An Integrated Human Resources Approach to Moving Information Technology Professionals Toward Best in Class

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Software is integral to every part of AT&T's business. More than 30,000 company employees are involved in some aspect of software development. Until recently, however, the AT&T information technology (IT) population was not recognized and supported as a professional community. In 1994, this situation began to change when a group called the People Team was established as part of a larger initiative to address AT&T's software competitiveness. The team comprised technical managers and human resources (HR) professionals appointed by the AT&T business units and divisions. Its objective was to develop different approaches to migrating the IT community to best-in-class HR practices. To guide its work, the People Team benchmarked HR practices for software professionals in selected high-technology companies. Key outputs from the team included a curriculum guide, recruiting and staffing strategies, and reward and recognition practices. Thus, AT&T software professionals are now better able to keep their technical knowledge and skills up to date and remain prepared for technology changes as they occur. In addition, AT&T's future leadership in IT and software development is ensured.

Introduction

Software is crucial to nearly all AT&T products and services. Its uses range from switching telephone calls to recording automatic teller machine transactions. Furthermore, the operation of AT&T's businesses depends on it. For example, software programs are used to track revenues and expenses, forecast demand for new products and services, and administer customer accounts. Not surprisingly, more than 30,000 AT&T employees support the development and application of information technology (IT).

Recognizing that software is crucial to its ongoing business success, AT&T launched an initiative in 1993 to establish software development as a core competency. To oversee the initiative, the Software Leadership Group (SLG) was formed, which comprised senior AT&T executives. Subsequently, the SLG organized three teams to focus on the three key aspects of software development:
- Platform,
- Process, and
- People.

In 1994, a parallel "people effort" was established under the auspices of the Corporate Information Office (CIO). The purpose of this effort was to propose an HR plan to address the needs of IT professionals at AT&T. Management quickly recognized that both HR efforts had much in common. Thus in mid 1994, the CIO/SLG People Team was formed to develop an integrated approach to recruiting, developing, and motivating the AT&T IT professional community.

The CIO/SLG People Team consisted of a mix of technical and HR professionals appointed by the business unit or division chief information officers and chief technical officers. The team's goal was to equip AT&T

Figure 1. Consisting of both long- and short-term components, the human resources (HR) strategy that directed the work of the People Team employs an HR conceptual model for managing the information technology community. The elements of the pyramid show the structure for the progression of the People Team's efforts.

IT professionals continually with the skills, knowledge, and experience to ensure that AT&T remains the globally recognized leader in software-based products and services.

Increasingly, HR practices are viewed as crucial components in achieving best-in-class status for software development. In fact, the Software Engineering Institute (SEI) has proposed a corollary to its Capability Maturity Model for Software—known as the People Capability Maturity Model (P-CMM)—to be used in assessing how well an organization manages and develops its talent in software and information systems development.[1]

The Capability Maturity Model for Software is widely acknowledged and accepted throughout the software development industry. Additionally, the P-CMM is viewed as a useful tool for validating the CIO/SLG People Team's work.

Strategy

The HR strategy that directed the work of the People Team closely parallels the P-CMM. Consisting of both long- and short-term components, the strategy

employs an HR conceptual model for managing the IT community (see Figure 1).

Based loosely on Maslow's hierarchy of needs,[2] the model provides the structure for the progression of the People Team's efforts. Over the short term, the People Team addressed the basic needs of the IT population—competencies, training, recruiting, career planning, and incentives.

As in Maslow's original model, these basic needs must be satisfied before moving on to satisfying societal and self-actualization needs. Issues concerning societal needs include the certification and peer review processes. Through these processes, standards of proficiency are defined, promoted, and ensured.

At the top of the hierarchy is the need for self-actualization. The long-term plan addresses self-actualization issues (for example, leadership development) and concepts (for example, high-potential development).

Although the People Team strategy was conceived prior to the release of the SEI P-CMM, individual concepts are closely aligned. Both the People Team's strategy and P-CMM recognize that HR practices must progress through a series of stages before achieving optimal continuous improvement.

The self-actualization component of the People Team's conceptual model roughly corresponds with level 5 (the highest level) of the P-CMM. For example, a key practice area of level 5 is personal competency development. The short-term strategy to address basic needs, at the base of the pyramid, focused on issues that correspond with those in level 3, the "defined" level of the P-CMM.

