

Process Education Training and Professionalism – Let’s Bring Together Process Improvement Knowledge

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Abstract

Reasons frequently given for process improvement failure include lack of training, education, awareness of the principles and value of process improvement, or how to do it. Whereas there is a growing body of knowledge regarding process improvement, this information is scattered and sometimes inconsistent. This paper examines issues, challenges and opportunities regarding process improvement education and training and recommends bringing together all stakeholders to develop a coherent body of knowledge to serve as a basis for process improvement education and training

1. Introduction

Reasons frequently given for process improvement failure include lack of training, education, awareness of the principles and value of process improvement, or how to do it. Whereas there is a growing body of knowledge regarding process improvement, this information is scattered and sometimes inconsistent. This paper examines issues, challenges and opportunities regarding process improvement education and training and recommends bringing together all stakeholders to develop a coherent body of knowledge to serve as a first step, as a basis for process improvement education and training.

It is hoped these thoughts can help us develop a strategy in pursuit of a common vision regarding process education, training and professionalism.

2. Background

Process improvement experts, consultants and practitioners have accumulated enormous experience and practical knowledge of what needs to be done for success in process improvement. See for example [Das13], [Ibr08], [ISO13], [Nia15] and [SPI10].

The IEEE Computer Society developed a Guide to the Software Engineering Body of Knowledge (SWEBOK) [IEE04] which includes one knowledge area focusing on Software Engineering Process.

Most major process models and standards include a process (or process area or clause or set of practices) pertaining to process improvement / process definition / process assessment / continual improvement as a (brief) part of the document.

There are curriculum guidelines for undergraduate and graduate software engineering programs (e.g. [ACM14] and [Pys09]) which address the entire software engineering discipline and include some information on processes, but do not focus specifically on process improvement education.

The Software Engineering Institute embarked on a major initiative to describe the subject matter of process improvement. The subject matter is intended for use in academic, industrial and governmental settings. See [Ibr95].

Professional organizations and professional certifiers have process improvement knowledge and information that they use in their certification programs. Some are standards based (such as SPICE training and certification) or best practice based (such as ITIL training and certification) or model-based (such as CMMI training) or methodology based (such as Six-Sigma or Lean Six-Sigma certification programs). See e.g. [Ent11], [ITI11], [ISO11], [CMM15] and [ASQ15].

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In-house process improvement training and education might typically include courses for executives, practitioners and assessors, often grounded in the domain and culture of the organization and offered by in-house staff. See e.g. [FAA06].

A variety of mechanisms are in use for delivering process improvement education and training: such as on-line education and training from various universities and colleges and institutes; on-site training; centralized classes in various locales, Massive Open Online Course (MOOC). These efforts are helping but we still have shortages of educated and trained professionals. See [Den15].

Despite all these activities there are difficulties that our customers have in sorting through the various educational and training opportunities, and attending classes.

And the vast process improvement knowledge we have is scattered. It needs to be consolidated, integrated and structured.

A first step to meet this challenge is to bring all this wisdom into an internationally recognized process improvement (PI) body of knowledge (BoK) that is endorsed and used for process improvement education, training and certification. The BoK would articulate what process improvement professionals should know and serve as a basis for skills development and continual learning. The time is clearly ripe.

3. Challenges

Several things need to come about to be successful in this effort, each with challenges.

- **Standards** - to be developed for content of process improvement education and training. But will BoK developers and owners of PI knowledge recognize the value of consolidation and integration and collaborate on its development? (Our customers may insist on this.)
- **Usage** - of the BoK. Will educators and trainers use the BoK? Will degrees and certifications be based on the BoK?
- **Organizations** - to value process and support process improvement training and education. Are our leaders ready to drive improvement

across the enterprise? Is the organizational culture ready? Do we have strategic-minded executives to lead and support the path to improved performance?

- **Practitioners** - to have appropriate skills and competencies to help organizations. Will they be equipped to use process improvement standards and models and best practices? Will they be able to tailor PI information to the business needs of their customers? Will they foster implementation of basic principles?

