Welcome to the Fourth International Workshop on Crowd-Based Requirements Engineering (CrowdRE'20)

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Abstract—**Welcome to the 4th International Workshop on Crowd-Based Requirements Engineering (CrowdRE'20), where scientists and representatives of industry meet to exchange ideas, experiences, and other contributions regarding the state of the art of Crowd-Based Requirements Engineering (CrowdRE). The discipline of CrowdRE seeks to address the challenges of traditional requirements engineering (RE) in scaling up to settings with thousands to millions of users of (software) products or (software-driven) services, who form a large and heterogeneous group that can be denoted as a 'crowd' [1],[2]. The user feedback generated by the crowd, such as texts or usage data, can be a valuable source of requirements, problems, wishes, and needs. Responding quickly, effectively, and iteratively to this feedback can greatly increase a product's success. CrowdRE comprises any approach that provides RE with suitable means for this crowd paradigm, especially by involving the crowd and by collecting, harmonizing, analyzing, and interpreting their user feedback.**

Index Terms—**Crowd-based requirements engineering, crowdsourcing, digital transformation, requirements engineering**

I. CONTRIBUTION OF CROWDRE'20

The CrowdRE workshop series has had a profound impact on this domain. Most recently, in his keynote at CrowdRE'19, Dr. Martin Glinz provided a revised definition of CrowdRE, according to which CrowdRE encompasses "all approaches that engage a crowd of mostly unknown people for performing RE tasks or providing requirements-relevant information" ([3], p. 172). This includes identifying concepts for bringing CrowdRE "into practice" with the right placement within the software product lifecycle. The central topic of this workshop is accordingly focused on understanding the potential of CrowdRE, including means for effectively deploying it, versus purposes for which it may be unsuitable. In the past, the CrowdRE workshop already helped to strengthen the relationship between CrowdRE and AI (CrowdRE@AIRE'18), established a roadmap and shared resources for CrowdRE (CrowdRE'17), and unified the vision in the early days of this domain (CrowdRE'15 [1]).

The Fourth Workshop on Crowd-Based Requirements Engineering (CrowdRE'20) continues to operate at the forefront of science and practice, with this edition marking an important leap undoubtedly driven by the redefined notion of CrowdRE. This year's contributions have ventured out beyond its comfort zone and into new territories, exploring the role of CrowdRE in innovative settings including software ecosystems, smart homes, and smart cities. The increased emphasis on experience reports and case studies of practical applications of CrowdRE in research and business settings is a testament to the domain maturing and making progress.

This workshop promises to provide participants with insights into the ongoing work on CrowdRE, practical knowledge and strategies for implementing and evaluating CrowdRE in applied settings, and insights on how CrowdRE can bring added value in spite of its limitations. Ultimately, we hope to inspire associated experts, researchers, and practitioners to move forward together through collaborations.

II. GOALS OF CROWDRE'20

The CrowdRE workshop seeks to reconsider the very foundations of RE for those contexts in which traditional forms of RE have been found to be ineffective, doing so by:

- Identifying and discussing the implications of Glinz' revised definition of CrowdRE [1], including opportunities for solutions to perform RE in settings with large groups of stakeholders, approaches for identifying unknown pitfalls, and ways of addressing known pitfalls.
- Obtaining a shared understanding of the status quo on CrowdRE, along with its benefits and limitations. Limitations may stem from the stakeholders' relative anonymity, threats to validity (e.g., selection effect), the absence of direct interpersonal contact, and the increased difficulty to reconcile conflicting requirements with larger numbers of stakeholders.
- Understanding which practitioners and researchers are associated with which of the various streams within CrowdRE in order to stimulate collaborations.
- Defining the means to making CrowdRE increasingly suitable for industry settings, along with ways of evaluating the implementation of CrowdRE techniques in those applied settings.
- Growing the body of knowledge related to CrowdRE, exchanging ideas, and identifying open challenges and future avenues for research relevant for both academia and industry in order to focus and spawn research topics.

III. Program of CrowdRE'20

To encourage a lively discussion on the current state of CrowdRE research, in addition to papers presenting technical solutions and experience reports (4–6 pages + 1 page for references), we also solicited shorter papers posing a problem statement or vision statement (2–3 pages). Each paper was reviewed by four Program Committee members noted for their contributions to the field of RE, resulting in three of six received submissions being accepted for presentation at the workshop.

