Misaligned Incentives

featuring Bill Novak interviewed by Heidi Brayer

Heidi Brayer: Welcome to the SEI podcast series, a production of the Carnegie Mellon Software Engineering Institute. The SEI is a federally funded research and development center at Carnegie Mellon University in Pittsburgh, Pennsylvania. To learn more about the SEI, please visit our website at www.sei.cmu.edu. A transcript of today's podcast will be posted on the SEI website. My name is Heidi Brayer, and today I'm pleased to introduce you to Bill Novak, a senior member of the technical staff in the SEI Acquisition Support Program. Bill currently works in the program's Air Force team supporting acquisition program clients, assessing programs, teaching classes, and conducting research and development on the dynamics of acquisition program behavior. In today's podcast we'll be talking with Bill about misaligned people incentives in software acquisition programs and how the wrong incentives can undermine acquisition programs and produce poor outcomes. Bill, thanks for joining us today.

Bill Novak: My pleasure, Heidi.

Heidi: So let me start out by asking you: Exactly what do you mean by the phrase *misaligned incentives*?

Bill: Well, we're not specifically talking about contractual incentives like incentive fees and award fees, although they can play a part. Instead we're using the phrase *misaligned incentives* to refer to situations where the incentives of the people or groups involved in an activity may not be aligned to achieve a common goal that's intended. Often the outcome is that cooperation's undermined, giving suboptimal results. We see these kinds of situations regularly in daily life. A salesperson's bonus plan may incentivize her to sell a product to customers that it's not well suited for, causing dissatisfaction. A company's interest in maximizing revenue and minimizing customer support costs aren't necessarily aligned with what its customers need. The incentives of a company's development team to build the best possible product may be at odds with the service organization's incentives to minimize service costs. Companies build custom extensions to industry standards so as to differentiate their products, which also locks customers into using their products.

Compensation plans at investment banks contain misaligned incentives favoring risk taking and contributed to the 2008 financial crisis—and it goes on and on. Now we have a special name for instances of incentives that are significantly misaligned; we call them "conflicts of interest." We tend to react strongly to the possibility of a conflict of interest in the legal context, and yet we still see misaligned incentives play out every day in many different business situations.

Misaligned incentives usually occur in the absence of well-designed rules that control the rewards or penalties for participants. The underlying idea is that unless the rules incentivize them to do otherwise, people and organizations both tend to act in their own self interest, which may not always be what was wanted.

Heidi: Thank you, Bill. Since our focus here is on software-aligned acquisitions, please explain for me how misaligned incentives figure into that.

Bill: Well, in a number of different ways. Acquisition decision makers are regularly faced with choices that are driven by misaligned incentives. For example, misaligned incentives in acquisition programs can put individual or program-specific interests ahead of PEO or service interests, turning planned cooperation into opposition and producing poor acquisition outcomes. Two of the most common types of misaligned incentives are those in which either an individual's interests are traded off against the group's interests, as I just mentioned, or long-term interests are traded off against short-term interests.

In general, if some stakeholder goals conflict with program goals, then incentives like users' self-interests in getting more features, or contractor self-interest in making more money, or PMO self-interest in reducing development costs versus reducing overall lifecycle costs may end up driving the decision making. Needless to say, none of those are in the best overall interest of the program or the DoD.

Heidi: Bill, can you give us one or two examples of specific instances where you've seen misaligned incentives at work in acquisition programs?

Bill: One example of this type of problem is when plans for a long program duration make the schedule even longer, a dynamic that we call "Longer Begets Bigger." While a longer program lets you develop more capability, it has side effects that you may not have planned on. It creates incentives for the use of less mature technology, since using technology that's mature at the start of a longer program might be obsolete by the time it's deployed. Similarly it incentivizes what's called requirement scope creep, the gradual addition of new requirements to the original program baseline because the changes in threats and operating environment and new technology is being introduced while the program is in development. While minimizing the growth of program schedule and cost seems like the right goal, there are conflicting incentives for stakeholders to do the opposite. In trying to deliver a better, more capable system, they may need to upgrade to

newer technologies, upgrade the platform, and address new threats that have arisen during development; and in the process, inadvertently drive up cost and schedule.

