise of this magnitude, many improvement initiatives occur simultaneously. One such initiative, which began in 1998, is called Lean Electronics. It stems from work at Toyota to increase productivity and profitability. The Lean Electronics philosophy focuses on the elimination of waste throughout the value

stream. Lean Electronics principles have traditionally been applied to manufacturing-oriented areas of the company. Very few software development activities or processes in the company have participated in the Lean Electronics initiative.

Script: Software Development Process

Years before the CMM project was conceived, a few volunteers from within the company (but outside of AD) documented the existing project management process in an ad hoc fashion so as to encourage consistency. This process was limited to a brief description of project management and sustainment activities. However, this process was incomplete with respect to CMM and was not indicative of actual practice. Although this process was documented and approved by management, neither project managers nor developers were involved. The volunteer team failed to realize that writing a process is only the beginning of an improvement program. Communication and training on the process was not provided to those expected to use it. As a result, the process was not well accepted by either project managers or software developers. Further, many activities performed by AD required assistance from other groups. This process inadequately addressed these interrelationships.

Because of this failure, AD management communicated early and often that improvement initiatives or new processes would have to pass the test of common sense. That is, AD was not interested in CMM for its own sake; improvements needed to make business sense before management would grant approval to proceed.

The PMO knew firsthand that the existing process was inadequate and had begun to refine it to reflect its current behavior. Progress was slow, however, and formality was discouraged. Requirements management and developmental configuration management were performed incompletely and inconsistently, with larger projects performing these activities more faithfully than smaller projects. Configuration control after production, however, was being performed adequately by the production support group. Software quality assurance functions were not performed at all, even though a quality services group existed in

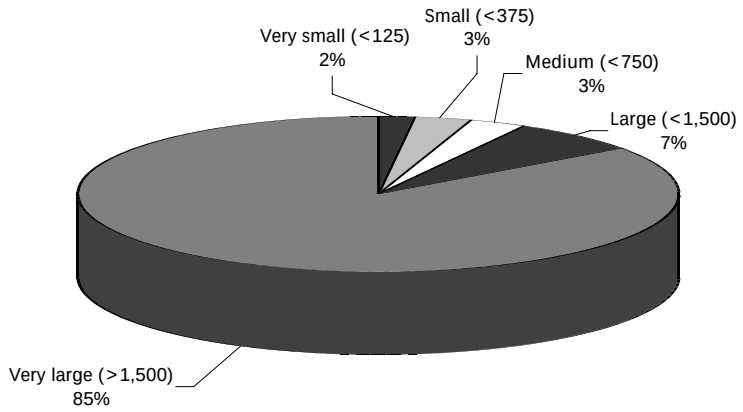

Figure 20 — Project effort (measured in staff-hours) by category.

IT. For the few software subcontracts that existed, software subcontract management was performed in an ad hoc fashion.

A Starting Point

To establish a maturity baseline, the AD manager initiated an evaluation of his department's capability to develop software through the use of CMM. A baseline capability evaluation is routinely completed prior to a CMM-based improvement initiative. A consulting team was retained to carry out the evaluation and report its findings. To no one's surprise, the evaluation revealed that AD was performing as a solid CMM Level 1 (ad hoc) organization! Strengths and weaknesses by key process areas (KPA) were included in the final report to support an action plan for the future. As a result of the evaluation, an 18-month CMM project was launched to develop and carry out the action plan to address the weaknesses found in the baseline evaluation.

Music: Engineering Process Group and Other Infrastructure Groups

Infrastructure serves to provide a sense of rhythm and melody to an organization. Rhythm is achieved by establishing and striving to complete regular project milestones. The melody is provided by the common theme of software process improvement that keeps the project in tune with its goals.

Never before did AD have an infrastructure in place to orchestrate its software improvement activities. The previous attempts to establish a consistent development process, mentioned

above, failed to provide care and feeding to the new process. This time around, the AD manager established a formal support mechanism to better facilitate the needed changes and ensure processes were followed. This support consisted of four critical components that were placed into service in a step-wise fashion: a project manager, a process group, a steering council, and several tactical process teams.

First, a project manager who had worked on previous CMM initiatives was identified to lead AD's CMM project. The project manager leveraged the Level 1 evaluation report to develop a software process improvement plan, which would be used strategically to guide the CMM project toward a successful Level 2 evaluation. To address tactical goals, however, a project management plan was written to describe specifically how the strategies would be carried out by the CMM project. The project management plan discussed details such as the tools, measures, and techniques that would be used on the project.

