Why Coaches Are Needed in Software Process Improvement

Lewis Gray
Abelia Corporation

This article defines an important role in software process improvement—the coach. The coach is different from the familiar roles of sponsor, champion, and change agent. The coach combines expert knowledge of new practices and tools with expert leadership skills in change management. Whether formal or informal, skilled or not, coaches are everywhere in software process improvement. Despite this, little has been written about what they do. Organizations often confuse the coach with other roles and fail to use coaches well. Software process improvement teams will likely perform better when their coaches do, just as sports teams with good coaches usually perform better than teams with poor coaches. Organizations can benefit from a better understanding of what process improvement coaches can and should do for them.

By now, everyone in software process improvement (SPI) knows about sponsors, champions, and change agents [1,8,9]. Watts Humphrey states that these roles are needed to lead stakeholders through their resistance to process change [1]. Humphrey has also discussed the need for coaches [2], and this topic has been mentioned here and there in articles and meetings, for example, in Gray and Stephenson [3] and Gray [4]. Still, leaders of SPI initiatives often overlook the coach's role and end up working too hard. Where they are used, coaches are the spark plugs of the process improvement engine. It is time to clarify what they do so process improvement will happen faster and easier.

In a famous psychological study of death and dying, Elisabeth Kübler-Ross [5] described five predictable stages of grieving over tragic news: (1) denial and isolation, (2) anger, (3) bargaining, (4) depression, and (5) acceptance. Implementation Management Associates, Inc. [6] and the Software Engineering Institute both argue in their training that people subjected to process change go through the same emotional stages. These emotional reactions are the source of the resistance to change that sponsors, champions, and change agents must overcome.

Figure 1 summarizes the Kübler-Ross grieving cycle graphically. In the typical Kübler-Ross case, shown by the darker curve in the figure, the cycle ends at a lower level of happiness and productivity than where it began. She studied people who were terminally ill; for these people, a happier, more productive final state was not a possibility.

During software process improvement, an important rationale for doing change management has to be that if process change is properly managed, people's resistance will be shorter in duration and less intense, and that following their period of resistance they will end at a higher level of happiness and productivity than where they began. A sample grieving cycle for well-managed process change is shown by the lighter curve in Figure 1.

There are some effective change management techniques that can be taught, such as the use of the Software Engineering Institute's Techology Transition Model [7] and the roles of sponsors, champions, and change agents. However, organizations that plan software process improvement should also seek help from a successful SPI coach, because change management is a complex, sensitive task that must be tailored to each different process improvement effort.

This article discusses activities that usually are necessary for successful software process improvement, distributed among four roles. Sponsors, champions and change agents are often ill-suited for the coach's activities. Following are all the roles in greater detail [1,8,9].

Sponsor

The sponsor's role is the easiest to describe. The sponsor acts like a banker who owns and donates resources to the process improvement effort for whatever reason the sponsor finds compelling, ranging from a bookkeeper-like attention to return on investment (ROI) to nothing more than a personal commitment to support the champion. The sponsor guarantees that the champion receives the resources needed for process improvement on time throughout the planned process improvement period.

A sponsor must have total control over the resources needed for the process improvement initiative. Only then can the sponsor guarantee that the champion will get them on time

Figure 1. *Grieving cycle with change management.*

(Külder-Ross, 1969)
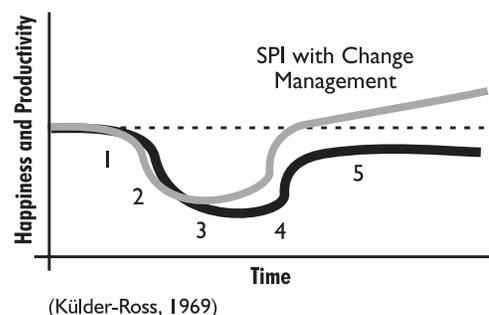
as planned. Literally, the buck stops at the sponsor's desk. However, the sponsor typically does not need to know all the details of process change.

Champion

The SPI champion has three jobs: to initiate, promote, and protect SPI.

First, the champion initiates process improvement. This involves finding enough resources to do it properly and then generating so much enthusiasm for process improvement that the organization budgets for it. The champion usually recruits the SPI sponsor and coach and collaborates with the coach on an SPI action plan. The champion selects the change agents with the help of the coach.