Another example is something we call the [Bow Wave Effect](). In any development there's a mix of tasks, some that are simpler and some that are riskier and more complex. In spiral development the intent is to complete the riskier tasks first, while there's plenty of time to recover if things don't go as planned. However, there can be an incentive to postpone the riskier tasks to a later spiral and do the simpler tasks up front. Doing the easier tasks will show good progress, making the program's cost and schedule performance look better in the near term. However, this strategy increases the risk in later development spirals by delaying the more complex development tasks to a future point when there's less flexibility for change and less time to complete the work successfully. The short-term interest of good cost/schedule performance takes precedence over the longer-term interest of successful deployment. That's a classic misaligned incentive.

Heidi: Are there other instances or more instances of this; in other words, is this a pervasive problem?

Bill: There are lots of others. There are PMOs that may support the continuation of high-risk, poorly progressing programs due to the impacts on people's careers of restructuring or canceling the program. There are cost-plus contracts that can inadvertently encourage longer programs because it can mean a more steady flow of revenue to the contractor. There are users who may demand nonessential capabilities because they bear little cost for doing so. There's the government preference for providing the greatest capability and the contractor preference for using the latest technologies to build new competencies, so both are inclined to use the latest and least mature technologies that have the most risk. And those are just the tip of the iceberg.

Heidi: But aren't people already trying to do the right thing when they're faced with misaligned incentives; and if they aren't, why aren't they?

Bill: Well, just because there's an incentive to take some action that's against the interest of a program or service doesn't mean that incentive will actually work and that people will follow it. But it may create an ethical dilemma where people are pressured to do some things contrary to their personal interest in order to do what's best for their program or service. As a result the system can undermine both personal integrity and the organization's goals. Ideally people shouldn't be put in those positions or given those choices. While we all believe we have the integrity to do the right thing when faced with a difficult decision, it's best not to offer the temptation in the first place.

Heidi: Bill, now your background is in computer science and computer engineering. How did you become involved in this area of work and thinking about incentives?

Bill: One of the types of projects I often work on at the SEI is called an Independent Technical Assessment or ITA. The SEI regularly conducts ITAs of mid- to large-size acquisition programs that have had issues with delivering their software components. In an ITA, SEI teams review the program's documents to gather information on the status and history and to interview the people who are involved with the program. When we're done collecting information, we produce a set of findings of what's been happening as well as recommendations to help things back on track. Well, as you'd expect, we learn a lot about acquisition programs and the way they work from doing these assessments because we get a deep and unvarnished look at the way things *really* are, as opposed to the way we think they should be. At the highest level, what we've noticed is that the technical issues aren't always the most challenging for programs. At first this was a little surprising to us as engineers since we typically view the world from a technical perspective. But after we'd done several ITAs, it started to become clear that many of the issues that these programs had were related to people, involving the program's organization and its management.

There were plenty of technical challenges too, but those weren't always the most problematic. Those at the SEI who participated on ITA teams began to notice that there were recurring patterns in the way different programs ran into problems. As we began to document those patterns and study them, one of the common factors that kept cropping up was misaligned incentives. As I began to look into that area, it became clear that the problems with misaligned incentives have been the subject of study in many different fields ranging from social psychology, to game theory, to behavioral economics, and many others. If you have an engineering focus, you typically might not spend a lot of time thinking about the effects of the incentives, but obviously other fields have been thinking about them a great deal. When I realized how important they were at influencing some of the programs that we were seeing, I knew that this was something that needed to be studied more closely.

Heidi: Bill, how significant are the effects of misaligned incentives on the overall outcomes of acquisition programs?

