

What do we know about the actual use of crowdsourced feedback in support of RE activities?

A systematic mapping study

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2017-11-30

Outline

- Background and Motivation
- Research questions
- Mapping study process
- Results
- Conclusions and Implications

Background

- Crowd-based RE is the practice of large-scale user involvement in RE activities.
- Prior research suggests that implicit and explicit user feedback is key to RE practitioners to discover new and changed requirements and to decide what features to add, enhance, or abandon.
 - With the growing application of machine learning and data mining techniques
 - Widely explored by the RE community, e.g. CrowdRE workshop
- It is needed to consolidate the understanding of this topic and map out areas which would benefit from future research.

Motivation

- Related work
 - 10 systematic literature reviews/surveys/mapping studies on related topics
 - 2 out of 10: explicitly deal with requirements evolution
 - 8 out of 10: talk with crowdsourcing but from different perspectives
- Overall objective of our mapping study
 - the use of crowd-based user feedback in RE activities

Research questions

- RQ1: What types of crowd-based user feedback have been employed for RE purposes?
- RQ2: What aspects of user feedback are reported as being useful for RE?
- RQ3: In which RE activities have the crowd-based user feedback been applied?
- RQ4: What degree of intensity characterizes the research on this topic?
 - RQ4.1: Which venues have the research topic been published?
 - RQ4.2: Which affiliations are reported to contribute to the body of knowledge of this area?

Mapping study process

following Kitchenham's book

Study search

- Scopus + Web of Science
 - The most comprehensive and user-friendly database.
- Time period: Jan. 2015 – May 2017
 - The concept “crowd source” was coined in 2005.
- Search query

(ALL (requirements) AND TITLE (user OR app OR software) AND TITLE (review OR comment OR feedback))

AND

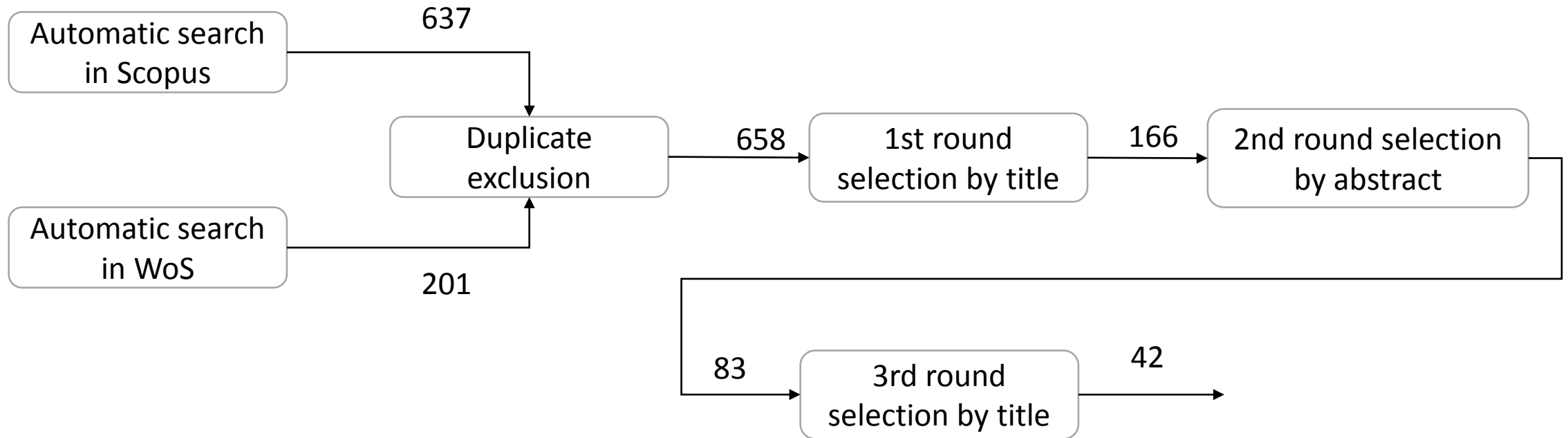
(TITLE (requirements) AND TITLE (crowd OR crowdsourced OR crowdsourcing OR data-driven))