Second, the champion promotes process improvement while it is under way. The champion is the public relations person for the effort. The champion justifies process improvement to colleagues and staff, and when the organization wants a presentation on SPI, perhaps for a proposal, the champion ensures it is done properly.

Third, the champion protects process improvement from detractors and poachers. Derogatory comments about process improvement stop at the champion, who defends the Process Improvement Team against detractors. Poachers are managers outside the process improvement effort who want to pull one or more of the SPI team members off the SPI initiative onto other projects that need help. The champion protects the integrity of the team against such poaching and defends the process improvement schedule.

Often, the role of champion is an informal one without a corresponding job description or funding. It is done in addition to the champion's regular duties. Typically, the champion does not need a detailed, implementer's understanding of the new practices and tools.

Change Agent

Change agents live and breathe the details of SPI. Their role is to make the changes that improve the organization's software process. Then, typically, they test the improved process on one or more example software development projects. These people are the players on the process improvement team. The sponsor and the champion could be compared to the team's owner and manager.

This is a tough, exciting job. The job is both a prize in itself and a burden. I recommend that it be assigned with care. Each Process Improvement Team member must learn to work with and trust every other member. Resistance to process change will appear in unexpected places in your organization, and the champion can never completely protect the team from it; so, change agents must cope with it. It helps if they are skilled and are respected by their peers. They should not be risk aversive, and they must not be heroic "prima donnas."

Change agents follow the action plan supplied by the coach. When they are criticized for what they are doing, they are protected by the champion. When they need planned resources, they get them from the sponsor by way of the champion. When they make mistakes, the coach corrects them. Change agents learn and implement all of the details of the new practices.

Coach

To date, unlike the other change management roles, the coach's role has not been defined in descriptions of SPI. To understand what the coach does, consider two key questions. First, who should prepare the process improvement action plan? Not the sponsor, champion, or the change agents, because one cannot assume they know enough details of SPI to properly plan it. Second, who corrects change agents when they make mistakes? Not the change agents, for obvious reasons, nor could the sponsor or the champion who, once again, may not know enough about SPI and change management to even spot a mistake.

In both cases, there is a clean fit to a fourth role in the process improvement effort—the SPI coach. An SPI coach is like a sports coach who tells the change agents what moves to make, but the change agents are the players. The coach plans the SPI effort, often in collaboration with the champion, corrects change agents when they make mistakes, and praises them when they perform well. In summary, the coach knows the improved practices and is skilled at introducing them.

A good coach is important to success. I recommend that an SPI coach finalize the action plan for process improvement and supervise implementation of the plan. Unlike the sponsor and the champion, the coach should be deeply involved in the implementation details of process change with the change agents. The coach will have the most influence on the change agents and should also serve as the champion's confidant and adviser on SPI. In some cases, the coach may play a similar role for the SPI sponsor.

The coach heads the change management effort and is most responsible for leading the other team members through the Kübler-Ross grieving cycle to a positive conclusion. It is easy to underestimate how difficult this is. Even SPI team members have occasional "allergic reactions" to what they are asked to do. The coach helps prevent and treat these types of reactions among stakeholders who are outside the team.

If you do not have a Software Engineering Process Group (SEPG) with an experienced coach, do not hesitate to bring one in from the outside. Keep in mind that for better or worse, someone will plan the software process improvement effort and guide the change agents. It is better if these roles are filled by people who are already knowledgable in the new practices and have the skills to successfully introduce new technologies.

Organizations that merely let coaching happen are likely to suffer from poor coaching. Unless someone knowledgeable is specifically assigned that role, there will be a series of SPI failures, as one would expect from a self-coached sports team.

Roles, Personnel, and Positions

Any of the above roles could be carried out by any number of personnel in the organization who may hold any of various positions. To understand how the roles interact, one must understand the

differences between the terms "role," "personnel," and "position."

- *Role* – A collection of activities with one name, such as sponsor, champion, coach, or change agent.
- *Personnel* – Individual people in a project or its parent organization.
- *Position* – A box on an organizational chart for a project or parent organization. A position has a title assigned such as project manager, quality manager, SEPG director, Process Action Team (PAT) member, software engineer, or software requirements analyst.

