

Celebrating 10 years of Workshop on Social, Human, and Economic Aspects of Software (WASHES): Extended Results of a Scoping Review

Otávio Santos Gomes¹, Estela Miranda Batista¹,
Gláucia Braga e Silva¹, Allysson Alex Araújo²

¹Universidade Federal de Viçosa (UFV) - Campus Florestal
Instituto de Ciências Exatas e Tecnológicas (IEF)
Programa de Pós-graduação em Ciência da Computação (PPGCC)
Florestal, Minas Gerais - Brasil

²Universidade Federal do Cariri (UFCA)
Centro de Ciências e Tecnologia (CCT)
Programa de Pós-graduação em Administração (PPGA)
Juazeiro do Norte, Ceará - Brasil

{otavio.s.gomes, estela.miranda, glaucia}@ufv.br
allysson.araujo@ufca.edu.br

Abstract. *Software systems are fundamentally socio-technical phenomena, shaped by human behaviors, organizational contexts, and economic factors, a perspective critical to Information Systems (IS). Since 2016, the Workshop on Social, Human, and Economic Aspects of Software Engineering (WASHES) has provided a dedicated venue for examining these dimensions within the software domain. Marking its tenth anniversary, this study presents a scoping review of WASHES publications from 2016 to 2025. Across ten editions, WASHES has published 116 papers authored by 351 researchers from 78 institutions, spanning 19 Brazilian states and five countries. We analyze publication trends, citation patterns, language distribution, thematic evolution, and award-winning papers. Our findings show that social perspectives are the most frequently addressed, followed by human and economic aspects, alongside a thematic shift from process- and artifact-centric concerns toward human-centered issues such as collaboration, experience, diversity, and accessibility. By consolidating these results, the study characterizes the evolution of WASHES as a venue concerned with socio-technical issues at the intersection of Software Engineering and IS, offering implications relevant to stakeholders interested in integrating human and organizational considerations into software and digital initiatives.*

1. Introduction

The role of software extends beyond its technical foundations, influencing human interactions, organizational practices, and broader economic and social dynamics. Within this

context, research in Software Engineering (SE) has increasingly converged with perspectives from Information Systems (IS), recognizing that software is not merely a technical artifact but also a socio-technical construct embedded in human and institutional contexts [Hyrnsalmi et al. 2025]. This convergence has stimulated a growing body of work examining how social, human, and economic factors shape the development, adoption, and impact of software systems [Lenberg et al. 2015, Boehm 2002].

To promote this agenda, the Workshop on Social, Human, and Economic Aspects of Software Engineering (WASHES) was established as an interdisciplinary platform for research that intersects SE with these broader dimensions. While international venues such as the International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE) and the International Conference on Software Engineering's Software Engineering in Society track (ICSE-SEIS) have long addressed socio-technical concerns in SE from a global perspective, WASHES provides a complementary space specifically tailored to the Brazilian context. In summary, WASHES provides an environment for the Brazilian community to discuss these aspects and their associated challenges, which can impact the development and use of software while also encouraging collaborations with the industry. This regional focus enables discussions that account for the particular cultural, institutional, and economic realities of software development in Brazil, while still contributing to the international discourse on social, human, and economic aspects of SE. By examining WASHES's evolution, this study also contributes to understanding how regional scientific communities engage with and adapt global socio-technical research agendas to local contexts.

Despite the growing interest in social, human, and economic aspects of software, there is still limited understanding of how these concerns have been collectively articulated, prioritized, and recognized within long-standing research communities. In the case of WASHES, the absence of a systematic and longitudinal analysis means that it remains unclear how themes have evolved over time, which perspectives have been most influential, and how the community has implicitly valued different forms of research. This gap is particularly relevant to IS research, which emphasizes the socio-technical nature of digital systems and calls for context-sensitive analyses of how research agendas emerge and stabilize within specific communities [Bostrom and Heinen 1977, Mumford 2006]. To address this gap, this study presents a scoping review of research published in WASHES over the past decade. A scoping review is well suited for this purpose, as it enables a broad and systematic mapping of thematic evolution, publication patterns, and community structure, capturing shifts in emphasis and emerging trends without restricting the analysis to predefined evaluative criteria [Smith and Duncan 2022].

Therefore, our objective is to examine how WASHES has evolved over the past decade. To this end, we provide an overview of the studies, including the number of publications each year, the distribution of publications by language, and an analysis of the evolution of topics in different time periods. Furthermore, we identified the most cited papers to highlight influential contributions. Our study also clarifies the most prolific authors, the institutions with the highest number of published papers, and the geographical distribution of research across Brazilian states.

It is worth noting that this article extends our previous publication, which received an award at WASHES 2025 [Gomes et al. 2025]. This extended version incorporates a set of clearly defined enhancements. First, all figures, tables, and descriptive analyses were updated to include data from the 10th edition (WASHES 2025), enabling a complete characterization of the workshop's first decade. Second, we introduced an additional research question focused on award-winning papers, allowing us to examine how recognized contributions align with the workshop's thematic axes. Third, we added a dedicated Discussion section that interprets the findings using theoretical perspectives from SE and IS. Finally, we expanded the discussions associated with each research question, providing a more detailed analytical reflection. These revisions result in a more comprehensive and analytically developed scoping review of WASHES.

The contributions of this work are threefold: (1) it provides a systematic synthesis of a decade of research presented at WASHES, offering an integrated view of how social, human, and economic perspectives have been incorporated into SE and related IS studies; (2) it maps the evolution of these discussions, highlighting emerging themes and shifts that reflect broader transformations in the socio-technical landscape of software and digital systems; and (3) it analyzes the research network surrounding WASHES, identifying influential authors, institutions, and the geographical distribution of contributions that illustrate the workshop's role within the Brazilian and international research.

Beyond documenting the workshop's trajectory, this study advances IS literature in different ways. It empirically characterizes how a regional research community has evolved in alignment with broader socio-technical research agendas, offering context-sensitive perspectives that are less visible in mainstream IS venues. The analysis of thematic evolution and award-winning papers provides empirical indicators of the types of research that have been most consistently recognized within the community over time. By mapping institutional participation and geographic distribution, the study also offers findings into knowledge production networks in a developing regional context, contributing to ongoing IS discussions on diversity, inclusion, and the situated nature of IS research.

The remainder of this article is structured as follows. Section 2 overviews the history behind WASHES. Section 3 details the research design. Section 4 presents our findings, while Section 5 discusses them in the light of literature. Section 6 outlines the study's threats to validity. Finally, Section 7 presents the final remarks of this study.

2. WASHES: A Decade of Growth and Impact

The history of the WASHES started in 2016, marking the beginning of a journey for the exploration of how SE intersects with broader human, societal, and economic issues. The inaugural edition of WASHES took place in Maceió, AL, co-located with the 15th Brazilian Symposium on Software Quality (SBQS 2016), and featured 15 papers. This first edition was organized by Sabrina Marczak, Igor Steinmacher, Davi Viana, and Rodrigo Santos, who curated the program and ensured a smooth introduction to the event. The second edition of WASHES, held in Salvador, BA, in 2017, was co-located with the 17th International Conference on Software Reuse (ICSR 2017) and featured 4 published papers. The program committee was led by Rodrigo Santos, Eldânae Teixeira, Emilia Mendes, and John McGregor. In 2018, WASHES found its home in Natal, RN, during the

38th Congress of the Brazilian Computer Society (CSBC 2018), where 11 papers were published in its third edition. The program committee for this edition was organized by Igor Scaliante Wiese and Davi Viana. The fourth edition, held in Belém, PA, in 2019, during CSBC 2019, also included 11 published papers. The program committee for this edition was led by Rodrigo Santos and Valdemar V. Graciano Neto.

