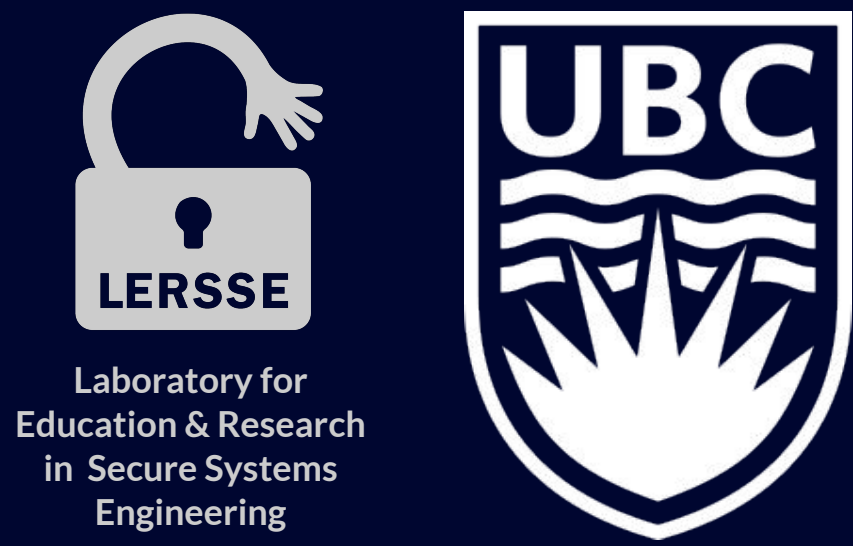# SoK: Human, Organizational, and Technological Dimensions of Developers' Challenges in Engineering Secure Software
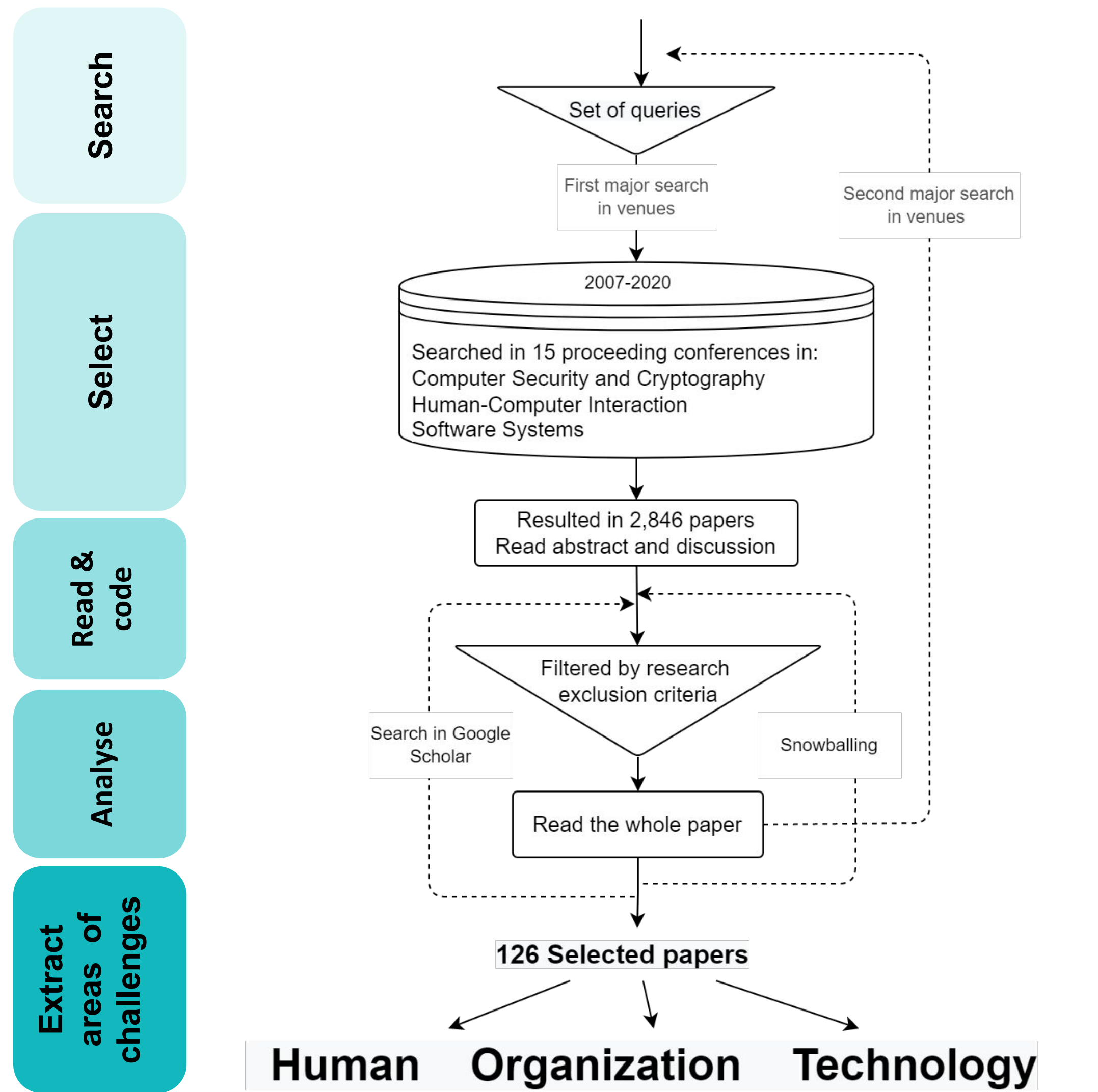
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LERSSE

