CEUR Make Graphical User Interface

A usable web frontend for supporting the workflow of publishing proceedings of scientific workshops

Rheinisch-Westfalische Technische Hochchule Aachen

MASTER THESIS

A USABLE WEB FRONTEND FOR SUPPORTING THE WORKFLOW OF PUBLISHING PROCEEDINGS OF SCIENTIFIC WORKSHOPS

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Abbreviations

AI Artificial Intelligence

UI User Interface

UxD User of Experience Design

ACM Association of Computing Machinery

UCD User of Centered Design

CAD Computer Aided Designing

HCI Human Computer Interaction

CHI Computer Human Interaction

SUS System Usability Scale

WWW World Wide Web Work

CSCW Computer Supported Cooperative Work

HTML Hyper Text Markup Language

QUIS Questionnaire for User Interaction Satisfaction

IEEE Institute of Electrical and Electronics Engineers

Abstract

Open access is becoming more popular for the scientific results and with it the scientific results are being shared more commonly in the form of workshop proceedings and conferences. An online repository with an open access workshop proceedings is CEUR Workshop Proceedings. Submitting workshop proceedings at CEUR Workshop Proceedings requires a user to follow a disintegrated workflow. The user requires to comply to workshop proceedings standards at CEUR Workshop Proceedings and use multiple tools and technologies to prepare a zip archive to be submitted at CEUR Workshop Proceedings. CEUR Make tries to solve this problem by partially automating the user workflow. It requires from user to create just two xml format file types that holds metadata of the contents and the metadata of the workshop. In this way the user avoids one step for publishing proceedings and by creating only xml format files the user gets fully stylized and standard compliant ready to publish workshop proceeding. CEUR Make enriches the user experience by partially automating the user workflow but the usability studies suggested major rooms for improvement. The system lacked as it was difficult to learn, was highly dependent on other softwares, was not portable and was tough to use. To solve these major issues CEUR Make eb based Graphical Interface was introduced, which is portable, easy to use as it has interactive user interface and it is not dependent on other softwares. Comparative usability study of CEUR Make Graphical User Interface with CEUR Make signified great usability improvement in terms of interface, ease of use, dependability on other systems and portability. The usability study of CEUR Make Graphical User Interface also pointed out areas where the user experience could be further enhanced such as collaborative editing for workshop editors.

Keywords: Workshop Proceedings, Open Access, CEUR Workshop Proceedings, CEUR Make experience, User Experience, Human Computer Interaction, MaterialUI

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Conventions

Throughout this thesis we use the following conventions.

Text conventions

Definitions of technical terms or short excursus are set off in coloured boxes.

Definition: *Excursus*

EXCURSUS:
Excursus is a detailed discussion of a particular point in a book, usually in an appendix, or digressions in a written text.

Source code and implementation symbols are written in typewriter-style text.

```
<?php
echo "Hello World!";
?>
```

The whole thesis is written in Canadian English.

Download links are set off in coloured boxes.

File: myFile[a]

[a] http://hci.rwth-aachen.de/public/folder/file_number.file

Chapter 1

Introduction

> "If you want a great site, you've got to test. After you've worked on a site for even a few weeks, you can't see it freshly anymore. You know too much. The only way to find out if it really works is to test it." - Steve Krug

1.1 Problem Description and Motivation

Scientific work, results and research data are being rapidly shared across the globe through internet, live conferences and workshops. Scientists are doing a lot of research in different areas of Computer Science and trying to present their contributions at different conferences. Among these conferences some of the most widely known ones are organised by organisations like IEEE and ACM, apart from them a lot of other conferences are organised by different organisations. Once the scientific work is presented at a conference, it is shared in the form of conference proceedings. Proceedings is the collection of scientific papers published and presented at conferences in context to a conference or a workshop. One such web portal where one can find and publish proceedings is CEUR Workshop Proceedings[3]. The material at the portal is open access and therefore, it is easily accessible to the audience. The focus of this thesis would be

Scientific discovery and scientific knowledge have been achieved only by those who have gone in pursuit of it without any practical purpose whatsoever in view. - Max Planck

on improving the workflow of CEUR Workshop Proceedings.

1.1.1 Problem Description

The growth of scientific research during the past decades has outpaced the public resources available to fund it. - Lutz Bornmann

Publishing at CEUR Workshop Proceedings require users to provide certain input files with metadata such as workshop names, author names etc. The submission files usually include Table of Contents file in XML format that holds the metadata associated to contents of the proceedings, Workshop file in XML format that holds metadata associated to workshops conducted and index file in HTML format that presents the workshop proceedings at the CEUR Workshop Proceedings website. In order to publish proceedings at CEUR Workshop Proceedings a user can choose currently among three workflows. Creating a package of files manually and submitting at CEUR Workshop Proceedings, creating Table of Contents file and Workshop file and then obtaining the submission package using CEUR Make utility and then submitting at CEUR Workshop Proceedings or using EasyChair to get files and using CEUR Make utility to generate submission package and then submitting at CEUR Workshop Proceedings. All of the workflows presented are discussed in more detail in Chapter 2 Section 2.3, which are currently not intuitive and require a lot of manual workforce. Hence, the main purpose of this thesis is to obtain a solution that could help users focus on the task instead of creating additional resources.

In this era, everything is designed while keeping the user needs at center. Hence, the user can focus more on the desired task rather than additional activities. It is also important so that the users can achieve the goals more easily. Initially, in order to submit at CEUR Workshop Proceedings, one had to follow a lengthy list of rules[22] and several standards[22] in order to publish at CEUR Workshop Proceedings. Later, Lange and coworkers[17] developed a terminal based utility that aimed to automate certain parts of publishing at CEUR Workshop Proceedings. The project is called CEUR Make and is open source which could be distributed freely. One has to be familiar with command

line in order to benefit from the CEUR Make and still has to follow certain file and naming standards in order to finally publish at CEUR Workshop Proceedings. The thing that makes it difficult for publishers to publish at CEUR Workshop Proceedings using CEUR Make is that it has a lot of software dependencies.

1.1.2 Motivation

Today, most of the software applications are interactive and designed according to the user needs in order to make the task for user easier to perform. Hence, the terminal based utility is without a doubt quite helpful for easing up task of publishing proceedings for the users and making certain processes efficient but it requires knowledge of command line utility, requires installation of dependencies and it does not validate data as much as required. Therefore, the aim of this thesis is to provide a web based graphical user interface that is interactive enough for users to publish the proceedings using CEUR Make workflow. It aims to help publishers in creating different artifacts for publishing at CEUR Workshop Proceedings.

The main thing is that everything become simple, easy enough for a child to understand. - Albert Camus

1.2 Thesis Structure

This thesis is organised as following:

Chapter 1 - Introduction : This chapter presents an introduction of the topic. It discusses the problem statement and motivation for the thesis.

Chapter 2 - Background : This chapter provides the background information of the topics covered in this thesis.

Chapter 3 - Related Work : This chapter discusses the related workflows, software systems and usability techniques.

Chapter 4 - Usability Evaluation Methodology and CEUR

Make Usability Evaluation : This chapter presents the evaluation technique for software systems and evaluates the usability of CEUR Make utility.

Chapter 5 - Design and Implementation of CEUR Make Web Interface : This chapter describes the new design and implementation of the CEUR MAKE Graphical User Interface.

Chapter 6 - Usability Evaluation and Comparative Evaluation of CEUR Make GUI : This chapter presents evaluation results of CEUR Make Graphical User Interface and also compares the usability of CEUR Make with CEUR Make Graphical User Interface.

Chapter 7 - Summary and Future Work : This chapter presents conclusion of the thesis and also presents possibilities of future work in the domain of workshop proceedings.

Chapter 2

Background

> "Design for spread and scale." – Denise Gershbein - Steve Krug

This chapter gives a description about the terminologies used in the scientific community and discusses workflow for publishing workshop proceedings at CEUR Workshop Proceedings. The chapter also presents the topics related to Human Computer Interaction and Usability and discusses usability evaluation methods. At the end, the chapter presents a brief description about the technologies used in our project.

2.1 Scientific Terminologies

2.1.1 Science

SCIENCE:
A department of systematized knowledge as an object of study.

Definition: *Science*

Science is collection of factual information related to different fields of study. It is based on experimentation. Science

includes both the work that is proven as scientific facts and the work that is still being researched as scientific research.

2.1.2 Scientist

Definition: *Scientist*

SCIENTIST:
A person who is trained in a science and whose job involves doing scientific research or solving scientific problems.

Scientist is someone who is working to make advancements in science. Scientists follow different approaches in order to present new advancements in science and in order to prove the impact of their advancement they carry on some experiments and they use the results of their experiments to make their statement impactful.

2.1.3 Research

Definition: *Cambridge*

CAMBRIDGE:
A detailed study of a subject, especially in order to discover (new) information or reach a (new)understanding.

Research is a systematic approach of deriving new phenomena and building upon it from time to time. It involves a lot of experimentation in order to derive a new scientific fact. One of the examples of a scientific research in computer science could be the invention of Functional Programming and then advancing the scientific work to make programming more efficient the invention of Object Oriented Programming.

2.1.4 Conference

Scientific conferences are conferences where scientists present their literature. Conferences usually last longer

than a day. Literature presented at scientific conferences is peer reviewed in some cases before a final verdict is issued on its acceptance or rejection. In most of the scientific conferences the literature gets accepted before it is presented at the conference depending on the regulations of the conference. Once the literature is accepted at a scientific conference, the authors of the papers give short presentations on their paper and share the knowledge with other researchers and scientific community. Later, the papers are published as the part of conference's proceedings. Organisations which conduct most number of conferences are ACM and IEEE.

2.1.5 Workshops

Scientific workshops are usually short in nature unlike scientific conferences. Scientific workshops could be the part of larger academic conferences. In scientific workshops scientists usually share the results of research that is not necessarily completed or is still in process. Workshops are usually short. Scientific workshops are more practical in nature.

2.1.6 Paper

Scientific paper is the literature written by a scientist in order to present his contribution in a particular field. Scientific papers are generally presented in scientific conferences which are then reviewed and if it get's accepted the paper is published at an scientific conference which is then made available in the form of proceedings. A scientific paper that is not published at an academic conference is sometimes presented as a first draft at a scientific workshop. Scientific papers hold importance as they help to progress research in different fields which are then used by other scientists to build theories upon the previous research.

According to a research 1.346 million papers were published in 23.750 journals within 2006.

2.1.7 Proceedings

Scientific proceeding is the record of scientific papers published in different conferences. Scientific proceedings are often assigned a unique series number in context to the submission of the proceeding. The number is allocated based on different metrics such as date. So, part of the proceedings published on the same date will have the same series number. Scientific proceedings are sometimes made available before the conference and sometimes after the conference. The papers are usually gathered by the editor of the proceeding or the proceedings chair of the conference. For the quality of proceedings, they should be peer reviewed before they get published in proceedings. Proceedings could be published in three common ways, which includes publishing it as a book, journal or as a serial publication.

2.1.8 Open Access

Open access is a term coined for research outputs available online, that doesn't have any restrictions on access and are also free of many restrictions on use.

2.2 CEUR Workshop Proceedings

Each year CEUR workshop proceedings have 200 volume submissions. Majority of workshops are computer science related.

CEUR Workshop Proceedings[3] is an open access platform for submitting the scientific proceedings. It is a platform that is hosted by Sun SITE Central Europe[1] and it runs under the i5 department[2] of RWTH Aachen University. CEUR Workshop Proceedings are officially authorised ISSN publication series[3]. CEUR Workshop Proceedings offer organisers of academic workshops and conferences to distribute their proceedings using the CEUR Workshop Proceedings. The main page of the CEUR Workshop Proceed-

[1] http://sunsite.informatik.rwth-aachen.de
[2] http://dbis.rwth-aachen.de/cms
[3] http://ceur-ws.org/issn-1613-0073.html

ings is shown in Figure 2.1. This is the most visited page of the CEUR Workshop Proceedings as it displays the list of all the proceedings that have been published till now. It also presents information regarding reserved volume number for upcoming proceedings.

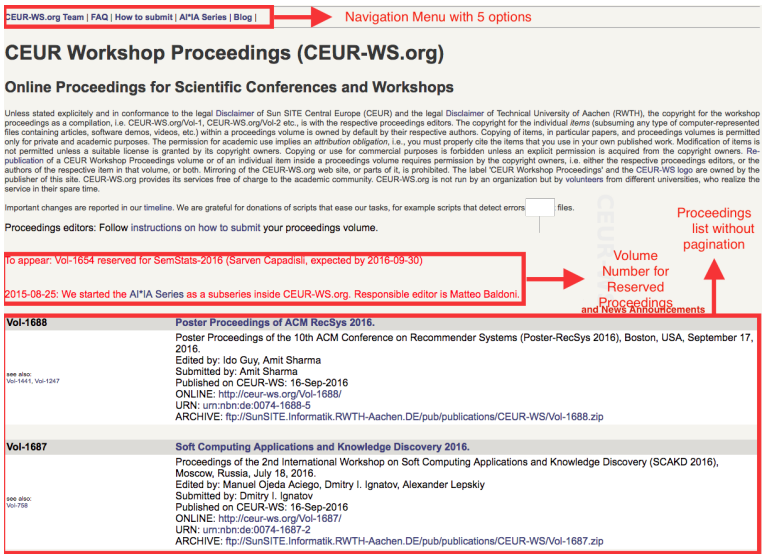


Figure 2.1: Index Page of CEUR Workshop Proceedings

2.2.1 Publishing at CEUR Workshop Proceedings

Publishing at CEUR Workshop Proceedings requires publishers to prepare content in a way that it can be published at CEUR Workshop Proceedings. For publishing at CEUR Workshop Proceedings, publisher needs to provide three types of artifacts enclosed in a Zip Archive that can be submitted at CEUR Workshop Proceedings through Sun Site Central Europe.

The artifacts that should be enclosed in Zip Archive of the final submission includes research papers and index.html file. Publishers need to include a folder in the submission Zip Archive with all the research papers that are related to that particular workshop proceeding. The most important artifact to be included in Zip Archive is index.html file, the file that is presented to the viewers of proceedings at CEUR Workshop Proceedings site. The file presents meta-

data in HTML file format associated to workshop proceedings, conferences, authors and editors. The general layout of the index.html[4] file is provided by CEUR Workshop Proceedings and the publishers are supposed to comply to that layout.

There are certain standards for filling in metadata in index file which are discussed below:

HTML Validation: The HTML code should be validated and therefore the index.html file should be validated using the W3C Validator[5].

Plain Text Editor: The publishers should create the index.html file using a plain text editor like notepad and they should avoid web based editors as the web based editors insert special characters in the file which can't be seen. The file should be encoded as UTF-8 Unicode.

Rules for Papers in Proceedings: The papers should have at least 5 pages. Short papers and an abstract could also be included.

Local vs Absolute Links: Links for the materials that have been published must be local, whereas the links for the workshops home pages and authors home pages are absolute links.

Title capitalization: Title capitalization must be done in emphasized capitalized style or regular english style. The index.html file for proceedings volume should comply to one of the title capitalization styles, mix of two is not recommended. MusicBrainz[6] is one such place to learn about title capitalization rules.

[4] http://ceur-ws.org/Vol-XXX/index.html
[5] https://validator.w3.org/nu/
[6] http://wiki.musicbrainz.org/Style/Language/English

2.3 CEUR Make

CEUR Make is a command line utility that generates the artifacts required to submit at CEUR Workshop Proceedings. As we discussed in the previous Section 2.2.1, to submit workshop proceedings at CEUR Workshop Proceedings publishers require index.html file and research papers all enclosed in an Zip Archive. So, CEUR Make takes as an input two XML format files namely Table of Contents and Workshop as shown in Figure 2.2 and based on those files it generates as an output artifacts that are used to publish workshop proceedings.

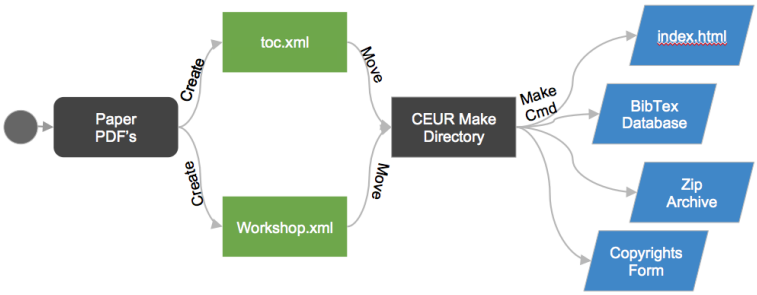


Figure 2.2: CEUR Make User Workflow

Publisher can create Table of Contents and Workshop file by using an XML templates[7],[8] as provided by the CEUR Make team. For creating artifacts linux based shell script commands are used. Before running the command users need to download the CEUR Make script package from the CEUR Make Github repository[9] and than add the XML files created into that folder. After that users can run the shell script commands from the directory that was installed from CEUR Make Github repository. The shell scripts for creating the different artifacts are explained below:

Index.html: This is the file that is actually presented to viewer as CEUR Workshop Proceedings. The command to make this file is: *make ceur-ws/index.html*.

[7] `https://github.com/ceurws/ceur-make/blob/master/toc.xml`

[8] `https://github.com/ceurws/ceur-make/blob/master/workshop.xml`

[9] `https://github.com/ceurws/ceur-make`

Copyright Form: This is the form that CEUR Make creates as a template based on the Workshop metadata. The command to make this file is : *make copyright-form.txt*.

Zip Archive: This is ready to submit package at CEUR Workshop Proceedings. It contains all the source files required to submit at CEUR Workshop Proceedings. The command to make this file is : *make zip*.

BibTex Database: This contains bibliography. The command to make this file is : *make ceur-ws/temp.bib*.

2.4 Human Computer Interaction

Different faculties that deals with HCI today includes design, communication studies, psychology, cognitive science, technology studies, systems engineering and industrial engineering.

The way humans have been interacting with computers had kept on evolving with time. Few years back graphical interfaces were not common and the most common way for humans to interact with computers was with the keyboards. Then, in the 1960s [19] direct manipulation of objects with pointing devices was first introduced, which changed the human thought process of interacting with computers and brought humans more in control of computers than computer's controlling human mind. Some of the building blocks of Human Computer Interaction are mouse, bitmapped displays, personal computers, windows and point and click editor's (Baecker and Buxton, 1987, Chapter 1).With the innovation of mouse and personal computers the human and computer interaction started evolving more firmly. Researchers, could finally see that programming complex systems was not the key in promoting technology among the common users but the key was to focus on Human Computer Interaction.