In his keynote "Crowd Ideas for Digital Innovation", Dr. Marcus Trapp inspires us to think of CrowdRE as a valuable instrument in shaping the digital transformation. This is a recurring thread in the paper presentations:

- "Open CrowdRE Challenges in Software Ecosystems" (problem statement) by David Johnson, Daniela Damian, James Tizard, Kelly Blincoe, and Tony Clear.
- "Towards a User Feedback Approach for Smart Homes: An Explorative Interview Study" (technical solution paper) by Melanie Stade, Amina Baikenova, Norbert Seyff, and Simon Scherr.
- "The Efficacy of Using Social Media Data for Designing Traffic Management Systems" (technical solution paper) by Mohammad Noaeen and Behrouz H. Far.

We wish you a good time at the CrowdRE'20 workshop!

IV. The Theme of RE'20 and CrowdRE'20

CrowdRE'20 is collocated with the 28th IEEE International Requirements Engineering Conference (RE'20), which has "Requirements Engineering for a Digital World" as its main theme. RE evolved in a mostly still analog world. The onset of mobile, social, and cloud apps, as well as disruptive technologies enabled by complex integrated networks of systems compelled RE to adapt. The main theme of RE'20 explicitly mentions "mining requirements from user feedback" as a possible approach, which only a few years ago was not taken seriously as a potential source for requirements elicitation.

CrowdRE is the discipline within RE that investigates and applies techniques dealing with large quantities of user feedback from the thousands to millions of current and potential users of (software) products and (software-driven) services. Such crowds can be an important driver for enabling collective intelligence about these products and services when their interactions and contributions are harnessed appropriately. Involving larger numbers of stakeholders by collecting, harmonizing, analyzing, and interpreting user feedback provides a unique opportunity to increase the yield of RE. To contain or even reduce the required effort for performing RE analyses effectively and iteratively over large amounts of data, the use of automation is warranted. Only in this way can the crowd's problems, wishes, and needs be addressed efficiently and in a timely manner.

V. CrowdRE Organization

A. Organizing Committee

- Muneera Bano, Deakin University (Australia)
- Eduard C. Groen, Fraunhofer IESE (Germany)
- Irit Hadar, University of Haifa (Israel)
- Anas Mahmoud, Louisiana State University (USA)

B. Program Committee

- Nirav Ajmeri, North Carolina State University (USA)
- Raian Ali, Hamad Bin Khalifa University (Qatar)
- Sjaak Brinkkemper, Utrecht University (Netherlands)
- Fabiano Dalpiaz, Utrecht University (Netherlands)
- Joerg Doerr, Fraunhofer IESE (Germany)
- Davide Fucci, Blekinge Institute of Technology (Sweden)
- Emitzá Guzmán, Vrije Univ. Amsterdam (Netherlands)
- Rachel Harrison, Oxford Brookes University (UK)
- Mahmood Hosseini, JP Morgan (UK)
- Zhi Jin, Peking University (China)
- Marjo Kauppinen, Aalto University (Finland)
- Fitsum M. Kifetew, Fondazione Bruno Kessler (Italy)
- Eric Knauss, University of Gothenburg (Sweden)
- Meira Levy, Shenkar College of Eng., Des., Art (Israel)
- Tong Li, Bejing University of Technology (China)
- Soo Ling Lim, University College London (UK)
- Walid Maalej, University of Hamburg (Germany)
- Pradeep Murukannaiah, Delft U. of Tech. (Netherlands)
- Marc Oriol, Universitat Politècnica Catalunya (Spain)
- Anna Perini, Fondazione Bruno Kessler (Italy)
- Kurt Schneider, Leibniz Universität Hannover (Germany)
- Norbert Seyff, University of Zurich (Switzerland)
- Zahra Shakeri, Calgary University (Canada)
- Chong Wang, Wuhan University (China)

VI. Conclusion

CrowdRE is a topic that is both highly relevant and strongly on the move. While on the one hand its scope broadens, on the other hand its application scenarios become more concrete. We look forward to an exciting workshop in which we hope to welcome you as well! We would like to express our gratitude to the members of the Program Committee for promoting the workshop and providing very constructive feedback to the submissions, and to Miroslav Tushev for his outstanding work managing our website and social media. We also thank the authors for their excellent contributions, and you, the audience, for letting yourself be inspired by this workshop and/or these proceedings! Best wishes from Muneera, Eddy, Irit, and Nash.

References

[1] E. C. Groen, N. Seyff, R. Ali, F. Dalpiaz, J. Doerr, E. Guzman et al., "The crowd in requirements engineering: The landscape and challenges," IEEE Software, vol. 34, ed. 2, 2017, pp. 44–52.

[2] C. Russ, "Online crowds: Extraordinary mass behavior on the internet," in Proc. I-Media '07 and I-SEMANTICS '07, 2007.

[3] M. Glinz, "CrowdRE: Achievements, opportunities and pitfalls," in Proc. 27th IEEE Int. Req. Engg. Conf. Workshops (REW'19), 2019, pp. 172–173.