Figure 2. The People Team's short-term work relied on a comprehensive and integrated approach for developing, deploying, and supporting common human resources practices, as shown in this block diagram. The work was completed in such a way that each successive output supported work on the next output.
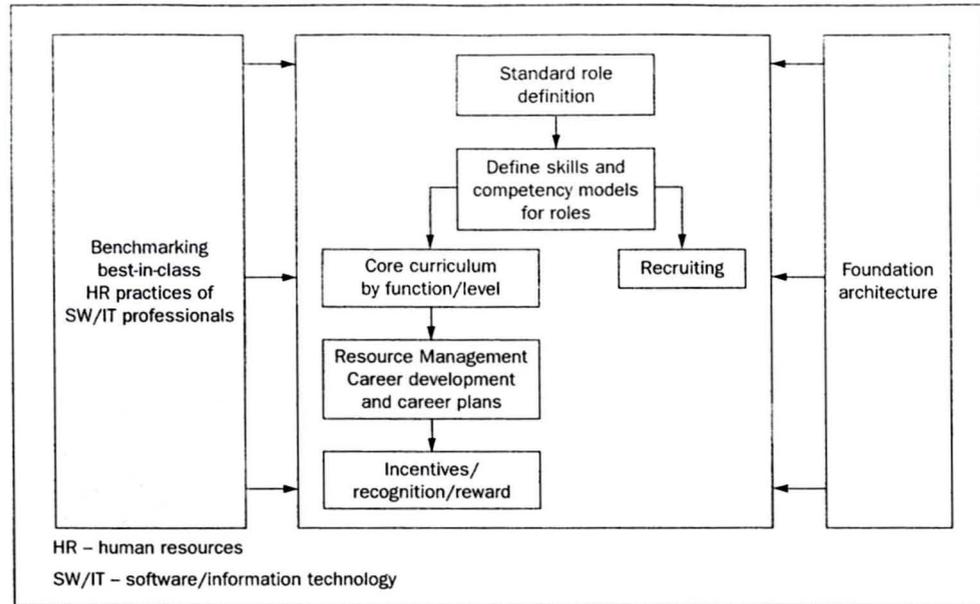
Specific examples of how the models are interrelated—particularly with respect to the People Team's short-term strategy—are discussed throughout the remainder of this paper.

Short-Term Approach

The team's short-term work has relied on a comprehensive and integrated approach for developing, deploying, and supporting common HR practices (see Figure 2). The work was completed in such a way that each successive output supported work on the next output. The following two discrete factors helped shape this approach:

- Knowledge of outside industry practices; and
- Adoption of a comprehensive AT&T Foundation Architecture, which is a standard list of hardware and software products and services used throughout AT&T by software development organizations.

Armed with the knowledge of both these factors, the team defined key IT roles. With these roles defined and the skills associated with them identified, the team tailored a curriculum to keep IT professionals knowledgeable about state-of-the-art tools and techniques. Additionally, the team defined practices in the areas of reward and recognition, recruiting, and resource management. The work undertaken in each area is described further in the sections that follow.

Benchmarking

One round of benchmarking was performed, which both guided the work and provided a tool for assessing performance in HR practices. Additional benchmarking is planned.

To perform the benchmarking, AT&T contracted with Software Productivity Research, a well-known consulting firm specializing in IT people management. Some of the external benchmarking participants included Texas Instruments, IBM* (software product development), and the U. S. Air Force. Several AT&T business units and divisions also participated, including AT&T Consumer Communications Services, AT&T Corporate Information Technology Services, and AT&T Global Information Solutions research and development.

Data were collected by means of multiple-choice questionnaires, as well as on-site interviews, which featured open-ended questions. Topics included the following:

- Nature of software demographics and occupations;