With the time came more interactive applications like art pads and computer games. Computer graphics research work have been closely associated with the development of Human Computer Interaction [14], as it helped in areas like direct manipulation of complex graphic softwares like CAD (computer aided designing). Technological advancements are important in the way they contribute to develop more advantageous Human Computer Interaction systems,

but with it, human psychology and perception is equally important. One of the most groundbreaking research in the way psychology helps advance Human Computer Interaction is by Donald Norman [21]. The research lays detail focus on the way things are designed and how human perception can be used to differentiate between good and bad design. Though, the two main categories of Human Computer Interaction is the human side and the technology side, but the field itself is growing enormously and contributing in different areas like Computer Supported Cooperative Work and Artificial Intelligence.

So, Human Computer Interaction is the way humans interact with the computers and the way computers respond to human interaction. More formal and complete definition of the field itself is given as below:

HCI:
Human Computer Interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. - ACM SIGCHI

Definition: *HCI*

Today, researchers are actively working in the field of Human Computer Interaction. They are trying to evolve graphical user interfaces and interactions of humans with computers. The current trend in Human Computer Interaction is to bring more advanced gestural interactions and human eye related computer interactions.

2.5 Design Patterns

This section will present a brief history about design patterns and then cover in detail the usage of design patterns in the field of HCI.

2.5.1 Design Patterns A Historical Background

Design patterns are important in order to promote standardization and quality of work. Design patterns in Human Computer Interaction takes its route from a contribution, A Pattern Language: Towns, Buildings, Construction[5]. A Pattern Language was a book published in 1977 which focused on following a neat approach in architectural design, so that the ordinary people could use a pattern language to construct beautiful buildings across the world.

At the core... is the idea that people should design for themselves their own houses, streets and communities. This idea... comes simply from the observation that most of the wonderful places of the world were not made by architects but by the people. — Christopher Alexander et al., A Pattern Language

Then, for the first time in software engineering design patterns were introduced in OOPSLA conference[10] by Kent Beck and Ward Cunningham. Further, the design patterns in software engineering became more mature in 1994 with the introduction of the book Design Patterns: Elements of Reusable Object-Oriented Software by so called Gang of Four[13]. The book covers in detail the patterns for software design, that could be used as standards to solve complex software problems. One example could be the observer pattern, that is commonly used to observe the changes in different classes and notify it.

Design patterns in HCI were first introduced by Norman and Draper in 1986 in their book called User Centered System: New perspectives on Human Computer Interaction[9]. The book concentrated on user centered approach in HCI that we will discuss in the next Section 2.7 that is user centered design. The book also provided certain patterns that could be used to solve user focused problems. Though, the design patterns were first introduced in 1986 but that was not the mark of formal definition of design patterns in HCI. Two years after the introduction of software design patterns, in 1996 was the formal beginning of realisation of design patterns in the field of HCI when Coram and Lee introduced A pattern language for interface design[31]. Today, design patterns in HCI are widely used across many applications from personal blogs to complex software systems like Adobe's Creative Suite[11]. Some

[10] http://c2.com/doc/oopsla87.html
[11] http://www.adobe.com/products/cs6.html

of the major contributions are presented at conferences like CHI[12] and INTERACT[13] every year to report the major design patterns and methodologies in HCI.

2.5.2 Design Patterns In HCI: An Introduction

Design patterns in HCI also referred as interaction patterns or user interface patterns are commonly used in order to report and solve problems of user interface. User interface patterns, provides designers a solution to common problems of interface and help them generalise it across different platforms. A common approach to present design patterns is that presented by Tidwell in her book Designing Interfaces[30]. This approach is simplistic and widely used among designers. The format is presented as follows:

Tidwell's Form of Design Pattern[29]

Name: Associates a unique reference number to the pattern and describes the main motivation behind the pattern.

Sensitizing Image: An image describing the main intent of the design pattern through a pictorial representation.

What: The problem that raises the need of the particular design pattern.

Use When: This section gives brief description of where to use the pattern and in when to use the pattern.

Why: Describes in detail the logic behind the pattern.

How: Describes in detail the solution that the design pattern suggests.

Examples: This presents examples of situations where the design pattern is in use.

[12] http://www.sigchi.org/conferences/
[13] https://www.interaction-design.org

The following example would make the idea of design patterns more clearer:

Example Design Pattern: Grid of Equals

Figure 2.3: Grid of Equals Design Pattern[26]

What: Content items should be arranged in a grid or list with standard format. The format of all the items should be exactly same and all the items should also have similar visual weight.

Use When: When the page contains a lot of visually similar items that can be categorised under one name. Examples could be blog posts, social connects, news articles or products for sale.

Why: A grid or list with equal spacing among individual items means all the items are equally important. Standard visual appearance of all the items means that they are similar to each other. Such technique helps you to present your user with better information architecture.

How: Choose a category that all the list items fall into. Based on semantics of your page decide what would be better to present the item, thumbnail images or graphics? Sections of text or a mix of text and graphics? Make them visually more informative by making the headings bold, graphics neat and highlighting the

important things. Once you have decided with design of single items, you can think of arranging them in a grid of single row or multiple rows.

Examples: Hulu uses the grid of equals design pattern displaying the TV Shows and their basic information as shown in the Figure 2.4. CNN arranges the news using grid of equals design pattern as shown in the Figure 2.5.

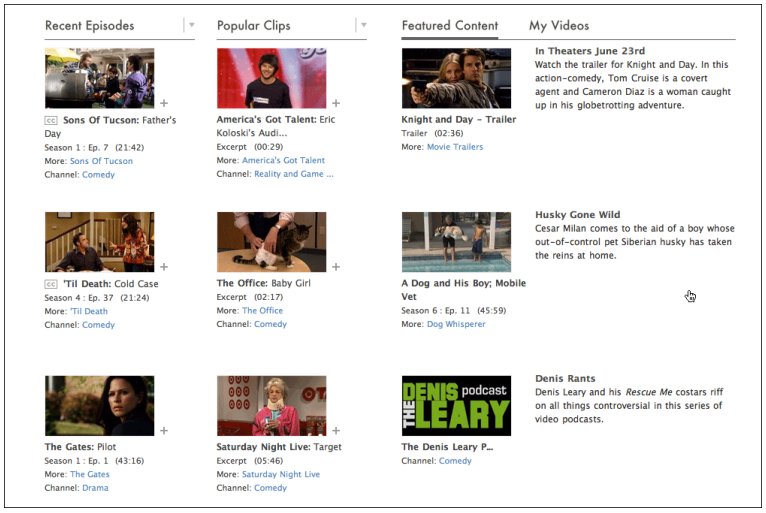


Figure 2.4: Grid of Equals Design Pattern by Hulu[28]

2.6 Usability and User Experience and Design

A topic that is quite correlated with HCI is the Usability. Usability of software systems is important in order to realise their impact on HCI. One of the most well known definitions of usability is given by the International Organisation for Standardisation as following:

Pay attention to what users do, not what they say. — Jakob Nielsen

USABILITY:
The extent to which a product can be used by specified users to achieve goals with effectiveness, efficiency and satisfaction in a specified context of use. - ISO 9241-11

Definition: *Usability*

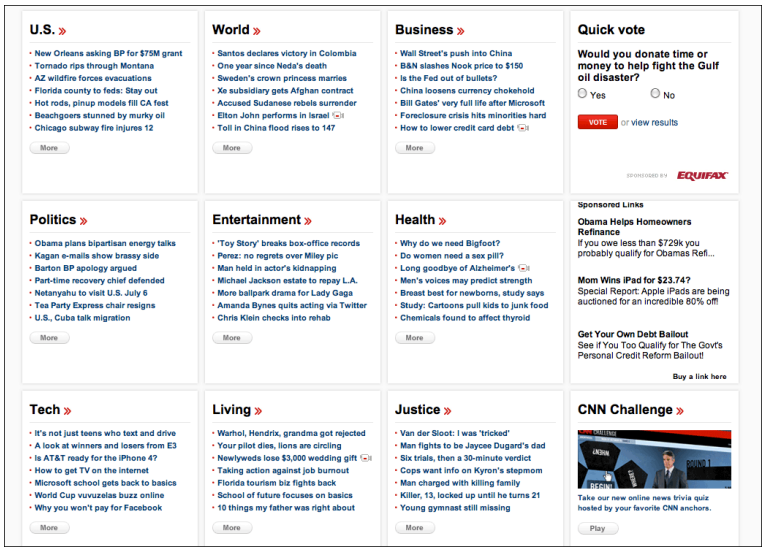


Figure 2.5: Grid of Equals Design Pattern by CNN[27]

Hence, usability is the term assigned for developing software systems that are more usable from a user's perspective. With the growth of software and electronic industry, the software systems are no more bound to conventional platforms such as desktops, but there are lot of other areas in which software industry is progressing such as web, mobile devices, handheld pc, smart watches and television. With the introduction of different platforms the number of potential users who can consume software applications are increasing and hence it is very important to realise their needs and usage. This brings up the field of usability and more particularly user experience design in play. Usability is a quality of the software application in terms of ease of use and user experience design is the overall experience of users in terms of using the software application.

According to Nielsen[23], usability is the quality attribute that evaluates users ease of use in using the interface? Nielsen lists five main quality components that usability is composed of, given as follows:

Learnability: With what ease of use, users can perform ba-

sic tasks of the application, the first time they use it?

Efficiency: After learning the design of the application how rapidly can users perform the tasks?

Memorability: How easy it is to remember the procedure of performing certain tasks, when a user returns to an application after a period of time?

Errors: How many errors users commit while performing the task, are those errors critical and is it easy for users to recover from those errors?

Satisfaction: How smooth and satisfactory it is to use the design?

Usability is one of the layers that user experience design depends on. It's common for people to mix up the terms usability and user experience but these are different. Usability is the process of making the software application more usable for the users and minimising the steps in which users can achieve certain tasks whereas user experience on the other hand is making the journey of users in using software sytems pleasant and emotionally strong.

2.6.1 Focus Groups

Focus groups are important in order to correctly identify the users of the system under development. It is very important to target the right users in order to develop the software according to the needs of the users who would be using the software. Though, the interface would be intended for a large number of users but in a user study it is possible to involve few users and test it on only limited number of users. Therefore, the focus groups should be precisely defined and they should represent the user groups that are pivotal and possibly most frequent users of the system.

A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools. – Douglas Adams

According to Nielsen and Landauer [16] five users can almost find the 75 percent of the problems. The study of Nielsen and Landauer shows that three experts or five users are enough for finding most of the problems. The study

conducted by Nielsen and Landauer is valid for the users from the same group and if there are more user groups, from each user group five users can be used to find the 75 percent of the problems.

2.6.2 Usability Evaluation

This section will present the usability metrics used while conducting a usability study and will present few different types of usability evaluation methods.

Usability Metrics

Usability metrics in usability evaluation study are used to realise the results of the usability study. Usability metrics reveal the insights about the usability of a particular system. Usability metrics can be divided into two major categories which are discussed as following:

Objective or Quantitative Metrics Objective metrics are used to collect the data concerning the performance measurements while testing the users. Examples of quantitative metric:

- Time to complete the task
- Errors committed while performing a task
- Number of tasks successfully completed
- Number of repeating mistakes

Subjective or Qualitative Metrics Subjective metrics state the satisfaction of users while using the graphical user interface of the system. Examples of the qualitative metric:

- Post task questionnaire
- Instructor notes
- Thinking aloud

Usability Evaluation Methods

There are number of usability evaluation methods but we can divide them into two general categories. The usability evaluation methods that requires the user interface to be tested on actual users or the ones without the actual users[20]. Both of the techniques can be further classified into number of techniques which are discussed as follows:

It doesn't matter how many times I have to click, as long as each click is a mindless, unambiguous choice.
- Steve Krug

Usability Evaluation Methods without Users Usability evaluation methods without users are discussed below:

Literature Review: It is a very handy approach and it saves time and money. It involves studying literature that has been already published. It gives insights over particular interfaces, design patterns and user behaviour. This could be helpful if the users of the system and their expertise are similar to your study. This is usually a good starting point to get an overview of what has already been studied and where their is room to experiment more?

Heuristic Evaluation: Usability experts critically analyse the interface based on the heuristics developed by usability professionals for example Nielsen and Norman[8]. This is quick and easy way to fix issues that are obvious.

Model-Based Evaluation: It is the least commonly used usability evaluation method. It provides a framework to evaluate user interfaces. GOMS[24] is one such model used to evaluate task completion time based on cognitive psychology framework. It can be performed on interface specification but the disadvantage is it has limited task applicability.

Cognitive Walkthrough: It is used to evaluate the learnability of the system for new or infrequent users. In cognitive walkthrough one or more evaluators go through different tasks from the perspective of the user and try to ask different questions. It is helpful as it provides detailed analysis of the system but at the same time it has a disadvantage that it is quite subjective.

Usability Evaluation Methods with Users Usability evaluation methods with users are discussed below:

Silent Observation: It is used to evaluate the interface by silently observing the user performing a task. Observation is done by evaluators. There is no communication between the evaluator and user in this method. This method is very good to understand the normal flow of the user without intriguing him in other activities. The problem with this method is that if the user gets stuck somewhere it's quite frustrating for him and he may perform the rest of the tasks with a biased behaviour.

Think Aloud: In this method the user is asked to think aloud while performing the task. In this way evaluators can analyse the mental model of the user. It also helps to record the actual experience of the user. It is the most commonly used usability evaluation methodology. A disadvantage of this methodology is that user might not feel comfortable talking aloud while performing tasks. Therefore, it is important to make user comfortable with the environment before performing the task.

Question Asking: It is based on think aloud method. It also allows evaluators to ask questions while the users perform tasks. It is much more interactive methodology and helps gain more insights of the problems the user face while performing certain tasks and why do they face those problems? A disadvantage of such usability evaluation methodology is that it could divert the user focus from the actual task. Another disadvantage of this methodology is that the user will pay more attention to those aspects of the system that he is asked questions about.

Retrospective Testing: In this method user are silently observed and recorded while performing the tasks. After the completion of test users are asked to explain their decisions and behaviour while viewing the video. The advantage of such testing is that it helps to get user suggestions while the disadvantage is that

it is very time consuming methodology. Another disadvantage is that user could have forgotten their behaviour at the time of performing the task, while reviewing the video.

2.7 User Centered Design

UCD:
Human-centred design is an approach to interactive system development that focuses specifically on making systems usable. It is a multi-disciplinary activity. - ISO

Definition: *UCD*

The most detailed standard of user centered design process is given by ISO 13407[1]. It also defines a lot of UCD methodologies. The core of the UCD process is that the design of the system is made while focusing on the users of the system, the environment and the tasks to be performed. It is iterative in nature and it evolves over time while keeping the user feedback in mind at each iteration. The team involves people of multiple disciplines.

The Figure 2.6 gives an overview of the general steps of the UCD process and brief overview of each step based on ISO standards[1] is discussed below:

Specify the context of use: In this step, the users of the product are defined, their reason of use is defined and the conditions under which they will use the product.

Specify requirements: In this step, all the user requirements are identified and the business goals that are supposed to be met are identified.

Create design solutions: This step involves creating design of the product. This step evolves in multiple stages from concept design to high fidelity prototypes.

Evaluate designs: It requires evaluating the user interface through usability testing.

The UCD process is iterative in nature and it can be merged with agile, waterfall or other software development models.

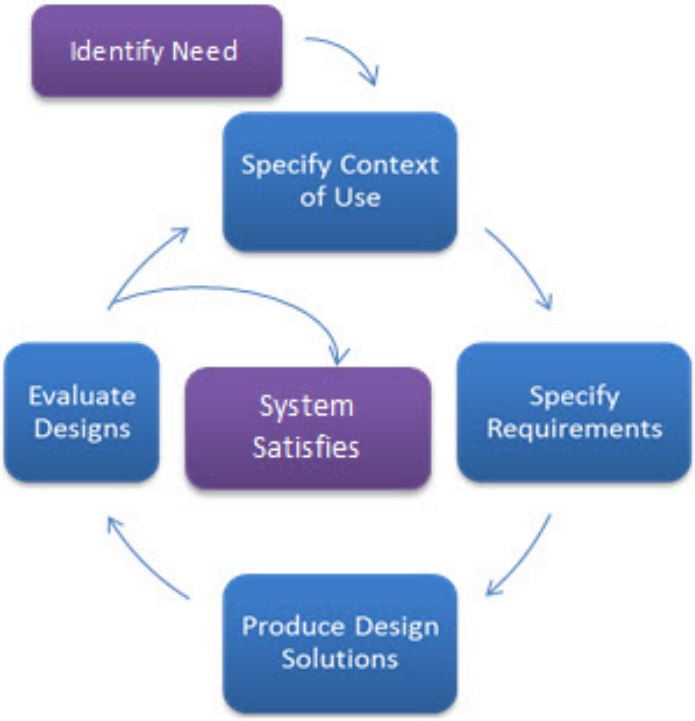


Figure 2.6: Steps of User Centered Design Process

2.8 Technologies Used in Implementation

Following is a brief description of the technologies that have been used in the project:

2.8.1 HTML5

Definition: *HTML*

HTML:
HTML is a markup language for describing web documents (web pages). - w3schools

HTML5 is a hypertext markup language. HTML5 is mainly used for designing web interfaces. HTML5 was first introduced as HTML and was used to describe scientific documents semantically. Later it became the most popular markup language of the World Wide Web and hence it is used widely among the consumers of the web to display their content. Today, HTML5 provides easy syntax for coding the web interface and hence used by everyone to code their application from designers to ordinary bloggers and from small scale application to the large scale businesses such as Facebook. HTML5 provides simple interface elements such as buttons, input fields and complex elements such as canvas for drawing vector graphics. Therefore, HTML5 is the standard today for designing web applications.

HTML5 comes up with advanced features such as canvas, geolocation and animation.

2.8.2 CSS3

CSS:
CSS is a language that describes the style of an HTML document. CSS describes how HTML elements should be displayed. - w3schools

Definition:
CSS

Cascading Style Sheets commonly referred to as CSS3 is the standard file format for enhancing and styling the basic HTML5 elements. CSS3 is used to stylize the elements of HTML5 such as buttons so that they appear more attractive visually, align and position according to presentation required. CSS3 can be used in two ways such as an inline styling or as classes in an external file. Inline styles are mostly used for styling elements that are not used repetitively across the application whereas, external CSS classes are quite common when one needs to set theme for the whole application. CSS3 classes helps to set a theme across the application in minimal amount of code. CSS3 classes are also very important as they help to set brand identity of the application. Today, CSS3 is powered with complex styling of HTM5 elements such as animation.

2.8.3 Materializecss

Definition:
Material Design

MATERIAL DESIGN:
Material Design is a design language that combines the classic principles of successful design along with innovation and technology. Google's goal is to develop a system of design that allows for a unified user experience across all their products on any platform. - Google

Material design is a design methodology introduced by Google. The main goal behind the material design is to provide a unified design experience across their products, while keeping in mind the principles of good design and using cutting edge technology. The following three principles are the key principles of material design:

Material is the metaphor This principle is based on the idea of paper and ink as a metaphor. Hence, the material design associates everything with real world element and gives fine definition to borders and edges giving it a feel of real element.