Study selection

- Inclusion and exclusion criteria

IC1	The paper directly relates to the topic of crowd-sourced user feedback.	EC1	The paper addresses the use of user feedback for machinery, not for software or information systems.
IC2	The title and abstract refer to the review topic.	EC2	The paper does not address approaches, studies, or platforms for using or processing user feedback but new approaches and tools that are claimed to produce and collect feedbacks with the help of crowds.
IC3	The paper addresses the research questions.	EC3	The paper is a research plan or literature review
IC4	The paper is published in a peer-reviewed journal, conference or a workshop.	EC4	The paper is about the use of feedback for non-RE purposes, including the improvement of recommending or selecting services, apps, etc.
		EC5	User feedback is not used for software requirements, either explicitly or implicitly
		EC6	The full paper version is not available for download.

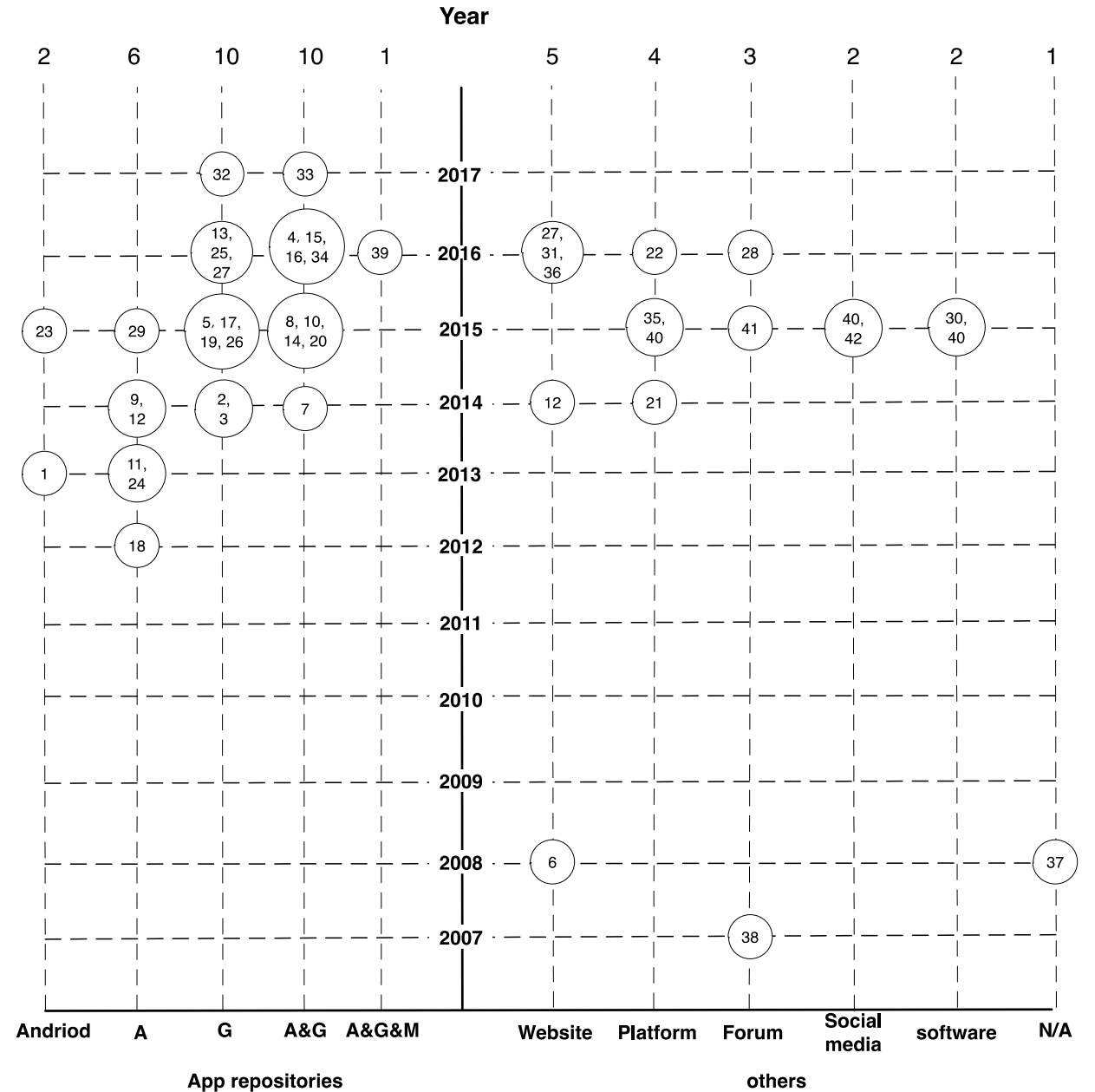
Study search and selection results



Results

Answer to RQ1

Feedback Type	No. of studies	Studies
Explicit	40	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S31, S32, S33, S34, S35, S36, S38, S39, S40 , S41, S42
Implicit	3	S30, S37, S40



App repositories: A = Apple Appstore; G = Google Play; A&G = Apple Appstore and Google Play; A&G&W = Apple Appstore, Google Play and Microsoft Store

Answer to RQ2

No	Metadata and its attributes	No. of studies	Studies
1	text content	40	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S31, S32, S33, S34, S35, S36, S38, S39, S40, S41, S42
	--length of text	8	S5, S10, S14, S15, S16, S18, S24, S34
	--tense of text	2	S14, S15
2	rating	22	S3, S4, S5, S7, S9, S10, S11, S13, S14, S15, S16, S17, S18, S19, S21, S22, S24, S25, S26, S27, S36, S38
3	submission date	7	S3, S5, S9, S18, S19, S26, S35
4	version	7	S5, S9, S18, S19, S25, S26, S35
5	title	6	S7, S8, S10, S14, S15, S16
6	total number	5	S5, S16, S19, S25, S26