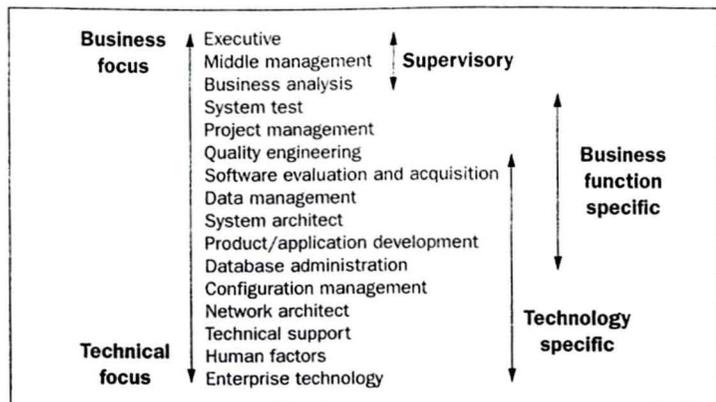| Business focus	Executive		
	Middle management	Supervisory	
	Business analysis		
	System test		
	Project management		
	Quality engineering		Business function specific
	Software evaluation and acquisition		
	Data management		
	System architect		
	Product/application development		
	Database administration		
	Configuration management		
	Network architect		Technology specific
	Technical support		
Technical focus	Human factors		
	Enterprise technology		

Figure 3. The initial work of the People Team was based on these 16 roles. For easy understanding, they move along a continuum from roles having primarily a business focus to others having a highly technical orientation. Although not intended to be inclusive, these roles cover the vast majority of the different types of work currently performed in the information technology arena.

- Personnel recruiting;
- Performance measurement and evaluation;
- Education and training;
- Career development;
- Benefits, awards, and incentives;
- Organization and work design; and
- Team culture and development.

Most if not all the topics are key practice areas covered in the P-CMM. Moreover, the questionnaire has served as a preliminary trial for the development of an assessment tool for the model.

Roles

Benchmarking was an important component of the team's work. The urgency of the benchmarking task, however, demanded that the team begin its activities even as the initial round of benchmarking was being planned.

The first issue was to define and classify the various types of activities performed by IT professionals throughout AT&T. It soon became evident that one generic curriculum for all IT professionals would not suffice given the myriad number of tasks they perform—for example, writing code or administering local area networks. The sheer diversity of jobs also precluded developing a curriculum for each position.

The problem of definition also presents itself. For example, a systems analyst in one organization might not perform the same set of tasks as performed by a systems analyst in another organization.

The team's approach was to define broad roles that were independent of the chosen software-development process (methodology) and technology (tools, language). As defined by the team, a role is "a commonly understood and readily identifiable function or position that is performed by an individual and requires the application of skills and knowledge." Roles, however, are not jobs.

Subsequent benchmarking data have shown that the use of roles in describing IT work is unique within the industry. As envisioned by the team, IT roles can be used as the basic building blocks to define an infinite number of individual jobs explicitly using shared terminology and common language. Providing the capability to define job descriptions succinctly in terms of standard IT roles enables job staffing based on the skills requirements for each unique job assignment.

The number and definition of the roles continue to evolve as required by new processes and technology. In addition, changing strategies and infrastructures causes new roles to be identified and existing ones to change. In time, some roles may become obsolete as AT&T and its IT professional community change the way they do business.

The initial work of the team was based on the 16 roles it proposed early in 1995 (Figure 3). To help in understanding them, roles are shown as moving along a continuum. They move from roles having primarily a business focus (for example, a middle-manager role) to those having a highly technical orientation (for example, a network-architect role). Although not intended to be inclusive, these roles cover the vast majority of the differ-
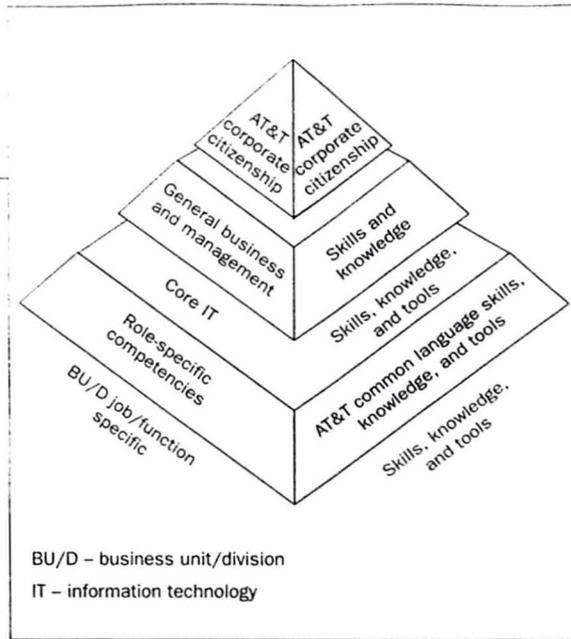
Figure 4. This drawing depicts the components of the competency model using a three-level pyramid. The top level represents the AT&T Transformational Leadership Framework and Common Bond principles. The middle level represents the more general business and management competencies applicable across a wide range of jobs in AT&T. The bottom level shows the specific skills, knowledge, and tools required to perform each information technology role.

ent types of work currently performed in the IT arena.

