ABSTRACT

Systematic Literature Reviews (SLRs) play an important role in the Evidence-Based Software Engineering scenario. With the advance of the computer science field and the growth of research publications, new evidence continuously arises. This fact impacts directly on the purpose of keeping SLRs up-to-date which could lead researchers to obsolete conclusions or decisions about a research problem or investigation. Creating and maintaining SLRs up-to-date demand a significant effort due to several reasons such as the rapid increase in the amount of evidence, limitation of available databases and lack of detailed protocol documentation and data availability. Conventionally, in software engineering SLRs are not updated or updated intermittently leaving gaps between updates during which time the SLR may be missing important new research. In order to address these issues, we propose the concept, process and tooling support of Continuous Systematic Literature Review (CSLR) in SE aiming to keep SLRs constantly updated with the promotion of open science practices. This positional paper summarises our proposal and approach under development.

Keywords Continuous Systematic Literature Review · Secondary Studies · Systematic Review Update

1 Introduction

Systematic Literature Reviews (SLRs) are considered the pillar of evidence-based medicine [1]. An SLR aims to identify, select, summarize and synthesize existing evidence about a research topic or phenomenon of interest [2]. Since the introduction of SLR in the Software Engineering (SE) field in 2004 [3], especially over the last years, the number of SLR has been increased substantially [4].

In the context of SE, an SLR is classified as a secondary study which includes also Systematic Mappings (SMs). An SM is a kind of lightweight SLR that aims to survey the available knowledge about a topic [2]. They follow the same process of conduction and they are considered key to the Evidence-Based Software Engineering (EBSE) field [2]. For these reasons, both types of secondary studies will be addressed in our research. In order to facilitate the understanding, in this study the SLR name will make reference to SLRs and SMs.

One known challenge in evidence-based disciplines is to keep SLR updated. As stated in the Cochrane’s handbook [5], SLR that are not maintained may become out of date or misleading. With the advance of the computer science field and the growth of research publications, new evidence continuously arises. This fact impacts directly on the purpose of
keeping SLRs up-to-date, consequently could leading researchers to obsolete conclusions or decisions about a research topic [6].

In the medicine field, SLR update has a consolidated process [7,8]. Also in SE, there are several initiatives on SLR updates such as on establishing the SLR update process [9,10], searching for new/updated evidence [11,12], selecting updated evidence [6] and experience reports [13,14]. Despite the effort of the SE community to keep SLR updated, a recent systematic mapping [15] showed that only 22 SLRs in SE were updated.

Creating and maintaining SLRs up-to-date demand a significant effort for reasons such as the rapid increase in the amount of evidence [16,17] and the limitation of available databases [18]. Furthermore, the lack of detailed protocol documentation and data availability make the SLR update process even more difficult since most of the tacit knowledge from the SLR conduction is lost [19].

Conventionally, in SE SLRs are not updated or updated intermittently [12]. Intermittent updating leaves gaps between updates during which time the SLR may be missing important new research, placing it at risk of inaccuracy and wasting the potential contribution of new research to evidence synthesis and decision-making. In the medicine field, in order to mitigate the SLR updating issue, Elliott et al. [20] introduced the concept of “Living Systematic Review” (LSR). An LSR is an SLR that is continually updated, incorporating relevant new evidence as it becomes available.

In the context of software development, DevOps concept (mindset, practices and tools) brought several benefits such as: faster release of features, improvement on the monitoring of systems in production, stimulate collaboration among team members, among others. All of these benefits lead to to high quality software [21]. Continuous Integration (CI), a DevOps practice, aims to build and integrate all working versions of the software code together, keeping the software updated. It includes automation, for example, a build service; and a cultural mindset such as integrate changes constantly [22].

Over the last years, the SE community started the open science movement which consists of making any research artifact available to the public addressing open access, open data and open source practices [23]. Open science approaches directly impact the SLR conduction not limited to the access and availability of primary evidence for the conduction of SLRs, but on the adoption of open science practices during the conduction of secondary studies that reflects on the reproducibility and maintainability of the SLRs. Concepts of open science must be addressed by researchers that conduct any kind of evidence-based study.

Inspired by LSR from evidence-based medicine and considering the DevOps movement especially the CI process and practices as well as Science 2.0 practices (open science, cooperation and incremental science) we propose the concept, process and tooling support on Continuous Systematic Literature Review (CSLR) in SE aiming to keep secondary studies constantly updated.

This positional paper presents our approach named Continuous Systematic Review. This approach may collaborate with the Evidence-Based Software Engineering area, enabling an innovative way to conduct secondary studies and supporting trustworthy and up-to-date evidence for secondary studies in SE.

2 Proposal

The update process does not have to be considered just after the SLR publication, but during the conduction of the SLR. Our research goal is to propose and validate the process of CSLR, including guidelines and automated tooling support.

Our research addresses the three hypothesis detailed next.

**Hypothesis 1**

CSLR mitigates the intermittent updating problem (secondary studies’ publication timing) that reflects on the missing of important new research.

**Hypothesis 2**

CSLR contributes to reduce the risk of inaccuracy and wasting of potential contribution of new research to evidence synthesis and decision-making.
Hypothesis 3

CSLR promotes open science in practice in the context of evidence-based software engineering.

In order to reach our research goals and validate our hypothesis, our research project is divided into five major steps: 1- Since the core for our approach address the search and selection of evidence activities, the first step was to performed a systematic investigation on automated support for these SLR activities [24]; 2- Creation and development of the CSLR process; 3- Elaboration and execution of a proof of concept validation of the CSLR process and practices; 4- Development of the automated tooling support prototypes; and 5- A complete validation of the CSLR process including the tooling support.

3 Conclusion

In this paper, we present our approach of Continuous Systematic Review in SE. In addition, we describe our proposal and the major steps of our research project.

We believe that creating and introducing CSLR process, practices and tooling will contribute to mitigate the intermittent updating problem reflecting on the reduction of the risk of inaccuracy and wasting of potential contribution of new research to evidence synthesis and decision-making and will promote Science 2.0 approaches such as open science in practice on the context of EBSE.

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