4. The Current Environment

Below are some SWOT observations on our current situation. (*Hopefully we can build further on such an analysis at our Workshop to help us develop a strategy for moving forward.*)

4.1 Strengths

What are our strengths? (*We need to maintain, build on and leverage these.*)

- Extensive community of people working in process improvement education and training and professional certification – including Universities, Colleges, Professional Societies, Institutes
- Courses offered using various delivery mechanisms e.g. on-line, instructor-led, in-house, off-site, options for self-study
- Process improvement knowledge captured via various initiatives

4.2 Weaknesses

What are our weaknesses? (*We need to remedy, change, stop and overcome these.*)

- Dwindling, sporadic interest in process improvement in industry and government
- Confusion in terminology regarding training and certification offerings e.g. Business Process Management (BPM), Quality Training, BPI (I=Innovation or Improvement), black belt, 6-sigma, Lean 6-sigma, ITIL, Business Process Re-engineering, TQM, etc.

- Confusion regarding which process improvement approach might help the most e.g., Model-based, SPICE, Six-sigma, Lean, IDEAL, black belt, Lean Six-Sigma, ITIL
- Insufficient attention to process in university courses to ground the fundamentals
- Lack of standardization regarding process education and training content – similar topics, overlap, inconsistency, various bodies of knowledge
- Customer confusion ... do I want/need model-based training, SPICE, CMMI, Six-sigma, Lean, IDEAL, black belt, ITIL, ... and who is best qualified to offer this training ...
- Is professional certification really needed or important? To whom?
- Stove-piped professional courses not recognizing the needs to integrate PI approaches, or the value obtained from various approaches
- Training and education too expensive, too time-consuming

4.3 Opportunities

What are our opportunities? (*We need to prioritize, capture, build on and optimize these.*)

- Clarification and standardization of subject matter, body of knowledge for process improvement
- Internationally recognized common content and authorization for professional certifications
- Curriculum guidelines for process improvement education and training
- Undergraduate capstone projects as well as graduate projects in industry
- Collection and publication of data on availability and effectiveness of education, training and professional programs
- Reduce training costs, distance learning, Massive Open Online Course (MOOC)
- Work to ensure executives and decision-makers understand the value of process

improvement to address dwindling interest in process improvement

- Bridge the gap between education and training
- We need to provide education, training and guidance to our customers based on the accumulating codified wealth of process knowledge and information available

4.4 Threats

What are our threats? (*We need to counter, minimize or manage these.*)

- Lack of buy-in from customers regarding the need for process improvement and hence education and training
- Lack of cooperation and buy-in from education and training institutions to work together to improve the quality and availability of process improvement education and training
- Dwindling, sporadic interest in process improvement in industry and government
- Competing training organizations

5. Issues and Concerns

5.1 Issues

Through my experiences in process improvement, I find recurring issues such as:

- A certification may help a practitioner get a job, but the employer may not be interested in using the skills acquired by the practitioner. Do practitioners have the skills and competencies they need? If they do, do they have the chance to use them?
- Are professional certifications providing needed competencies, and offering recognized subject matter? Are certifications sought just to check the box, and don't really address customer needs?
- The organization may not be ready or interested in process improvement.
- Our executives need to know process improvement principles and concepts to lead us effectively. There is a need to educate

executives and decision-makers on the value of process improvement. How can we reach leaders and influence them to effect process improvement?

- Is it clear to the customer what education and training will really help them in their process improvement quests? What training should I invest in? The market is too confusing.
- Training is too expensive and too time consuming.
- Do education and training endeavors address essential process improvement concepts and principles in the field?

What can we do to help our customers and professionals rectify these situations?

5.2 Concerns

There are also several concerns I have regarding our efforts in process improvement education and training, such as:

- **Lack of integration:** I worry that separate process improvement approaches are taught and followed diligently without realizing the value of each and how they can and need to work together for optimal customer benefit. Practitioners need to recognize what is gained from focusing on model-based best practices, what quality systems offer, what measurement focused problem-solving techniques offer, and how a recognition of all of these will help the organization. How they interact. Black-belts can find issues in a process but are not inclined to improve the process using best practices ... just find what's broken in the existing process, but the process itself may not recognize or use the best practices available in models and standards. Professional certifications are typically stove-piped on a particular method or model that may not reap the true benefits of process improvement when pursued in isolation.
- **Standards:** We don't want to have the model-wars that have gone on in the process model endeavors. Will this happen in the

process improvement education arena if we decide to develop a standard body of knowledge for PI? Will the stakeholders collaborate?

- **Organizations:** Process improvement is not yet fully ingrained in many organizational cultures. We need to reach enterprise executives, via education and training, so we can help organizations improve their performance via strong leadership and strategic vision tied to process improvement. Social and cultural changes are needed to bring about the full benefits of process improvement.

