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# HCITools: Strategies and Best Practices for Designing, Evaluating and Sharing Technical HCI Toolkits

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**Abstract**

Over the years, toolkits have been designed to facilitate the rapid prototyping of novel designs for graphical user interfaces, physical computing, fabrication, tangible interfaces and ubiquitous computing. However, although evaluation methods for HCI are widely available, particular techniques and approaches to evaluate technical toolkit research are less well developed. Moreover, it is unclear what kind of contribution and impact technical toolkits can bring to the larger HCI community. In this workshop we aim to bring together leading researchers in the field to discuss challenges and opportunities to develop new methods and approaches to design, evaluate, disseminate and share toolkits. Furthermore, we will discuss the technical, methodological and enabling role of toolkits for HCI research.

**Author Keywords**

Toolkit; framework; HCI

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## Background

Toolkits and frameworks are central artifacts used in Human-Computer Interaction as a way to translate conceptualizations, demonstrators and abstract ideas into real and often reusable technology. They can enable new insights, technical concepts or programming paradigms to provide a supporting infrastructure for new technology, applications or ideas. We broadly define toolkits as *a set of software and hardware components, programs, routines, building blocks, toolchains, concepts and interfaces that are used to prototype, design, develop, maintain and deploy interactive computing systems*. Both in industry and academia, toolkits play an important and central role as mediating artifacts that abstract, embody and represent complex software and hardware concepts into reusable, understandable and usable interfaces.

The importance of toolkits is emphasized by the fact that since the inception of HCI as a scientific discipline in 1980, more than 500 toolkit papers have been published at the main HCI conferences (CHI and UIST), and more recently technical conferences, such as EICS, are specializing in tools for interactive systems. Toolkits are fundamental building blocks of innovation, progress and conceptualizations of human-machine interaction. Through toolkits human interfaces are created, shaped and conceived. Moreover, they also become an inherent part of the underlying infrastructure of the interface [1,2] and, thus, directly influence the usability and user experience of the interface. The technical capabilities and limitations of toolkits essentially define and dictate the design space of the human interfaces. Conversely, since toolkits are essentially human interfaces, their design and implementation should follow methodologies similar to all other human interface designs [4, 10].

While within HCI there exists a plethora of well documented evaluation methods, heuristics and metrics (e.g., [5]), much less is known about *appropriate metrics to employ to evaluate a toolkit*? Few previous attempts have emphasized the importance of technical work by making us aware of the “*infrastructure problem in HCI*” [1,2], providing heuristics for evaluating user interface *system research* [7,9], and even pointing to the scientific importance of designing artefacts and tools [3,6]. Moreover, other authors have pointed out that classic evaluation methods designed to evaluate the usability and user performance, do not always transfer well to technical contributions that conceptualize, design or implement human interfaces in the form of toolkits [4,8].

We need a better understanding of the (historical) role of toolkits for HCI research in order to develop new insights for how to design, evaluate and share toolkits, but also how toolkits can have a lasting impact on the HCI community at large.

## Objectives

The central goal of the workshop is to develop a long-term research agenda around toolkits for HCI from the perspectives and experience of HCI researchers in designing, building and sharing toolkits. We particularly focus on four main themes:

### **T1: Taxonomy and Trends in Toolkit**

The first theme is aimed at mapping the historical context of toolkits in HCI. We are interested in synthesizing seminal publications, toolkits and systems that have influenced the field and shaped research directions. Furthermore, we intend to map out recent trends and developments in toolkit designs in order to

produce a taxonomy of toolkits that can help provide overview of the role of toolkits in HCI. What kind of toolkits were introduced in HCI? Which (type of) toolkits were successful in enabling new research? Which toolkits were less successful, and what can we learn from them?

### **T2: Strategies for Designing and Building Toolkits**

The goal of the second theme of the workshop is to enumerate a number of successful and failed strategies for designing and building toolkits. We are particularly interested in summarizing the motives, goals and ambitions of toolkit papers, as well as the approaches that were taken to achieve these goals. Why should we design toolkits? How does one architect and design a toolkit? Who is the toolkit aimed at and what does the toolkit enable?

### **T3: Methods for Evaluating Toolkits**

The third theme focuses on exploring previous methods used to evaluate toolkits and frameworks to build a comprehensive toolbox for evaluating toolkits. This theme is aimed at designing a new set of criteria and evaluation methods that can be used by authors when developing toolkits. How does one evaluate a toolkit? What are characteristics or properties of well-designed or impactful toolkits? What methods or approaches can be used to evaluate toolkits?

### **T4: Toolkits as a Research Method for HCI**

The final theme explores the methodological and conceptual role of toolkits within HCI research. It is often difficult and unclear how to articulate the precise research contribution of toolkits. This theme draws inspiration from design research and engineering to propose new ways in which toolkit design can be

positioned as a research method for HCI. What is the role of toolkits within HCI? How can we establish toolkit design as a research method? What are the contributions of a toolkit paper?

## **Organizers**

**Nicolai Marquardt** is a Senior Lecturer (Associate Professor) in Physical Computing at the University College London. At the UCL Interaction Centre he works on projects in the research areas of ubiquitous computing, interactive surfaces, sensor-based systems, prototyping toolkits, and physical user interfaces

**Steven Houben** is a Lecturer (Assistant Professor) in Interactive Systems at Lancaster University. His research is focused on cross-device tools and systems, physical computing interface and devices, and sensor-based IoT systems.

