Editorial to the Second IFIP WG 2.7/13.4 Workshop on HCI Engineering Education

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Abstract. The second workshop on HCI Engineering Education continued the effort of the IFIP Working Group 2.7/13.4 on User Interface Engineering by discussing the issues and identifying the opportunities in teaching and learning Human-Computer Interaction (HCI) Engineering. The workshop attracted eight papers covering different teaching contexts, ranging from massive university courses, passing through different teaching experiences in specific academic curricula, and even teaching engineering concepts to children. In addition, the workshop received input for improving and adapting the repository material to the dynamic nature of this field. The discussion after the presentation of the contributions focused on how to model competencies, the support to interdisciplinary work, the overall course design, the recruitment of the students and the provision of educational resources, paving the way for further editions of the workshop.

Keywords: HCI Engineering, education, teaching, case study, repository, Git, end-user development, model-based design of user interfaces

1 Introduction and Background

In the dynamic market of new interactive technologies and varying users' needs, in both professional and personal settings, the quest to bridge the gap between human interaction and computing systems stands as an ever-evolving challenge. The proliferation of interactive possibilities makes it difficult for traditional curricula to consistently cover the relationships between the interface design and the engineering aspects of an interactive system.

HCI Engineering stands at the intersection of numerous disciplines, each contributing to a facet of the complex mosaic representing an interactive system. It concerns the methods, techniques, and tools essential for the systematic design, development, testing, evaluation, and deployment of interactive systems across various application domains. However, traditional Computer Science or Computer Engineering curricula seldom include dedicated courses on this topic. On

Authors' version of the paper published in Design for Equality and Justice. INTERACT 2023. Lecture Notes in Computer Science, vol 14535. Springer, 2024. The final publication is available via: https://doi.org/10.1007/978-3-031-61688-4_18

the one hand, traditional courses on Human-Computer Interaction (HCI) focus on the basics of the human-centred design approach. In contrast, traditional courses on Software Engineering often neglect interactive aspects of systems [1, 4, 8, 12].

To answer the question of how to address the topic of HCI Engineering in academic curricula, the first edition of the workshop, at INTERACT 2021 [3], aimed at identifying, examining, and structuring educational approaches and resources to empower the teaching and learning of HCI Engineering. During the first edition, participants discussed the various students' skills and experiences, exploring how to introduce and teach HCI Engineering in multiple contexts, whether within Computer Science programs or UI/UX Design curricula. In addition, the discussion covered also the diverse lecturing modalities, encompassing on-site lectures, project-based pedagogy, and online/remote lecturing.

Building upon the foundations laid by its predecessor, the second edition of the workshop, at INTERACT 2023, aimed at creating an organized compendium of educational resources presented in a standardized structure. This resource will be available online and serve as a hub for various educational materials, from slides and reference materials to exercises and exams. In addition to the educational resources, the goal was again to collect further experiences teaching HCI Engineering topics in an academic context and additional educational settings, including practitioners and professionals in related fields.

This paper summarises the results achieved during the second edition of the workshop, by introducing the different contributions and reporting on the discussion and the identified open issues. The paper is organised as follows. Section 2 provides details about the organization of the workshop, Section 3 summarizes the presented papers and, finally, Section 4 describes the discussion during the workshop and future work.

2 Workshop Organization

To have a starting point for the discussion and building the second edition results, we solicited contributions by distributing a Call for Papers on different channels, such as mailing lists on HCI and Software Engineering, social media and publicity on related conferences. Position papers should report experiences related to HCI Engineering (HCI-E) education such as curricula or teaching units dedicated to HCI-E, case studies/projects demonstrating aspects of HCI-E and evaluation of students' skills related to HCI-E. We received eight submissions from different authors, all considered to be of high quality and interesting for the workshop.

The workshop took place on August 28, 2023. Ten people participated in the workshop, four remotely and six on-site. The activities in the agenda included a morning session where authors presented the material, course, module or position described in their paper through a brief talk of 15 minutes. After each talk, participants had a 5-minute slot for asking questions to clarify the presented contribution's scope. We introduce the papers discussed in this part in Section 3.

In the afternoon, the organisers moderated the discussion and reflection on common themes from the collected experiences. We organised it in two parts to keep it focused on the most important topics. The first part was a half-an-hour brainstorming session in which participants proposed topics they considered important to discuss. We spent the last 10 minutes establishing an order to discuss the topics. In the second part, participants discussed the topics identified. We report the main points resulting from the discussion in Section 4.

3 Presented Papers

The list of accepted papers at the workshop is the following:

An Online Repository for Collecting and Sharing HCI-Engineering Case-Studies (included into [11] after the workshop). This paper builds upon the first HCI Engineering Education workshop to create an online repository for sharing HCI-related content using Git versioning. It outlines the repository's structure and content addition process.

A Revised Presentation Format for Educational Resources in HCI Engineering (included into [11] after the workshop). This paper introduces a new teaching sample framework for the above mentioned online repository, emphasizing the practical application of conceptual knowledge and discusses its application using an end-user design tool example for mobile data collection.