The year 2020 was an impactful moment in WASHES' history. Due to the COVID-19 global pandemic, the workshop was conducted remotely for the first time, yet this did not lessen its impact. With 14 papers published, WASHES 2020 was co-located with CSBC 2020. This fifth edition was organized by Igor Steinmacher and Awdren Fontão. In 2021, the workshop continued its remote format, gathering 7 published papers. The sixth edition event, led by Awdren Fontão and Flávio Horita, continued to foster the dialogue on how software shapes societal transformation. The seventh edition took place in Niterói, RJ, in 2022, co-located with CSBC 2022. With 7 published papers, the program committee was coordinated by Flávio Horita and Emanuel Coutinho. WASHES continued to build momentum in 2023, with its eighth edition held in João Pessoa, PB (CSBC 2023). This edition featured 12 published papers, and the program committee was led by Emanuel Coutinho and Anna Beatriz dos Santos Marques. The ninth edition of WASHES took place in 2024 in Brasília, DF, with 21 papers published. Co-located with CSBC 2024, the event was organized by Anna Beatriz dos S. Marques and Allysson Alex Araújo. The celebrated tenth edition returned to Maceió, AL, where the workshop was first held. Integrated into CSBC 2025, this edition published 16 papers selected through a double-blind peer review process from 35 submissions, the highest number of submissions to date. This edition was coordinated by Allysson Alex Araújo and Luciana Zaina.

Over the years, WASHES has expanded both its scope and geographical reach across Brazil, reflecting the importance of addressing the social, human, and economic aspects of SE. The workshop's varied locations (from Maceió and Salvador to Natal, Belém, Niterói, Brasília, and beyond) unravel its wide influence and dedication to fostering inclusive regional engagement. Moreover, the partnership with CSBC has been particularly instrumental in amplifying the workshop's impact within the broader Brazilian Computer Science community. Co-locating with CSBC has provided WASHES with the opportunity to leverage the event's established reputation and attract a more diverse audience. Lastly, the continued success and growth of WASHES would not have been possible without the strong commitment of its program committees and co-chairs.

3. Research Design

This scoping review follows the methodological guidelines proposed by Peters *et al.* (2020). In particular, scoping reviews are promising for exploring the breadth of available literature, synthesizing knowledge, identifying gaps, and guiding future research directions [Munn et al. 2018]. Given the decade-long history of WASHES, this approach enables an examination of how the event has evolved and how its academic impact has unfolded over time. In this regard, we established four key aspects to be discussed: the overall characteristics of published studies, the evolution of research topics, the most active contributors, and the institutional and geographical distribution of publications. To

achieve this aim, we established five Research Questions (RQs) that guided our study:

- **RQ1: What is the distribution of published studies in WASHES by year, number of citations, and language?**

Rationale: This question aims to provide an overview of the workshop's publication landscape, including the number of studies published per year and the distribution of languages in which they were written. In addition, we identify the most cited papers and categorize publications based on their thematic axes (social, human, or economic aspects of SE).

- **RQ2: What thematic axes and topics have been most frequently addressed over time in WASHES?**

Rationale: This question aims to observe the coverage of the social, human, and economic thematic axes of the workshop on the published studies. Furthermore, using word clouds generated from paper titles, keywords, and abstracts at three-year intervals, we map recurring themes, emerging trends, and the evolution of research interests in the WASHES community.

- **RQ3: Who are the most active contributors to WASHES?**

Rationale: This question identifies the most prolific authors in WASHES, highlighting those who have published the most papers over the years. By analyzing the most active authors, we gain insights into the researchers driving discussions in the workshop.

- **RQ4: Which institutions have contributed the most to WASHES, and how is research geographically distributed?**

Rationale: This question explores institutional participation in WASHES by identifying the institutions with the highest number of published papers. We also analyze the geographical distribution of contributions across Brazilian states, providing an understanding of the workshop's reach and institutional engagement.

- **RQ5: How do award-winning papers align with the thematic axes of WASHES?**

Rationale: This question examines the set of papers that received awards across different editions of WASHES. By mapping their alignment with the workshop's thematic axes, we describe which dimensions of SE have most frequently been associated with recognized work. This descriptive analysis provides findings into how the community has highlighted different aspects of research over time, revealing which themes have stood out as particularly relevant within the history of WASHES.

To ensure a comprehensive dataset, we included all studies published in the WASHES proceedings without imposing exclusion criteria. The dataset was retrieved from dataWASHES [Araújo et al. 2024], which contained publications up to 2025. This search, conducted in October 2025, resulted in a final dataset comprising 116 studies. For efficient organization and analysis, we structured the collected data within a Google Sheets file, systematically documenting the key attributes of each study. The dataset included information on the workshop edition, year of publication, study title, authors, institutional affiliations, and corresponding Brazilian states. We also recorded each paper's abstract, resumo (Portuguese abstract), keywords, study category (full, short, poster, etc.), and the respective download link.

Our analysis combined quantitative and qualitative procedures. Quantitative analyses addressed publication trends, citation metrics, and geographic distribution (RQ1, RQ3, and RQ4) using descriptive statistics, including absolute counts, relative frequencies (percentages), and temporal aggregation by year and edition. Specifically, we computed (i) the number of publications per year and per publication type, (ii) the distribution of papers by language, (iii) total and average citation counts per year and per study, (iv) the frequency of publications per author and institution, and (v) the distribution of publications across Brazilian states. These analyses were implemented using Jupyter Notebook¹, and the resulting visualizations were generated using Canva².

To investigate the research themes explored in WASHES (RQ2 and RQ5), we conducted a qualitative analysis using a deductive coding approach, guided by the predefined thematic axes of the workshop, combined with interpretive judgment to handle thematic overlap. The coding process began by examining each paper's title, abstract, and keywords to identify its dominant analytical focus. Papers emphasizing human behavior, perceptions, skills, or experience were classified under the *Human* axis; those centered on organizational interaction, collaboration, or societal impact were classified as *Social*; and studies foregrounding cost, value, or economic reasoning were classified as *Economic*. When two dimensions were substantively intertwined in the problem framing, an intersectional category (Social and Human, Social and Economic, or Human and Economic) was assigned.

As we can see, this categorization of papers along social, human, and economic axes is also theoretically grounded in IS scholarship, particularly in socio-technical systems theory and behavioral IS research [Bostrom and Heinen 1977, Mumford 2006, Orlikowski and Iacono 2001]. From an IS perspective, the *Social* axis captures organizational, relational, and institutional dimensions central to studies of collaboration and governance [Avgerou 2001]. The *Human* axis reflects individual-level concerns such as experience, cognition, and behavior, aligning with behavioral IS research [Zhang and Li 2005, Burton-Jones and Straub Jr 2006]. The *Economic* axis addresses value creation and resource allocation, connecting to IS research on IT value and digital economics [Bharadwaj 2000, Melville et al. 2004]. Rather than imposing arbitrary categories, these axes reflect long-standing analytical distinctions within IS research. At the same time, the allowance for intersectional categories acknowledges that many socio-technical phenomena cannot be meaningfully separated into discrete dimensions, consistent with socio-technical systems theory. This theoretically informed and flexible classification supports a valuable mapping of how IS-relevant concerns are articulated within the WASHES corpus.

