

# Accessibility and Software Engineering Processes

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A SYSTEMATIC LITERATURE REVIEW

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# AGENDA

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- Abstract
- Introduction
- Literature Background
- Population Targeted
- Key Aspects of Research Design
- Key Aspects of Research Methods
- Findings
- Implications
- Personal Thoughts

# ABSTRACT

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- The paper presents a systematic literature review (SLR) about accessibility in the context of software development processes and is an update of two SLRs previously carried out.
- The study shows that software testing and software design had been the focus of research in the last decade when considering the inclusion of accessibility during software development.
- The authors suggest that software engineering plays a fundamental role in developing accessible applications since it can promote the integration between methodologies and specific accessibility techniques and activities in a software development process.

# INTRODUCTION

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- The expansion of the web and new platforms have led to an increased focus on digital accessibility for people with disabilities, impairments, and reduced skills.
- The World Wide Web Consortium's Web Accessibility Initiative (WAI) developed the Web Content Accessibility Guidelines (WCAG) to address software design for accessibility.
- Systematic literature reviews (SLRs) have analyzed the inclusion of accessibility in software engineering processes.
- The SLR methodology aims to be unbiased, auditable, and repeatable.

# LITERATURE BACKGROUND

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- The Background and Related Literature Review sections discuss the importance of accessibility and previous research on accessibility in software engineering.
- The review found barriers to incorporating accessibility and promising practices, such as involving users with disabilities and providing training for software engineers. The authors call for more research and action in this area.
- The Web Content Accessibility Guidelines (WCAG) is one of the most widely used sets of accessibility recommendations (World Wide Web Consortium, 2019c).
- The study by Freire et al. (2007a) identified several techniques for different phases of the Web Engineering process, such as architectural design, user interface design, and software testing.
- Dias et al. (2010) updated Freire et al.'s research by analyzing 65 studies selected from an initial set of 301. The results showed an increased interest in research on web accessibility during the period from 2007 to 2010.

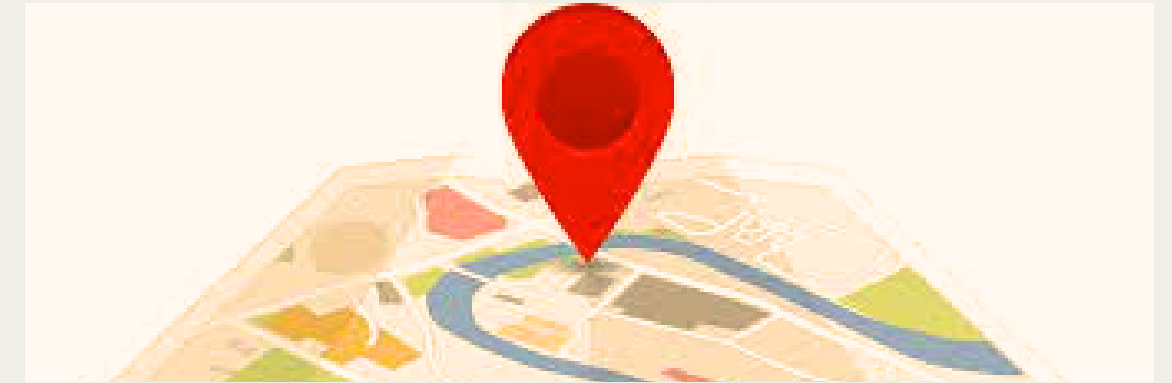
# POPULATION TARGETED

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- The paper targets people with disabilities, who are a diverse and heterogeneous population with different characteristics and needs.
- This includes people with blindness and low vision, deafness and hearing loss, limited movement, speech disabilities, photosensitivity, cognitive limitations, and learning disabilities.
- The paper acknowledges that people with disabilities form a pluralistic population with different accessibility needs that should be considered during software engineering processes.

# KEY ASPECTS OF THE RESEARCH DESIGN

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## Research design:

The study is a systematic literature review that follows a predefined research protocol. The authors searched for relevant articles in several databases and analyzed them using a qualitative approach.

## Sample size:

The authors identified 94 relevant articles through their search process and quality assurance criteria.

## Data collection:

The data were collected through a search of several databases, including IEEE Xplore, ACM Digital Library, and ScienceDirect.