Bold, graphic, intentional This principle again takes its route from print based design.The elements of print based design typography, color and grids should not only please the eyes of the user but they should also define the content hierarchy and visual guide through their presentation.

Motion provides meaning As users map everything to what they see in the real world, motion gives them such a feel. Hence, making the design more feedback intensive and familiar user experience could enhance.

Materializecss is a css framework based on the principles of google's material design. Materializecss provides several features such as components, themes and scripting. It is easy to use and integrate in the web application.

2.8.4 Javascript

JAVASCRIPT:
Javascript is the programming language of HTML and the Web. - w3schools

Definition: *Javascript*

Javascript is the programming language for the Web. Javascript is widely used and is one of the most famous programming language of the world. Javascript can be written within the HTML5 pages or could be written in external files with a file format type javascript. The main use of javascript is that it is widely used to manipulate HTML5 elements. Javascript could also be used to manipulate HTML5 elements in real time and sending server requests. Javascript is also used to validate forms. Today, Javascript has grown a lot, it is being used from frontend to backend. Another advantage of Javascript is that as it is a scripting language it is very fast. As Javascript could run on any machine and has no dependencies it has a lot of open source code base.

Javascript is the fifth most popular language of the world.

2.8.5 jQuery [26]

JQUERY:
jQuery is a JavaScript Library. jQuery greatly simplifies JavaScript programming. - w3schools

Definition: *jQuery*

jQuery steps is jQuery based plug-in. It is not very well documented for now but is quite powerful for generating stepwise forms. It could be customised according to the user needs and also has a support for styling the form. It has a form validator plugin included too but that is not well documented for now on the site and has several bugs. The plugin could be downloaded from their online site [14].

[14] `http://www.jquery-steps.com`

2.8.6 XML

Definition: *XML*

XML:
XML stands for EXtensible Markup Language. XML was designed to store and transport data. XML was designed to be both human- and machine-readable. - w3schools

Extensible markup language is widely known as XML. XML was introduced to provide a solution for electronic publishing. XML takes a tag based approach. XML is widely used today for publishing electronic contents such as scientific papers or blog feeds. XML also plays an important role in exchanging the data across multiple web applications. XML is generally written using a code editor and today almost every programming language provides library to write XML content through programming.

2.8.7 PHP

Definition: *PHP*

PHP:
PHP is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. - w3schools

PHP originally known as personal home page, and today as hypertext preprocessor is scripting language that is commonly used for web development. PHP has all the basic language features such as looping and classes. PHP can be used to retrieve data from the database and display it at the front end. PHP is powerful and easy to learn language. Today, lots of web applications from personal blogs to large scale business are using PHP to code their applications.

Chapter 3

Related Work

> "It's not good enough to just keep producing technology with no notion of whether it's going to be useful. You have to create stuff that people really want, rather than create stuff just because you can." – Genevieve Bell, head of Intel's USA User Experience Group

The main aim of the thesis is to improve the usability of CEUR Make and to come up with the design and implementation of a more usable system. Therefore, in order to develop something more usable and impactful, it is important to know the related software systems and on going research. Hence, in this chapter we present related software systems and ongoing research, on the usability aspects of the related systems.

3.1 Related Workflows and Software Systems

In this section we will discuss the softwares that are related to our system and workflows for publishing proceedings. First, we will give an overview of the large scale proceedings workflow that requires professional third party systems in order to publish their proceedings. Then, we will

discuss middle budget and virtual proceedings which can use third party systems, but normally due to lack of funds or because of their open access or virtual nature they follow a different track. At the end of this section we will present a professional web application called EasyChair, that helps different conference and workshop organisers to automate their tasks and also to support in publishing proceedings.

3.1.1 Proceedings for Large Scale Conferences and Workshops

ACM held more than 170 events in 2016 under their banner and IEEE publishes around 1,400 conference proceedings every year.

Large conference and workshop organising bodies like ACM and IEEE use highly professional software system to publish the proceedings. This is important as they have high number of participants and it is often a complex task to manage the conferences and workshops. Usually, such conference and workshop organising bodies have a lot of conferences and workshops under their name. Both of these organising bodies, organise more than hundred events each year. Hence, they have proceedings chair or program chair associated to their conferences and workshops, who are responsible to produce proceedings couple of weeks prior to a conference or workshop. In the following section, we give an overview of how the proceedings are published at large scale conferences?

Proceedings Workflow for Large Scale Conferences and Workshops

This section will present workflow for large scale conferences and workshops and in the next section we will present the workflow for small scale conferences and workshops. The workflow categorization is based on the experience of two researchers who have been involved in the organisation of several computer science conferences and workshops. The categorization is also based on my experience as a proceedings chair of Computer Science Conference for University of Bonn Students(CSCUBS) and my discussion with the proceedings chair of ESWC 2016. Program chair or proceedings chair are normally responsible

for publishing proceedings. Once, the authors have received the reviews by professional scientists on their paper's, only if the paper got accepted, the next step for the authors is to prepare a camera ready version of the paper that could be published in the conference or workshop proceeding. In order to prepare camera ready version of the papers, authors are supposed to strictly follow the rules of conference or workshop proceeding they are targeting. ACM has a list of rules[2] to be followed for proceedings creation and similarly IEEE has provided templates[15] that comply to IEEE proceedings standard. Along with the camera ready version of the paper author's also sign the copyright form. Once, these artifacts have been submitted by the author using the third party system the organisation body is taking service from, then, it is the responsibility of program chair or proceeding chair to check these artifacts. After carefully reviewing these artifacts for formatting and layout this time, the chair generate proceeding using the software system and tailoring it to the standards of the particular conference or workshop. The system used for generating the proceedings, usually had an interface tailored for proceedings chair such that it makes him accomplish his tasks easily. One such third party system that provides service to different conferences and workshops is discussed in Section 3.1.3. The summary of the workflow for large scale conferences and workshops is shown in the Figure 3.1.

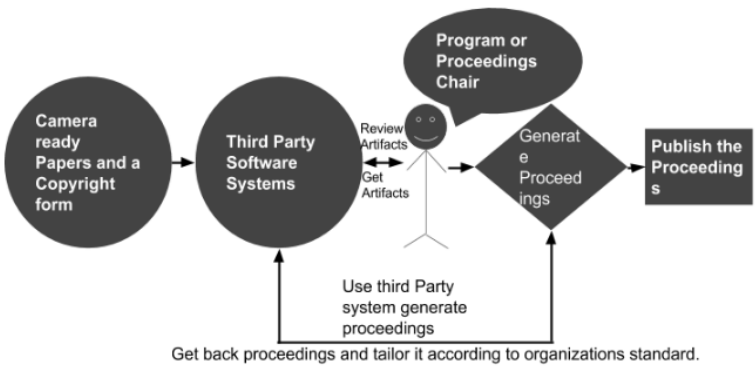


Figure 3.1: Proceedings Workflow for Large Scale Conferences and Workshops

3.1.2 Proceedings for Small Scale and Virtual Conferences and Workshops

Global Virtual Conference[6] has till now published four volumes of proceeding, starting from year 2013 to 2016. It is managed by publishing society, Slovakia.

Small scale and virtual conference (conferences organised over web etc.) and workshop's proceeding structure is different than the large scale conference and workshop structure. Small Scale conferences and workshops usually have low budget to take service of professional software. Therefore most of the time they are following standards inspired by different organisations and perform tasks manually or use open source software systems such as CEUR Make to automate their task of publishing proceedings. Likewise, virtual conferences and workshops are also not high budgeted ones and they have to follow the similar approach. Two such examples of a conference and workshops virtual proceeding are Global Virtual Conference [6] and CEUR Workshop proceedings [3]. Global Virtual Conference is an online conference service for scientists to present their contributions. The proceedings of the virtual conference are made available online. CEUR Workshop proceedings as explained previously in the Section 2.2, is an open access proceeding publishing platform. In the following section, we will discuss in general the workflow of such conferences and workshops.

Proceedings Workflow for Small Scale and Virtual Conferences and Workshops

Proceedings workflow for small scale and virtual conferences and workshops is a bit different from workflow for large scale conferences and workshops. Proceedings for such conferences and workshops are generated and published by a program chair or proceedings chair. Program or proceedings chair use open source software or use manual labour in order to collect artifacts from the authors. Usually, the artifacts consist of camera ready papers and copyright form. Once, the artifacts are submitted, the program or proceeding chair either uses the open source software system to generate proceedings or create the proceeding manually based on the format followed by the organisation in creating previous year's proceeding.The summary of the work-

flow for small scale and virtual conferences and workshops is shown in the Figure 3.2.

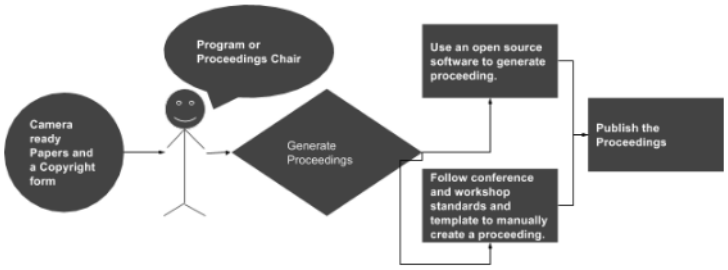


Figure 3.2: Proceedings Workflow for Small Scale and Virtual Conferences and Workshops

3.1.3 Easy Chair

EasyChair[4] is one of the most widely used and common conference management system. EasyChair supports two types of conference models.

EasyChair has hosted 48,249 conferences and served 1,760,506 users[12] till now.

a The standard model supported by the EasyChair is the conference having a single program committee. Based on the preferences of program committee, papers are then assigned to them.

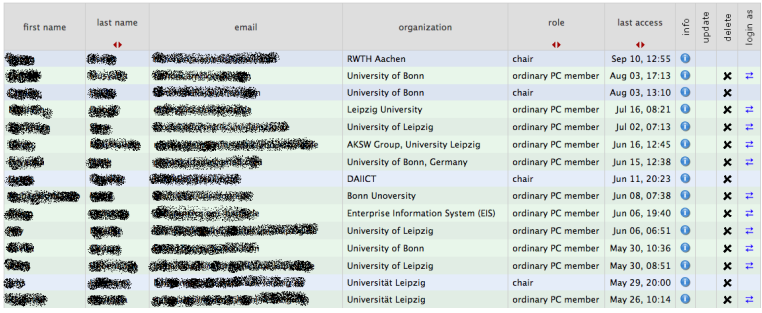
b The other model supported by EasyChair is the one with conferences having multiple tracks. Each track has a separate program committee and has one or more track chairs. It requires a superchair to supervise multiple tracks.

EasyChair's primary focus is to make the conference management tasks easier for the conference organisers, to assist program committee members to perform their task easily and to make submission of papers easier for respective authors. EasyChair's interface allows the chair to manage the program committee, assign them roles, view their access to the system and to monitor their activity. View of a program committee manager for a sample conference is shown in the

Figure 3.3. Moreover, EasyChair facilitates the paper referees to give their preferences for refereeing papers and also provides an overview of conflicts of interests for program committee. Figure 3.4 gives an overview of a sample conference.

EasyChair's flexibility has been also used for evaluating project proposals[11], teaching students paper writing and peer reviewing, teaching HCI students and generating program Web pages for very large conferences.

EasyChair allows authors to submit papers and extra resources, edit their resources and also allows them to view the reviews given on their papers by other people. It also allows author to reply to the reviews and get detailed insight of reviews received. Likewise, EasyChair assists in sending emails to program committee members, referees and authors. It also aids in monitoring of emails and notifies about latest events. EasyChair also facilitates in generation of proceedings, which is discussed in the following section:



first name	last name	email	organization	role	last access	info	update	delete	login as
[redacted]	[redacted]	[redacted]	RWTH Aachen	chair	Sep 10, 12:55				
[redacted]	[redacted]	[redacted]	University of Bonn	ordinary PC member	Aug 03, 17:13			✕	⇄
[redacted]	[redacted]	[redacted]	University of Bonn	chair	Aug 03, 13:10			✕	
[redacted]	[redacted]	[redacted]	Leipzig University	ordinary PC member	Jul 16, 08:21			✕	⇄
[redacted]	[redacted]	[redacted]	University of Leipzig	ordinary PC member	Jul 02, 07:13			✕	⇄
[redacted]	[redacted]	[redacted]	AKSW Group, University Leipzig	ordinary PC member	Jun 16, 12:45			✕	⇄
[redacted]	[redacted]	[redacted]	University of Bonn, Germany	ordinary PC member	Jun 15, 12:38			✕	⇄
[redacted]	[redacted]	[redacted]	DAIICT	chair	Jun 11, 20:23			✕	
[redacted]	[redacted]	[redacted]	Bonn Unoversity	ordinary PC member	Jun 08, 07:38			✕	⇄
[redacted]	[redacted]	[redacted]	Enterprise Information System (EIS)	ordinary PC member	Jun 06, 19:40			✕	⇄
[redacted]	[redacted]	[redacted]	University of Leipzig	ordinary PC member	Jun 06, 06:51			✕	⇄
[redacted]	[redacted]	[redacted]	University of Bonn	ordinary PC member	May 30, 10:36			✕	⇄
[redacted]	[redacted]	[redacted]	University of Leipzig	ordinary PC member	May 30, 08:51			✕	⇄
[redacted]	[redacted]	[redacted]	Universität Leipzig	chair	May 29, 20:00			✕	
[redacted]	[redacted]	[redacted]	Universität Leipzig	ordinary PC member	May 26, 10:14			✕	⇄

Figure 3.3: Interface of EasyChair's Program Committee Manager

3.1.4 Proceedings Workflow for Easy Chair

EasyChair has a specialized workflow for generating proceedings and it automates the process of generating proceedings for the program chair or proceedings chair. Once, the camera ready papers are submitted on an online portal of EasyChair using it's conference management portal the proceedings or program chair could add the accepted papers after peer review for an inclusion in proceedings. After the program chair or proceedings chair has collected all the papers and the additional material, for example the copyrights form. They need to define an order of papers, add or edit additional documents such as preface. Once they have completed these steps they just need to confirm

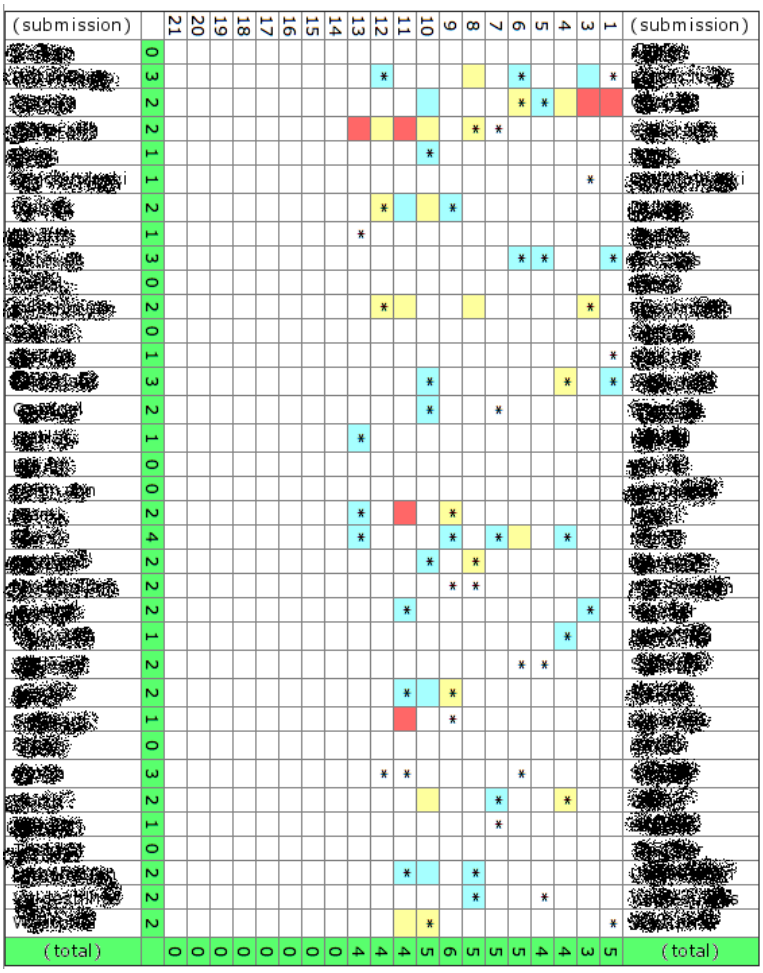
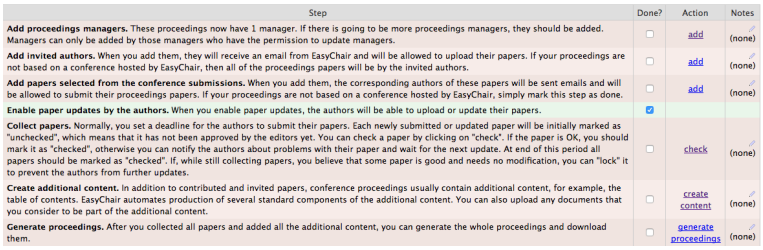


Figure 3.4: Interface of EasyChair's Paper Assignment Overview

it using the EasyChair's interface and click to generate the proceedings. See the last option in the Figure 3.5. Once, you have selected the option to generate the proceedings the system generates it for you at the backend and by visiting the proceedings content page you can view the contents of the proceeding. You can also download proceedings from the same view, an example of the proceedings content view is shown in the Figure 3.6. At the top right hand side of the interface you have an option of downloading all the contents of proceedings that are shown in the table of interface. For instant view of different artifacts that are part of proceedings, you can view the document by clicking on

the magnifying glass icon next to the document name in the table.