To illustrate the qualitative classification process, consider the paper “Impact of Remote Work on Software Teams: A Qualitative Study” [Menolli et al. 2023]. The study examines how remote work reshapes team collaboration and communication patterns, as well as how it affects individual developers' experiences. Because the analytical focus simultaneously addresses collective social dynamics and individual human experience,

¹<https://jupyter.org>

²<https://www.canva.com>

the paper was classified under the Social and Human thematic axis. This analysis was conducted in pairs of authors. One author performed the initial thematic assignment, while the second independently reviewed the classification. Disagreements were resolved through discussion and, when necessary, by revisiting the study content to reassess the dominant analytical focus or eventually consulting a third author. This process was repeated iteratively until consensus was reached, ensuring consistency across the dataset. To further enhance transparency, we developed a decision flowchart (Figure 1) that visually represents the classification logic used to assign papers to thematic axes. The same coding and validation procedure was applied in RQ5, which focuses exclusively on award-winning papers.

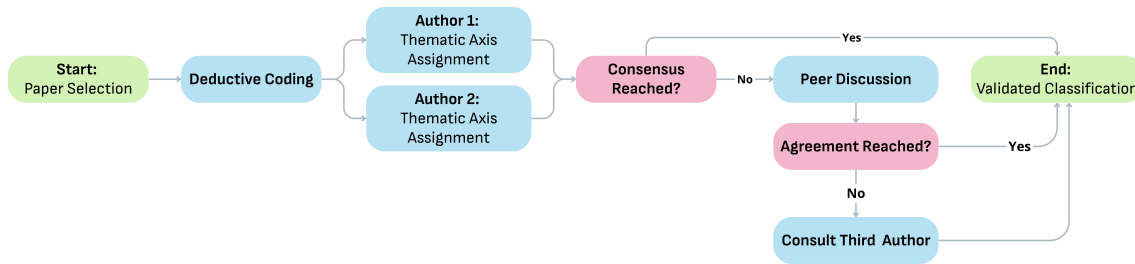


Figure 1. Decision flowchart.

In addition, to analyze the evolution of research topics over time (RQ2), we conducted a complementary keyword-based analysis of titles, abstracts, and keywords across four temporal segments (2016–2018, 2019–2021, 2022–2024, and the 2025 edition). We used Python’s NLTK³ library for text preprocessing (tokenization, stopwords removal, lemmatization) and WordCloud⁴ library for visualization. To enhance transparency and reproducibility, we have made all supporting materials publicly available in our Zenodo repository [Gomes et al. 2024].

Lastly, our scoping review approach aligns with recent applications of this methodology to analyze specialized research communities in computing and information systems. For instance, Neves *et al.* (2023) conducted a scoping review of 18+ years of the Brazilian Symposium on Information Systems (SBSI), analyzing 995 studies across dimensions including temporal trends, geographic distribution, topics, author profiles, industry participation, internationalization, and gender inclusion. In turn, Araujo *et al.* (2014) examined the first 10 years of SBSI from a community perspective, discussing what motivates the community, how it has structured itself, research themes, and future challenges. Similarly, Freire, Cedro, and Serra (2018) analyzed five years of the Brazilian Symposium on Software Quality (SBQS), examining institutional participation, geographic distribution, and cooperation patterns between academia and industry. Valaski *et al.* (2014) reviewed 15 editions of the Workshop on Requirements Engineering (WER), identifying active research groups, debated topics, trends, and citation patterns to assess the workshop’s relevance. Like these studies, we adopt scoping review methodology not to synthesize findings on a specific research question (the typical use case) but to

³<https://www.nltk.org/>

⁴https://amueller.github.io/word_cloud

map the breadth, characteristics, and evolution of a research community over time. This community-oriented application treats the venue itself (rather than a topical literature) as the object of analysis, enabling longitudinal examination of collective knowledge production patterns in specialized forums [Arksey and O'malley 2005, Levac et al. 2010].

4. Results and Analysis

4.1. RQ1: What is the distribution of published studies in WASHES by year, number of citations, and language?

In Figure 2(a), we present the **number of studies published yearly** in the WASHES event. Since 2016, an average of 11.6 studies have been published annually at the WASHES. In total, 116 papers were published in the workshop. In 2016, the workshop published 15 papers, and the modalities of publication were short papers, with 6 publications, posters, with 3 publications, and full papers, in which 6 publications were made. In 2017, the workshop published 4 papers, 3 being full papers and 1 being a short paper. In 2018, only full papers were published, resulting in 10 publications. Also, in 2019, 10 papers were published, 8 full papers, and 2 short papers. In 2020, 14 papers were published, 11 full papers and 3 short papers. In 2021, a total of 7 papers were published, 4 full papers and 3 short ones. In 2022, 7 papers were published, 5 full papers and 2 short ones. In 2023, 12 full papers were published, and in 2024, 21 papers were published, 13 of which were full papers, 2 of which were short papers, and 6 of which were published in a new category called I Fórum dos Grandes Desafios em Aspectos Sociais, Humanos e Econômicos de Software (GranDASHES-BR). Notably, 2024 witnessed a substantial increase in publications, marking it the highest in the event's history. Finally, in 2025, 16 papers were published, 1 of those being published in the II Fórum dos Grandes Desafios em Aspectos Sociais, Humanos e Econômicos de Software (GranDASHES-BR).

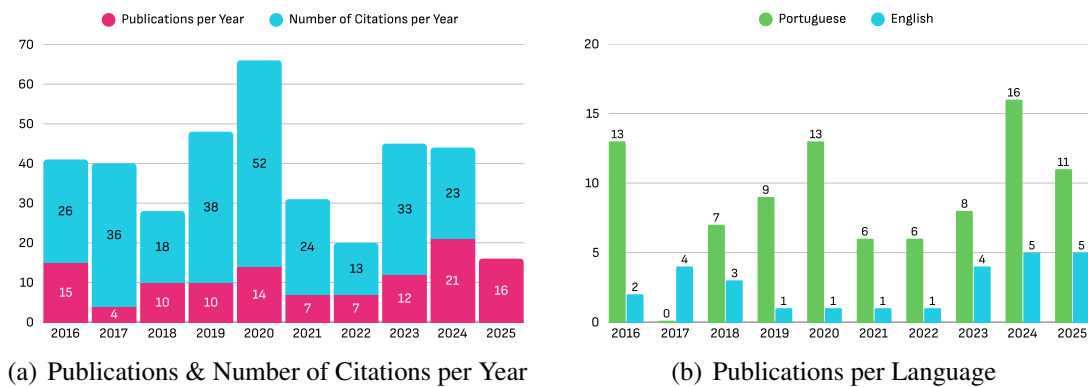


Figure 2. Studies distribution by year, number of citations, and language

Furthermore, to assess the scholarly visibility of the studies presented at WASHES, we analyzed **citation data** from Google Scholar to identify the most influential contributions. Figure 2(a) illustrates the temporal variation in citation frequency. The citation counts for the workshop studies have exhibited substantial variability over the years. In particular, 2020 stands out as the year in which publications received the

