Tracy Hall, University of Westminster

NO QUALITY WITHOUT EQUALITY

New views of mature ideas on software quality and productivity.

As software engineers, we often focus on how technology affects the quality of the software we develop. Our research investigates the influence of process, tools, languages, and methods to determine how best to fine-tune our products' attributes. When we look at the developers themselves, we tend to categorize them in terms of experience and skill. Tracy Hall has been looking at a different but potentially powerful aspect of developer influence: attitude toward quality.

— Shari Lawrence Pfleeger

QUALITY-CONTROL MECHANISMS PLAY an important role in improving software quality. However, quality improvement requires us to customize and calibrate these mechanisms to particular development environments. To do this, managers must understand how quality mechanisms affect developers and, in turn, how developers and their perspectives affect quality mechanisms. Otherwise, calibration and improvement are uncontrolled.

Managers must recognize that software developers do not form a homogeneous group. Different developers may have different thoughts about and reactions to the use of formal quality mechanisms, which makes optimizing quality control a tricky business. Indeed, developers may have significantly different views of what quality itself means. To implement effective quality-control tools and practices, managers must understand these different developer attitudes.

When differentiating types of developers, we often classify them in terms of their experience with different domains, languages, tools, and practices. But my research reveals that we may want to look also at the differences in attitudes between men and women. Fewer women than men work as software engineers, yet they form a significant and growing proportion of that industry's population.

Recently, I surveyed more than 200 software engineers from five different development organizations. Women accounted for about 20 percent of those surveyed. Their responses indicate that female developers had perspectives on software quality that clearly differed from those of male developers. This difference was particularly evident in the areas of work quality, effectiveness of formal quality mechanisms, satisfaction with how quality mechanisms are used, feedback on quality, and honesty about quality.

WOMEN DEVELOPERS MAY HAVE HIGHER STANDARDS THAN MEN.

WORK QUALITY. Female respondents showed consistently less satisfaction with the quality of the work they produce than did their male counterparts. Figure 1 shows that 27 percent of the women surveyed said they "rarely" produced good quality work, compared with just 12 percent of the men. Furthermore, twice as many men as women said they "always" produced good quality work.

Because I could find no measurable difference in the *actual* quality of work produced by the two groups, this result raises many questions whose answers have quality-control implications. The difference in attitude may indicate that women developers have higher standards than men. Or it may mean that women are more objective and less defensive about the quality of their work. If the latter, male developers may be less likely to look for ways to improve the quality of their work.

The difference in attitude may also reflect unequal treatment by managers. If men have an inflated sense of their work's quality, it may be because managers praise them more for it. That is, the managers may (intentionally or not) be keener to criticize women than men for poor work. Regardless, managers must recognize this bias and take steps to understand and correct it.

FORMAL QUALITY MECHANISMS. Although women and men spent equal amounts of time on quality-related activities, my study suggests that women are more critical of the effectiveness of formal quality mechanisms. In particular, women were less convinced about the effectiveness of standards, inspections, and software metrics. As Figure 2 shows, 33 percent of the women surveyed thought that metrics were not useful, compared with only 23 percent of the men.

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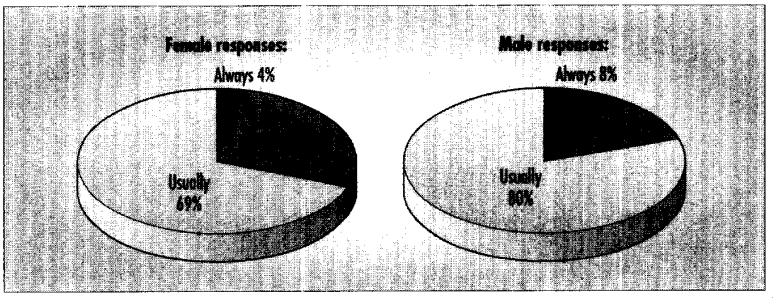

Figure 1. *How often do you produce good quality work ?*

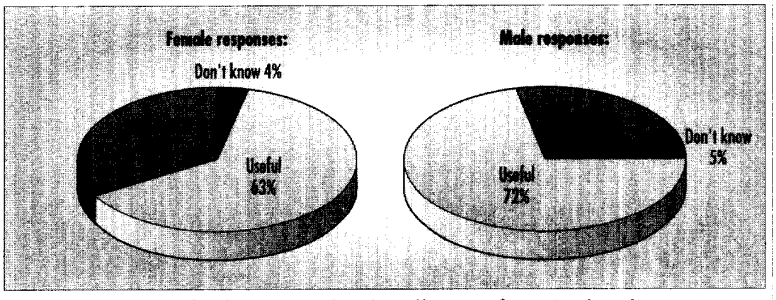

Figure 2. *How useful do you consider the collection of metrics data ?*

These results may relate to gender-based differences in the perception of work quality. For example, women may fear that formal quality practices will reveal their low-quality work. Or perhaps women dislike being in the spotlight more than men, as can happen during inspections or reviews. Alternatively, it may be that women are more inclined to view quality practices as distractions from the actual job at hand. Or they may see quality practices as robbing them of autonomy and flexibility. In any case, the apparent disenchantment with quality mechanisms appears to relate directly to how poorly both genders claim those mechanisms have been implemented.

These results contradict common wisdom. We would expect women to favor inspections and carefully organized quality checks. One explanation for this situation may be that managers apply assessment techniques more severely to women than to men. We must research ways to ensure that assessment is consistent, fair, and remains focused on the product, not the personnel.

QUALITY-MECHANISM USE. Overall, the women surveyed were consistently more critical than men about how quality mechanisms are being used. For example, when asked what they thought about metrics-data use, more women than men thought that metrics data were

- not accurate — only 14 percent of the women judged the collected data accurate, compared with 25 percent of the men;
- manipulated — 78 percent of the women compared with 67 percent of the men;
- not used constructively — 28 percent of the women compared with 18 percent of the men.

Although women had less faith than men in the way quality mechanisms were being used, women generally expressed more satisfaction with their jobs and with the organizations for which they worked. The relationship between these job characteristics and the products produced is unclear. What is clear is that a woman's morale does not seem to be affected by her disappointments with quality processes or products.

FEEDBACK ON QUALITY. When the survey asked developers if they received enough feedback on work quality, some interesting trends emerged. Men and women generally agreed that their organization did not provide enough overall feedback on quality performance. However, women tended to be more satisfied with the level of team-based quality feedback and a lot more satisfied with the level of individual quality feedback: 61 percent said they were satisfied with the current level of individual feedback compared with just 43 percent of the men.

In light of the work-quality perceptions mentioned above, perhaps women developers need less direct feedback than men. If true, the reasons may be historical; women developers may be less keen about feedback because they have received a disproportionately large amount of negative feedback in the past. On the other hand, women may need less feedback because they get enough from other sources, such as informal code-reading with colleagues or simple metrics tools for static-code analysis.

HONESTY ABOUT QUALITY. Employees from all the organizations that participated in the study showed an extreme lack of knowledge about their organization's quality practices — evidence that these organizations had big problems communicating with employees about quality. For example, 52 percent of all staff in the survey did not know whether their work was externally quality-certified using either ISO 9000 or the British software-quality standard, BS5750. Likewise, 10 percent of all staff members did not know if their current project had a quality manager. In general, women answered "don't know" to a question about quality mechanisms more often than men did. I'm unsure if this disparity results from women's comparative lack of knowledge or men's greater willingness to guess the correct answer.

The results and questions presented here should encourage managers to consider the different perspectives and motivations of women and men on their projects. For productive staff and effective practices, managers must understand these differences and their potential effect on software quality. ◆