Competency Modeling

The definition of roles provided the team with a common terminology and mutual understanding of the various functions performed by AT&T IT professionals. Role definitions alone are not sufficient, however, to establish curricula or to formulate effective development plans. What is required is an identification of the specific skills and knowledge necessary to perform the role effectively.

The P-CMM specifically addresses knowledge and skills analysis as a key practice area in level 3 (defined) of the model. To perform the analysis, the team implemented *competency modeling*, which explicitly specifies and describes the skills, knowledge, and other characteristics required to perform the work—in this case, as defined by the roles.
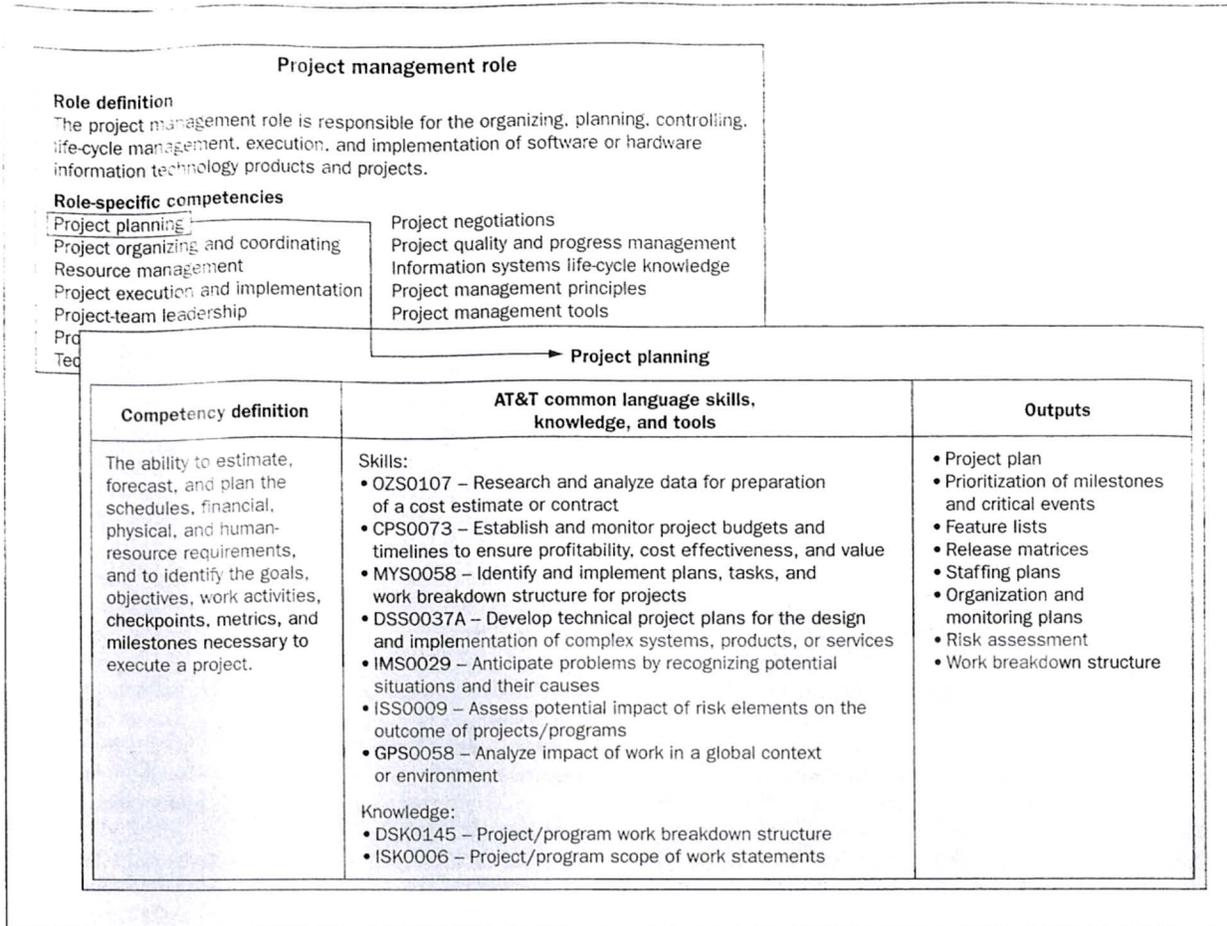
Competency modeling is complex, requiring a thorough analysis of the work to determine the skills, knowledge, and other characteristics that underlie performance. To establish competency models, trained facili-

tators conducted focus groups consisting of individuals who represented each role. These individuals were drawn from a cross section of AT&T business unit and division IT organizations.

