

Continuous Process Improvement Applied to Health Care Related Disputes

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Overview: Processes are pervasive in virtually all domains of human endeavor, including government and health care. We have studied processes in these two domains, as well as others, and have discovered that defects and vulnerabilities are not uncommon. This has encouraged us to explore and extend the Continuous Process Improvement (CPI) paradigm, promulgated successfully by Shewhart, Deming, and Juran in manufacturing, to non-manufacturing domains such as government and health care.

In our work in CPI, we have learned that processes are more complex than might be anticipated, are more numerous and diverse than might be expected, and play a critical role in coordinating the activities of humans, machines, and computer systems. All of these factors increase the chances that defects and vulnerabilities will occur that can lead to errors. These errors, and responses to them, often lead to disputes. In our work on medical safety, we have focused on the identification and removal of process defects in order to reduce the incidence, severity, and cost of errors. Increasingly, however, we are realizing that errors will undoubtedly occur, and thus it is important to look for ways to easily detect and correct these errors and, when errors occur, handle the disputes that result. Interestingly, we have found that dispute resolution is itself a process domain, and thus our CPI approach and technologies are applicable here as well.

Background: Our research has indicated that appropriately clear, precise, and detailed definitions of processes can be used as the basis for rigorous analyses that can then lead to improvements in the processes. We have developed a language, Little-JIL, that is proving to be an effective vehicle for process definition, and we have shown that our FLAVERS finite-state verification system can be used to identify defects in processes defined using this language. We are also showing that fault-tree analysis and discrete event simulation analysis can be based upon these process definitions and can be used to identify process defects and vulnerabilities. Our collaborative research with Baystate Medical Center in Springfield, MA has demonstrated how our approach can identify areas for improvements in actual health care processes.

In work that seems particularly relevant for this workshop, we have been studying how to use a precise, detailed process definition as the basis for specifying the required behaviors of the devices and computer systems used to support that process. Our work suggests that different processes can place different requirements on the devices and systems used to support them. Thus, there is a risk that the support provided by any given device or computer system might not match the needs of all the processes in which it is employed. Some of the reported failures of medical devices and health care systems in actual

practice might well be consequences of such mismatches. We believe that our technologies could be of considerable value in identifying such mismatches in advance, hopefully avoiding some of the worst consequences.

Our work has also addressed support for the process of labor-management dispute resolution. In this domain we suggest that clear and precise process definitions can help the parties to a dispute to agree on the process by which the dispute is to be resolved and, in doing so, encourage compliance with the outcomes of the resolution process, even when the results are unfavorable to them. The dispute resolution process research has also resulted in the creation of the *Storm 2* system for providing on-line, real-time support for the key brainstorming process at the heart of dispute resolution. *Storm 2* was developed as part of a collaboration with the National Mediation Board (NMB) and is expected to be introduced by the NMB into their training program and into use for the support of actual dispute resolution.

Prognosis: Our experience suggests that our work could be effective in supporting the definition and the continuous improvement of processes used in resolving disputes arising in the domain of health care. Our work has given us firsthand understandings of how health care processes can cause errors that could lead to disputes. Other research has given us insights into how to approach dispute resolution. Synthesis of both lines of research might indicate how process-based understandings of the sources of the errors causing disputes could support more effective resolution of those disputes and subsequent improvement in those processes. Effective tools and technologies for this sort of dispute resolution will require a program of research that builds upon what has been done so far and tackles new challenges.

Position: Our position is that CPI approaches and technologies should be applied to the reduction of process defects and vulnerabilities, which should help reduce the number and severity of disputes, but when such disputes do arise, automated process technology and CPI should be applied to the resolution of the disputes themselves. Our early work has suggested that these approaches and technologies have considerable promise, but a considerable amount of additional research is needed to develop this promise into effective working systems.

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