Step	Done?	Action	Notes
Add proceedings managers. These proceedings now have 1 manager. If there is going to be more proceedings managers, they should be added. Managers can only be added by those managers who have the permission to update managers.	☐	add	(none)
Add invited authors. When you add them, they will receive an email from EasyChair and will be allowed to upload their papers. If your proceedings are not based on a conference hosted by EasyChair, then all of the proceedings papers will be by the invited authors.	☐	add	(none)
Add papers selected from the conference submissions. When you add them, the corresponding authors of these papers will be sent emails and will be allowed to submit their proceedings papers. If your proceedings are not based on a conference hosted by EasyChair, simply mark this step as done.	☐	add	(none)
Enable paper updates by the authors. When you enable paper updates, the authors will be able to upload or update their papers.	☑		
Collect papers. Normally, you set a deadline for the authors to submit their papers. Each newly submitted or updated paper will be initially marked as "unchecked", which means that it has not been approved by the editors yet. You can check a paper by clicking on "check". If the paper is OK, you should mark it as "checked", otherwise you can notify the authors about problems with their paper and wait for the next update. At end of this period all papers should be marked as "checked". If, while still collecting papers, you believe that some paper is good and needs no modification, you can "lock" it to prevent the authors from further updates.	☐	check	(none)
Create additional content. In addition to contributed and invited papers, conference proceedings usually contain additional content, for example, the table of contents. EasyChair automates production of several standard components of the additional content. You can also upload any documents that you consider to be part of the additional content.	☐	create content	(none)
Generate proceedings. After you collected all papers and added all the additional content, you can generate the whole proceedings and download them.	☐	generate proceedings	(none)

Figure 3.5: EasyChair Interface for Generating Proceedings

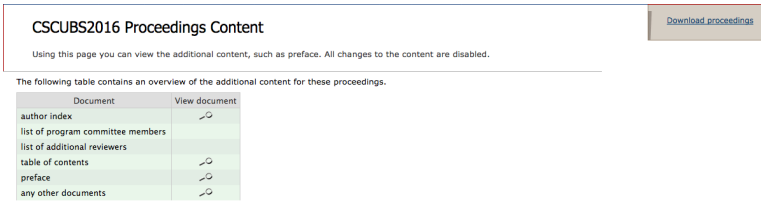


Figure 3.6: EasyChair Interface for Viewing Contents and Downloading Proceedings

3.1.5 Overview of other Conference Management Systems

Two other popular conference management tool's apart from EasyChair are ConfTool[7] and Microsoft's Conference Management Tool(CMT)[18]. ConfTool has an advantage that it supports two workflows, one for small scale workshops which is free of cost whereas it has a professional version which is paid with full customer support. This is unlike EasyChair as EasyChair does not separate workflows for small scale and large scale conferences. On the other hand, Microsoft's CMT is free web based service with features as advanced as EasyChair for example supporting multiple roles such as Reviewer and Program Chair.

Overall, both the tools ConfTool and Microsoft's CMT are good conference management tools but due to the usability of EasyChair software and it's support of great features, it is one of the most used conference management tool.

3.2 Usability Evaluation of Related Systems

This section will focus on presenting usability research on topics closely related or similar platforms. Usability of a software is highly critical in realizing its long term users. Therefore, we will explore the usability and features of applications similar to CEUR Make and we will also explore usability of software's that used similar platforms to built the application.

3.2.1 Gracoli: A Graphical Command Line User Interface

The research[39] presents the drawbacks of the command line user interface for text editing and purposes a hybrid approach. A hybrid approach is a mix of graphical user interface and command line interface. The main drawbacks of the command line user interface in terms of user experience which are discussed in the paper are listed below:

Many Integrated Development Environment take a hybrid approach. An approach that combines graphical user interface with command line interface. For example, Eclipse, Netbeans, Xcode and Visual Studio.

a User can interact with the application in very limited way.

b Output is hard to understand for the user.

c User does not get easy clue to perform their tasks.

The paper presents an interesting hybrid system gracoli that has good graphical user interface along with command line interface. The system is built for performing all general purpose tasks such as viewing facebook news feed, setting date and time, text editing and managing network. Gracoli is more usable as in it system displays hints or description in an overlay near the command. In it mouse can be used to interact with the output of the command. Pagination is used to see the output. The main contribution of the research is that it makes it clear how graphical user interfaces make command line interfaces more interactive and usable.

3.2.2 Student preferences toward microcomputer user interfaces

Apple laid the foundation of graphical user interfaces by introducing desktop and icons in Macintosh.

In this paper[25] author tries to figure out the problem with command line user interfaces and compare it to graphical user interfaces. The author points that users from educational field requires time to learn command line interfaces and perform tasks using it. Whereas, on the other side author tries to reflect the usability of graphical user interfaces. The author presents the fact that with the introduction of Mac OS and Windows, the user's interaction have become much more interactive and easy.

In order to discover the difference of both, author conducts a study on technical writing course. Some students were asked to do a technical writing assignment using graphical word processor and other using command line word processor. The background knowledge of the users was almost same.The highlights of the result are listed below:

a 72 percent of people were comfortable using graphical user interfaces within two weeks while 48 percent of people were comfortable using it in two to four weeks.

b Performance of performing tasks on graphical user interfaces was slightly higher than that of doing tasks on command line user interface. Command line interfaces correspond to higher task performance rates when users have learned to used the system but as users of our system does not need to use the system so frequent so learning can be an overhead. We will discuss more about task performance rates for our system in Chapter 4 and Chapter 6.

c User attitude towards both the interface was also analysed. For command line interfaces users said that it has a huge learning curve, windows based word facility is better, it is not much interactive and has only one font type. For the graphical user interfaces users mentioned that it is easy to use, it is self explanatory, layout is logical and manual was confusing at some places.

Hence, the study concludes that graphical user interfaces are much more easier to use than command line interfaces and they have low learning curve. It also mentions that if the interface is user friendly, users would like to use it more frequently for performing their tasks.

Chapter 4

Usability Evaluation Methodology and CEUR Make Usability Evaluation

> "If you don't talk to your customers, how will you know how to talk to your customers?" – Will Evans

This chapter is divided into two sections. First part of this chapter layouts general strategy for conducting usability test for the CEUR Make and CEUR Make Graphical user interface. The second part of this chapter presents usability evaluation results for CEUR Make. Usability evaluation results for CEUR Make graphical user interface are discussed in Chapter 6.

4.1 Evaluation Design and Setup

For the usability evaluation of CEUR Make and CEUR Make graphical user interface, a mix of different usability evaluation methods were used from the one's discussed in

Section 2.6.2. The usability evaluation for our systems is divided into two sections that are Think aloud and Question Asking Usability testing.

4.1.1 Participants

Total number of participants who participated in the usability test of CEUR Make and CEUR Make graphical user interface were 12. Users of the system were divided into two groups. As, the publishers at CEUR Workshop Proceedings were virtually located around the world and it was hard to meet all the users in person. Six of the users participated in the Think Aloud Usability test design setup which is conducted in person and the other six in Question Asking usability test design setup which could be conducted virtually.

Our focus group was researchers and scientists who want to publish proceedings at CEUR Workshop Proceedings. As our users were globally located and it was hard to reach our target group we chose 9 participants with previous knowledge of publishing at CEUR Workshop Proceedings, but 3 participants without prior knowledge of publishing at CEUR Workshop Proceedings. The participants who were not experienced in publishing at CEUR Workshop Proceedings were also from academia and had background in using CEUR Workshop Proceedings site. These participants were given training to publish at CEUR Workshop Proceedings so that we can balance our evaluation results.

We conducted two usability tests, one for CEUR Make and the other for CEUR Make Graphical User Interface. The design used to select the participants for each test is within subject design[1]. That means, for both the tests same participants participated, so that they have the same level of knowledge. This was also used so that the comparison of both the systems could be evaluated from each participant's perspective.

[1] http://www.statsmakemecry.com/smmctheblog/within-subject-and-between-subject-effects-wanting-ice-cream.html

4.1.2 Experiment Procedure

Usability test for both the systems were conducted separately on all user. Participants were given four tasks for both the tests that were further divided into smaller sections. The tasks were designed such that all the major use cases of the system could be tested. An example task is given as following:

Example: Task 4 - Search a Proceedings Volume

- Go to the proceedings page at ceur-ws.org
- Search the proceeding by the following name:
  - Cultures of Participation in the Digital Age 2015

The experiment procedure could be further divided into two categories as two different usability testing techniques were used. Two techniques that were used are described as following:

Think Aloud Design Setup

Number of participants who participated in the Think Aloud Design setup were 6. For the Think Aloud experiment, participants were provided with task sheet for both the systems as given in Appendix A and B. The participants were then timed for their tasks and notes were taken for the problems they faced or their unusual mental models. The task completion time for each task was recorded so that it could be used to make comparison analysis in both the systems.

Question Asking Design Setup

Number of participants who participated in the Question Asking design setup were also 6. Evaluator performed the tasks that are provided in task sheet for both the systems as

given in Appendix A and B. The participants were allowed to ask questions during the interview and the notes of the interview were made in parallel. It was interactive session and the participants were also allowed to use the system. The interview session was conducted through skype.

After the experiment in both the usability test setups, the participants were provided with post study questionnaire that are discussed in the next Section 4.1.3.

4.1.3 Usability Evaluation Questionaire

In order to evaluate user satisfaction and user experience of the system, participants were asked to fill in two post study questionnaires and a demographics form. It was an electronic survey and Google Form[2] was used to create and conduct the survey. The post study questionnaire was divided into three sections System Usability Scale, Question for User Interaction Satisfaction and a questionnaire related to demographics. Each of the questionnaire and its importance is discussed briefly below:

System Usability Scale

According to a study SUS gives best results for small sample sizes.

System Usability Scale(SUS)[33] was used to analyse the general experience of users with the system. SUS is widely used in industry for analysing the user satisfaction with the system. The advantages of SUS are that it is quick and cheap. It is also good with large sample sizes, such that the calculation is fairly simple even with large sample size. SUS consists of 10 questions. Users can rate each question from a Likert scale ranged from 1 to 5. 1 stands for strongly agree and 5 stands for strongly disagree.

In order to calculate the final results, there is a specific technique. 1 needs to be subtracted from the user response of an odd question and for even question user response needs to be subtracted from 5. In this manner all the user responses

[2] https://docs.google.com/forms

would be converted from 0 to 4 range, where 0 is the most negative response. After this, for each user add up all the responses and multiply it by 2.5. It would convert the responses from a range of 0 to 100.

In order to evaluate the CEUR Make System Usability Score result we analyse it using the key provided in Figure 4.1. The SUS score key[32] is based on the results analysed after evaluating 500 systems over usability. System Usability Scores above 80 means a good usability, 68 means an average usability and below 51 means the system needs an immediate usability improvement.

Please view Section A.2.2 in Appendix A or Section B.2.2 in Appendix B to view complete list of questions asked in SUS questionnaire.

AVG System Usability Scale score is 68
80.3 or higher is an A. People love your site and will recommend it to their friends
68 or thereabouts gets you a C. You're doing OK but could improve
51 or under gets you a big fat F. Make usability your priority now and fix this fast.

Figure 4.1: System Usability Scale Key

Question for User Interaction Satisfaction

QUIS is developed by two usability experts: Dr. Ben Shneiderman and Dr. Kent L. Norman.

SUS give an overall usability assessment of the system. Therefore, we also used Question for User Interaction Satisfaction(QUIS)[10] in order to get insights about different areas. Those areas that can be evaluated using QUIS[10] are general reaction to software, learning curve, system capabilities, screen display and terminologies. As these were the areas we were interested in for investigating in terms of usability evaluation, we use QUIS questionnaire.

To gather satisfaction ratings QUIS-style paired adjective questions were used. Users can rate each question from a Likert scale ranged from 0 to 9. 0 stands for most negative answer and 9 stands for most positive answer. A mean score was calculated for each question. A mean score below 4.5 shows negative response and above 4.5 shows positive response where 4.5 shows neutral response.

Please view refer Section A.2.2 in Appendix A or Section B.2.2 in Appendix B to view complete list of questions asked in QUIS questionnaire.

4.1.4 Dataset for Usability Testing

A standard dataset was used in order to test the usability of the system. This was used so that when users create the files required to generate workshop proceedings, all of the users have the same data. In this way the results of individual users could be compared. Hence, this was important in order to achieve task completion time estimates. Choosing a standard dataset, for two different systems allowed the users to experience same time complexity while entering the data, in this way task completion time addressed more about system usability. The dataset for both the tests could be viewed in Appendix A and Appendix B.

4.2 Usability Evaluation of CEUR Make

In this section we will describe the results attained during the usability testing of CEUR Make. The approach taken is described in previous Section 4.1. The users identity is kept confidential due to the privacy.

There are two main techniques that are used to conduct the usability testing, which are Think Aloud and Question Asking. Think Aloud was used because it gives realistic results that are close to user's experience, while Question Asking was used because it can be conducted remotely. Combining both was important as half of our participants were remote participants. Therefore, we chose design techniques that were similar but had the difference of usability test environment. For both of these usability testing types, in three main stages test results were recorded that are: Demographics, Usability Evaluation Interview and Post Evaluation Questionnaire. Usability Evaluation Interview is further divided into Qualitative and Quantitative results.

Quantitative results were recorded using Think Aloud Design setup and six participants participated in it, while Qualitative results were recorded using both Think Aloud Design and Question Asking Design setup. Six participants participated in recording the Qualitative results. We discuss these in the following sections:

4.2.1 Participants

Overall twelve participants took part in the usability testing of the CEUR Make. Participants of CEUR Make usability test were all academic researchers. The prerequisite of participating in the usability test of CEUR Make was the background knowledge of publishing proceedings. Participants had varying native languages, ages and experience with computers. All the participants had majors in computer science or related field. The specifics of the participants are discussed below:

Think Aloud Design Setup

The participants who participated in the Think Aloud Design setup were from age 28 to 32. In order to avoid gender biases half of the participants were male and the other half female. All the participants who participated in the Think Aloud Design setup had knowledge of publishing proceedings.

As our tool deals with CEUR Make and CEUR Workshop Proceedings, we also got participants knowledge regarding these domains. It was hard to find all the users who had knowledge of publishing at CEUR Workshop Proceedings and who used CEUR Make to publish proceedings as they were located remotely all around the globe. Therefore, we found three participants who had the knowledge of CEUR Make and CEUR Workshop Proceedings and the other three without any previous knowledge. In this way 50 percent of participants had the knowledge and the other 50 percent didn't had the knowledge, so that the results could be normalized. The participants who didn't had

knowledge of using CEUR Make and publishing at CEUR Workshop Proceedings were given training so that they could have some experience and they could match up to the skill set of other half of users.

Question Asking Design Setup

The participants who participated in the Question Asking design setup were from age 28 to 41. Two of the participants were female and the other four male. All the participants who participated in Question Asking design setup had immense experience of publishing proceedings and also to publish proceedings at CEUR Workshop Proceedings. All of them had experience of publishing proceeding using CEUR Make too. These participants were all consistent users of the system and had shared feedback and pointed problems based on their immense experience.

Overall, all the participants who participated in the usability test had good experience in publishing proceedings. Seventy five percent of participants had experience of publishing proceedings at CEUR Workshop Proceedings and also using CEUR Make to publish proceedings. The comparison of experience of participants who participated in Think Aloud and the ones who participated in Question Asking Design setup is shown in Figure 4.2

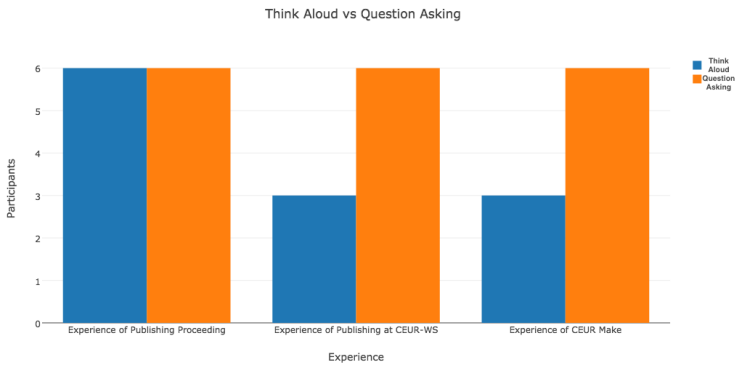


Figure 4.2: Experience Comparison of Participants: Think Aloud VS Question Asking

4.2.2 Usability Evaluation Interview

The results of the usability evaluation interview could be divided into two sections:

- Quantitative: Task Completion Time
- Qualitative: Notes, Feedback

Both of these results are presented in following sections:

Quantitative Results

The users were asked to Think Aloud while performing their tasks, the time to complete the task was recorded by a stopwatch. Six participants actually participated in this type of experiment. The time taken to complete each task for all the six users is presented in detail in Appendix C Section C.1.2. Average time taken for all the users to complete task is shown in Table 4.1 and in Figure 4.3.

The tasks were designed in most natural order of generating a proceeding. Hence, Task 1 and Task 4 are easier which are just to initiate generation or to search a proceedings volume. Whereas, Task 2 and Task 3 are lengthier which are to generate the artifacts required for creating a proceeding. Task 2 requires user to create Workshop file which returns user with Copyrights form based on Workshop file created. So the average time taken for a user to complete a task is more for Task 1 and Task 2 as shown in Figure 4.3, whereas it is quite higher for Task 3 and Task 4. These average time taken to complete a task would be compared with our new system in Chapter 6.

Qualitative Results

Important notes were made in case of both the design setups, Think Aloud and Question Asking. The notes

Table 4.1: Average Time Taken To Complete A Task (Minutes)

Average Time Taken To Complete A Task	
Task 1 - Initiate Generation	0.13
Task 2 - Generate Workshop and Copyright Form	4.77
Task 3 - Generate Table of Contents and Zip Archive	2.40
Task 4 - Search a Proceedings Volume	0.76

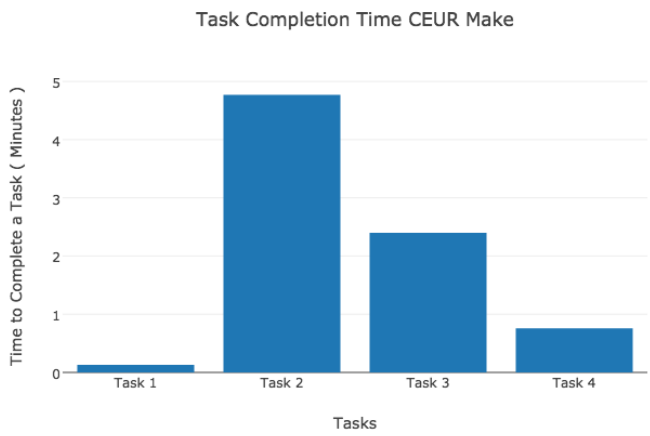


Figure 4.3: Average Time Taken To Complete A Task

recorded depict the mental model of users towards CEUR Make. It also states the problems faced by the users and the things they liked about the system.

So we categorized the qualitative results into different sections such as Learnability, Navigation, Speed, Error and Help, Documentation, Portability, Interface in order to quantify the qualitative results.

The positive feedback can be categorized into three main sections that are Speed, Documentation and Task as you can see in Figure 4.4. The highest feedback as you can see in Figure 4.4 is for Task performance. Users felt that it helped them perform the task easily and it reduces a lot of work on their side. Speed and Documentation got nearly equal feedback. As CEUR Make is a terminal based utility so it is quite robust and lightweight which was appreciated by the

users. Users also appreciated the descriptive documentation available online for setting up and using CEUR Make.