The second part of the organization's software process improvement infrastructure was a permanent Software Engineering Process Group (SEPG). While not required for Level 2, the SEPG was considered crucial for promoting process improvement and for giving software developers a sense of ownership of the processes. The SEPG was made up of 12 senior AD developers who had enthusiasm for process improvement and the ability to influence other developers in the organization to embrace improvement-oriented change. The CMM project manager served as the SEPG lead. Care was taken to ensure that every customer support area within AD was represented by at least one SEPG member. The SEPG met biweekly to review progress, make decisions, and assign action items. This group acted as the conductor of all process improvement activities associated with the CMM project.

Shortly after the SEPG was established, it became evident that some decisions could only be made by management. Decisions requiring allocation of funding and assignment of resources, as well as those related to policy, all required management involvement. Furthermore, management representation from all affected groups needed to be part of these decisions. The consulting team suggested that a management steering group (MSG) be established to address this need. The MSG would become the third segment of the improvement infrastructure and would be led by the department manager. The MSG comprised managers from across IT that would entertain requests for resources and funding and analyze progress reports given by the SEPG. In addition, as process issues crossed the AD organizational boundary, the MSG would be consulted in order to identify candidate solutions.

The final portion of the process improvement infrastructure was a process action team (PAT) for each KPA. A PAT is a temporary group of 6-10 employees, established to address specific process-oriented issues and develop process documentation. Six PATs were planned (one for each KPA at Level 2) and were to be formed at the time each KPA was developed. Each PAT selected a leader who would report status to the SEPG and the MSG, as required.

Although not strictly part of the improvement infrastructure, the PMO was identified early as a key player in the development and improvement of AD's processes. Members of the PMO were involved in the SEPG and PATs, since CMM at Level 2 involves many project management activities. The PMO was composed of 12 managers who met weekly to assign new projects, discuss process-related issues, and share experiences.

The relationship between the different parts of the improvement infrastructure is shown in Figure 21. The MSG directs the activities of the SEPG, which forms and directs PATs to address specific needs. PMO members participate in PATs and the SEPG.

Production: Workshops, Training, and Peer Reviews

The goals of each KPA require the existence of various process artifacts such as policies and procedures. For the CMM project, these process artifacts were produced during seven-day workshops — one workshop per KPA. Workshops were led by the consulting team and attended by the associated PAT. Each PAT was tasked with producing the

process that the organization would eventually use to develop software. Each workshop was composed of four parts:

1. Selecting a PAT leader and members of the PAT
2. Tailoring the KPA according to agreed-upon business and process goals
3. Identifying any existing policies, processes, procedures, work instructions, or tools that are applicable to the KPA
4. Leveraging the best existing practices (from the previous step) to define plans, processes, procedures, or guides for the functions within the KPA

Workshops were planned so that, at their completion, a package of work product drafts was delivered to the SEPG for its review. The work products might include changes to existing processes or entirely new processes. A standard package of work products for a KPA consisted of a policy, a process description, a plan template, plus a procedure for each function or major activity of that KPA. The PAT, with assistance from the SEPG, was then responsible for completing the package, having the work products undergo a peer review, delivering the training on the package to AD project members, and piloting the new process.

Peer reviews had been informally performed on a few large projects, but were by no means widespread. Since peer reviews are a high leverage technique and would yield a great deal of value to AD, the SEPG decided to enhance and document the existing peer review procedure and make it an AD standard. Peer reviews were first used on the CMM project to improve the quality of KPA work products and address overall project concerns. Training of the peer review process was provided to AD as well, in hopes AD would benefit from its use on its projects.

Rehearsal: Pilots

Pilot projects were used to test-drive each process as a risk-reduction strategy. As the work products from each KPA workshop were finalized, several projects were selected to begin using the new process. These pilots served two purposes: to familiarize the organization with the new processes and to ensure the new processes would work on actual projects.

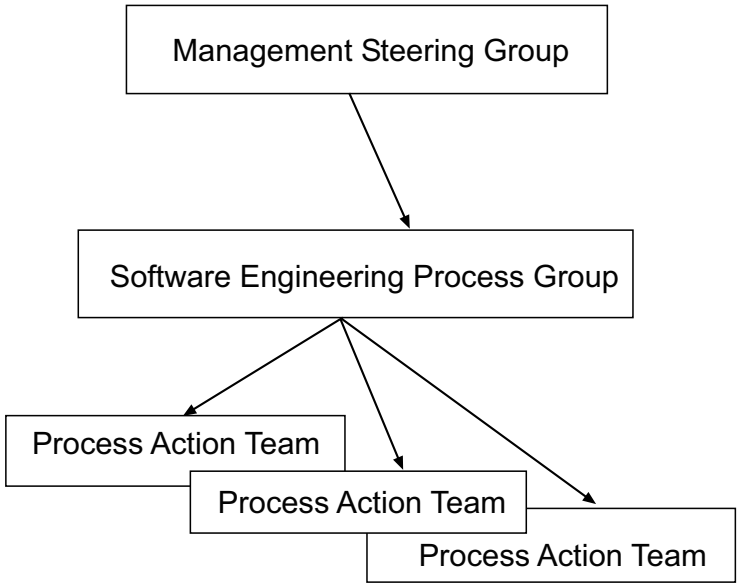

Figure 21 — Process improvement infrastructure.