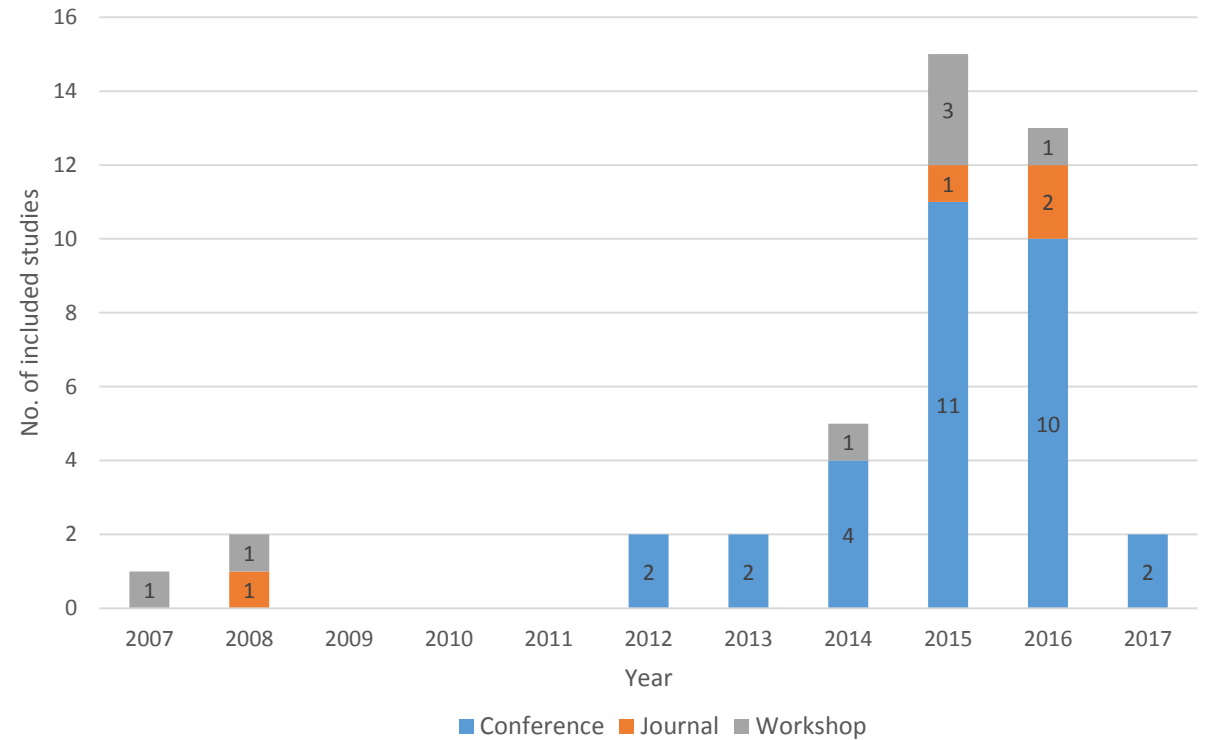
Answer to RQ3

RE activities	No. of studies	Studies
Requirements Elicitation	8	S12, S13, S29, S30, S33, S40, S41, S42
Requirements Analysis	6	S5, S13, S29, S33, S35, S38
Requirements Specification	0	/
Requirements Validation	1	S40
Requirements Management	6	S1, S7, S12, S14, S23, S37, S38

the Guide to Software Engineering Body of Knowledge (SWEBOK) proposed that, the software requirements knowledge area is concerned with the *elicitation, analysis, specification, and validation* of software requirements as well as the *management* of requirements during the whole life cycle of the software product (Bourque and Fairley, 2014).