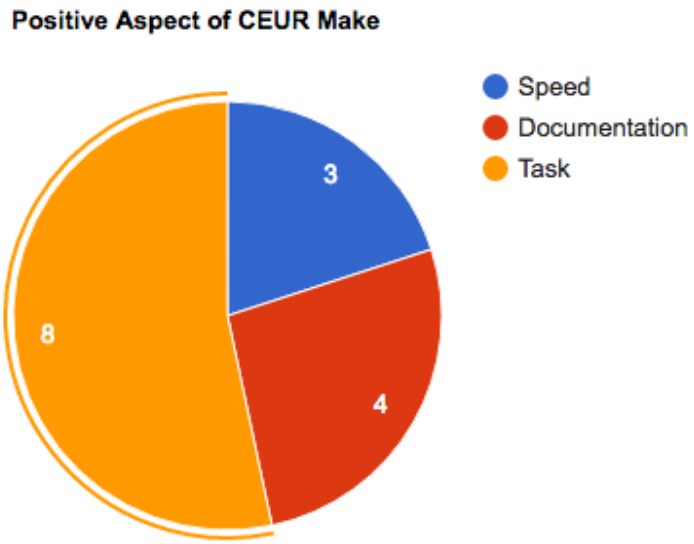


Figure 4.4: Qualitative Feedback: Positive Feedback for CEUR Make

The negative feedback can be categorized into six main sections that are Learnability, Navigation, Portability, Dependency, Error and Interface as you can see in figure 4.5. The highest negative response from users was for Learnability. Users felt that it has a huge learning curve and as the use is not quite frequent, so it requires relearning every time they want to use it. Navigation, Dependency and Interface got equal negative response from the users. Users felt that they had to deal with too many applications at the same time, which required a lot of window switching and it was not good. Users also felt that the system has dependency on different softwares which is hard to set up. As CEUR Make is a terminal based utility, so users thought that it would be good if it can be more modern and easy to use graphical user interface based application. Users also complaint about the portability of the application which is limited to only linux based environments and the fact the feedback for the errors is not easily understandable.

More details of qualitative results could be viewed in Appendix C, Section C.1.2 and Section C.2.2.

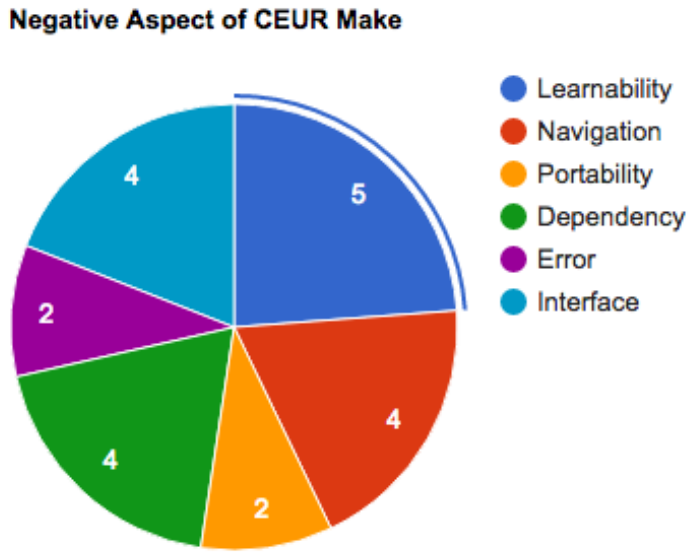


Figure 4.5: Qualitative Feedback: Negative Feedback for CEUR Make

4.2.3 User Satisfaction Questionnaire

After conducting usability test in both types of design setups, Think Aloud and Question Asking we asked users to fill in post test questionnaire. In this section, we present the results for two types of questionnaire that are System Usability Scale and Question for User Interaction Satisfaction.

System Usability Scale

System usability Scale is used to analyse overall usability of the software. The key for System Usability Scale is given in the Figure 4.1. Complete results for score per each question our presented in detail in the Appendix C, Section C.1.3 and Section C.2.3. From the Table 4.2 we could see that none of the users SUS score for the Think Aloud Design setup is above 51 and according to the key as shown in the Figure 4.1 it is pathetic usability. For the Question Asking design setup apart from one user who lies above average score,

Table 4.2: System Usability Scale Results for CEUR Make

System Usability Scale Results			
	Think Aloud Design Setup		**Question Asking Design Setup**
User 1	50	**User 7**	72.5
User 2	42.5	**User 8**	40
User 3	37.5	**User 9**	32.5
User 4	20	**User 10**	45
User 5	30	**User 11**	45
User 6	50	**User 12**	30
Average	38.3		44.2

the SUS score for the rest of the users is well below passing criteria that is 51. The average SUS score for all the 12 users is calculated below:

Average SUS score for Think Aloud Design setup participants **(SUS1)** = 38.3

Average SUS score for Question Asking design setup participants **(SUS2)** = 44.2

Average SUS score for Question Asking design setup was relatively better then Think Aloud Design setup as all the participants of Question Asking design setup were relatively more experienced in publishing using CEUR Make. The difference is just of 5.9 which is insignificant as both of the scores are well below the passing criteria which is a SUS score of 51.

Average SUS score for all the participants = x

$$x = \frac{SUS1 + SUS2}{2} = \frac{38.3 + 44.2}{2} = 41.25$$

Hence, the average SUS score for all the participants is **41.25**. It is well below the passing criteria for SUS questionnaire which can be seen in Figure 4.6 and therefore the usability of the application must be improved.

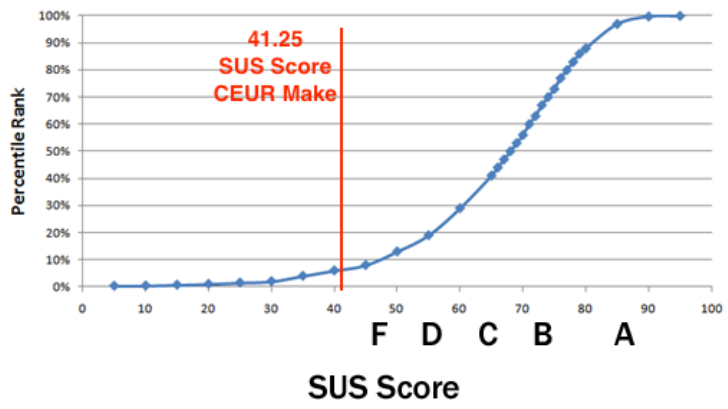


Figure 4.6: System Usability Scale Score for CEUR Make

Question for User Interaction Satisfaction

Question for User Interaction Satisfaction is used to realise different parts of usability in an application. We presented QUIS to the users in case of both design setups, Think Aloud and Question Asking design setup. The details of QUIS scores for each user is presented in Appendix C, Section C.1.2 and Section C.1.2. Average score per question for QUIS is shown in Figure 4.7 and in Figure 4.8. The mean scores encircled in red are below average, which means they need attention in terms of usability improvement.

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA	Mean Score
1.	terrible											wonderful		4.75
2.	difficult											easy		4.5
3.	frustrating											satisfying		5
4.	inadequate power											adequate power		6.75
5.	dull											stimulating		4.75
6.	rigid											flexible		4.75
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	
7. Reading characters on the screen	hard											easy		5.5
8. Highlighting simplifies task	not at all											very much		2.25
9. Organization of information	confusing											very clear		4
10. Sequence of screens	confusing											very clear		4.5
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	
11. Use of terms throughout system	inconsistent											consistent		5.5
12. Terminology related to task	never											always		5.75
13. Position of messages on screen	inconsistent											consistent		4
14. Prompts for input	confusing											clear		4
15. Computer informs about its progress	never											always		3.25
16. Error messages	unhelpful											helpful		3.5

Figure 4.7: Question for User Interaction Satisfaction Average Score per Question for CEUR Make - Part 1

Overall reaction to the system was satisfactory as the mean scores per question were all marginally above average. Sys-

LEARNING		0	1	2	3	4	5	6	7	8	9		NA	Mean Score
17. Learning to operate the system	difficult											easy		3.25
18. Exploring new features by trial and error	difficult											easy		4.25
19. Remembering names and use of commands	difficult											easy		3.75
20. Performing tasks is straightforward	never											always		5.75
21. Help messages on the screen	unhelpful											helpful		3.75
22. Supplemental reference materials	confusing											clear		6.5
SYSTEM CAPABILITIES		0	1	2	3	4	5	6	7	8	9		NA	
23. System speed	too slow											fast enough		7.75
24. System reliability	unreliable											reliable		5.25
25. System tends to be	noisy											quiet		6
26. Correcting your mistakes	difficult											easy		5.25
27. Designed for all levels of users	never											always		3
		0	1	2	3	4	5	6	7	8	9		NA	

Figure 4.8: Question for User Interaction Satisfaction Average Score per Question for CEUR Make - Part 2

tem capabilities were also satisfactory apart from one question which has an average score of 3. The only question in system capabilities that has an average below mean is that the system is designed for all level of users. It is understandable as in qualitative results also users pointed out the problem, that the system is not designed for all level of users. The publishers at CEUR Workshop Proceedings have different level of expertise with command line utilities, hence it is desirable to make it usable for all potential publishers at CEUR Workshop Proceedings.

The most problematic areas according to mean scores per question for QUIS are Terminology and System Information, Learning and Screen. As shown in Figure 4.9, both the areas Information and Learning had 4 questions out of 6 that scored below mean. In Learning section of QUIS questionnaire users found it difficult to remember the commands, learn to use the system, exploring new features and assistance on screen. In Information section users found problems with prompts for input, position of messages, progress report and error messages. The third problematic area according to QUIS questionnaire is Screen in which 2 questions out of 4 are below average. In the Screen section, users found problems in information architecture and highlighting of tasks. The results of QUIS questionnaire further back the qualitative notes taken during evaluation interviews and the SUS score.

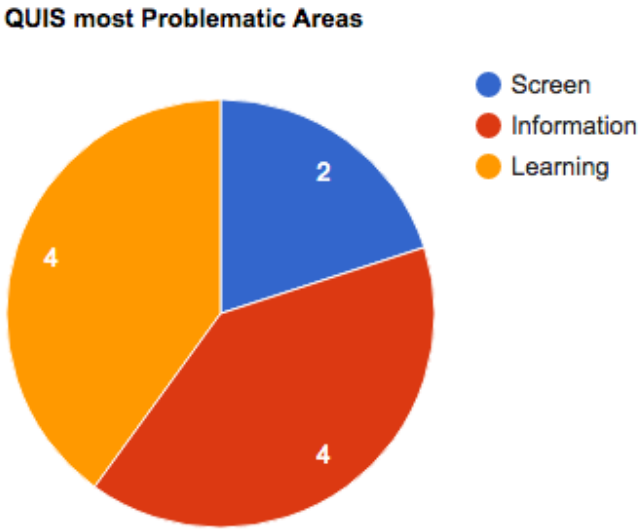


Figure 4.9: Most Problematic Areas according to QUIS for CEUR Make

4.2.4 Summary

In this chapter we presented the general approach that we took for conducting usability tests. Then we presented the results of usability tests for CEUR Make. Overall, we tested on 12 users from which 6 users participated in Think Aloud Design setup and other 6 participated in Question Asking design setup. For Think Aloud Design setup users were recorded for task completion time and notes on their mental models and feedback were taken. In case of Question Asking design setup experimenter performed the tasks and users evaluated the system, for which notes were recorded. After evaluation interview in both the design setups users were asked to fill in System Usability Scale questionnaire for overall usability of the system and Question for User Interaction Satisfaction questionnaire for analyzing user satisfaction with different usability aspects of the system. Results for time completion per task were satisfactory. Average SUS score was 41.25 which was very low, that means systems needs to be improved. QUIS questionnaire spotted three main problems in the system from usability perspective that we're learning curve was high, information architecture of the system needs to be improved and the

system is not assistive. Hence, from the results of the usability evaluation of CEUR Make we derived requirements for our system. In the next chapter that is Chapter 5 we will present the design and implementation of our new system and in Chapter 6 we will evaluate the usability of our new system and compare it to CEUR Make.

Chapter 5

Design and Implementation of CEUR Make Web Interface

This chapter presents the design and implementation of CEUR Make web interface. After usability evaluation of CEUR Make as discussed in Chapter 4 we came up with CEUR Make Graphical User Interface. CEUR Make Graphical Interface is a web interface for CEUR Make. We choose to design a web interface based on the usability evaluation of CEUR Make that had problems in areas such as portability, interface, learnability, navigation, dependency and task performance.

This chapter contains two sections, in first section we describe the architecture of the Ceur Make Graphical User Interface and in the second section we describe the interface elements of the system.

5.1 Architecture

In this section we describe the architecture of the CEUR Make Graphical User Interface in detail. Ceur Make Graphical User Interface's architecture is shown in figure 5.1. Basically, the system architecture is divided into three layers that are: Interface Layer, Middleware Layer and Storage Layer.

Interface Layer consists of all the presentation elements. It is responsible in displaying visual elements, handling the dependencies on external libraries for user interface elements, styling the web pages and managing the user interactions with the web pages. It is also responsible in initiating communication with middleware based on user's request and displaying the results from middleware.

Middleware Layer is responsible in generating artifacts that are required for publishing at CEUR Workshop Proceedings. Middleware Layer creates the files as requested by the Interface Layer and also communicates with the Storage Layer for temporary storage of files to be presented to the user.

Storage Layer stores the files that are created temporarily on the server. It separates the files based on user identity and then also based on the workflow that the user chooses to create the artifacts for publishing at CEUR Workshop Proceedings.

In the following sections we will explain all three layers in more detail:

5.1.1 Interface Layer

This section will explain the general file structure at the Interface Layer, the dependent user interface libraries included and their usage, main interface files and their roles and the validation of the forms.

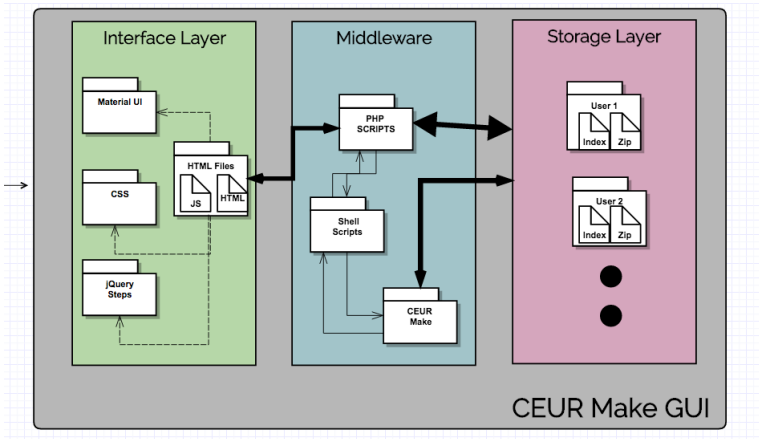


Figure 5.1: CEUR Make Graphical User Interface Architecture

MaterialUI

Throughout the interface MaterialUI design techniques are used. One of the most used design element from MaterialUI in CEUR Make Graphical User Interface is Card design pattern. It is explained in the Section 5.2.3. Content material is shown using Cards. Cards usually have a header, body section and action section. Header usually holds title, body displays the main attributes associated to the material being displayed using Card and action section shows the list of buttons that could trigger actions associated to that material. Figure 5.2 shows an example of representing a proceeding using a Card. The whole Card is enclosed in a HTML based *div* with two children *div* that are assigned classes of card-content and card-action. The *div* with class of card-content contains the body using normal HTML syntax displaying the metadata of a proceeding and title of a proceeding. The *div* with class card-action contains the actions associated to proceedings for example visiting the online version of workshop proceeding. The buttons used to trigger actions are coded in regular HTML, but the associated CSS classes gives them MaterialUI design look.

The second most used MaterialUI design technique is a Toast. Toasts are used to give feedback to the user on any events success or failure. Toast can take any position on the

```
<div class="card grey lighten-3">
  <div class="card-content black-text">
    <span class="card-title">
      <a href="http://ceur-ws.org/Vol-1648/" target="_blank">Vol-1648 Knowledge-
      based Techniques for Problem Solving and Reasoning 2016.</a></span>
      <div class="divider"></div>
      <br/>
      <p>Proceedings of the Workshop on Knowledge-based Techniques for Problem
      Solving and Reasoning (KnowProS 2016), New York City, USA, July 10, 2016.
      </p>
      <p>Edited by: Roman Bartak, Thomas Leo McCluskey, Enrico Pontelli
      </p>
      <p>Submitted by: Enrico Pontelli
      </p>
      <p>Published on CEUR-WS: 25-Jul-2016
      </p>
  </div>
  <div class="card-action spacingWorkshop">
        <a class="waves-effect waves-light btn "  href="http://ceur-ws.org/Vol-
        1648/" target="_blank">ONLINE</a>
        <a class="waves-effect waves-light btn " href="urn:nbn:de:0074-1648-1"
        target="_blank">URN</a>
        <a class="waves-effect waves-light btn "
        href="ftp://SunSITE.Informatik.RWTH-Aachen.DE/pub/publications/CEUR-
        WS/Vol-1648.zip" target="_blank">ARCHIVE</a>
  </div>
</div>
```

Figure 5.2: MaterialUI based Card: Proceedings Code

screen. An example Toast after the creation of Table of Contents file is shown in the Figure 5.3. Code for a Toast based feedback on creating Table of Contents file is shown below:

```
Materialize.toast(
 'Table Of Contents Has
 Been Successfully Created!',
 3000,
 'rounded'
) ;
```

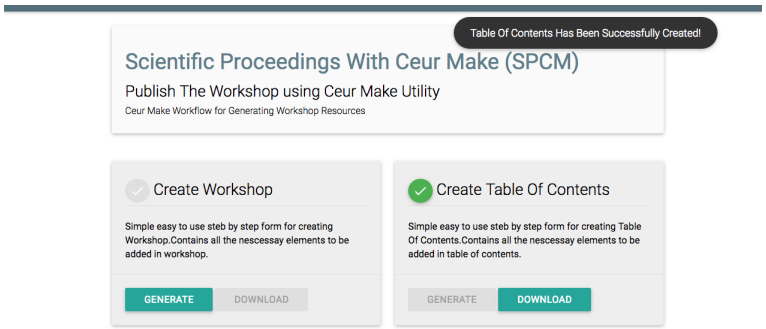


Figure 5.3: Toast: Feedback Toast after Table of Contents Creation

It is function based Toast generation. First argument of the function takes as input string based message to be dis-

played as a feedback. The second argument takes time for which the toast should last on screen in milliseconds and the third argument is related to its styling that the edges of the Toast should be with rounded corners.

jQuery Steps

jQuery Steps is an external JavaScript library that is used to create stepwise wizard for presenting the user with stepwise form. We use jQuery stepwise wizard for presenting user with views for generating Table of Contents file as shown in the Figure 5.15 and Workshop file as shown in the Figure 5.15. Stepwise form is created in two steps. We will discuss the creation of stepwise while keeping in mind the creation of wizard for Workshop file generation view. There is a HTML section and a JavaScript section. The HTML Code for Workshop wizard is shown below:

```
<div id="wizard2">
<h1>Metadata</h1>
<div id="Metadata">
//HTML fields for filling in
//workshop metadata..
</div>
<h1>Conference</h1>
<div id="Conference">
//HTML fields for filling in
//conference metadata associated
// to workshop..
</div>
<h1>Editors</h1>
<div id="Editors">
//HTML fields for filling in
//workshop metadata..
</div>
</div>
```

As shown in the code whole wizard is enclosed in a HTML based *div* with a unique *id*. There are three steps of the wizard and each step has a name represented using HTML *h1*

tag and the body of that section represented in a *div*. The JavaScript code of the wizard is shown below:

```
var wizard = $("#wizard2").steps({
onStepChanging: function(e,
currentIndex, newIndex)
{//As wizard has three steps so pressing
// previous and next buttons
// could create six possibilities ..
//using if we check all

if( currentIndex == 0 && newIndex == 1)
{}
if( currentIndex == 1 && newIndex == 2)
{}
if( currentIndex == 2 && newIndex == 0 )
{}
if( currentIndex == 2 && newIndex == 1)
{}
if( currentIndex == 1 && newIndex == 0 )
{}
if( currentIndex == 0 && newIndex == 2)
{}
},
onStepChanged: function (event,
currentIndex, priorIndex)
{//check all the conditions on
//step changed....
if (currentIndex == 1 && priorIndex == 0)
},
onFinishing: function (event,
currentIndex)
{//on pressing finishing button
},
onFinished: function (event,
currentIndex)
{//when everything is done...
//used to hide the form
},
});
```

For initializing the wizard, one needs to use jQuery func-

tion syntax and the argument for the function should be the *id* of the parent *div* in which the whole wizard is enclosed as discussed while explaining the HTML section of the wizard. The function is then further divided into four main child functions that are *onStepChanging*, *onStepChanged*, *onFinishing* and *onFinished*. *onStepChanging* function is called everytime the user presses previous or next button for changing the step of the wizard. We have six conditions in that function as shown in the code above. As for Workshop wizard we have in total 3 steps and 6 possibilities of moving from one step to another so we use conditions to code for possible step movement. For example moving from step 1 to step 2 or moving from step 3 to step 1. *onStepChanging* is used for client side validation of the fields. *onStepChanged* funtion is triggered after *onStepChanging* has been executed and it is basically used to get field values and store it in temporary memory. For *onStepChanged* we also have six conditionals to execute the code according to step movement. *onFinishing* is like *onStepChanging* apart from one difference that it is triggered when user presses finish button and there are no more steps remaining. *onFinsihed* is triggered at the end when there are no more steps remaining and it is used to send server side requests.