6. Body of Knowledge – Previous Efforts

6.1 Software Engineering Body of Knowledge

The Guide to the Software Engineering Body of Knowledge (SWEBOK) [IEE04] broadly addresses ten knowledge areas (KA) describing the discipline of software engineering. One of these KAs is called Software Engineering Process, which includes some topics relevant to our process improvement workshop. This KA is structured into 4 topics: Process Implementation and Change; Process Definition; Process Assessment; and Process and Product Measurement. Each topic is broken down into 2 to 5 subtopics with a brief description and references for each.

6.2 Software Quality Engineer Body of Knowledge

The Software Quality Engineer Body of Knowledge [ASQ08] includes seven parts: General Knowledge; Software Quality Management; Systems and Software Engineering Processes; Project Management; Software Metrics and Analysis; Software Verification and Validation; and Software Configuration Management. This BoK is used to certify quality engineers.

6.3 The Subject Matter of Process Improvement

The need for process improvement education and training has been recognized for some time. To address this need I led an initiative while working at

the Software Engineering Institute of Carnegie Mellon University focused on developing a description of the subject matter of process improvement. The purpose of this work was to assist software engineering educators and trainers in selecting topics for curricula or training programs in the process improvement arena.

Data were collected from a variety of sources including courses, workshops, tutorials and documents relating to various aspects of process improvement; selected literature including published standards, certification and professional society publications; customer views, including experiences, viewpoints and documents provided by change agents, educators and trainers in industry, government and academia. Several surveys and focus group sessions were carried out to gather subject matter content as well as issues relating to education and training. Approximately 100 professionals participated in the initiative.

The subject matter is presented in a framework describing:

- what you need to *Know* (Process Fundamentals, Process Improvement Fundamentals);
- what you need to *Do* (Process and Process Improvement Management, Culture Change);
- what you need to *Use* (Tools and Techniques, Pervasive Supporting Skills).

Each topic area contains annotated subtopics with references. In addition the report aligns the subject matter with general audiences across academic and industry/government domains, proposing the extent of mastery that might be required for proficiency.

For further information see [Ibr95].

6.4 Practitioner Knowledge Collection

Throughout the years, process improvement practitioners have built up a broad body of knowledge regarding process improvement. Some examples are provided below. *(Note that several journals (e.g. [ASQ15]) regularly offer articles on process improvement experiences but this paper does not intend to bring together all these sources of information.)*

6.4.1 SPI Manifesto

The SPI Manifesto [SPI10], developed by a group of international SPI experts, provides a wealth of SPI knowledge and experience. The Manifesto brings together three core SPI values, 10 principles supporting the values, with examples for each principle.

6.4.2 Success Factors

Another example is the following set of known factors that are deemed critical for successful process improvement, consolidated from numerous publications and sources (extracted from [Ibr08]).

- Support, commitment and involvement
e.g., visible support and sustained commitment from senior management; middle management support and commitment; grass roots support and involvement; technical staff involvement
- Showing measurable, observable results
e.g., observable results backed with data to sustain interest and motivation; process improvement measured, results made visible
- Process improvement management
e.g., effort must be planned, managed; senior management actively monitors progress; adequate staff time/resources dedicated; clear assignment of responsibility; process group staffed by highly respected people; risks recognized and mitigated as necessary
- Goals and alignment
e.g., clearly stated, communicated, well understood, appropriate process improvement goals aligned with the business; shared values and goals, improvement in everyone's performance plan; sustained focus and follow through; no constant shifting of priorities
- Knowledge
e.g., having ability, skills, knowledge; sufficient education about process and process improvement; for managers, learn enough to manage it and to have confidence in methods used
- Culture
e.g., open communication; teamwork; mutual trust; respect for the individual; investment in people; quality orientation, customer focus; continuous learning; NOT: belief that PI gets in the way of real work; NOT: cynicism from

previous unsuccessful PI efforts

7. Conclusions and Recommendations

This paper recommends working together to develop a process improvement body of knowledge for use in education and training. It has brought together some thoughts and issues and challenges we face in process improvement education, training and professionalism. It provides some views on our current environment, and summarizes some previous initiatives. The paper calls for bringing together process improvement knowledge into an internationally recognized and endorsed standard.

We need to build on and improve previous initiatives; continue to integrate subject matter content from broad international sources; engage stakeholders to pilot the subject matter content in various venues and report experiences and lessons learned.

Such an effort might be part of a strategy developed by the broad community of process improvement professionals concerned about improving process education, training and professionalism.

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