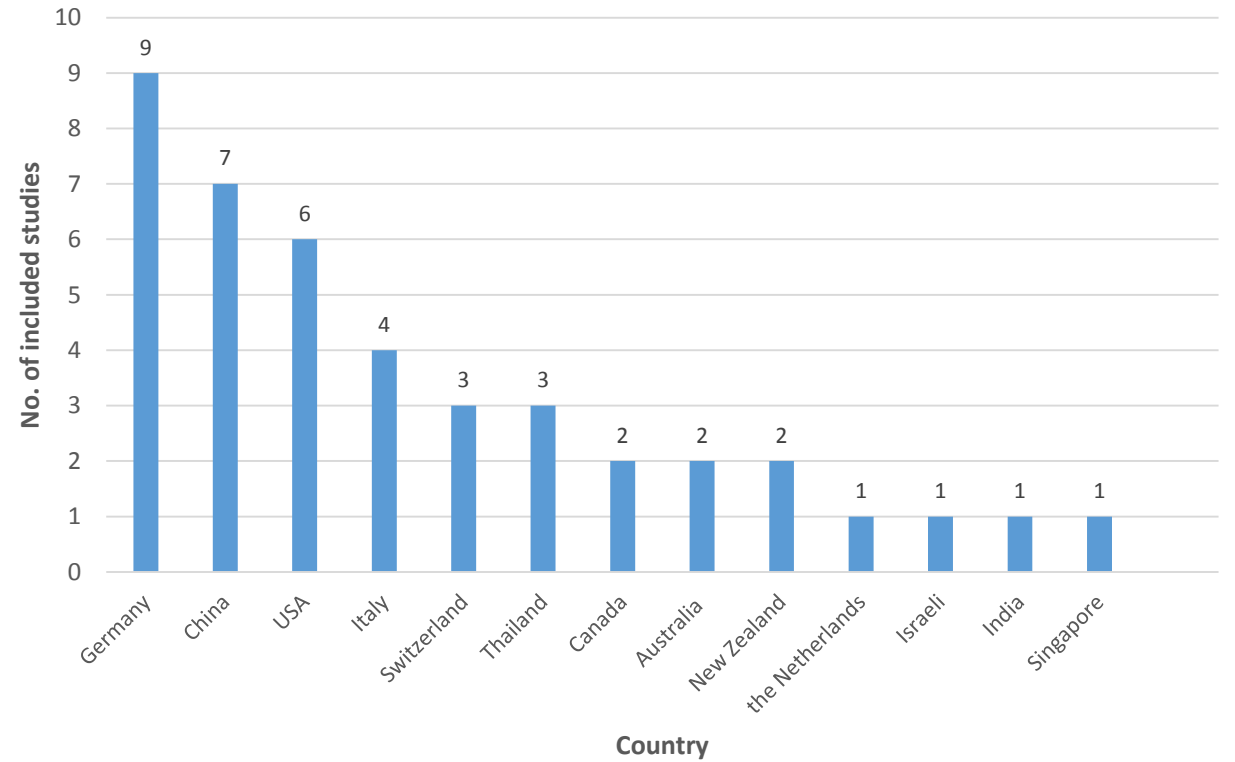
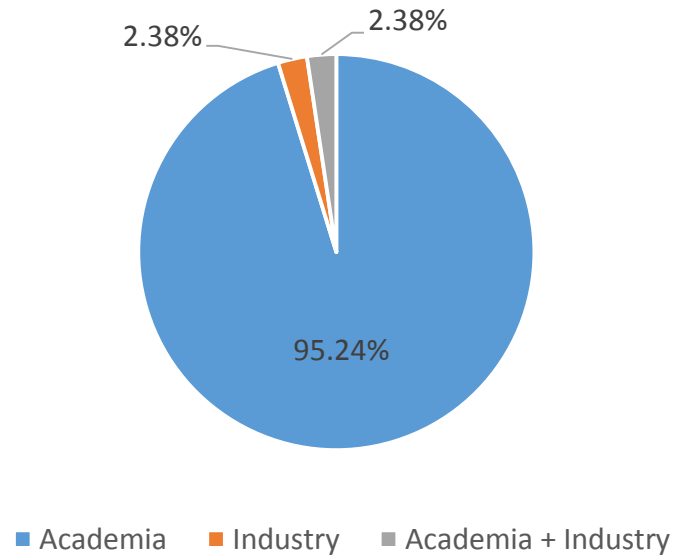
Answer to RQ4.1

Publication Type	No. of studies	%
Conference	32	74.4
Workshop	7	16.3
Journal	4	9.3
Total	43	100



32 publication venues are identified, and 21 out of 32 sources are on RE or SE.

Answer to RQ4.2



Conclsions and Implications

Regarding RQ1

1) Explicit user feedback

- ❖ The application of **App reviews** in crowdRE is becoming mature in academia and expecting to benefit RE practices in industry.
- ❖ Attractions to use crowd-sourced user feedback on **other types of software** are emerging.

2) Implicit user feedback

- ❖ Need more **collaboration between academia and industries.**

Regarding RQ2

- There could be some combination patterns of the metadata of user feedback for specific RE activities.
 - 25 out of 42 studies used at least two aspect of user feedback.



- How to combine identified aspects of user feedback for RE purposes?
- What combinations would be more effective in what kinds of research contexts?

Regarding RQ3

- RE activities treated in the included studies could be combined in various ways, to support various RE purposes.
- More investigation on these five RE activities is needed.
 - Especially for requirements specification and validation
- We call for more research on the reasons of ****why**** these RE activities get benefits from crowd-based user feedback.

Regarding RQ4

- We need to produce more diverse evidence on how user feedback is useful and tracing the use of feedback to the SWEBOK's fundamental RE activities seems urgent.
- The extensive attention on this research topic is being paid from researchers and practitioner.
 - in a broad range of research interests in the research topic
 - with affiliations spreading in different continents
- Current application domains of our review topic are narrow and focused, although the exploration of other disciplines are emerging.

Thank you!