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Software Process Improvement: Where Is the Evidence?

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Abstract: Software process improvement (SPI) is around for decades: frameworks are proposed, success factors are studied, and experiences have been reported. However, the sheer mass of concepts, approaches, and standards published over the years overwhelms practitioners as well as researchers. What is out there? Are there new emerging approaches? What are open issues? Still, we struggle to answer the question for what is the current state of SPI and related research? We present initial results from a systematic mapping study to shed light on the field of SPI and to draw conclusions for future research directions. An analysis of 635 publications draws a big picture of SPI-related research of the past 25 years. Our study shows a high number of solution proposals, experience reports, and secondary studies, but only few theories. In particular, standard SPI models are analyzed and evaluated for applicability, especially from the perspective of SPI in small-to-medium-sized companies, which leads to new specialized frameworks. Furthermore, we find a growing interest in success factors to aid companies in conducting SPI.

This summary refers to the paper *Software Process Improvement: Where Is the Evidence?* [Ku15]. This paper was published as full research paper in the *ICSSP'2015* proceedings.

Keywords: software process, software process improvement, systematic mapping study

1   Introduction

Software process improvement (SPI) aims to improve software processes and comprises a variety of tasks, such as scoping, assessment, design and realization, and continuous improvement. Several SPI models compete for the companies' favor, success factors to support SPI implementation at the large and the small scale are studied, and numerous publications report on experiences in academia and practice. SPI is considered an important topic. However, SPI is a diverse field: On the one hand, a number of standards is available, e.g., ISO/IEC 15504 or CMMI but, on the other hand, these standards are criticized often [St07]. In a nutshell, the different facets of SPI and the corresponding research provide a huge body of knowledge on SPI.

Problem. The field of SPI evolved for decades and provides a vast amount of publications addressing a huge variety of topics. Still, we see new method proposals, research on success factors, and experience reports. However, missing is a big picture

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that illustrates where SPI gained a certain level of saturation and where are still hot topics and unresolved issues calling for more investigation.

Objective, Method, and Contribution. To better understand the state of the art in SPI, we aim to analyze the whole publication flora to draw a big picture on SPI. As research method, we opted for a combination of the well-known *Systematic Literature Review* and *Mapping Study* instruments. We contribute initial findings from a comprehensive literature study in which we analyze 635 papers from 25 years of SPI-related research.

2   Results

In total, in our study, we obtained 635 papers on SPI published between 1989 and 2013. Most papers ($\approx$2/3) were categorized as solution proposal (n=244) or philosophical paper (n=214). However, the result set also contains a number of evaluation research (n=102) and experience papers (n=70) showing the field of SPI still moving. The classification shows that lessons learned (n=290, 46%) and frameworks (n=235, 37%) make the majority of the contributions. Other categories are barely represented, e.g., tools (n=36), models (n=24), and theories (n=12). Most of the solution proposals focus on frameworks (n=167), i.e., 26% of all papers propose a new SPI framework. The largest share of the philosophical papers is devoted to lessons learned (n=155, i.e., 24%). Yet, the result set also points to some new trends, e.g., SPI in the context of agile software development and in the context of small-to-medium-sized companies.

3   Conclusion

The field of SPI suffers from missing evidence: Proposed solutions are barely evaluated for their feasibility, studies comparing and analyzing proposed solutions for their advantages and disadvantages are missing, and testable theories are—if at all—in the construction phase awaiting confirmation. Furthermore, our study reveals some trends in SPI-related research: We found growing interest over the recent years in SPI for SME's and adopting agile principles for SPI. Also, we found an increasing number of secondary studies of which some already started to collect, structure, and generalize knowledge.

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