Table 1. Top most cited studies

ID	Study Title	Year	Citations
S1	Facing up the primary emotions in Mobile Software Ecosystems from Developer Experience	2017	20
S2	Análise de Soft Skills na Visão de Profissionais da Engenharia de Software	2019	12
S3	Investigando Colaboração em Ecossistemas	2021	12
S4	Fatores de Governança em Sistemas-de-Sistemas: Análise de uma Instituição Pública Brasileira	2020	9
S5	Designing for Reuse in an Industrial Internet of Things Monitoring Application	2017	8
S6	Acessibilidade para Pessoas Cegas: Avaliação de Compatibilidade do TalkBack com a ABNT NBR 17060	2023	8
S7	Ethical design of social simulations	2018	8
S8	Applying Software Craftsmanship Practices to a Scrum Project: an Experience Report	2016	8
S9	Compreendendo a Evasão em uma Década no Curso Sistemas de Informação à luz de fatores humanos e sociais	2019	7
S10	Uso da Netnografia para a Geração de Personas e Requisitos para Sistemas com foco em pessoas com Transtorno do Espectro Autista: Um Relato de Experiência	2020	7
S11	Como influenciar decisões em ambientes digitais através de nudges? Um mapeamento sistemático da literatura	2020	7

highest number of citations (52). Finally, on average, WASHES papers receive 26 citations per year.

Concerning **language**, the yearly breakdown of publications by language is illustrated in Figure 2(b). In the workshop, 77% of the accepted papers were written in Portuguese, while the remaining 23% were written in English. The majority of publications are in Portuguese, but the WASHES community has made an effort to internationalize the published studies. Since 2016, there has been at least one publication written in English each year, with 2024 and 2025 being the years with the highest amount of publications in English (5 each year).

Table 1 highlights the most cited studies, revealing a growing but still developing body of knowledge. The analysis of the citation counts of the publications was conducted on October 26, 2025. There is a notable presence of studies in Portuguese (S2, S3, S4, S6, S9 S10), indicating a regional scholarly impact. Thematically, the studies cover diverse topics, including developer experience (S1), soft skills (S2), accessibility (S6), and ethical design (S7). The inclusion of empirical studies and experience reports (S8, S10) also suggests an interest in applied research. In this regard, 7 out of the 10 editions of the event have publications in the list of the most cited studies published in the workshop.

4.2. RQ2: What thematic axes and topics have been most frequently addressed over time in WASHES?

Figure 3 presents the **distribution of papers across five thematic axes**. The thematic axes indicate that social aspects (61 papers) are the primary focus of discussion within the WASHES community, followed by human (55 papers) and economic aspects (41 papers). Among all the WASHES publications, 52% addressed social aspects, 47% focused on human aspects, and 35% covered economic aspects of the software. The sum of the values will be above 100% as some papers address two distinct aspects (e.g. Human and Social). This finding reflects a balanced distribution of publications across the proposed themes, while still emphasizing the prominence of social aspects.

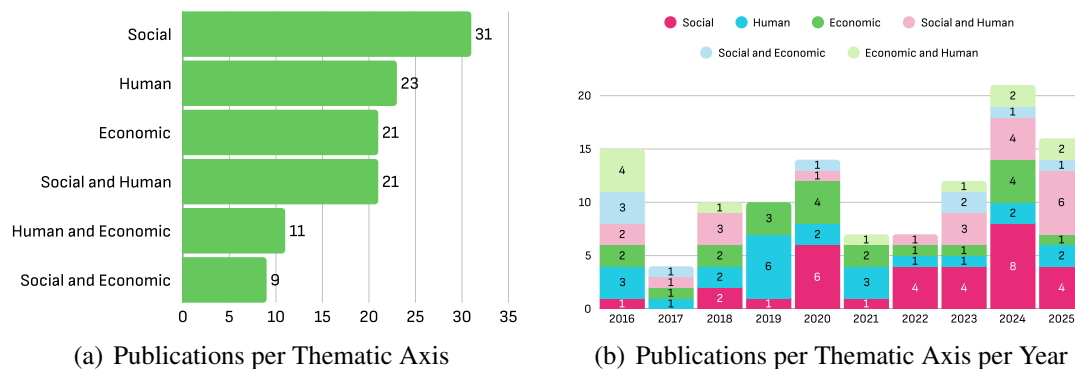


Figure 3. Number of Publications

Furthermore, to investigate **which topics were most discussed throughout the editions**, we generated word clouds for four moments in the event’s history: 2016–2018, 2019–2021, 2022–2024, and 2025 (the tenth edition). For this analysis process, titles, keywords (when available), and abstracts from the papers were used. Figure 4 presents the word clouds generated for each period. In summary, the themes discussed at the workshop evolved over the years. In the first three editions, the focus was on technical topics such as ‘models’, ‘patterns’, ‘ecosystems’, ‘processes’, and ‘crowdsourcing’. In the following three editions, while ‘ecos’ and ‘processes’ remained prominent, new themes like ‘quality’, ‘social issues’, ‘management’, and ‘personas’ emerged, signaling a certain shift towards human-centered and practical concerns. The introduction of the Fórum dos Grandes Desafios em Aspectos Sociais, Humanos e Econômicos de Software (GranDASHES-BR) submission type in 2024 led to a dominance of the term “challenge” (‘desafio’ in Brazilian Portuguese), but after removing this keyword, topics like ‘experience’, ‘practices’, ‘professionals’, ‘communication’, and ‘team’ became noticeable, reflecting a growing emphasis on real-world application, collaboration, and the human aspects of SE. Finally, the 10th edition had an emphasis on data, process, teams, and open science, signaling another perspective in the main topics being discussed in the conference.

4.3. RQ3: Who are the most active contributors to WASHES?

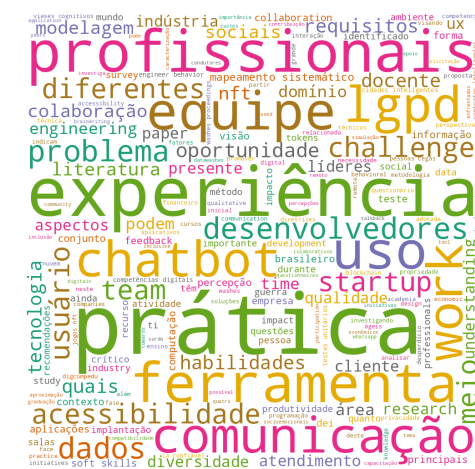
Figure 5 illustrates the **distribution of authors who have contributed at least three publications** to the WASHES. The analysis reveals that the majority of contributors have



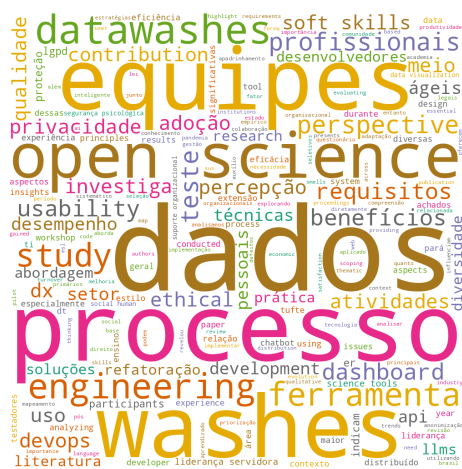
(a) 2016–2018 editions



(b) 2019–2021 editions



(c) 2022–2024 editions



(d) 2025 edition

Figure 4. Wordcloud of 4 event moments

published only once or twice in the proceedings. In total, 351 distinct authors have been identified, among whom 40 authors (11.4%) have published more than once.