These distinctions are helpful because, for example, personnel who hold two different positions in the same organization, such as a corporate vice-president and a midlevel manager, might both need to share the role of sponsor for an SPI effort to be successful. For example, the corporate sponsor might provide funds to the midlevel managers for the effort, but the managers might have authority to divert the funds to other more "important" projects if they can justify it. In such a case, a champion must also recruit the midlevel managers as sponsors if the funding from the corporate level is ever to reach the change agents on the Process Improvement Team.

Qualities of a Good Coach

What makes people good SPI coaches? These people share many of the same qualities as good basketball or football coaches. In a 1996 article in *The Washington Post*, Richard Justice [10] writes, "Coach inspires players with respect, honesty, and unrelenting drive." This coach was Jim Lynam of the Washington Bullets basketball team. Indiana Pacers Coach Larry Brown told Justice, "What that team has done is what everyone strives for in this business." According to Brown, "Jimmy Lynam has taken a group of players and gotten the absolute most out of them." When Justice tried to explain how Lynam did it, he was also describing qualities that good SPI coaches should have.

- **Knowledge of the game and its strategies.** Most good sports coaches also were once good players. In SPI, a good coach is likely to be someone who was a good software developer in an organization with a mature software process.
- **A sense of humor.** They can put work in the proper perspective. Excellence is not based on drudgery; it is based on fun.
- **Honesty and straightforwardness.**
- **Inspire trust.** This is critical to process improvement. Change agents cannot feel they must constantly second-guess the coach. Trust is built on honesty and success.
- **Good communication.** SPI coaches must be able to explain to change agents how to carry out the activities of a mature software process. Coaches must know when their explanations are getting through and when they are not. When team members do not understand them, coaches have to find another way to package the message so that it is understood.
- **Respect for the team.** A good SPI coach listens to team members when they raise an objection.
- **No grudges.** Richard said of Lynam: "If he chews out a player during a game—and he does it frequently—he has a one-on-one chat the next day to explain his actions." An SPI coach may have little control over who is chosen as SPI team members. The coach discovers a way, if there is one, to make the given team successful in improving the software process. Personal antagonism between the SPI coach and a team member, or between two team members, usually blocks long-term process improvement. The coach must find a way to avoid or defuse antagonistic situations.
- **Negative reactions seen in the proper perspective.** Coaches must understand that even their team members will have negative reactions to the pressures of change from time to time. The reactions are usually not directed personally at the coach, and the coach must not act as though they are unless they are.
- **Focus on what *can* be done.** I emphasize the word "can." Do not dwell on what cannot be done or waste time grieving about it. For example, there are many ways to accomplish each of the key practices in the CMM. Some practices, such as requirements management, software project planning, and software configuration management, can be much easier to perform with decent software tools than with pencil and paper. Nevertheless, pencil and paper are much underrated as tools. Organizations that cannot afford the proper software tools must learn a method that does not involve the desired tools—but they should not give up on the key practice. The coach must look for what the SPI team can do and show the team how to construct a mature software process that builds on that. An SPI coach never lets the SPI team give up as long as there is a reasonable probability of success.

Resources on Coaching

Readers who want to understand SPI coaching better can get a good start by reading Humphrey: "We have not yet developed a coaching ethic in software development. It could certainly help if we did. Sports and the performing arts have learned the value of coaching. … It seems unlikely that truly superior software development performance will be achieved without the help of skilled coaches." [2]

For further exploration of coaching as an organizational activity, see Curtis [11] and the SEI People Capability Maturity Model (P-CMM). Recognizing the value of coaches, SEI has placed coach development in the P-CMM as a Level 5 activity. Coach development is hard, but hiring a good coach is much easier. For most organizations, I recommend that you consider the key coaching activities in the P-CMM to be a checklist of what to look for in a prospective SPI coach.

Conclusion

In conclusion, the following is a quiz. Pick any ongoing SPI initiative (or software technology introduction effort) within your project or parent organiza-

TIS Achieves CMM Level 5

The Ogden Air Logistics Center, Software Engineering Division (OO-ALC/TIS) at Hill Air Force Base, Utah was assessed July 13-23, 1998 and found to be a Level 5 maturity organization according to the Software Engineering Institute Capability Maturity Model (CMM).

The Software Engineering Division, which comprises over 500 employees, develops and maintains software for operational flight programs and automatic test equipment. TIS is the first government agency known to be rated at this maturity level. Only three other companies involved in software development are known to share this rating.