## Location of study

The articles analyzed in the study were published in various locations, including academic journals and conference proceedings from different countries

# ACTIVITIES AND RELATED QUESTIONS

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**Planning**

**Conducting**

**Reporting**

**Research questions of SLR include:**

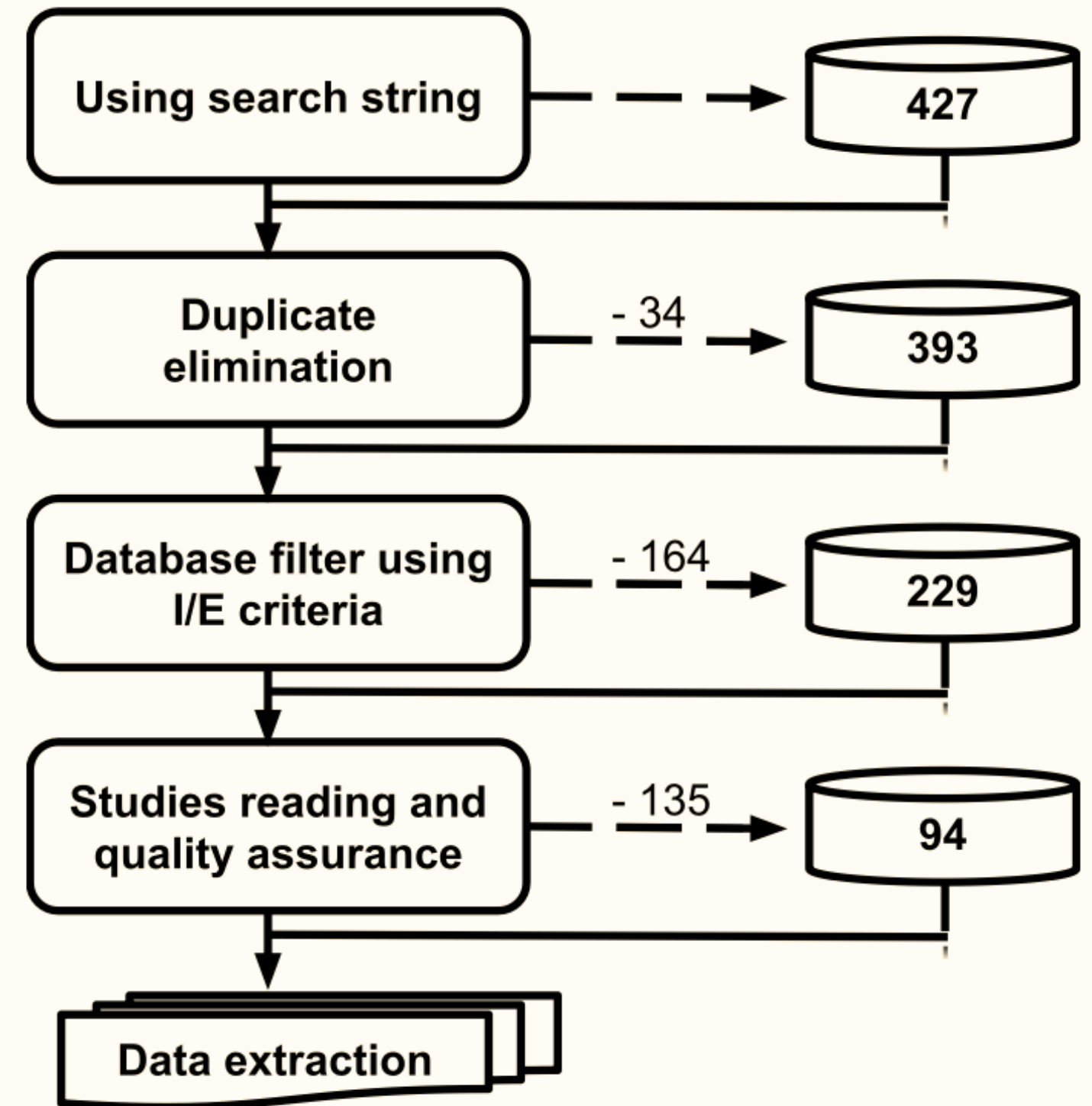
(RQ1): “What are the current methods, techniques, processes, and approaches to support the development of accessible software?”

(RQ2): “What are the main assets (methods, techniques, tools, etc.) available to contribute to the development of accessible software?”



