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Broadening software process perspectives

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***Abstract*— A reason we may be at a crossroads in process simulation is that our view has been limited. Possibly we aren't simulating all the relevant aspects of importance to enterprises. For example, being overly focused in the weeds of development and not modeling the business or mission value of process options. To make greater impact we should involve other disciplines and considerations in broader, more holistic models. Software is critical and provides the edge for successful products and organizations, so we should take on a commensurate larger perspective and more informed role. This requires a pro-active approach within organizations.**

***Keywords*- software process modeling; integrating systems and software engineering**

I. INTRODUCTION

Broadening software process perspectives implicitly refers to process simulation perspectives, but the shortened title speaks for both practitioners and modelers. We may be at a crossroads in process simulation because our view has been limited. Maybe we aren't simulating all the relevant aspects of importance to enterprises. For example, being overly focused in the weeds of development and not modeling the business or mission value of process options.

To make greater impact we should involve other disciplines and considerations in broader, more holistic models. Software is critical and provides the edge for successful products and organizations, so we should take on a commensurate larger and more informed role. As simulationists we should model the interactions of software processes with other disciplines (notably systems engineering) and aspects such as program acquisition, financial operations or marketing that specific environments dictate.

Why should we? Software is embedded more and more in everyday life. A holistic approach to developing complex systems will help software engineers better understand the overall context of where their critical software resides and thus create more effective systems. This behooves simulationists to model the same.

Often software engineers have knowledge that isn't shared, and thus others aren't aware of all the options software technology can provide. By not speaking up, software people may remain as second class citizens while hardware-oriented systems engineers or marketing people (for example) decide on capabilities uninformed. The driving decision forces may vary in your organization.

There are other issues in our discipline that merit discussion, such as methods used for empirical research, or statistical analysis of simulation results. The lack of rigor or other technical shortfalls are recognized but not discussed herein, and the focus is on broadening process perspectives.

II. NEED TO BE INTERDISCIPLINARY

In most circumstances the software process is one of several processes to be integrated in an enterprise. Some examples include systems engineering, business processes (e.g. sales, hardware development, supply chain, etc.), or acquisition processes undertaken by large governmental agencies. We should explore interactions with other disciplines, not just internal processes and isolating ourselves.

A prevalent trend is the increasing integration of software engineering and systems engineering disciplines. Notably this ICSSP conference recently added systems engineering to the previous software process focus. This movement is also reflected in process standards (e.g. CMM-I) and the refocusing of many organizations to integrate both disciplines. Yet there have been no simulation models to-date that focus on their integration dynamics.

Integrated models should include more disciplines and business aspects, such as integrated systems and software engineering processes; business processes with software processes; and integrated views of acquisition processes and supplier development processes on large government projects with acquisition oversight. Simulation should also be integrated with more traditional project management tools. These include planning and scheduling tools, earned value reporting systems, etc.

III. BROADENED SCOPE EXAMPLES

Fortunately I have some colleagues also exploring these larger concerns. I will briefly highlight some current research as examples of broadened scope for 1) defense acquisition and 2) system-of-system enterprise processes. These also represent a shift from a prior focus on single project/system dynamics [1] towards multiple, interacting ones for systems of systems and product lines.

Last year at ICSSP we presented a process model for the assessment and improvement of a system acquisition process performed at the defense enterprise level [2]. The system-of-

interest is the U.S. Department of Defense (DoD) socio-technical acquisition system covering activities of many contractors and agencies. Subsumed within these organizations are the detailed, traditional systems and software engineering processes conducted for respective system portions.

The basis Wirthlin Acquisition model [3] is for systems engineering performed in the extremely large. It takes the highest-level view of managing all development processes within the acquisition system supply chain enterprise.

The discrete-event simulation model of the larger "enterprise of acquisition" for large, complex weapon systems has a broad scope from program beginning through development.

This year we are presenting initial simulation research on integrating systems and software processes for overlapping systems of systems [4] at the enterprise level. Systems engineering processes using pull scheduling methods are being evaluated with hybrid modeling and simulation.

We are assessing integrated systems and software engineering at the enterprise level, where rapid response software development projects incrementally evolve capabilities of existing systems and/or systems of systems.

In developing the simulations for this application, it became clear the complexity of the environment and the nature of integrated systems and software engineering dictates a hybrid approach with discrete-event, agent-based and continuous components. Now we would update our earlier comparison of modeling approaches to include agent-based modeling [5].

This research project also illustrates well how relevant measures for processes and simulation models depend on the context and level of decision. A simple application of the Goal-Question-Metric (GQM) demonstrates that.

In this case we are quantifying the value of processes at three levels of hierarchy. Standard project-level indicators are irrelevant at the enterprise capability level.

IV. Wrapup

To be more effective and have our research transitioned to practice, it behooves us to consider the broader picture where software processes live. We must work hard to capture the relevant aspects for enterprise-level decisions.

Time will tell whether our modeling discipline has more impact, but until then we should expand our view down the road and new paths for leverage may emerge.

In a sense, this is also a growing-up or maturing phase in software engineering. It is time to speak up at the adult table. Let's not isolate ourselves, mingle with other disciplines, show what can be done with process simulation and get the attention of all decision-making stakeholders.

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