Interface Layer File Strucure

The file structure of CEUR Make Graphical User Interface is simple with dependencies on two external libraries that are MaterialUI and Jquery Steps. These two libraries will be discussed in later sections. Apart from the external libraries, the Interface Layer of the CEUR Make Graphical User Interface is based on HTML format files that are the base views presented to the users of the system and CSS format files that help to stylize those views. Figure 5.4 shows the HTML and CSS files of CEUR Make Graphical User Interface. The first six files shown in the Figure 5.4 are HTML file types and the last four are CSS file types.

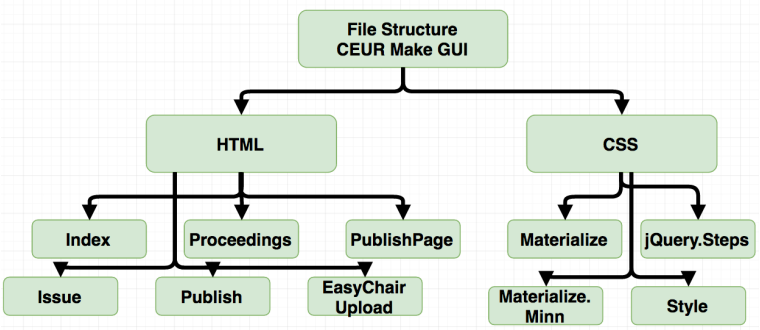


Figure 5.4: Interface Layer file Structure for CEUR Make Graphical User Interface

HTML Files

HTML files as shown in Figure 5.4 are supposed to present the view to the users of the system. In this section we will discuss the role of each HTML file in general and then we will present the example with the main use case presented by that HTML file. The interface elements of the views would be discussed in the Section 5.2.

Index.html: Index.html file is the view that the user views on entering the system. This view is responsible for presenting the announcements related to volume numbers allotted to publishers. This view also gives an introduction to CEUR Workshop Proceedings and CEUR Make. For each view the main content of the view would be viewed using a div class named container as shown below in the code section. The table used to display announcements is a regular HTML based table that is styled by a CSS class called table. The announcements are edited by the administrator of the CEUR Make Graphical User Interface. The associated attributes to each announcement are volume number, expected publishing date and name of the workshop proceeding for which volume number is reserved. These attributes are displayed in table header using normal HTML syntax and in the table body each row represents an announcement.

```
<div class="container">
  <div class="section">
    <h6 class="header col s12 light">
     Announcements
    </h6>
    <!--   Icon Section   -->
      <table class="table">
        <thead>
          <tr>
            <th>Volume Number</th>
            <th>Expected By</th>
            <th>Reserved For</th>
          </tr>
        </thead>
        <tbody id="addIssue">
          <tr>
            <td>Vol-1646</td>
            <td>2016-07-31</td>
            <td>
             Reserved for DMNLP-2016
             (Peggy Cellier)
            </td>
          </tr>
          <tr>
            <td>Vol-1638</td>
            <td>2016-08-05</td>
            <td>
            Reserved for ITNT-2016
            (Denis V. Kudryashov)
            </td>
          </tr>
        </tbody>
      </table>

  </div>
  <br><br>
</div>
```

Issue.html: The Issue.html file is the view that user uses to publish an issue related to CEUR Make Graphical User Interface. The Issue view presents view for two use cases, that are publishing an issue related to the system and view-

ing an issue already published related to the system. HTML table syntax is used to display the issues just like announcements table. The classes used for styling the table are the same across the system. For publishing an Issue user is presented with a HTML syntax form. On user's form submission the field values are acquired using JavaScript and an Ajax request is sent to the PHP schript at path Scripts/Index.php at Middleware Layer. The script returns the success message which is then displayed on the current issues table.

Proceedings.html: The Proceedings.html file is the view that the user uses to view all the proceedings published at CEUR Workshop Proceedings and along with that the user can search a proceeding already published. For listing the proceedings we use Card design pattern as discussed with an example in an earlier section of MaterialUI. Autocomplete design pattern is used to provide a search functionality to users. Autocomplete design pattern is discussed in the Section 5.2.3.

Publish.html: Publish.html view presents users with two options of generating a workshop using CEUR Make Graphical User Interface workflow or by EasyChair workflow. The two choices are presented using Card design pattern.

PublishPage.html: PublishPage.html file is the view that presents user with two stepwise wizards, one for creating Workshop file and the other one for creating Table of Contents file. Both of the wizards are created using the code discussed in jQuery Steps section earlier. After the form validation and temporary field storages for Workshop wizard an Ajax request is sent to a PHP script named workshopCreate.php for creating Workshop.xml and Copyrights form. The code for Ajax request is shown below:

```
var data = JSON.stringify(workshopArray);
var xhr = new XMLHttpRequest();
xhr.open(
"POST",
"workshopCreate.php",
!0
);
xhr.setRequestHeader(
"Content-Type",
"application/json;charset=UTF-8"
);
xhr.send(data);
xhr.onreadystatechange = function ()
{
if(xhr.readyState == 4 &&
xhr.status == 200)
{// in case we reply back from server
jsondata = xhr.responseText;
    //after Workshop Creation
       copyrightsFormCreation( );
  }
 }
```

As we can see in the code it an Ajax request the data from the fields is sent as a JSON array to the server and if the workshopCreate.php script running on server side is able to create Workshop.xml, another function is called that creates the Copyrights form based on Workshop.xml metadata. After Workshop.xml and Copyrights form when user follows the wizard for creating Table of Contents XML format file, a similar Ajax request is sent to another PHP script named doc.php. If the script is successful in creation of Table of Contents file, another script creates all the resources required for publishing at CEUR Workshop Proceedings.

EasyChairUpload.html:

EasyChairUpload.html is the view that allows user to generate artifacts required for CEUR Workshop Proceedings using a wizard to create Workshop.xml just like created in case of PublishPage.html. Instead of Table of Contents wizard we import EasyChair resources to create Table of Con-

tents. An Ajax request is sent to a PHP script called ManagingExtract that uploads the EasyChair resources to the server and creates Table of Contents file and other artifacts required to publish proceedings at CEUR Workshop Proceedings.

CSS

For CSS four main files are used for styling the interface elements as shown in the Figure 5.4. Materialize.css and Materialize.min.css are both same files with only one difference Materialize.min.css is compressed and the other is not compressed. Materialize.css sets the theme of the application based on Material design. It is downloaded from Materializecss site [1]. It is preferable not to customize it. For customization and overriding we use Style.css. Jquey.steps.css is the file that sets the theme of the step wise wizards used for generating Table of Contents and Workshop files as shown in the Figure 5.15 and the Figure 5.16.

Validation

Form validation is done using regular expressions. The regular expressions used to validate forms could be seen in the JavaScript section of the code files PublishPage.html[2] and EasyChairUpload.html[3].

Throughout the thesis this technique is used to validate the forms as CEUR Make is also doing server side validation using regular expressions so in order to maintain standards we used regular expression based validation on client side.

[1] http://materializecss.com/
[2] https://github.com/ceurws/ceur-make-ui/blob/master/CeurMakeGUI/index/PublishPage.html
[3] https://github.com/ceurws/ceur-make-ui/blob/master/CeurMakeGUI/index/easyChairUpload.php

5.1.2 Middleware Layer

The Middleware layer file structure is shown in the Figure 5.5. Middleware layer is responsible for receiving the requests from Interface layer and provide Interface layer back with the things required. Middleware layer of CEUR Make Graphical User Interface is based on PHP scripts. The layer is divided into three main sections Scripts, CEUR Make GUI workflow and EasyChair workflow. The Scripts sections contains general scripts, CEUR Make GUI workflow contains script related to that workflow and EasyChair section contains scripts related to EasyChair workflow. The Middleware is discussed in more detail as following:

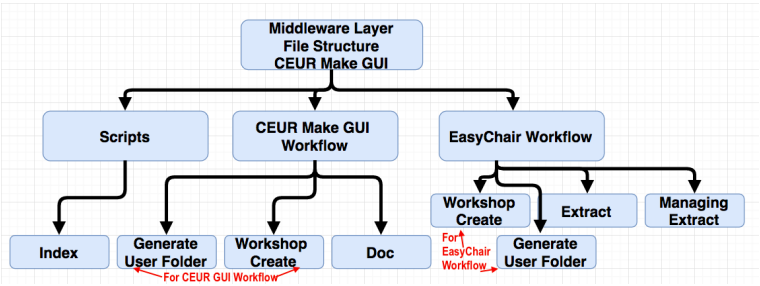


Figure 5.5: Middleware Layer File Structure

Scripts/Index.php: This PHP script is responsible to send the request at CEUR Make's github repository with the issue details provided by the user using the GitHub API[4]. Once the issue is submitted it returns the success message to Issue.html view.

CEUR Make GUI Workflow/GenerateUserFolder.php: This PHP scripts creates user directory in the userDirectories of Storage Layer. It maintains the session of the user. The user directory is given a unique id. It returns the directory name to the PublishPage.HTML so that client side is aware of the user session. Session is maintained by keeping the route to the files created by a particular user. This is essential as the CEUR Make script is dependent on multiple artifacts and the output is created in parts so to keep track of a particulars user file creation it is essential.

[4] `https://developer.github.com/v3/`

CEUR Make GUI Workflow/doc.php: This PHP script receives as a JSON object the field values from the Table of Contents wizard. It is received using an Ajax request from PublishPage.HTML. The PHP script reads the JSON object and translates it into an XML file, following the format of CEUR Make. In order to transform JSON Object of array to XML, PHP SimpleXML Functions are used.

CEUR Make GUI Workflow/WorkshopCreate.php: This PHP script receives as a JSON the field values from Workshop wizard. It is received using an Ajax request from PublishingPage.HTML. The PHP script reads the JSON object and translates it into an XML, just like in the case of Table of Contents.

EasyChair Workflow/GenerateUserFolder.php: This PHP scripts creates user directory in the EasyChair directory of Storage Layer. It maintains the session of the user just like in case of CEUR Make GUI Workflow. The user directory is given a unique id. It returns the directory name to the EasyChairUpload.html so that client side is aware of the user session.

EasyChair Workflow/WorkshopCreate.php: This PHP script receives as a JSON the field values from Workshop wizard of EasyChairUpload.html. It is received using an Ajax request from EasyChairUpload.html. The PHP script reads the JSON object and translates it into an XML, just like in the case of WorkshopCreate.php of CEUR Make GUI Workflow.

EasyChair Workflow/Extract.php: This PHP script receives a request from the client side that is EasyChairUpload.html to upload and unzip a zip archived based EasyChair resources. It is received using an Ajax request from EasyChairUpload.html. The PHP script reads the metadata of the zip archive and creates a new directory with the contents of zip file.

EasyChair Workflow/ManagingExtract.php: This PHP script receives as a JSON the field values from Table of Contents wizard of EasyChairUpload.html. It is received using an Ajax request from EasyChairUpload.html. The PHP

script reads the JSON object and translates it into an XML, just like in the case of WorkshopCreate.php of CEUR Make GUI Workflow. It then creates the Table of Contents file.

5.1.3 Storage Layer

The storage layer file structure is shown in the Figure 5.6. Storage layer is responsible for storing files. Storage layer stores the data in three main directories that are JSON, EasyChair and UserDirectories. The structure of these directories is discussed in detail below:

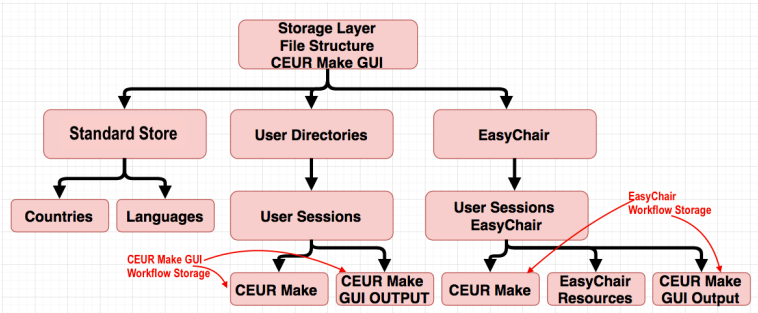


Figure 5.6: Storage Layer File Structure

Standard Store

This directory in storage layer contains JSON format file types. Currently CEUR Make Graphical User Interface is maintaining two JSON format file types as shown in the Figure 5.6. The JSON format file types are Countries and Languages. These files are used to store in JSON format all the countries of the world and all the languages of the world. This is important to present user with all the options of countries and languages while user is filling in details for metadata of Table of Contents and Workshop files.

UserDirectories

This directory as shown in the Figure 5.6 maintains the sessions of the users while they use CEUR Make Graphical User Interface workflow for creating workshop proceedings. Against every session for generating resources manually a user directory with unique name is created. The user session directory further contains CEUR Make scripts and CEUR Make Graphical User Interface outputs based on CEUR Make Graphical User Interface manual workflow.

EasyChair

This directory maintains the sessions of the users as shown in the Figure 5.6 while they use EasyChair resources based workflow for creating workshop proceedings. Against every session for generating resources manually a user directory with unique name is created. The user session directory further contains CEUR Make scripts, imported EasyChair resources and CEUR Make Graphical User Interface outputs based on EasyChair workflow.

5.2 User Interface

This section will present the sitemap of the application, different views, the important design patterns used while creating the views and the User Centered Design methodology followed in creating the CEUR Make Graphical User Interface.

5.2.1 Sitemap

The sitemap of the CEUR Make Graphical User Interface is shown in the Figure 5.7. The main view is the Home view which can be seen on entering the CEUR Make Graphical User Interface. Navigation Menu helps to navigate be-

tween top level views Home, Proceedings, Publish and Issues. The Home view can further display a detailed Announcement view. Proceedings view displays a list of proceedings and clicking on any proceeding can take user to a detailed Proceedings View. Publishing view displays options for publishing proceedings, therefore user can choose between two options that are Publishing using a EasyChair resources that is a zip archive with a list of papers and copyrights form or manually creating the resources for publishing a proceeding. By choosing any option user can view the detailed view of publishing a proceeding using that option. Issue view presents user with fields with which they can report an issue related to CEUR Make Graphical User Interface system and along with that it also presents the issues raised by the other users.

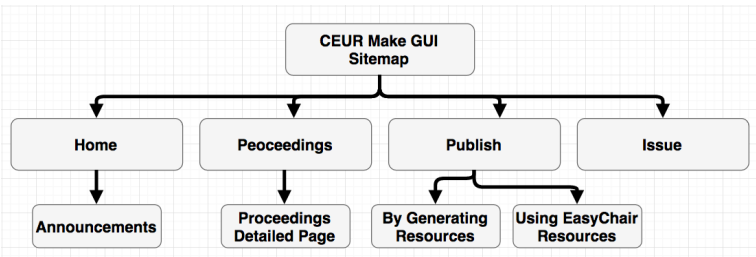


Figure 5.7: Sitemap of CEUR Make Graphical User Interface

5.2.2 Interface Design

This section will present the design and layout of the five main views, navigations through those views and their different states. So the detail to these views are given as following:

Navigational Menu

Navigational menu of CEUR Make Graphical User Interface is shown in the Figure 5.8. It remains same across all the views discussed further. Therefore, Navigational menu is not shown in the figures presented in the later sections. It

is presented for quick navigation between the main views of the application that are Home, Proceedings, Publish and Issue views.

Figure 5.8: Navigational Menu

Footer Menu

Footer menu of CEUR Make Graphical User Interface is shown in the Figure 5.9. It remains same across all the views discussed further. Therefore, Footer menu is not shown in the figures presented in the later sections. It is presented for information related to submission, information related to submission using CEUR Make or CEUR Workshop Proceedings site and information related to team.

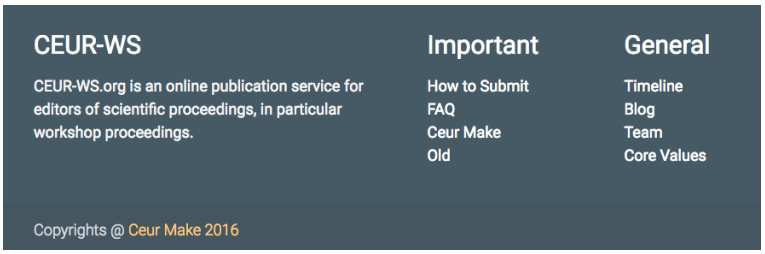


Figure 5.9: Footer Menu

Home View (Index.html)

Figure 5.10 shows the Home view. The main section of the view shows the announcements related to the reserved volume numbers for publishing proceedings in form of a table. The rest of the view shows piece of information related to CEUR Workshop Proceedings and CEUR Make.