The data gathered from the focus groups were analyzed and mapped to the AT&T Common Language, a corporate-wide vocabulary of skills, knowledge, tools, and other information used to describe both people and their work. The resultant mappings were aggregated into competency descriptors to provide a concise summary of the requirements for each IT role. Subsequently, draft models were shared with focus group participants and members of the People Team to validate the contents prior to creating the final models.

Figure 4 depicts the components of the competency model using a three-level pyramid. The top of the pyramid represents the AT&T Transformational Leadership Framework and Common Bond principles, factors corresponding to the practices that demonstrate leadership and living the corporation's values.

The middle pyramid level represents the more general business and management competencies applica-

Project management role

Role definition
The project management role is responsible for the organizing, planning, controlling, life-cycle management, execution, and implementation of software or hardware information technology products and projects.

Role-specific competencies

Project planning
Project organizing and coordinating
Resource management
Project execution and implementation
Project-team leadership
Pro
Tec

Project negotiations
Project quality and progress management
Information systems life-cycle knowledge
Project management principles
Project management tools

→ Project planning

Competency definition	AT&T common language skills, knowledge, and tools	Outputs
The ability to estimate, forecast, and plan the schedules, financial, physical, and human-resource requirements, and to identify the goals, objectives, work activities, checkpoints, metrics, and milestones necessary to execute a project.	Skills: • OZS0107 – Research and analyze data for preparation of a cost estimate or contract • CPS0073 – Establish and monitor project budgets and timelines to ensure profitability, cost effectiveness, and value • MYS0058 – Identify and implement plans, tasks, and work breakdown structure for projects • DSS0037A – Develop technical project plans for the design and implementation of complex systems, products, or services • IMS0029 – Anticipate problems by recognizing potential situations and their causes • ISS0009 – Assess potential impact of risk elements on the outcome of projects/programs • GPS0058 – Analyze impact of work in a global context or environment Knowledge: • DSK0145 – Project/program work breakdown structure • ISK0006 – Project/program scope of work statements	• Project plan • Prioritization of milestones and critical events • Feature lists • Release matrices • Staffing plans • Organization and monitoring plans • Risk assessment • Work breakdown structure

Figure 5. This example shows a fragment of a specific competency model for the project manager role. It illustrates how the People Team implemented the competency model concept. Each AT&T business unit and division can use the models for each role to tailor specific requirements for information technology jobs. This tailoring may involve driving certain information to higher levels of detail depending on its intended use and purpose.

ble across a wide range of jobs in AT&T, such as communications skills.

The specific skills, knowledge, and tools required to perform each IT role appear at the base of the pyramid. A fragment of a specific competency model for the project manager role is shown in Figure 5 to illustrate how the People Team implemented the competency model concept.

Each AT&T business unit and division can use the models for each role to tailor specific requirements for IT jobs within its Chief Information Officer and Chief Technical Officer organizations. This tailoring may involve driving the skills, knowledge, and tools informa-

tion to higher levels of detail depending on its intended use and purpose.

Core Curriculum

The integrated approach for the People Team's efforts required that competency models be developed for each role prior to the development of a core curriculum. Nonetheless, an initial cut at a core curriculum was completed early in 1995. The curriculum focused on the following six crucial functions in the software product area:
- Project management,
- Software management,
- Systems engineering,
- Software development,
- System and integration testing, and
- Technical support.

The initial curriculum was called the *kernel curriculum* because it addressed only a portion of the population. The team believed that courseware could be developed in such a way to make it usable throughout AT&T.

To develop the courseware, a governance structure was established having sponsors—at an executive

level—for each significant topic area. Sponsors then appointed lead subject-matter experts (SMEs) to provide input on the state of the art and the content and requirements training. Other SMEs provided additional assistance if needed.