# RESEARCH METHODS

- The paper uses a systematic literature review (SLR) as the research method.
- The authors conducted a search of academic databases, including IEEE Xplore, ACM Digital Library, and Scopus, using specific search strings and inclusion/exclusion criteria.
- The paper provides a detailed description of the SLR methodology, including the search strategy, screening process, data extraction, and analysis.
- Quality assurance checks were conducted and 94 papers were selected for further analysis.



**Fig. 1.** Search strategy used in this SLR.

# DATA EXTRACTION AND ANALYSIS

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**Table 1**

Information extracted in the form from the selected papers.

Information	Options
1. Paper ID	
2. Title	
3. Abstract	
4. Software development phase or activity discussed	
5. Asset presented	Yes (which?)/no
6. Context description	Yes (which?)/no
7. Design and implementation description	Yes (which?)/no
8. Evaluation description	Yes (which?)/no
9. Local and data	

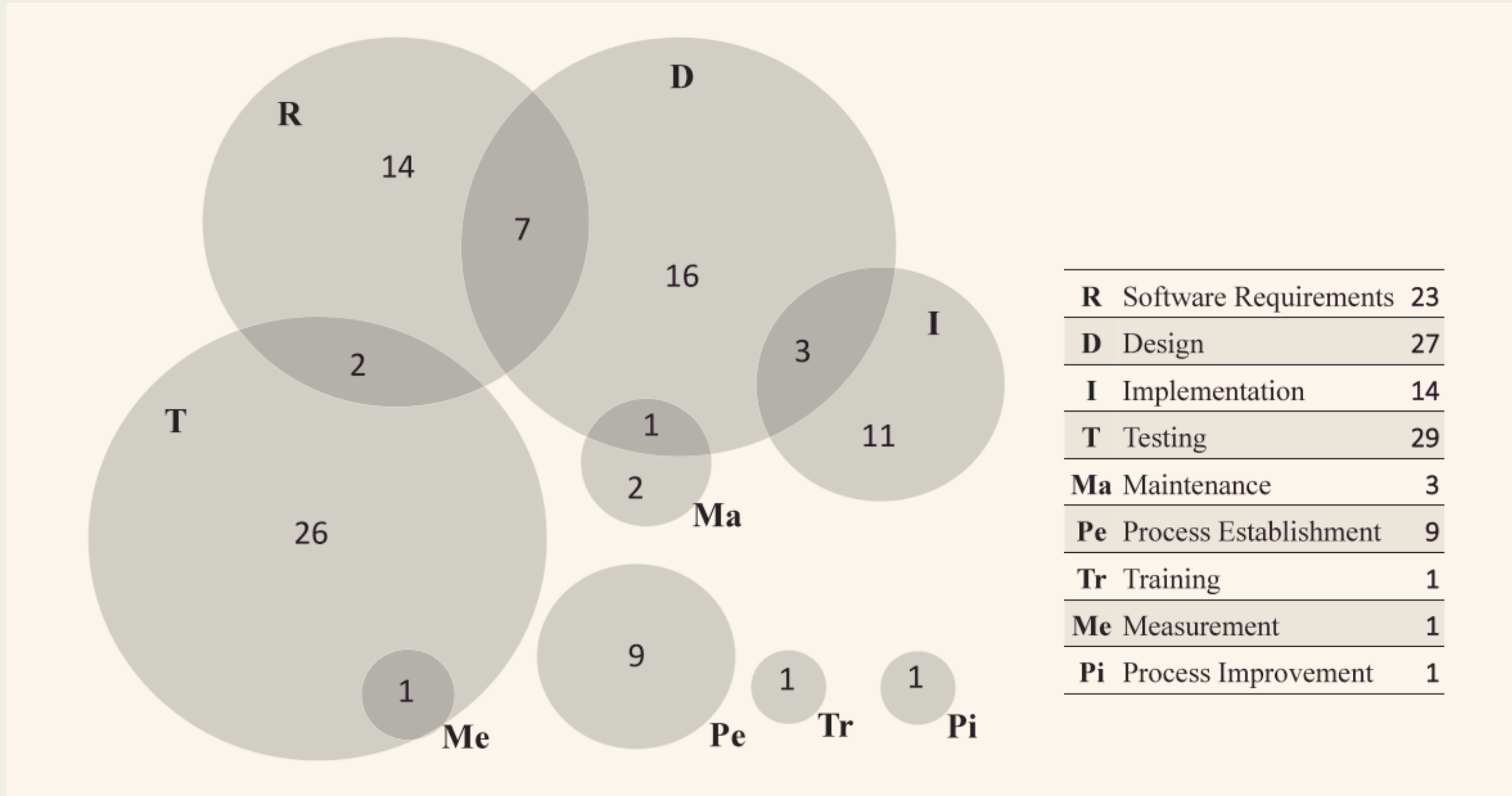
- The papers were categorized according to the ISO/IEC/IEEE 12207 Standard and evaluated their quality based on specific criteria.
- Only papers with clear answers to at least three quality assurance questions were included.
- They used an extraction form and spreadsheet to gather information on each paper.