All the practice in the world does no good, however, if management is not able to encourage behavioral change in the organization.

Promotion: Sponsorship, Buy-In, and Commitment

The AD manager and his director were sold on the viability of CMM. Senior management outside of IT, however, had no more than a conversational knowledge of CMM or its benefits. In the end, with multiple high-profile priorities, demonstrating management commitment to the project proved too difficult.

Early in the project lifecycle, executive management (up through the vice president) participated in two seminars, designed to address the benefits of CMM and the concept of software process improvement. Dialog among the participants served to establish some management commitment and clarify the sponsors of the project.

Audience: Business Units

The company's business units (customers of AD) were the primary recipients of the improvements realized by the CMM project. The benefits realized were applications that cost less, were developed faster, and were of higher quality. The company's external customers would also receive benefits such as faster turnaround for service or better access to order information. In addition, software developers benefited from greater pride of workmanship and a sense of professional achievement.

Reviewer: Consultants

The CMM consultants served as guides and teachers for the entire project. The consultants were selected based on their experience on AD's baseline evaluation and other similar work. Their wealth of experience on other assignments prepared them to provide fundamental and ongoing assistance to this project as well. The consultants were used heavily to conduct training seminars and workshops, CMM evaluations, and general process-oriented consulting tasks.

As each KPA work package was prepared, the consultants evaluated how these work products satisfied the goals of the organization in the context of that KPA. If weaknesses were discovered, the PAT would rework the package to address these problems before the package was deemed ready for use.

A formal metrics program was not initially planned as part of the CMM project because of budgetary constraints. As a result, the consultants encouraged PATs to integrate the measures needed for each KPA into their work packages. This integrated approach was helpful, but the absence of a metrics focal point prevented refinement of the overall metrics approach and establishment of a direction for the future.

Camera: Senior Management

The strongest sponsorship came from senior AD and IT management. They were versed in CMM and had firsthand knowledge of its benefits. Above IT management there existed only conversant knowledge of CMM; below AD management there was virtually no knowledge or appreciation of CMM.

The AD manager's role was to provide resources for the project and to lead the MSG. Funding for the project came from the AD budget, so the manager's commitment to the project's success would seem ensured. When AD staff members were requested for the CMM project, they were already busy on other projects. It was expected that the AD manager would resolve any priority conflicts arising between the CMM project manager and the resource owners (line managers).

Lighting: Metrics and Tools

Early on, the project manager realized that part of the AD organization was not convinced CMM could deliver bottom-line value. Experience with previous improvement initiatives showed that, without proving the value of software improvements, the initiative would be subject to cancellation. Internal benchmark data was previously used in other business units to measure the return on investment of process improvement. Another important use of an organization's benchmark data is to support cost and schedule estimates for future projects.

A quantitative historical benchmark study was planned to establish a performance baseline of AD's own projects, relative to industry trends. This benchmark study would provide a starting point at which future performance would be quantitatively compared, in order to show bottom-line benefits. A consulting firm, which specializes in this type of work, was retained to collect and analyze data and present findings to the organization.

Unlike the process baseline evaluation, this benchmark study measured quantitative and qualitative performance of numerous recently completed projects in order to compile a statistical sample. Performance was quantitatively measured in terms of schedule, cost, staffing, and quality. Qualitative measures included positive and negative impacts on the project and demographic information (e.g., team members, department name, and geographic location).

Data was collected during on-site interviews with project managers and developers who

were directly involved with the projects studied. Once the data was collected from these projects, analysis followed. The consulting firm studied the project data as a group for trends and correlations in order to characterize the development ability of the organization with respect to industry trends. Graphical representations of these relationships were prepared to tell the "story" of the organization.

One part of the AD story is told by the graphic shown in Figure 22. This graph demonstrates effort across projects of varying size (small on the left, large on the right) for the projects in the AD benchmark study. The Y-axis depicts the amount of effort expended between the start of detailed design until production release. The X-axis represents the size of the application measured in new and modified (effective) source lines of code. The thick center line represents the IT industry average trend and the lighter lines represent one standard deviation above and below that, respectively. The dots represent individual projects in the AD benchmark study.

The story this graph tells is that the vast majority (82%) of AD projects require less effort (cost) than the IT industry average. This positions AD as a low-cost provider of IT applications. It can be observed that this analysis supports the IT goal to become a low-cost provider of software applications. To tell the rest of the story, additional graphs were produced to show variance from plan and distribution by phase for effort and schedule, quality performance, productivity, and volatility (requirements turbulence and staff turnover).