All the SMEs worked closely with the AT&T Technical Education Center (AT&T-TEC) on the development or purchase of the courseware.

Now that the competency models are completed, design of a full core curriculum for all IT roles is under way. This design work is progressing in parallel with the ongoing development of the kernel curriculum. Meanwhile, the AT&T-TEC has adopted the People Team's approach as a model for planning similar curricula for other communities.

Resource Management and Career Planning

After work on curricula had been initiated, team members felt that planning work could begin for resource management and career development. Resource management refers to an overall corporate approach to the sharing of technical resources throughout AT&T.

An accurate and up-to-date skills inventory is crucial to the implementation of resource management. Managers can use such an inventory to identify individuals having the skills needed for new programs. A skills inventory is also crucial for implementing the use of competency models for career planning and to determine specific training needs. The P-CMM notes that a key activity within the knowledge and skills practice area is the maintenance of appropriate profiles in an information database.

The People Team supported a limited trial of a skills inventory platform throughout several business units in the AT&T Communications Services Group. The purpose of this trial was to anticipate and manage growth, restructuring, career planning, and training more effectively. The trial served to illuminate and resolve some of the fundamental questions associated with the implementation of a common skills inventory, such as how to ensure that it is kept current or how data specific to business units can be incorporated into the database.

Recruiting

The existence of a common platform throughout AT&T to track people, as well as their skills and knowl-edge, also supports recruiting efforts. In developing recruiting processes, the People Team focused on the following IT community issues:
- Identifying processes and criteria for hiring college graduates and experienced workers,
- Structuring college intern and co-op programs,
- Maintaining diversity, and
- Employing contractors and consultants most effectively.

To perform the work, the team had to understand existing recruiting and hiring criteria and how special programs influence and support hiring in each category. The team then devised a plan to increase awareness, linkage, and use of the existing processes and programs. The team also recommended new processes to ensure consistent IT community hiring practices.

Incentives

While many AT&T IT organizations make use of incentives, the People Team investigated methods for ensuring that incentives were used consistently throughout the community. Incentives to reward cross-functional team efforts, to emphasize training and skills renewal, and to support reuse and multiple uses were assessed.

Recommendations included one-time cash payments, spot awards, trips, and compensation plans having variable risk/reward ratios (especially useful on crucial projects). Level 3 of the P-CMM similarly provides compensation and rewards to motivate improved performance.

Long-Term Needs

After completing many short-term initiatives, the People Team is now working on long-term issues that address the needs outlined in the higher levels of the HR conceptual model. These issues include succession planning, high-potential development, peer review, and certification.

Certification is a particularly difficult problem. Several companies have implemented their own certification programs, but such programs are not recognized by other firms. The Institute of Electrical and Electronics Engineers is also investigating the prospect of certifying software engineers. In grappling with this issue, the People Team will consider what roles to certify, how to handle lateral movement across roles and vertically within roles, as well as testing and recertification.

The People Team has also begun the process of

evaluating its initial work for alignment within the new structure being proposed for AT&T in 1996. As technology and business needs change, so will the roles and skills required to perform the work. Over time, the team predicts it will evolve into a council whose primary responsibilities will be to ensure the ongoing care and management of IT professionals.

Summary

Although the first phase of the People Team's work has been completed, it will take some time before it is implemented uniformly throughout AT&T. As the AT&T business units and divisions implement the People Team's proposals, members of the IT community will have the opportunity to acquire state-of-the-art skills, which they can apply when developing new products and services based on leading-edge software.

New HR systems will further benefit IT professionals. Such systems will facilitate identifying individuals having the requisite skills, knowledge, and experience for specific jobs. New HR systems will support career-planning activities, as well as the recognition and reward for achievements. These systems—together with the continuing partnership of HR and technical management—will also facilitate enhanced recruiting and hiring processes to ensure that AT&T continues to attract the most highly qualified candidates.

In short, the IT community will be equipped with the skills, knowledge, and experience needed to ensure AT&T's globally recognized leadership position in software-based products and services.

*Trademark

IBM is a registered trademark of International Business Machines Corp.

References

1. W. Curtis, W. E. Hefley, and S. Miller, *People Capability Maturity Model*, Software Engineering Institute, Pittsburgh, Pennsylvania, September 1995.
2. A. H. Maslow, *Motivation and Personality*, Harper & Brothers, New York City, 1954.

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