**Michel Beaudouin-Lafon** is a Professor of Computer Science at Université Paris-Sud and a senior member of the Institut Universitaire de France. His research interests include fundamental aspects of interaction, engineering of interactive systems, computer-supported cooperative work and novel interaction techniques. His current research is conducted in the *Ex Situ group*, a joint lab between LRI and INRIA.

**Andy Wilson** is a principal researcher at Microsoft Research. His research is focused on applying sensing techniques to enable new styles of human-computer interaction. He directs the Natural Interaction Research group at Microsoft Research.

## Website

The workshop, position papers, agenda and call-for-papers will be hosted at <http://hci.tools>. The website will remain active after the workshop and all results from the workshop will be accessible to the public.

## Pre-Workshop Plans

### *Participants*

We aim to bring together 20-25 participants from both academia and industry that are active within the toolkit development space, but encourage anyone with interest in systems research to contribute to the workshop. We will solicit participants through an open call for participations that will be distributed through appropriate mailing lists, Twitter and Facebook groups, but the organizers will also personally invite researchers of interest to submit their position papers and ongoing work to the workshop. We will select participants based on the submitted position paper as well as the relevance of their research and background. All accepted position and system papers will be published on the website of the workshop, and distributed to all participants in advance.

### *Soliciting Submissions*

We will solicit position and technical papers of up to 6 pages in the ACM SIGCHI Extended Abstract format that describe original research, case studies, new perspectives and positions, or ongoing technical work. In addition, the position paper should outline a person's interest and experience in the topic of the workshop. Selected papers will serve as introductions for discussions and will be made available to the participants and the public on the workshop website. All submissions will be juried by the organizing committee based on relevance and originality.

### *Soliciting Submissions*

To kick-start discussions and allow participants to come to the workshop prepared, we will provide a registration page where participants are asked to contribute a range of insights they found useful in toolkit research, to describe 4 core problems or open issues they encountered with relations to toolkits, 5 examples of successful toolkit papers which they found inspiring, and set of keywords that could help us start a design space mapping of all HCI toolkits

## Workshop Structure

The workshop will be organized around four short keynotes that will each be based around one of the four key themes that we described in the background section: (i) taxonomy and trends in HCI toolkits, (ii) strategies for building toolkits, (iii) methods to evaluate toolkits, and (iv) toolkits as a research method. After each keynote, participants will break out into smaller groups to discuss the challenges and issues related to the specific theme from the keynote.

Time	Activities
09:00	Welcome and introduction by organizers
09:15	<i>Theme 1: Taxonomy, history and trends</i>
10:30	Coffee break
11:00	<i>Theme 2: Building, designing and prototyping</i>
13:00	Lunch
14:00	<i>Theme 3: Evaluating toolkits</i>
15:15	<i>Theme 4: Toolkits as Research Methods</i>
16:30	Coffee break
17:00	Wrapping up and call for book chapter authors
17:30	End of workshop
20:00	Dinner

Each theme consists of three phases:

1. Introductory keynote on the theme discussing the main challenges, problems, directions or issues.
2. Open issues are discussed in smaller groups
3. Reflection and general discussion leading to recommendations and insights.

### **Post-Workshop Plans**

The aim of the workshop is to bring together experts in toolkit research from academia and industry to kick-start an edited book on "Toolkits for Human-Computer Interaction" which is intended to summarize the results of the workshop in a set of chapters based around the four themes. During the workshop day, we will discuss a book outline and invite participants to contribute chapters as co-author. Furthermore, we will disseminate the results on the workshop website after the conference.

### **Call for Participation**

*Toolkits and frameworks are central artifacts used in Human-Computer Interaction as a way to translate conceptualizations, demonstrators and abstract ideas into real and often reusable technology. They can enable new insights, technical concepts or programming paradigms to provide a supporting infrastructure for new technology, applications or ideas. The importance of toolkits is emphasized by the fact that since the inception of HCI as a scientific discipline in 1980, more than 500 toolkit papers have been published at the main HCI conferences (CHI and UIST), and more recently technical conferences, such as EICS, are specializing in tools for interactive systems. Toolkits are fundamental building blocks of innovation, progress and conceptualizations of human-machine interaction.*

*Through toolkits human interfaces are created, shaped and conceived. While within HCI there exists a plethora of well documented evaluation methods, heuristics and metrics, much less is known about the appropriate metrics to employ to evaluate a toolkit? Few previous attempts have emphasized the importance of technical work by making us aware of the "infrastructure problem in HCI", providing heuristics for evaluating user interface system research, and even pointing to the scientific importance of designing artefacts and tools. We need a better understanding of the (historical) role of toolkits for HCI research in order to develop new insights for how to design, evaluate and share toolkits, but also how toolkits can have a lasting impact on the HCI community at large.*

*The central goal of the workshop is to develop a long-term research agenda around toolkits for HCI from the perspectives and experience of HCI researchers in designing, building and sharing toolkits. We particularly focus on four main themes: (i) taxonomy and trends in toolkits, (ii) strategies for designing and building toolkits, (iii) methods for evaluating toolkits, and (iv) toolkits as a research method for HCI.*

*We solicit position papers of up to 8 pages in the ACM Extended Abstracts Format that describe original research and outline a person's interest and experience in the workshop topic. Supplementary material can be submitted. Submissions will be juried by the organizing committee based on originality and relevance and selected papers will be made available on the workshop website beforehand. Contributions must be submitted by 15 of December, 2016 through our website: <http://hci.tools>. Please note that at least one author of each accepted position paper must attend the workshop*

and that all participants must register for both the workshop and for at least one day of the conference.

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