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Enabling Software Process Improvement Through Feedback Mechanisms

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This dissertation examines whether feedback mechanisms (such as process maturity and individual proficiency) can enable software process improvement efforts. Similar to control mechanisms (such as speedometers or gauges) in state machines, feedback mechanisms are both cause and effect. Two examples are process maturity and inspector proficiency. Process maturity focuses on inspection team practices rather than overall organizational cultures. Inspector proficiency focuses on individual abilities and motivations (coding, using support tools, and executing strategies) to work effectively during a process such as an inspection or a development project.

If feedback mechanisms can be recognized, then teams and larger organizations can better allocate resources (people) and assign tasks. The expected benefits are increased productivity and faster time to market. Within distributed contexts, such mechanisms should enable different-time/different-place work processes. For example, effectiveness and efficiency should improve given access to expertise across an entire organization and ability to form virtual teams.

Three overlapping process maturity phases are posited. The first is a process definition phase in which a team forms a consensus about how and what to do during a process. During this phase, the team is learning and establishing the process. The second phase focuses on productivity and doing the process effectively. The third phase focuses on proficiency and process efficiency. During the later phase, the team realizes that the process must be more selective because the issues are harder and more complex.

Prior knowledge of process maturity and reviewer proficiency should help with resource allocation.

Thirty-one experienced software developers representing organizations with different organizational process maturity levels were surveyed regarding inspection process maturity and inspector proficiency. The results support the importance and need for further research. Significant process variations exist within relatively mature development organizations. In one process mature organization, inspections process practices ranged the entire spectrum of process maturity (ad hoc, repeatable, defined, managed, and optimized). Inspector proficiency is difficult to measure. Proficiency might be better measured based on perceptions of expertise instead of quantified historical performance.

Another result of the survey and subsequent interviews was recognition that feedback mechanisms are important outside the context of inspections. Earlier collaborative research found that visual display of performance measures dramatically affected group performance especially when group norms were suggested. Robert Austin points out problems of measurement dysfunction when it is difficult to measure major performance factors. Austin suggests that team-based goals are better than partially measured performance metrics. Understanding how and when to measure feedback mechanisms has significance beyond inspection processes in areas such as project team formation. The larger problem context is any group process that is expected to improve over time and in which people are assigned to process tasks.

Feedback mechanisms might provide a means of measuring and managing performance at the workgroup level. Doing so in an unobtrusive and effective manner is a challenge. The goal is to enable teams to self-define tasks and assign of responsibilities in a manner that encourages productivity and decreases time to market.

References