Considering Modelling Techniques in HCI Engineering Education [9]. This paper explores the importance of teaching modelling in HCI engineering, addressing students' perception challenges. It suggests strategies to engage students effectively with modelling techniques in evolving technologies and methodologies.

Human-Centred Engineering with Micro-Electronics for Pre-teens [7]. This paper reports a study with ten pre-teens using the IoTgo educational toolkit for human-centred engineering with microelectronics. The research analyzes the experience and offers insights for future education and human-centered engineering work for young learners.

Teaching HCI to Hundreds of Undergraduate Software Engineering and Computer Science Students [2]. This paper reports on the experience of moving an introductory HCI course from a postgraduate to an undergraduate program, resulting in a mandatory course with larger class sizes. It shares experiences and advice on teaching HCI to large classes, including adapting to online teaching during the COVID-19 pandemic, as well as students' assessment.

Using an HCI perspective to encourage young students to pursue Computer Science & Engineering careers: the "Envisioning the Digital City" workshop [5]. The paper discusses two workshop formats for middle and high school students as part of a university program promoting STEM careers. It focuses on teaching basic HCI concepts and problem-solving to address real-world issues. Students are tasked with envisioning innovative mobile apps using design thinking, resulting in creative solutions and low-level prototypes, even without prior design and programming experience.

Teaching HCI in Multidisciplinary Situations: Experience report and Lessons learnt [6]. Technical Bachelor degrees in France are constrained by a national pedagogical program requiring thematic volumes and schedules for their implementation. The program now puts more emphasis on practical knowledge and interdisciplinary collaboration and requires degree programs in computer science to set up multidisciplinary projects for students. This paper highlights how Grenoble and Valenciennes Technical Institutes handle teaching HCI in multidisciplinary situations to prepare students to design and implement computing solutions for user needs. The authors share lessons from their experiences.

The User Interface Technologies Course at the University of Cagliari [10]. This paper discusses the teaching of HCI Engineering concepts within the User Interface Technologies course in the Master's Degree in Computer Science at the University of Cagliari. The course encompasses various aspects of User Interface technology, from desktop interface toolkits to information visualization, gestural interaction, eXtended Reality, and the intersection of Artificial Intelligence with User Interface development. The paper delves into the rationale behind the syllabus design, the assessment method, and the lessons learned over four years of offering the course.

Each accepted paper was first reviewed before the workshop presentation. Then, the authors were requested to update the submission considering the comments in the reviews and the discussion during the workshop. The updated version underwent a second round of reviews before being accepted for publication. All the papers have been improved and extended during this process and leveraged the collaboration during the workshop. In particular, the paper [11] is the result of merging the first two contributions in the list above initially submitted to the workshop into one, since they addressed the same topic of structuring the description of learning materials.

4 Discussion and Future Work

The focus in the workshop was on HCI Engineering education for students in computer science, software engineering and related subjects. Main themes that arose from the presentations and were discussed by the participants included modeling competencies, interdisciplinary work, overall course design, recruitment of students, and provision of educational resources.

The presentation of [2] raised a discussion on the challenges of teaching HCI Engineering at different stages of the students path, and the impact that has on the Syllabus. Additionally, the challenge of managing large classes was discussed, particularly the challenges faced when teaching work intensive topics like empirical usability evaluation to a large number of students.

A particular goal of HCI Engineering education is to promote systematic approaches to user interface design which require modeling competencies [9]. It is important that students understand the role of different models (e.g., contextual and task models) and learn to create and connect them. In this context, one participant pointed out that more reliable educational software tools are needed that support students in following such systematic development approaches to see their advantages.

The presentation of [6] started a discussion on how to prepare students for interdisciplinary collaboration as necessary in the development of interactive systems. Workshop participants pointed out the potential of HCI Engineering education in producing "belief-changing exercises" [2] for students that help them to learn switching between different design perspectives. Additionally, workshop formats such as those in [5, 7] may attract school students with more diverse interests to study computer science or related disciplines as they depict them not as a "niche for stereotypical programmers" [5] but provide a human-centric and pragmatic perspective on these disciplines. However, the participants also discussed the challenges of designing courses for both undergraduate and graduate students that result from the broad range of topics and methods in HCI Engineering [10]. It was emphasized that a balance between the breadth and depth of topics has to be achieved that are covered in a course.

Based on the presentations of [11], participants exchanged views on how to improve the existing online repository for educational resources in HCI Engineering. One idea was to create an ontology that supports keyword-based search in the repository. Another idea informed by the presentation of [9] concerned the development Pedagogical Content Knowledge that is specific to HCI Engineering. Pedagogical Content Knowledge describes typical student misconceptions and proven teaching strategies to overcome them [13]. Future work will be dedicated to the further development of the online repository for a stronger integration with other HCI resources, to make it more flexible and richer in content but also support its maintenance.

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