Rodrigo Santos (UNIRIO) leads with 15 publications (15% of all WASHES publications), showing particular strength in Social dimensions (9). Emanuel Coutinho (UFC) follows with 11 publications and demonstrates the most balanced cross-dimensional approach. Among mid-tier contributors with 9 publications, Allysson Araújo (UFCA) and with 8 publications Davi Viana (UFMA) exhibit complementary specializations. Allysson primarily addressed Social aspects (7) while Davi mainly contributed with publications addressing Social and Economic dimensions. The remaining contributors, with 4 publications each, show more specific profiles: Anna Beatriz and Glaucia Braga e Silva concentrate mainly on the Social dimension.

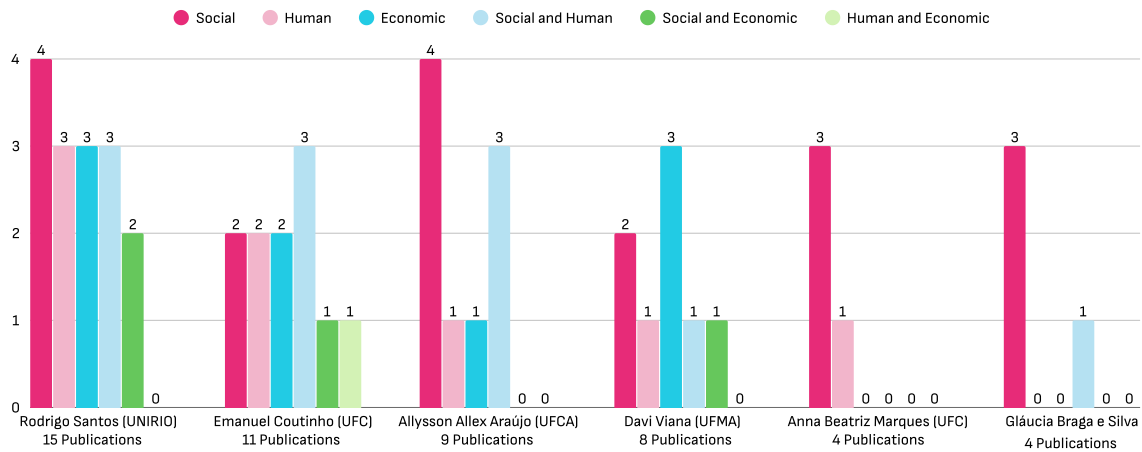


Figure 5. Authors with the most publications and corresponding thematic axis

4.4. RQ4: Which institutions have contributed the most to WASHES, and how is research geographically distributed?

WASHES has studies that involved 351 researchers and 78 distinct institutions from 5 countries and 19 Brazilian states. Figure 6(a) displays the **institutions with at least five publications** in the WASHES. Notably, the Federal University of Ceará (UFC) leads with 20 publications, followed by UTFPR, UFG and UFCA each with 8 publications. In total, 78 institutions have published in the workshop.

In terms of **geographical distribution** (see Figure 6(b)), Ceará emerges as the most prolific Brazilian state with 38 published papers, followed by Rio de Janeiro with 26 publications and São Paulo and Pernambuco with 21 each. Only seven Brazilian states, namely Alagoas, Espírito Santo, Piauí, Rondônia, Roraima, Santa Catarina, and Sergipe, as well as the federal district of Brasília, have not yet contributed to the workshop, underscoring its extensive national reach.

Moreover, five papers featured contributions from international authors, respectively published in 2017, 2018, and 2024. Of these, three involved authors were based in the United States: one from Northern Arizona University, four from Clemson University, and one from The Pennsylvania State University. These American-based authors contributed to the 2017, 2018, and 2024 editions. Additionally, a Canadian-based author from the University of Montreal contributed to the 2018 edition, while a German-based author from the University of Hohenheim was involved in the 2024 edition. This result highlights the international presence of authors, with contributions spanning institutions in North America and Europe.

4.5. RQ5: How do award-winning papers align with the thematic axes of WASHES?

The analysis of **award-winning papers** (Figure 7) provides an opportunity to explore how the WASHES community has recognized excellence and innovation across its thematic axes. Although the Social axis is the most prevalent across all publications, studies addressing Human aspects were the most frequently awarded, accounting for 17 of the 27

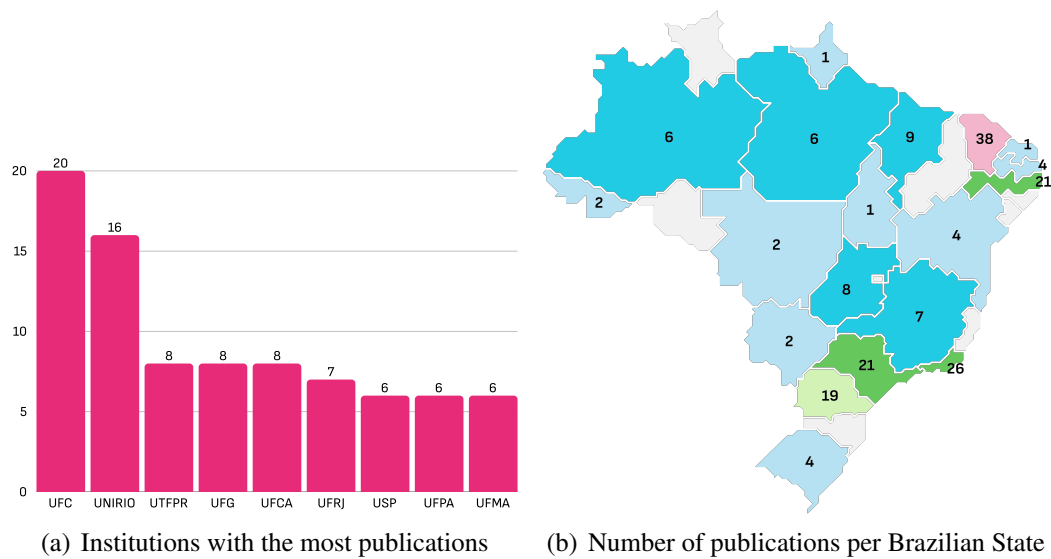


Figure 6. An Overview of the Perspective of Institutions and Brazilian States

award-winning papers (62%). In total, 23% of all published papers received some form of award throughout the workshop's history. When comparing across thematic axes, approximately 30% of the papers categorized as Human, 20% as Social, and 9% as Economic received awards.