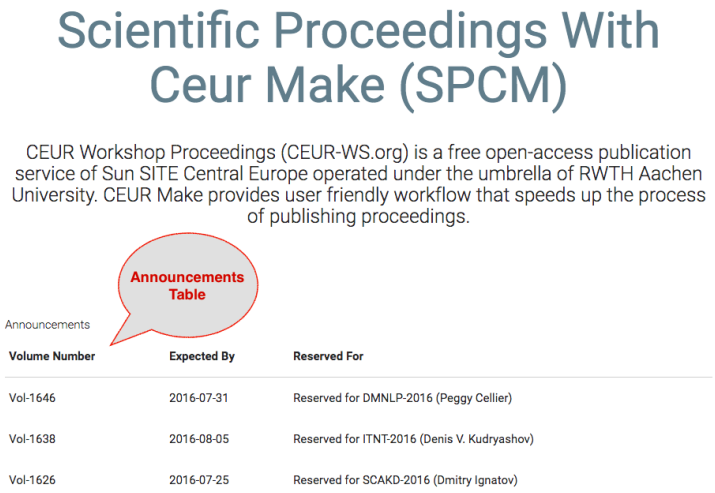


Figure 5.10: Index View

Issue View (Issue.html)

The Issue view is shown in Figure 5.11. The view is divided into two sections, the first section shows the current issues in the form of a table and the rest of the view presents user with the fields to report an issue.

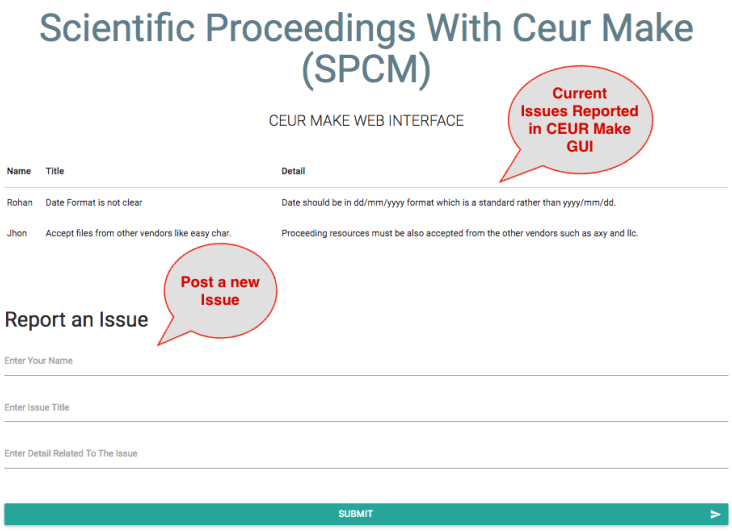


Figure 5.11: Issue View

Proceedings View (Proceedings.html)

The Proceedings view is shown in Figure 5.12. The view provides a search bar to search different proceedings. Each proceeding is displayed as a card with a short description. Clicking on the name of the proceeding or the online button would take the user to the published version of the proceeding.

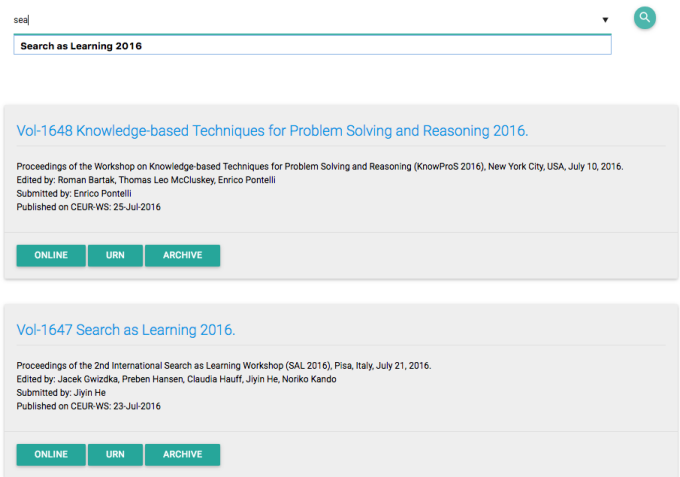


Figure 5.12: Proceedings View

Publish View (Publish.html)

The Publish view presents two options to the users of the system. Users can either generate workshop proceedings by creating the Table of Contents and Workshop files by the wizard provided by CEUR Make Graphical User Interface or the users can upload the Table of Contents from EasyChair and create Workshop file by the wizard provided by CEUR Make Graphical User Interface. Publish view presents these two options to the users as shown in the Figure 5.13

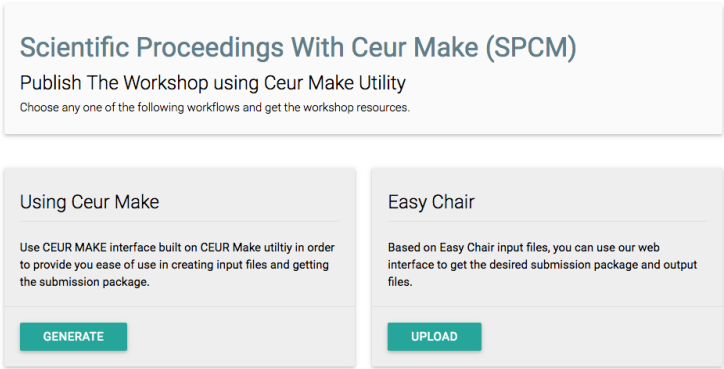


Figure 5.13: Publish View

PublishPage View (PublishPage.html)

The PublishPage view gives users option to create two required files for generating proceedings that are Workshop and Table of Contents. User can create anyone of the files first depending on their choice. Figure 5.14 shows the view with the option of creating the files.

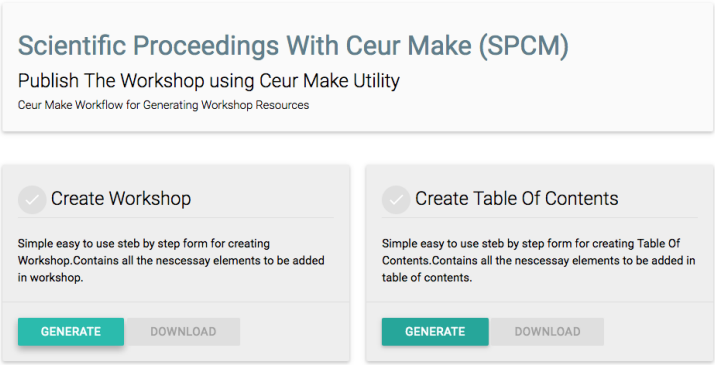


Figure 5.14: File Generation View

Figure 5.15 shows the stepwise form for creating metadata for Table of Contents. It is divided into two steps. The first step requires filling in metadata related to session and the other requires filling in metadata related to associated papers presented at the workshop proceedings.

Figure 5.16 shows the stepwise form for creating metadata for Workshop. It is divided into three steps. The first step

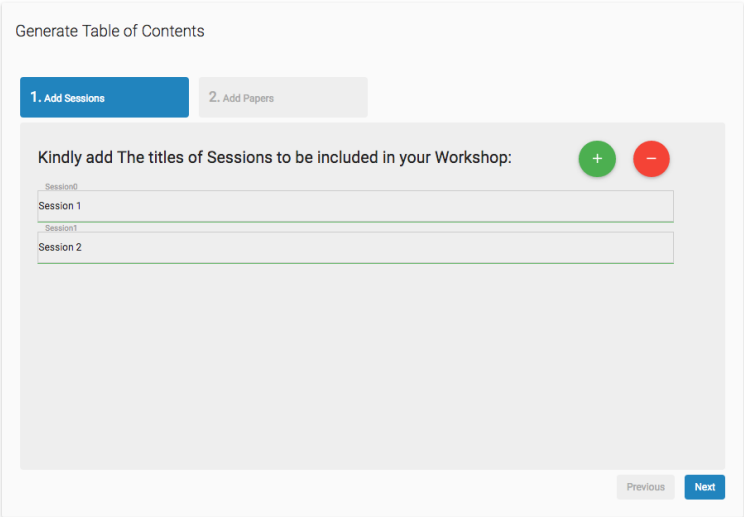


Figure 5.15: Table of Contents File Generation Wizard

requires filling in metadata related to workshop in general, the second step requires metadata of associated conference to the workshop and the third step requires the metadata of associated editors of the workshop proceedings.

Once the user have created the two files using the stepwise forms. The user is presented with all the artifacts required for publishing the workshop proceedings at CEUR Workshop Proceedings. The final state is shown in the Figure 5.17. The system presents with downloadable artifacts that are Workshop file, Table of Contents file, Copyrights form, Zip archive, BibTex Database and Index.html. Workshop and Table of Contents files are the generated files using the stepwise forms. Index file is the generated workshop proceedings layout. Copyrights form is generated using Workshop metadata. Zip archive is the ready to submit package at CEUR Workshop Proceedings. The important thing to note in the interface is that in the Figure 5.14 the download button and the check sign were disabled because at that time user was still suppose to create the Table of Contents file and Workshop file. While in the Figure 5.17 both of them are enabled signifying the completion of steps.

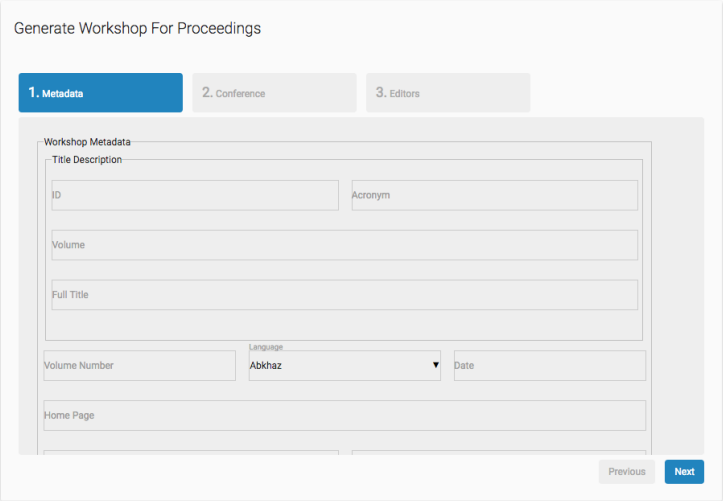


Figure 5.16: Workshop File Generation Wizard

EasyChairUpload View (EasyChairUpload.html)

The interface elements for EasyChairUpload view are all same as of PublishPage view apart from the Table of Contents file creation. Instead of wizard for Table of Contents file the user is provided with upload option of resources provided by EasyChair. Table of contents file is created through the resources provided to the user by EasyChair. Figure 5.18 shows the EasyChairUpload view.

5.2.3 Design Patterns

This section describes the usability design patterns used while designing the CEUR Make Graphical User Interface.

Design Pattern: Pagination[36]

Image: Image of the Pagination design pattern as used in CEUR Make Graphical User Interface could be seen in the Figure 5.19.

What: Lots of similar sorted user interface elements on a

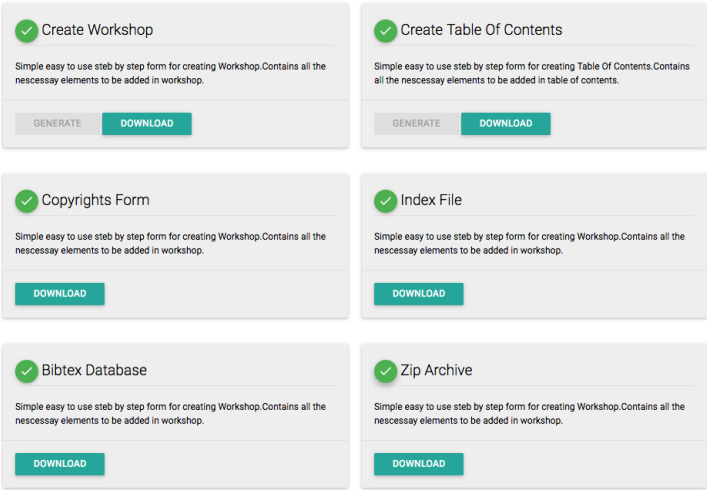


Figure 5.17: Resources Generated by CEUR Make Graphical User Interface

single page. In our case proceedings in most recent order.

Use When: When the page contains a lot of user interface elements on the same page and to view a particular element the page requires a lot of scrolling.

Why: A list of similar user interface elements on a single page means that the user is being displayed a large number of elements among which most recent ones are of more importance and the later ones are of less importance.

How: Use list buttons to view ordered list of user interface elements. Each button should hold a standard number of user interface elements against it. The buttons should be numbered in an order of content items for example from recent to old proceedings.

Design Pattern: Autocomplete[34]

Image: Image of the Autocomplete design pattern as used in CEUR Make Graphical User Interface could be seen in the Figure 5.20.

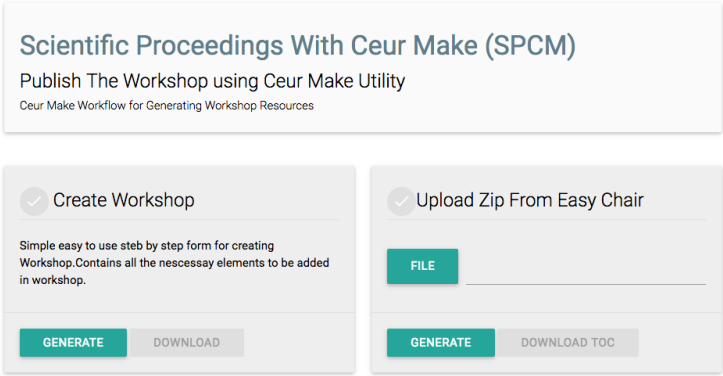


Figure 5.18: EasyChairUpload View

What: User interface elements should be easily accessible. For example in our case proceedings should be easily searchable.

Use When: Difficulty in remembering the full names of user interface elements data and more chances of errors while searching. For example hard to remember the proceedings name.

Why: It is hard to search content items with large names or where the full names are not known and the user searches based on keywords. For example in our case user can't remember the full name of workshop proceedings and the user will most probably try to search the proceeding by the keywords.

How: Provide user with a search field which on entering alphabets and words displays filtered hint list as shown in the Figure 5.20.

Design Pattern: Card[35]

Image: Image of the Card design pattern as used in CEUR Make Graphical User Interface could be seen in the Figure 5.17.

What: User interface elements that consists of different elements and whose supported actions vary. For exam-

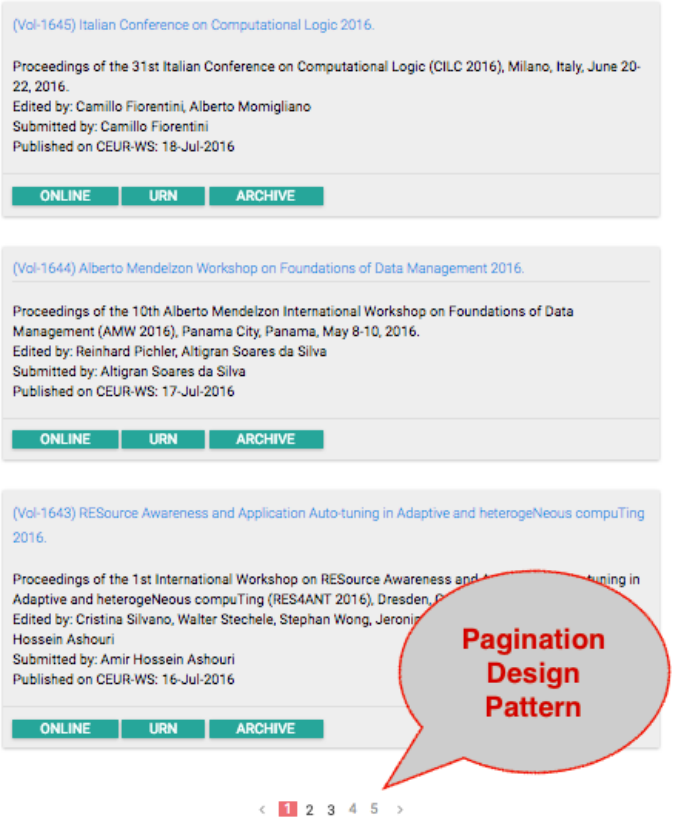


Figure 5.19: Design Pattern: Pagination

ple in our case they are different artifacts for publishing proceedings.

Use When: When user interface element as a whole consists of multiple data types for example text and numbers.

Why: So that the group of similar user interface elements with varying actions and data types can appear as an individual material and at the same time, can adjust in the design layout with other materials.

How: Provide user with a layout divided into sections. The sections can be divided into header, body and footer.

Figure 5.20: Design Pattern: Autocomplete

Design Pattern: Wizard[37]

Image: Image of the design pattern as used in CEUR Make Graphical User Interface could be seen in the Figure 5.15 and 5.16.

What: Helps user in completing the task step by step in a defined order. For example in our case of creating Workshop.xml.

Use When: Used when the tasks are longer and when user is willing to give control to the system of sequence of the events.

Why: The task can become much simpler in user's mental space by dividing the task into smaller pieces.

How: By dividing the whole task into smaller steps. The steps should appear one by one by one to the user. User could use next and previous buttons to toggle between the tasks. The task should be divided such that it eliminates the data redundancy and makes it much efficient for user to perform the task.

5.2.4 User Centered Design

In order to design the interface of the system user centered design approach was followed. We went through three major iterations with a lot of smaller iterations. In this section we will present the three major iterations and the important findings in those iterations.

Iteration One: Low Fidelity Prototype

In this iteration we developed paper prototypes and electronic prototypes using Balsamiq Mockup[5]. The prototypes well defined the navigations of the CEUR Make Graphical User Interface and the major use cases of the CEUR Make Graphical User Interface. When discussed with the users of CEUR Make they found it interesting as CEUR Make was dependent on external libraries and was not portable whereas they really liked the idea of portability in CEUR Make Graphical User Interface and the fact that it was not dependent on any other softwares also made them happy. An example prototype presented to the users is shown in the Figure 5.21.