Bill: It's difficult to tease out the individual contributions of a set of different causes to the ultimate outcome as all of these various and contributing factors are working simultaneously. We don't have the ability to isolate out a single variable in a controlled experiment, as much as we might like to. Having said that, it seems as though the effects of incentives can be very significant. We've seen large programs developing critical capabilities fail and ultimately be cancelled because the stakeholders were being pulled in different directions due to the influences of strong incentives. Even the best of intentions can be undermined by incentives that are pulling people and groups in opposite directions, ultimately causing cooperation between stakeholders to break down.

Heidi: What can be done about misaligned incentives? They seem to be fundamental to the way people make decisions. What about them might make them hard to change?

Bill: Many of the incentive problems seen in acquisition are inherently difficult to fix, which is why they persist not only in acquisition but in public policy, economics, sociology, and other areas. However, different approaches to dealing with specific types of incentive problems have been developed, both by using new theories and by identifying past strategies that have been used in different domains to successfully deal with these issues. When the participants in an acquisition program find themselves facing misaligned incentives, the goal is to try to align them.

Not all incentives, however, are within the sphere of influence of the engineers and managers working on the program. Some incentives are inherent in the governance—in other words, the policies and regulations that acquisition workers operate within—and can't be changed very easily. When that's the case, one of the best ways to mitigate the consequence is simply to recognize their existence. Knowing what lies ahead allows managers to make a compelling case for considering workarounds, new policies, and other alternative options.

Heidi: So tell me what kind of work is the SEI doing on misaligned incentives, and what is the progress to date?

Bill: Some of the work that the SEI has done in this area is described in the acquisition archetypes. These are short one-page summary sheets that only take a few minutes to read, which you can download from the SEI website. Each sheet takes one of these situations, tells a story of where it happened to a real-life acquisition program we've worked with, analyzes what was going on, and recommends some possible solutions, including corrective and preventative steps that could have been taken. There are archetypes on "Longer Begets Bigger" and the "Bow Wave Effect" that we've already discussed, along with a number of others that describe common ways that acquisition programs can get into trouble. Getting a good understanding of the incentives at work can expose opportunities for improving governance by changing the rewards to bring the goals of the various parties into better alignment and thus help reduce conflict among the stakeholder groups.

Going beyond that, there are a number of different possible solutions to misaligned incentives problems that we're currently investigating. For example, a substantial amount of research has been done on social dilemmas, which embody some of the most significant issues that we've seen in acquisition. "The Tragedy of the Commons" that Garrett Hardin identified in 1968 is one of the most famous types of social dilemmas and has received extensive study since it was first published. People are still continuing to study it today as Elinor Ostrom received the Nobel Prize in economics in 2009 for her work on solutions to the "Tragedy of the Commons." However, because the approaches to dealing with these problems come from different disciplines, they may not be well known to the software-intensive acquisition or software development communities.

One area of new work that we're involved in is combining our characterization of situations involving misaligned incentives with complex system modeling of acquisition program behavior to give us a better understanding of what happens. We're not just doing that because it's interesting. We're doing it because we can use these models to test out different policies and other approaches for resolving these behaviors and identify the most effective ones. Also, we can use our better understanding of the causes of the problems to design classes that will educate acquisition staff on how to recognize these problems when they occur and deal with them more effectively. One of the things we're interested in doing there is creating interesting, interactive games that can be used in acquisition classes to help people actually experience some of these problems before they're dealing with a multimillion-dollar program. They'll get a chance to see if they can see the problem coming and try different types of responses to see what works and what doesn't. Ultimately what we're trying to do is help acquisition staff make better decisions that result in better program outcomes.

Heidi: Bill, along those lines, do you have any recommendations for acquisition staff who are dealing with these issues right now?

Bill: I'd recommend taking a look at the SEI website where you can read all of the acquisition archetypes we've produced, view a short animated video on dealing with the Firefighting archetype, and download the technical report *Success in Acquisition: Using Archetypes to Beat the Odds*. Also I'd recommend that people check back in with the website from time to time as we're continuing our work in this area, and we'll be making our latest findings available there.

Heidi: Bill, thank you so much for joining us today. This has been really interesting. This recording and a downloadable transcript are available at sei.cmu.edu/podcasts. If you have any questions, please email us at info@sei.cmu.edu.