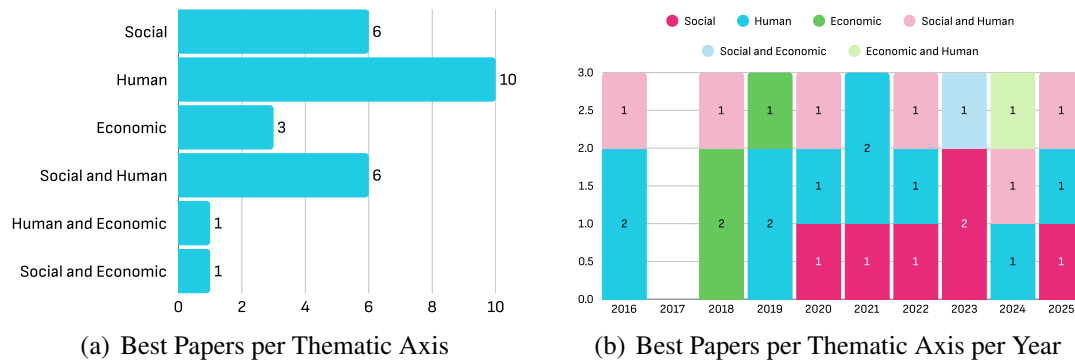


Figure 7. Award-winning papers per thematic axes

Table 2 lists all awarded papers from 2016 to 2025. We notice that no awards were found in 2017, and since 2019, distinctions have been granted to first, second, and third places. In this regard, temporal analysis reveals an evolution in the nature of recognized work. This evolution mirrors broader trends in both SE and IS research, where understanding the human experience and institutional context of technology use has become critical. In the early editions (2016–2018), award-winning papers were primarily technical or methodological, often focusing on software processes and tools (e.g., sentiment analysis, cost prediction). From 2019 to 2021, the emphasis shifted toward human-centric and organizational issues such as onboarding, turnover, and team interaction. In the recent editions (2022–2025), the awarded papers concentrated on topics such as accessibility, di-

versity, soft skills, and open science, evidencing a consolidation of human-centered, inclusive, and ethically aware perspectives. Intersectional categories (SH, HE, SE) also became increasingly represented among award winners, indicating that the WASHES community values research that bridges technical, behavioral, and societal dimensions.

In summary, the analysis of award-winning papers suggests that recognition within WASHES increasingly aligns with research that integrates human and organizational dimensions of software. The growing presence of studies addressing soft skills, UX, diversity, and open science also indicates a maturation of the community toward an explicitly socio-technical identity. Awards thus serve as mirror of this transformation, revealing how the workshop has progressively repositioned itself as a forum connecting SE practices with IS perspectives on technology, people, and society.

5. Discussion

This scoping review documents a transformation in how the WASHES community approaches SE research. Over its first decade, the workshop has evolved from a venue primarily concerned with technical artifacts and processes into one that embraces the relationships between software, people, and organizational contexts. This change reflects a broader convergence between SE and IS scholarship, grounded in the understanding that software systems are fundamentally socio-technical in nature.

5.1. Paradigmatic shift toward socio-technical integration

The longitudinal thematic evolution documented in RQ2 reveals a certain paradigm shift in WASHES's research priorities. Early editions (2016–2018) concentrated on technical concerns such as software processes, architectural models, and methodological frameworks, which aligns with SE's traditional focus on artifact construction [Nazar et al. 2016]. However, beginning in 2019, we observe an inclination toward human experience, organizational practices, team dynamics, and institutional contexts. This transition mirrors long-standing developments in IS research, where scholars have consistently emphasized that system outcomes depend heavily on user cognition, social interaction, and organizational context [Orlikowski 2000, Venkatesh and Thong 2016].

This shift may represent what Kuhn (1997) would call a *paradigm change*: a fundamental transformation in what the community considers valid and valuable knowledge. In addition, the increasing presence of intersectional thematic categories identified in RQ2, such as Social-Human and Human-Economic, suggests that researchers increasingly recognize the limitations of examining software phenomena through single analytical dimensions. Instead, there is growing acceptance that understanding software requires integrated socio-technical perspectives. This trajectory mirrors the broader evolution within IS, where early technology-centric approaches gradually gave way to the recognition that information systems are social phenomena mediated by technology [Orlikowski and Iacono 2001]. The sustained publication growth documented in RQ1 provides further evidence of this transformation. With 116 papers published over ten years and notable acceleration in recent editions, WASHES has established socio-technical research as a legitimate and valued area within the Brazilian SE community. The increasing proportion of English-language publications signals growing international engagement,

Table 2. Award-winning papers

ID	Study Title	Year	Rank	Axis
AW1	Applying Software Craftsmanship Practices to a Scrum Project: an Experience Report	2016	-	H
AW2	Explorando a Personalidade do Desenvolvedor em Ecossistemas de Software Móvel	2016	-	H
AW3	Uma avaliação de ferramentas de análise de sentimentos aplicadas a comentários da plataforma GitHub	2016	-	SH
AW4	How Much Does It Cost? A Simulation-Based Method for Cost Prediction in Systems-of-Systems Acquisition Processes	2018	-	E
AW5	BPEL4PEOPLE Anti-Patterns: Discovering Authorization Constraint Anti-Patterns in Web Services	2018	-	E
AW6	Análise da Percepção de Importância de Requisitos de Usabilidade no Desenvolvimento de um Sistema Web com Scrum	2018	-	SH
AW7	Compreendendo a Evasão em uma Década no Curso Sistemas de Informação à luz de fatores humanos e sociais	2019	1º	H
AW8	Internalização de novos membros em equipes de desenvolvimento de software: benefícios e limitações	2019	2º	H
AW9	Um Estudo sobre Turnover em Empresas de TI Embarcadas no Porto Digital de Recife	2019	3º	E
AW10	Uso da Netnografia para a Geração de Personas e Requisitos para Sistemas com foco em pessoas com Transtorno do Espectro Autista: Um Relato de Experiência	2020	1º	S
AW11	Projetando a Usabilidade e a Experiência do Usuário com a Técnica UXUG-AP: um Estudo Exploratório	2020	2º	H
AW12	O Organizar de Práticas Cooperativas no Contexto de um Ambiente de Estágio em Desenvolvimento de Software	2020	3º	SH
AW13	Um estudo comparativo na geração de personas de crianças autistas com base em dados reais	2021	1º	H
AW14	Investigando Colaboração em Ecossistemas	2021	2º	S
AW15	Um Levantamento de Fatores Humanos e Técnicos em Garantia de Qualidade de Projeto de Software Embarcado Aeronáutico no Brasil	2021	3º	H
AW16	Towards Inclusive Software: Accessible Questionnaires for Deaf People	2022	1º	SH
AW17	Programando às cegas: investigando a acessibilidade de ambientes de desenvolvimento de software	2022	2º	H
AW18	Análise quali-quantitativa sobre a influência da diversidade na produtividade de equipes ágeis: um estudo na indústria	2022	3º	S
AW19	Investigando a Percepção de Feedback em Times de Desenvolvimento de Software: Um Estudo Inicial	2023	1º	S
AW20	The impact of UX work on communication and collaboration in software startups	2023	2º	SE
AW21	Brainwriting na elicitação de requisitos para IA confiável	2023	3º	S
AW22	Uma Proposta de Framework Multimodal para Avaliação de Experiência de Usuário em Sistemas Web Interativos	2024	1º	H
AW23	Caracterizando Condutores de Carga Cognitiva na Prática de Testes Unitários	2024	2º	HE
AW24	Um Estudo Comparativo entre a Visão de Líderes e Liderados sobre a Importância de Soft Skills em Desenvolvimento de Software	2024	3º	SH
AW25	10 years of Workshop on Social, Human, and Economics Aspects of Software (WASHES): Results of a Scoping Review	2025	1º	S
AW26	Aligning Soft Skills in Requirements Engineering Between Academia and Industry: A Pilot Study	2025	2º	SH
AW27	Bridging Open Science and Data Visualization: Evaluating the Usability of dataWASHES Dashboard	2025	3º	H

while the continued dominance of Portuguese maintains accessibility for regional audiences. This linguistic balance reflects a strategic positioning between global visibility and local relevance.