Laboratory for Education & Research in Secure Systems Engineering

UBC

Motivation

Source code vulnerabilities lead to many security problems[25, 49, 80, 82] and developers play a crucial role in engineering secure code. Developers' bad decisions and errors in their coding can adversely affect end-users and everyone who relies on their work[5, 40]. Studies have shown that developers face a number of challenges when developing secure software. In this study, for the first time, we developed a model of developers' challenges in engineering secure software (ESS).

Methodology

Search
Select
Read & code
Analyse
Extract areas of challenges

Set of queries

First major search in venues

Second major search in venues

2007-2020

Searched in 15 proceeding conferences in:
Computer Security and Cryptography
Human-Computer Interaction
Software Systems

Resulted in 2,846 papers
Read abstract and discussion

Filtered by research exclusion criteria

Search in Google Scholar

Snowballing

Read the whole paper

126 Selected papers

Human   Organization   Technology

Results: Dimensions of Developers' Challenges in ESS

Human Dimensions

Role of personality
Attitudes and perceptions
Deterrents
Knowledge
Experience
Learning strategies
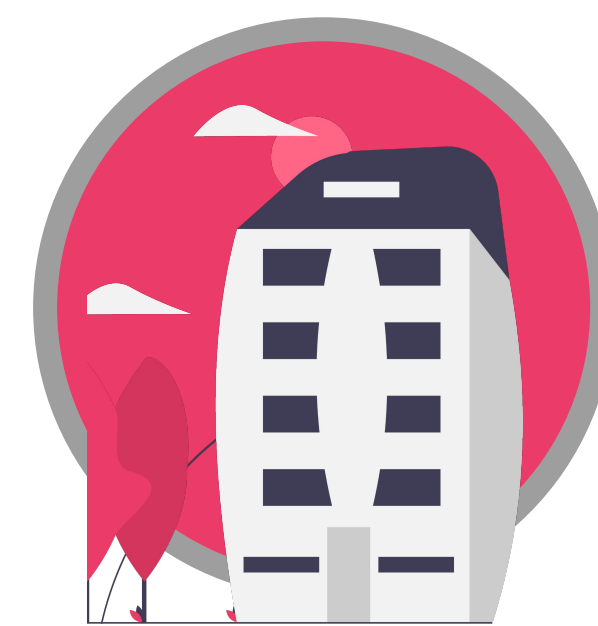
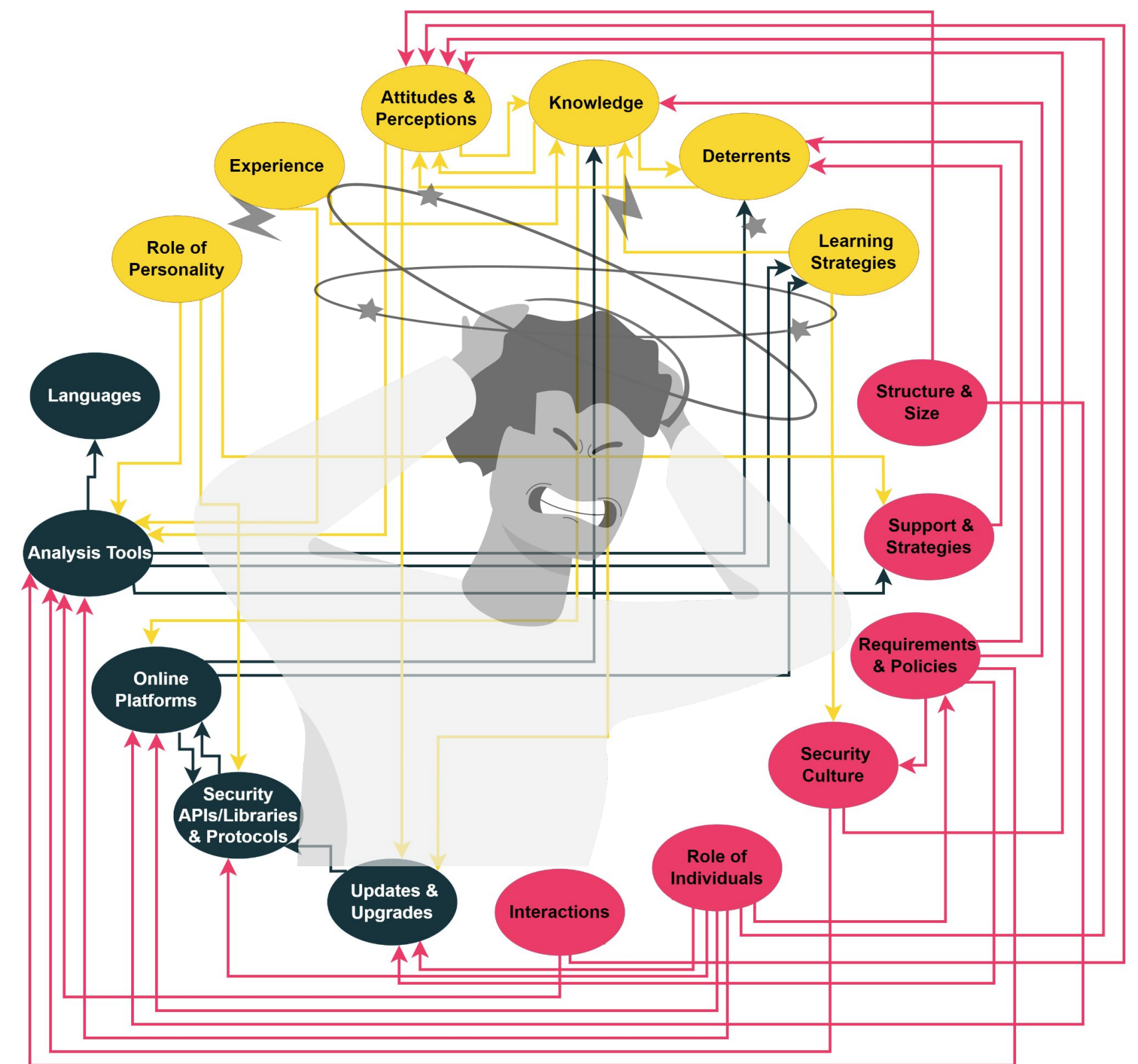### Organizational Dimensions

Security culture
Requirements and policies
Support and strategies
Structure and size
People in organization
Interactions

Technological Dimensions

APIs/libraries and protocols
Analysis tools
Updates and upgrades
Online platforms
Languages

Developers Trapped in Multiple Challenges in ESS

Arrows indicate correlations between the areas of challenges.

Secure software engineering is affected by 17 various factors. These factors appear to influence each other directly and indirectly.

Organizational dimensions have the most interplay with other areas.

This model would help to reveal patterns for future research directions. We found that some areas of challenges play a more important role because they have effects on many other factors.

Reference

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Azadeh Mokhberi and Konstantin Beznosov. 2021. SoK: Human, Organizational, and Technological Dimensions of Developers' Challenges in Engineering Secure Software. European Symposium on Usable Security 2021. Association for Computing Machinery, New York, NY, USA, 59–75.