## **RQ1- FINDINGS**

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- The authors conducted a systematic literature review and identified several methods, techniques, and processes that can be used to ensure accessibility in software development.
- These include user-centered design, accessibility testing, and the use of accessibility guidelines and standards.
- Overall, the findings related to RQ1 provide insights into the current state of research on accessibility in software engineering processes and highlight the importance of considering accessibility in all stages of software development.

# RQ1-RESULTS



Fourteen studies emphasized two activities, which are 7 (R&D) + 3 (D&I) + 2 (R&T) + 1 (D&Ma) + 1 (T&Me), as presented in the Venn Diagram

# RQ1- RESULTS

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Processes	Groups of the main topics of interest
Requirements (R)	R1. Accessibility requirements definition R2. Engineering approaches to include accessibility issues R3. Tool for gathering accessibility requirements
Design (D)	D1. Accessible wearable app design D2. Adaptive user interfaces D3. Accessibility for specific contexts D4. Design for disabilities D5. Ontology knowledge modeling D6. New representation (design) of web pages D7. Architecture for accessible web pages D8. Design patterns D9. Model driven engineering
Implementation (I)	I1. Techniques to implement accessible products I2. Adaptive user interfaces implementation I3. Library of software code I4. Accessibility and standards I5. Framework to build accessible software
Testing (T)	T1. Evaluation tools T2. Automatic detection of accessibility problems T3. Mobile apps testing T4. Framework for accessibility evaluation/tests

The distribution of all the groups of the topics of interest evidenced by the selected papers, related to the nine processes.

# RQ1 - RESULTS

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Maintenance ( <b>Ma</b> )	Ma1. Refactoring technique Ma2. Reengineering
Process establishment ( <b>Pe</b> )	Pe1. Accessibility and Software Engineering Pe2. Case tool for accessibility and Software Engineering Pe3. Accessible software processes
Training ( <b>Tr</b> )	Tr. Gamification for accessibility training
Measurement ( <b>Me</b> )	Me. Measure the fulfillment of the WCAG 2.0
Process improvement ( <b>Pi</b> )	Pi. Capability maturity of usability and accessibility

The distribution of all the groups of the topics of interest evidenced by the selected papers, related to the nine processes.