5.2. Mapping findings onto the IS triad

The classic IS triad of people, organizations/processes, and technologies [Laudon et al. 2014] offers a useful lens for interpreting WASHES's evolution. Our thematic axes align naturally with this conceptualization. The *Human* axis corresponds to the “people” dimension, addressing individual experience, cognition, and behavior that are key to behavioral IS research [Beath et al. 2013]. The *Social* axis captures the “organizations/processes” dimension, examining collaboration practices, governance structures, and community dynamics that resonate with IS research on organizational routines and digital work [Orlikowski and Scott 2008]. The *Economic* axis represents resource flows that enable socio-technical systems, aligning with IS research on IT value and digital economics [Melville et al. 2004]. Notably, technology itself is not represented as a standalone axis in WASHES. Instead, it operates as an underlying and transversal component across all thematic dimensions. Technologies in WASHES publications are typically examined not as isolated artifacts but as socio-technical mediators that shape and are shaped by human behavior, organizational practices, and economic constraints. This perspective aligns with IS research that conceptualizes technologies as embedded in use contexts and organizational arrangements rather than as neutral or autonomous entities [Orlikowski 2000].

What makes WASHES's trajectory particularly insightful is the changing emphasis across these dimensions over time. As RQ2 reveals, early editions privileged the technology dimension, treating software primarily as technical objects that could be optimized through better methods and tools. The progressive shift toward people and organizational dimensions, with 47% of papers addressing *Human* aspects and 52% addressing *Social* aspects, represents a rebalancing that aligns WASHES with a core IS orientation: effective systems emerge from joint optimization of all three dimensions rather than technical excellence alone [Bostrom and Heinen 1977, Sarker et al. 2019]. The prevalence of intersectional categories in recent editions further suggests that the community increasingly rejects artificial separation of these dimensions, embracing instead the work system perspective that treats information systems as configurations of people, technologies, processes, and context [Alter 2013].

5.3. Award patterns as institutional signals

The award analysis in RQ5 reveals another interesting finding. While *Social* dimensions are most frequently addressed across all publications (52%), *Human* dimensions dominate among award-winning papers (62% of 27 awarded works). This result suggests that awards may function as institutional signals, indicating what forms of scholarship the community considers most valuable [Gallus and Frey 2017, Ghobadi and Robey 2017]. The pattern implies that WASHES has come to define research excellence, at least in part, by how well studies illuminate the ways software systems affect and are shaped by individual human experience. In other words, this emphasis reflects a broader recogni-

tion within IS that systems succeed or fail based on whether they align with human capabilities, motivations, and contexts [Tai et al. 2019]. The temporal evolution in awarded themes documented in RQ5 reinforces this interpretation. Early awards (2016-2018) went to papers focused on technical tools and methodologies. The middle period (2019-2021) saw recognition shift toward organizational issues such as onboarding, turnover, and team interaction. Most recently (2022-2025), awards have concentrated on human-centered and ethical concerns including accessibility, diversity, soft skills, and open science. This progression mirrors a similar shift in IS research from technical optimization toward organizational and societal relevance [Benbasat and Zmud 2003]. Therefore, the recognition of papers addressing diversity, accessibility, and open science signals that the WASHES community increasingly values research that engages with questions of technological justice and responsible innovation, themes that have become central to contemporary IS debates [Walsham 2012, Avgerou 2001].

5.4. Research community structure and knowledge production

The community analysis conducted through RQ3 and RQ4 reveals findings that help us understand how knowledge is produced and circulated within WASHES. The identification of 351 distinct researchers from 78 institutions demonstrates considerable community engagement. At the same time, the concentration of contributions in specific institutions and geographic regions reflects structural asymmetries in research capacity. The nine most prolific authors identified in RQ3, led by researchers who have published between six and fifteen papers each, represent an established core driving socio-technical discussions within the workshop.

Geographically, RQ4 shows that contributions concentrate heavily in four Brazilian states: Ceará (38 papers), Rio de Janeiro (26), São Paulo (21), and Pernambuco (21). The involvement of institutions from 19 Brazilian states and five countries demonstrates broadening participation over time. In particular, this perspective matters because IS scholarship increasingly recognizes that effective socio-technical solutions must be context-sensitive, accounting for local cultures, institutional arrangements, and social practices [Walsham 2012]. In turn, the citation analysis in RQ1 provides another lens on WASHES's growing influence. With some works reaching over 20 citations, the workshop's research is attracting sustained attention. Notably, the most cited papers span diverse topics including developer experience, soft skills, collaboration, and accessibility, reinforcing that socio-technical research resonates within and beyond the immediate WASHES community.

5.5. Organizational and societal implications

The thematic shifts documented across our research questions carry practical implications for both organizations and society. From an organizational perspective [Teece 2007], the movement toward human-centered and organizational themes identified in RQ2 suggests that competitive advantage in software development increasingly depends on the organizational capacity to integrate technical skills with human-centered design [Bogdan et al. 2019]. Research addressing onboarding challenges, collaboration patterns, diversity initiatives, and soft skills development, topics prominent in recent editions and

among award-winners (RQ5), documents real challenges that organizations routinely face but that purely technical SE research often overlooks.

The growing attention to accessibility and diversity also reflects organizational imperatives around inclusive innovation. Research in IS demonstrates that organizations practicing inclusive design not only fulfill ethical obligations but also expand their market reach, enhance innovation capacity, and improve employee satisfaction [Olbrich et al. 2015]. WASHES's engagement with these themes, particularly evident in awarded papers from 2022-2025 (RQ5), positions the research produced by this community to inform organizational practices around inclusive and human-centered development. This issue becomes increasingly critical as organizations face mounting regulatory and societal pressures to ensure technological accessibility and equity [Sulastri et al. 2024].

At the societal level, the emphasis on accessibility, ethics, and inclusion documented in RQ2 and RQ5 reflects a growing recognition that information systems function as societal infrastructures with profound implications for social justice and equity [Pang et al. 2024]. Papers examining accessibility for blind users, diversity in software teams, and ethical considerations in AI development engage with fundamental questions about who benefits from software systems and how technology either perpetuates or challenges social inequalities. This perspective aligns with IS scholarship on digital inclusion, which examines how technology can expand rather than constrain human capabilities [Trauth 2017]. The Brazilian context, marked by ongoing challenges around digital exclusion and inequality, adds particular urgency to these concerns [Celestino and Valente 2022, Nemer and Hakken 2016]. WASHES is well-positioned to address context-specific societal needs while contributing to broader international conversations about responsible innovation.

5.6. Regional contribution to global socio-technical discourse

The findings revealed in RQ1 and RQ4 regarding geographic concentration, linguistic diversity, and international participation illuminate WASHES's contribution to socio-technical discourse. While international venues such as CHASE and ICSE-SEIS have long advanced socio-technical discussions on a global scale, WASHES offers complementary contributions that enrich the international conversation. The workshop's emphasis on accessibility, public-sector systems, and inclusion reflects challenges particularly salient in Brazilian contexts, where these issues receive focused investigation that might be less central in mainstream international venues. This perspective exemplifies what regional IS scholarship can offer: knowledge production that is both internationally relevant and locally grounded [Avgerou 2008].

