Assessing and Improving Architecture Competence

Technology Is Necessary but Not Sufficient

As the software and systems engineering world is increasingly realizing the importance of architecture, the focus has been on technical aspects: methods and tools for creating, analyzing, and using architecture. What has received less attention—while holding equal importance—is that these activities are carried out by people, working in teams, within organizations.

Even when your organization knows that maintaining good architecture is important for meeting business and mission goals, engaging technically qualified architects does not guarantee architecture success. Your architects must be able to work effectively within a project team, in the context of supportive organizational culture and practices.

> The architecture competence of an organization is the ability of that organization to *grow, use, and sustain* the skills and knowledge necessary to effectively carry out architecture-centric practices at the *individual, team, and organizational levels* so as to produce high-quality architectures aligned with the organization's business.

Assessing Competence

To guide investment in improving architecture capability, the SEI has developed a diagnostic method to systematically assess your architecture competence at the individual, team, and organizational levels. This diagnostic is flexible in scope and can be applied effectively to a project, business unit, or overall organization.

Following an initial scoping phase to define the objectives and boundaries of the assessment, your architects and other stakeholders, including technical managers, complete a questionnaire. Their responses then guide the on-site phase, where the SEI team interviews architects, executives, and stakeholders. During this phase, the SEI team also examines architectures that have been produced in the past by your organization. The final phase of the assessment presents the findings and recommendations to the architects and assessment sponsors.

The assessment instrument is based on the SEI Architecture Competence Framework, which focuses on the areas of software engineering, technical management, and organizational management. Your architects' and stakeholders' responses to the questionnaire and interview questions will reveal whether your architects have adequate technical and nontechnical skills, as well as the overall value of your architects' outputs to the organization. Responses also indicate the influence of the architects within the organization. For example, does your organization value their input on product feasibility, promote their frequent
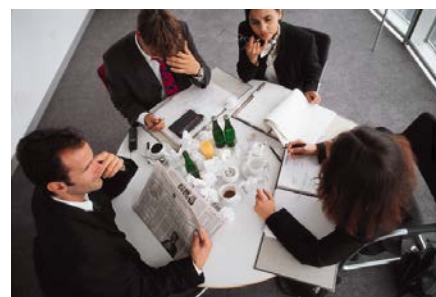
interaction with stakeholders, and provide them ample opportunity to communicate, coordinate, and learn? Such opportunities are tied to aspects of your organization's structure and culture. Assessment often reveals attitudes or practices that you may not recognize as influencing your architects' performance. The ingrained nature of organizational culture can make it difficult to imagine alternatives; the assessment team's perspective can provide new direction.

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Improving Competence

The SEI research in this area has been driven by the question "How can we help an organization help its architects to do their best work?" Achieving architecture competence will ensure that you realize the benefit of architecture-centric practices, including predictable, routine success in architecture and the alignment of your architecture to your business goals.

Four Views of Architecture Competence

The SEI Architecture Competence Framework is based on four models, or perspectives, of competence that directly inform improvement strategies. Each model helps you understand your organization's capabilities in a different way and provides a basis for planning improvements to close gaps found in the diagnostic assessment.

The *duties, skills, and knowledge* perspective defines what an architect must know and do to be competent.

The SEI work on this model involved reviewing more than 200 job descriptions, resumes, course listings, and other resources and cataloging 201 duties, 85 skills, and 96 knowledge areas, many of them nontechnical. The competence assessment team pinpoints your architects' strengths and deficits and recommends activities for improvement. The team may suggest how to better value your architects and enable their best performance.

The *human performance technology* model was developed by Thomas Gilbert, who defined worthy performance as that which "produces value at reasonable cost,"[1] without regard to the processes used to achieve the results. The assessment team will help you assess the value of your architectural output as well as its cost and provide recommendations for creating a more favorable ratio between the two.

Organizational learning is defined as a change in an organization's knowledge, routines, or performance that occurs as a function of experience.[2] Organizations that routinely produce suboptimal results are not transforming experience into knowledge. A competent organization will recognize opportunities for organizational learning and the types of learning processes best suited for different types of experiences. The assessment team will advise on how various types of learning context affect the transformation of experience into knowledge.

Teams developing a product must cooperate, or *coordinate* their activities. Assessment in this area will show you which coordination activities are necessitated by particular architectural decisions (e.g., dependencies between modules being developed by separate teams) and the effectiveness of your specific coordination and communication mechanisms, with recommendations for improvement.

Applications

Beyond the proactive targeting of areas for capability improvement, the SEI assessment can be used to determine how architecture capability deficits may be contributing to system failures. It can also be useful for evaluating contractors as part of acquisition decision making.

Related Web Site

www.sei.cmu.edu/architecture/research /competence/index.cfm

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[1] Gilbert, Thomas F. *Human Competence: Engineering Worthy Performance*. International Society for Performance Improvement, 1996.

[2] Argote, L. & Todorova, G. *International Review of Industrial and Organizational Psychology*. John Wiley & Sons, Ltd., 2007.

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