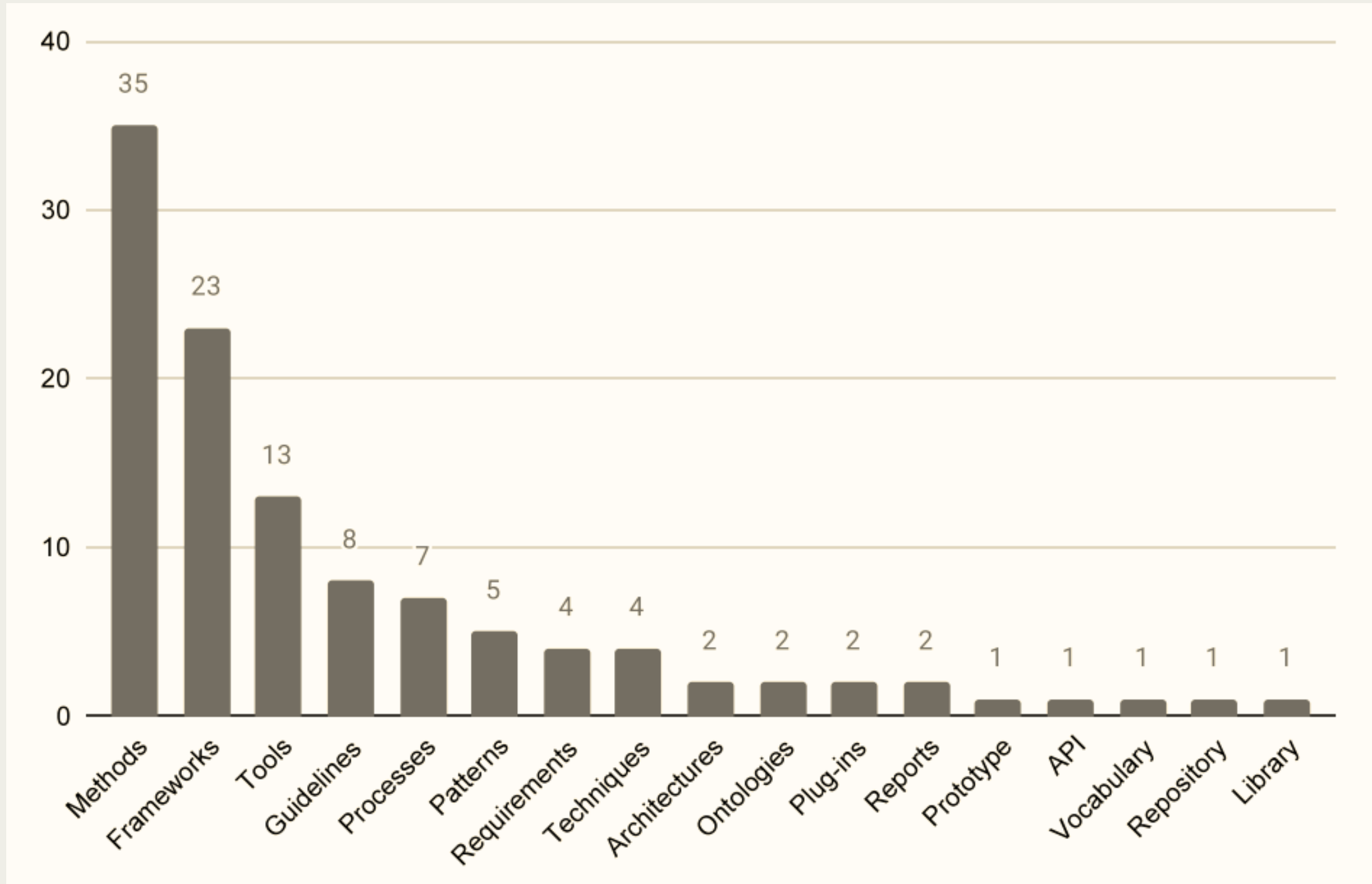
## **RQ2 - FINDINGS**

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- The authors identified several assets that can be used to ensure accessibility in software development, including accessibility guidelines and standards, automated accessibility testing tools, and assistive technologies.
- The authors also highlighted the importance of involving people with disabilities in the development process and the need for training and education on accessibility for software developers.
- Overall, the findings related to RQ2 provide valuable resources for software developers and researchers interested in accessibility and software engineering processes.

# RQ2-RESULTS

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ASSETS RESULTING  
FROM RESEARCH



# IMPLICATIONS

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- The SLR presented significant findings that delineate how the proposals of methods, techniques, processes, approaches, and assets to support the development of accessible applications have progressed in the last decade.
  - Contexts and platforms
  - Evolution of research on accessibility and Software Engineering
  - Software development phases and activities approached by the studies

# CONCLUSION

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- The paper presented an updated systematic literature review (SLR) on accessibility in software development processes.
- Software testing and software design were the main areas of focus in the last decade when it comes to including accessibility in software development.
- Additionally, there was a slight increase in the number of publications between 2011 and 2019 compared to previous SLRs.
- The study highlights several open questions for future research, including the incorporation of accessibility into agile methodologies and open-source development.

# MY PERSONAL THOUGHTS / REFLECTIONS

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- The methods used in the literature review appear to be valid, as the study followed a systematic approach to identify and analyze relevant articles on the topic of accessibility and software engineering processes.
- A meta-analysis could provide a more rigorous statistical analysis of the findings across the included studies.
- Incorporating ML and AI into research on accessibility and software engineering processes have the potential to improve the efficiency and effectiveness of accessibility efforts and make software products more accessible for all users.

# Thank you!

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