The coexistence of Portuguese (77%) and English (23%) publications identified in RQ1 reflects a deliberate balance between international visibility and regional accessibility. This linguistic strategy embodies what Santos (2016) describes as “epistemologies of the South”: efforts to produce and circulate knowledge in ways that resist exclusive dependence on dominant academic circuits while still engaging with international scholarly conversations. WASHES's evolution demonstrates that paradigm shifts toward socio-technical integration can emerge from regional communities in genuine dialogue

with, rather than simply following, international trends. This challenges common assumptions about unidirectional knowledge flow from established “centers” to supposed “peripheries”.

5.7. Synthesis

Synthesizing across all five research questions, WASHES has undergone a transformation from a primarily technical SE venue into a research community that bridges SE and IS scholarship. This transformation is evidenced by multiple indicators: sustained publication growth (RQ1), a clear paradigm shift in thematic emphasis from technical to human-centered concerns (RQ2), an engaged community of prolific researchers (RQ3), diverse institutional and geographic participation despite regional concentrations (RQ4), and systematic recognition through awards of research that integrates socio-technical perspectives (RQ5).

This evolution represents more than an expansion of topics. It reflects a reorientation in what the community considers valuable knowledge: a shift from technical optimization toward integrated understanding of how software systems both emerge from and shape human experience, organizational practices, and societal contexts. In this sense, WASHES exemplifies the productive convergence between SE and IS that scholars have long advocated [Iivari and Lyytinen 1999, Hyrynsalmi et al. 2025, Fitzgerald 2024]. As WASHES enters its second decade, the challenge will be sustaining this integration while continuing to address emerging challenges at the intersections of software, people, organizations, and society. The findings documented in this scoping review suggest the community is well-positioned to meet this challenge, having demonstrated both the capacity for paradigmatic change and the commitment to scholarship that addresses real-world organizational and societal concerns.

6. Threats to Validity

Our validity threats were based on the checklist proposed by Ampatzoglou *et al.* (2019). The three categories of threats identified are presented below with their corresponding mitigation actions.

Study inclusion/exclusion bias: This study aims to provide an overview of WASHES publications, and therefore, all studies published in the event proceedings were selected without applying any inclusion or exclusion criteria. To ensure accurate data retrieval, an initial dataset was obtained from dataWASHES [Araújo et al. 2024]. Minor inconsistencies in author names or citation counts may occur, but manual cross-checking ensured consistency across sources.

Researcher Bias and Repeatability: To address RQ1, RQ3, and RQ4, descriptive statistical analyses were conducted on publication trends and geographic distribution using established libraries and methods. For RQ2 and RQ5, a qualitative analysis was performed on each publication, categorizing them along five thematic axes aligned with the scope of WASHES (‘Social’, ‘Human’, ‘Economic’, ‘Social’ and ‘Human’, ‘Social’ and ‘Economic’, or ‘Human and Economic’). The categorization was done in pairs to reduce interpretation bias, with the results double-checked. Specifically, one pair of authors analyzed the papers from 2016 to 2020, while another pair analyzed the papers from

2021 to 2024. The 2025 papers were also divided between the authors and analysed in pairs. This division allowed for a more thorough and consistent review. Divergent outcomes were discussed and resolved on a case-by-case basis to ensure alignment. While this process improved data accuracy, it is important to note that some papers were more difficult to classify than others, as they could not be directly linked to a specific axis. To enhance the reproducibility of our study, all supporting data are openly available through a Zenodo repository [Gomes et al. 2024].

Robustness of Classification: Our analysis of papers by thematic axes (RQ2 and RQ5) may be subject to inherent subjectivity, as the categorization is influenced by the authors' interpretations. To mitigate biases and enhance the reliability of the identified mappings, we employed an approach of dividing the papers into pairs of authors, with double-checking of results. This method helped to strengthen the consistency of the classifications.

7. Final Remarks

WASHES was established in 2016 as a dedicated forum for discussing the social, human, and economic aspects of Software Engineering. By reaching its tenth edition in 2025, the workshop consolidated its position as a sustained scientific venue within the Brazilian computing community. Over this decade, WASHES has progressively converged with themes central to Information Systems (IS), reflecting a shared concern with socio-technical systems, organizational contexts, and the societal implications of digital technologies. This study presented a scoping review of the WASHES proceedings, examining how research topics, community structure, and patterns of recognition have evolved over time.

Addressing RQ1, we characterized the overall publication profile of WASHES, identifying growth in publication volume, increasing linguistic diversity, and stable citation activity across its ten editions. These results provide an empirical overview of the workshop's maturation and its role in sustaining scholarly dialogue on socio-technical issues. Through RQ2, we observed a clear thematic evolution: while early editions emphasized technical and process-oriented concerns, later editions increasingly foregrounded social and human dimensions, such as collaboration, experience, diversity, accessibility, and ethical considerations. This shift signals a reorientation from artifact-centric perspectives toward more human-centered and organizationally grounded problem framings. The analyses conducted for RQ3 and RQ4 revealed the structure of the research community behind WASHES. The workshop has fostered a diverse and geographically distributed network of researchers, involving multiple institutions across Brazilian states and international contexts. These findings highlight WASHES' role in supporting regional participation and in contributing to a more inclusive research ecosystem. Finally, RQ5 showed that award-winning papers increasingly emphasize human and intersectional themes. Over time, recognition within the workshop has moved from predominantly technical or methodological contributions toward studies that integrate technical artifacts with human experience, organizational practices, and societal concerns.

Regarding the contributions, this study presented a scoping review of research from 10 editions of WASHES, offering an overview of the published studies and the evo-

lution of discussions around the workshop's thematic axes. The analysis also examined the research network underlying WASHES, identifying the most active authors, contributing institutions, and the geographical distribution of publications across Brazil. In addition, by exploring award-winning papers in relation to the workshop's thematic axes, the study highlighted how the community has recognized work that bridges technical, social, and organizational dimensions, areas increasingly relevant to both SE and IS. Overall, the findings reveal potential directions for WASHES' continued development, including the incorporation of emerging socio-technical themes, broader engagement with underrepresented regions, and a balanced language strategy that promotes international visibility while preserving national accessibility.

From an IS perspective, this study contributes to understanding how socio-technical research agendas emerge, stabilize, and gain legitimacy within a long-standing research venue. The observed thematic evolution and the analysis of award-winning papers provide empirical evidence of the types of socio-technical inquiries that a research community has consistently recognized as relevant and impactful, revealing implicit evaluation criteria that privilege human-centered, organizationally embedded, and socially responsive forms of inquiry. For organizations, these findings signal a growing recognition that effective software and information systems development depends not only on technical performance, but also on factors such as collaboration, skills, inclusion, accessibility, and ethical responsibility. At a societal level, the increasing prominence of themes related to diversity, accessibility, and open science reflects broader concerns about equitable access to digital systems and the social consequences of technological change. Finally, by mapping institutional participation and geographic distribution, this study illuminates how knowledge about socio-technical systems is produced in a developing regional context, contributing to IS discussions on diversity, inclusion, and the situated nature of research, and highlighting the importance of locally grounded perspectives in addressing global digital challenges.

Future work could explore different avenues. First, investigating the impact of WASHES research on industry practices and software projects could offer insights into how the workshop's findings are applied outside academia. Another direction would be comparing WASHES with similar international conferences to identify regional differences in addressing social, human, and economic aspects of software engineering. Lastly, conducting a network analysis of authors and institutions could highlight collaboration patterns and interdisciplinary connections that shape the workshop's research agenda.

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