Tools to support the collection and analysis of metrics as well as quantitative estimation and project tracking were already part of the standard tools available to AD. However, most project managers were not trained to

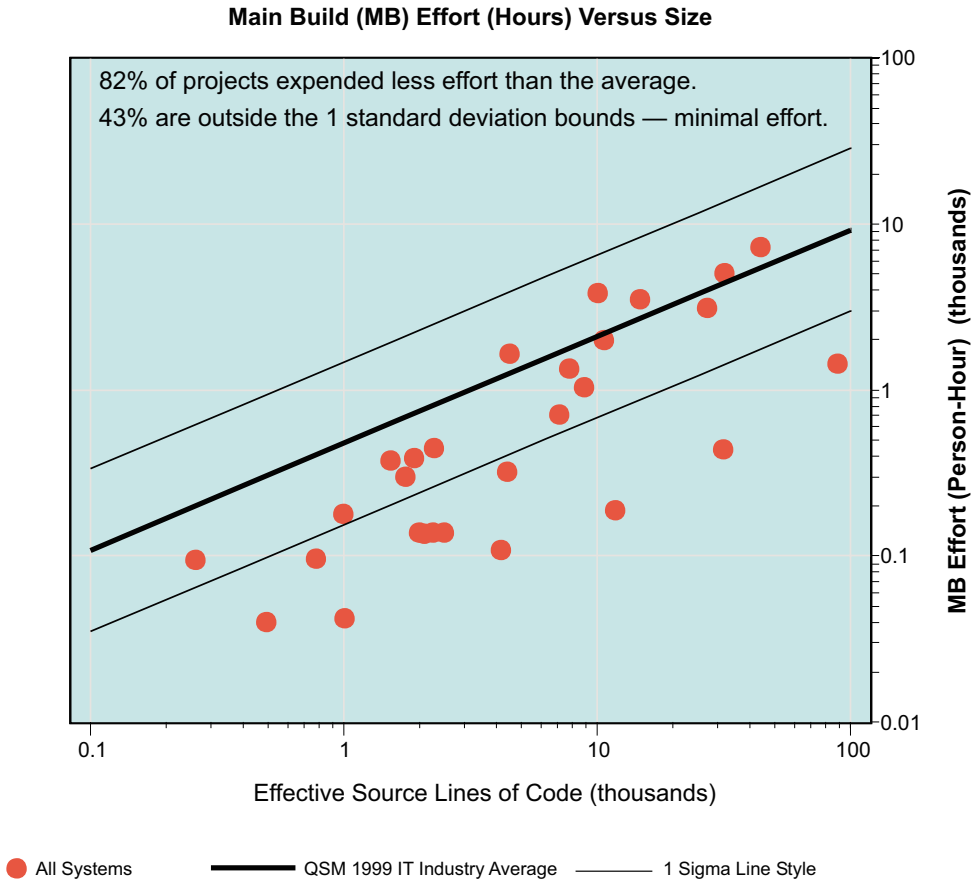

Figure 22 — Project effort scatter plot.

use them. This reflects the perception that management did not consider this level of discipline as a requirement of its project managers (unfortunately). Tools to support requirements management and configuration management were requested by the PATs as progress was made on work packages. Locally produced tools were utilized for peer reviews, action item tracking, risk management, and meeting minutes.

Initially, recommending and providing training on process-oriented tools was not within the scope of the CMM project, but this was identified later as vital to the success of the project. AD management realized this and asked the project manager to add these activities into the scope of the project.

About the Authors

James Perry has taught computer science and software engineering for more than 15 years. He also worked in the defense industry for GTE Government Systems for 15 years and was one of the first resident affiliates at the Software Engineering Institute from 1986 to 1989. He has taught and consulted in software process and engineering since 1996. Mr. Perry received a doctorate in computer science from the University of Connecticut.

James Heires is a 15-year veteran of the software industry; he spent the majority of that time with Rockwell Collins, Inc. His professional experiences include design of Electronic Flight Instrumentation Systems, Engine Indicator and Crew Alerting Systems, Flight Management Systems, and consumer electronics. Five years of software process improvement followed, illuminated by the achievement of Software Engineering Institute Capability Maturity Model Level 3 in two Rockwell Collins business units. Recently, Mr. Heires has been working to improve the state of the practice of project management through parametric cost estimation and quantitative tracking techniques.

Carol Wickey is an award-winning technical writer with more than 15 years of diversified experience writing for software, Internet, telecommunications, environmental, and industrial applications. She has served as manager for development of software applications for home and small business use, specifically legal and desktop publishing products, for Parsons Technology, Inc. Her experience also includes managing technical publications and multimedia development departments. Prior to working on the Capability Maturity Model initiative, Ms. Wickey directed Y2K contingency planning for McLeodUSA, a US $1-billion telecommunications firm.

Contact any of the authors at jtheires@netins.net.