The development of numerous tools, such as time and accounting systems, defect tracking databases, and a technology change management database helped TIS automate many of the activities relating to the goals in the Level 4 and Level 5 key process areas.

As a final self-check, TIS prepared cross matrices between their documentation and the goals, commitments, abilities, and activities associated with each key process area. These matrices provided a road map through the hierarchy of documentation. The projects within TIS also organized examples by each key process area. The seminar "Surviving a Software Capability Evaluation," presented at the April 1998 Software Technology Conference in Salt Lake City, Utah, reinforced TIS's belief in the need for this detail of preparation. This final check was also a benefit to the assessment team; it helped shorten the long days experienced by the assessment team members.

The assessment team consisted of nine members, six of which were either lead assessors or candidate lead assessors. The team consisted of Mark Paulk, Brian Larman, and Donna Dunaway from the Software Engineering Institute, Bonnie Bollinger and Millee Sapp from Robins Air Force Base, Ga., Mike Ballard from the Software Technology Support Center, and David Putman, Pat Cosgriff, and David Haakenson from the Software Engineering Division.

tion. Using the descriptions above of the four roles of sponsor, champion, coach, and change agent, and restricting your answers just to this initiative, can you answer:

- What personnel are the sponsors for that initiative? What positions do they have within your project or parent organization?
- What personnel are the champions for the initiative? What positions do they have within your project or parent organization?
- What personnel are the coaches for your initiative? What positions do they have within your project or parent organization?
- What personnel are the change agents for your initiative? What positions do they have within your project or parent organization?

Now ask yourself, if no one is filling one or more of these four roles, how will the activities associated with those roles be accomplished? Do you have one or more of the risks here in your initiative? Should you be tracking them in your risks matrix? ◆

About the Author

Lewis Gray, president of Abelia Corporation, has 30 years experience introducing new technology. He specializes in coaching and teaching CMM-based software process improvement. He was a leader in the development of IEEE/EIA 12207, MIL-STD-498, and J-STD-016 and is the only instructor outside the SEI authorized to present the Technology Transition Model for leading the adoption of new technology.

Prior to founding Abelia, Gray had key project management and technical positions at TRW, GTE, and INTELLIMAC. He received a bachelor's degree in mathematics and a doctorate in the philosophy of science (specializing in technology assessment) from Indiana University, where he also taught mathematics, technology assessment, and philosophy of science.

Abelia Corporation
12224 Grassy Hill Court
Fairfax, VA 22033-2819
Voice: 703-591-5247
Fax: 703-591-5005
E-mail: lewis@abelia.com
Internet: http://www.abelia.com

References

1. Humphrey, Watts S., *Managing the Software Process*, Addison-Wesley, Reading, Mass., 1989.
2. Humphrey, Watts S., *A Discipline for Software Engineering*, Addison-Wesley, Reading, Mass., 1995.
3. Gray, Lewis, and Dennis G. Stephenson, "Achieving Intergroup Coordination Through a Product Architecture Organization," *Proceedings of the Seventh Annual Software Technology Conference*, Salt Lake City, April 1995.
4. Gray, Lewis, "Defining the Coach's Role in Software Process Improvement," *Proceedings of the Tenth Annual Software Technology Conference*, Salt Lake City, April 1998.
5. Kübler-Ross, Elisabeth, *On Death and Dying*, Collier, New York, 1969.
6. "Implementing Change," Implementation Management Associates, Inc., Denver, Colo., 1989.
7. The Technology Transition Model (TXM), SEI workshop on "Introducing New Software Technology." For more information, see http://www.abelia.com/instcrse.htm.
8. Fowler, Priscilla and Stan Rifkin, *Software Engineering Process Group Guide*, Technical Report CMU/SEI-90-TR-24, Pittsburgh, Pa. Software Engineering Institute, 1990.
9. Rogers, Everett M., *Diffusion of Innovations*, New York, The Free Press, 4th ed., 1995.
10. Justice, Richard, "Bullets Take Heart from Lynam," *The Washington Post*, April 10, 1996.
11. Curtis, Bill, William E. Hefley, and Sally Miller, *People Capability Maturity Model*, SEI, Pittsburgh, Pa. 1995.