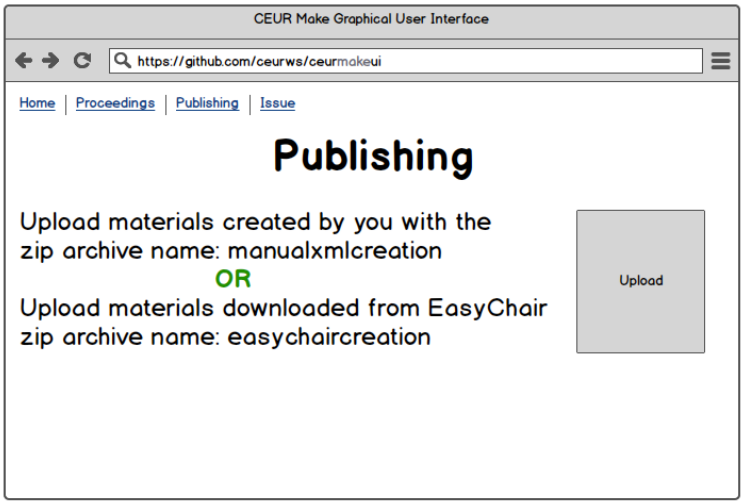


Figure 5.21: Iteration One: Mockup

Iteration One: Medium Fidelity Prototype

Based on the iteration one feedback we translated the low fidelity prototypes into medium fidelity prototypes. Using Bootstrap[6], HTML and CSS. In iteration two we introduced some new features to test upon users that include an animated announcement ticker as shown in the Figure 5.22

[5] https://balsamiq.com/products/mockups/
[6] http://getbootstrap.com/

and a proceedings page as shown in the Figure 5.23 with a brief description of proceedings. We also translated the view shown in the Figure 5.21 to a medium fidelity prototype shown in the Figure 5.24.

The user feedback on this iteration was positive but users required a bit of change. Users did not like the announcements animated ticker, but they liked the proceedings detail with a suggestion that it can contain some more description. Regarding the publishing page users wanted system to aid them more in publishing a proceeding.

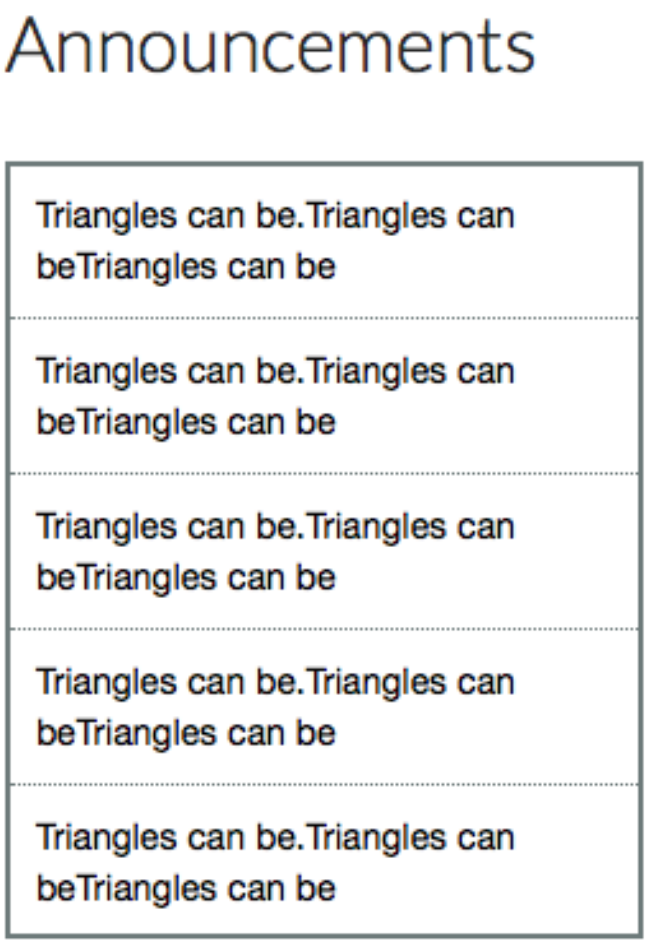
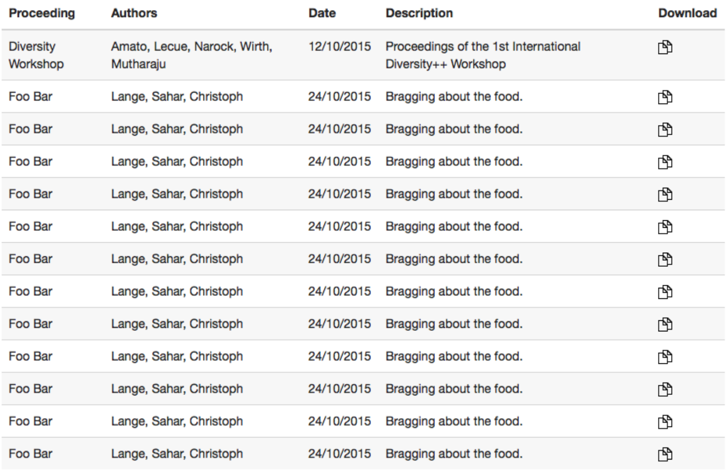
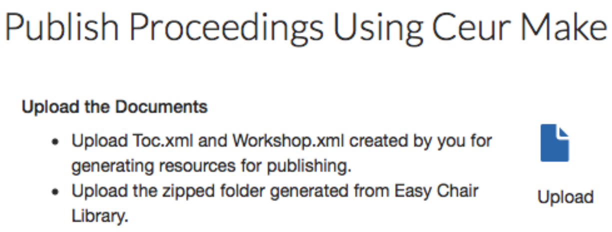


Figure 5.22: Iteration Two: Announcements Page



Proceeding	Authors	Date	Description	Download
Diversity Workshop	Amato, Lecue, Narock, Wirth, Mutharaju	12/10/2015	Proceedings of the 1st International Diversity++ Workshop	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋
Foo Bar	Lange, Sahar, Christoph	24/10/2015	Bragging about the food.	📋

Figure 5.23: Iteration Two: Proceedings Page



Publish Proceedings Using Ceur Make

Upload the Documents

- Upload Toc.xml and Workshop.xml created by you for generating resources for publishing.
- Upload the zipped folder generated from Easy Chair Library.

Figure 5.24: Iteration Two: Publish Page

Iteration Three: High Fidelity Prototype

Based on the user feedback in iteration two, we designed iteration three. The iteration three is discussed in the Section 5.2 in detail. The major things that were introduced in iteration three as discussed before in interface section were the wizard for creating the Workshop and table of Contents file, Card based layout and total revamp of the application based on material design principles.

Chapter 6

Usability Evaluation and Comparative Evaluation of CEUR Make GUI

> "Even the best designers produce successful products only if their designs solve the right problems. A wonderful interface to the wrong features will fail." - Jakob Nielsen

In this chapter we will evaluate the usability of our new system, CEUR Make Graphical User Interface that we presented in the previous chapter. Then we will compare the usability results of CEUR Make with CEUR Make Graphical User Interface.

6.1 Usability Evaluation of CEUR Make Graphical User Interface

In this section we will describe the results attained during the usability testing of CEUR Make Graphical User Interface. The approach taken is described in previous section 4.1.

The techniques used and the stages in which usability tests were recorded are the same as discussed in Chapter 4, Section 4.2. We discuss these in the following sections:

6.1.1 Participants

As we discussed in Chapter 4 in Section 4.1.1 that we choose within subject design, so our users remain the same as they were for the usability test of CEUR Make. To go through the details of participants who participated in the usability test of CEUR Make Graphical User Interface, you can refer to Chapter 4, Section 4.2.1.

As in CEUR Make usability test the first 6 users participated in the Think Aloud Design setup and the other 6 in Question Asking Design setup. Likewise, in the usability test of CEUR Make Graphical User Interface the same 6 users participated in the Think Aloud Design setup and the other six in the Question Asking Design setup.

6.1.2 Usability Evaluation Interview

The results of the usability evaluation interview could be divided into two sections:

- Quantitative: Task Completion Time
- Qualitative: Notes, Feedback

Both of these results are presented in following sections:

Quantitative Results

The experiment was performed in the same manner as in case of CEUR Make. The time taken to complete each task for all the six users is presented in detail in Appendix D sec-

Table 6.1: Average Time Taken To Complete A Task

Average Time Taken To Complete A Task (Minutes)	
Task 1	0.10
Task 2	2.88
Task 3	1.46
Task 4	0.10

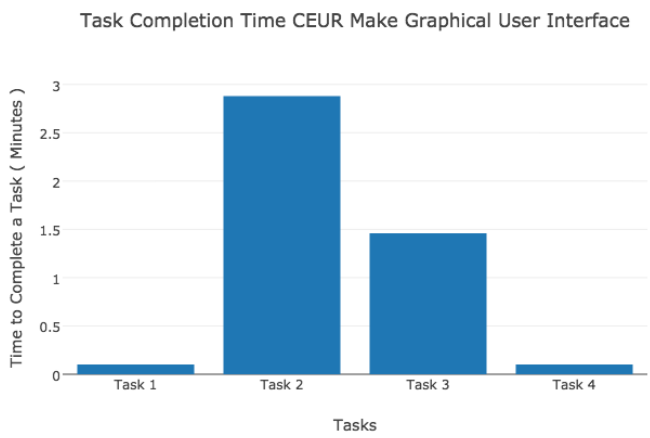


Figure 6.1: Average Time Taken To Complete A Task

tion D.1.2. Average time taken for all the users to complete task is shown in table 6.1 and in figure 6.1.

Like CEUR Make the tasks were presented in most natural order of appearance. Users took more time on Task 2 and Task 3, whereas users took nearly one tenth of a minute to complete Task 1 and Task 4 which is quite speedy. In case of Task 2 and Task 3 we would compare the task completion time of CEUR Make with CEUR Make Graphical User Interface in the Section 6.2. It would help us compare the results of both the systems and evaluate which is more efficient in terms of task completion.

Qualitative Results

Important notes were made in case of both the design setups, Think Aloud and Question Asking. The notes

recorded states the problems faced by the users and the things they liked about the system.Detailed qualitative results are presented in the Appendix D.

So we categorized the qualitative results into different sections such as learnability, navigation, error and help, portability, interface, dependency and feature in order to quantify the qualitative results.

The positive feedback can be categorized into six main sections that are learnability, navigation, portability, error, interface and dependency as shown in the Figure 6.2. The highest feedback as shown in the Figure 6.2 is for interface. Users felt that the interface design was good and it was overall good experience to work with CEUR Make Graphical User Interface. Learnability and Navigation got second highest feedback. Users thought that the system was easy to adapt to and there was not much learning required before using the system. Users also felt that the navigational elements of user interface were designed keeping in mind their natural workflow. Dependency and Error got equally good response. Users felt good that the system was not dependent on any other systems as far client side of the system is concerned and it helped them commit less errors while performing the tasks. Users also appreciated the portability of the system, they felt good that it was a web interface that can be opened on any system and environment.

The negative feedback can be categorized into two main sections that are feature and navigation as you can see in the Figure 6.3. The highest negative response from users was on features. Users felt that the system had huge room for improvement in terms of features. Users had problem dealing with the navigation, as they felt that the state of the system should be stored for long navigations. This is presented as future work in the Chapter 7.

More details of qualitative results could be viewed in the Appendix D, Section D.1.2 and Section D.2.2.

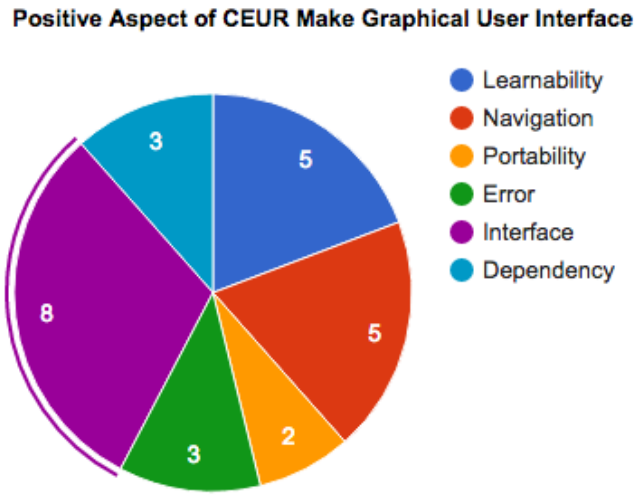


Figure 6.2: Qualitative: Positive Feedback

6.1.3 User Satisfaction Questionnaire

After conducting usability test in both types of design setups, Think Aloud and Question Asking. We asked users to fill in post test questionnaire. In this section, we present the results for two types of questionnaire that are System Usability Scale and Question for User Interaction Satisfaction.

System Usability Scale

Complete results for score per each question our presented in detail on Appendix D, Section D.1.3 and Section D.2.3. Summary of results for our System Usability Scale are shown in the Table 6.2. From the table we could see that none of the users who participated in the Think Aloud Design setup has SUS score below 80 and according to the key as shown in the Figure 4.1 it is an A. According to the key that means, "people will love the site and also recommend it to their friends". This signifies that the usability of CEUR Make Graphical User Interface is good. For the Question Asking Design setup, only two users had score that was below 80 but above 68 that means an average site which

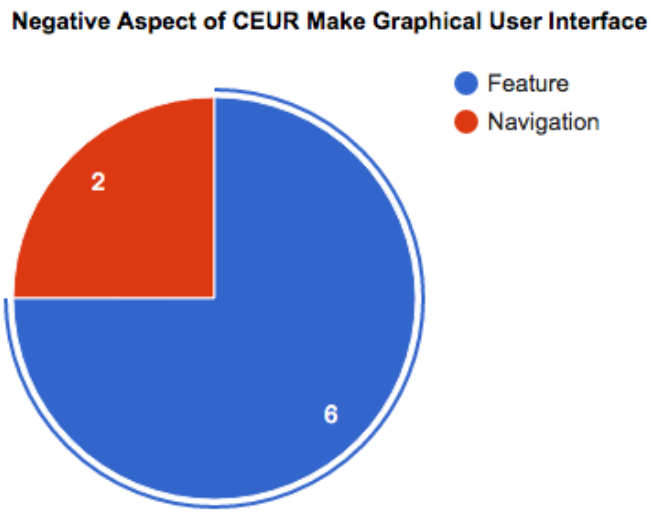


Figure 6.3: Qualitative: Negative Feedback

could still be improved. The rest four users had above 90 which again means really good usability. Overall SUS score for Question Asking Design setup was 86.25, which again appreciates the usability of the system. The average SUS score for all the 12 users is calculated below:

Average SUS score for Think Aloud Design setup participants **(SUS1)** = 87.9

Average SUS score for Question Asking Design setup participants **(SUS2)** = 86.25

Average SUS score for all the participants = y

$$y = \frac{SUS1 + SUS2}{2} = \frac{87.9 + 86.25}{2} = 87.08$$

Hence, the average SUS score for all the participants is **87.08**. It is well above A criteria for SUS questionnaire which could be seen in figure 6.4 and therefore the usability of the application according to SUS score is good.

Table 6.2: System Usability Scale Results for CEUR Make Graphical User Interface

System Usability Scale Results			
	Think Aloud Design Setup		**Question Asking Design Setup**
User 1	90	**User 7**	95
User 2	85	**User 8**	75
User 3	95	**User 9**	95
User 4	90	**User 10**	70
User 5	85	**User 11**	92.5
User 6	82.5	**User 12**	90
Average	87.9		86.25

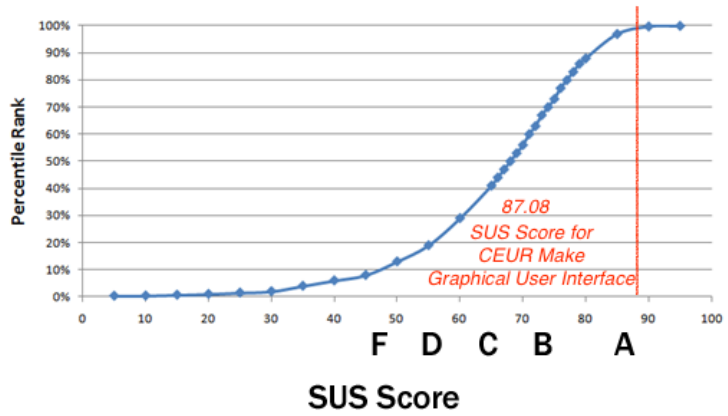


Figure 6.4: System Usability Scale Score for CEUR Make Graphical User Interface

Question for User Interaction Satisfaction

We presented QUIS to the users in case of both design setups, Think Aloud and Question Asking design setup. The details of QUIS scores for each user is presented in Appendix D, Section D.2.2 and Section D.1.2. Average score per question for QUIS is shown in the Figure 6.5 and in the Figure 6.6. The mean scores encircled in green are well above average, which means they are good usability aspects.

Overall reaction to the systems was very good as 19 out of 27 questions had mean scores well above average. Other

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA	Mean Score
1.	terrible											wonderful		7.25
2.	difficult											easy		7.25
3.	frustrating											satisfying		7
4.	inadequate power											adequate power		7
5.	dull											stimulating		7.5
6.	rigid											flexible		6
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	
7. Reading characters on the screen	hard											easy		8
8. Highlighting simplifies task	not at all											very much		6
9. Organization of information	confusing											very clear		7.75
10. Sequence of screens	confusing											very clear		8
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	
11. Use of terms throughout system	inconsistent											consistent		7.75
12. Terminology related to task	never											always		8
13. Position of messages on screen	inconsistent											consistent		8
14. Prompts for input	confusing											clear		6
15. Computer informs about its progress	never											always		6.25
16. Error messages	unhelpful											helpful		6

Figure 6.5: Question for User Interaction Satisfaction Average Score per Question for CEUR Make GUI - Part 1

LEARNING		0	1	2	3	4	5	6	7	8	9		NA	Mean Score
17. Learning to operate the system	difficult											easy		8.25
18. Exploring new features by trial and error	difficult											easy		8.0
19. Remembering names and use of commands	difficult											easy		8.5
20. Performing tasks is straightforward	never											always		8.0
21. Help messages on the screen	unhelpful											helpful		6.75
22. Supplemental reference materials	confusing											clear		5.75
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	
23. System speed	too slow											fast enough		7.0
24. System reliability	unreliable											reliable		6.25
25. System tends to be	noisy											quiet		7.25
26. Correcting your mistakes	difficult											easy		7.25
27. Designed for all levels of users	never											always		7.75
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**	

Figure 6.6: Question for User Interaction Satisfaction Average Score per Question for CEUR Make GUI - Part 2

questions had also mean scores on the margin of average score. Overall reaction to the software system was excellent as 5 out of 6 questions had mean score were well above average and the remaining one was exactly on the average. The screen design was also good as users felt the information was organized properly, it was easy to understand characters on the screen and sequence of screens was good. Users felt really good about the ease of use with which they can learn to operate the system, as we can see in QUIS questionnaire. Four out of six questions in Learning section have mean scores well above average. According to QUIS questionnaire results the users could easily explore new features, remembering task was easy and performing tasks were straightforward.

System Capabilities showed excellent results as shown in the Figure 6.6 users appreciated system speed and reliabil-

ity. Users also appreciated that the system was designed for all level of users and that it was easy to correct mistakes using CEUR Make Graphical User Interface. Terminology and System Information section had 3 questions with mean scores well above average and other 3 on the margin. Overall, QUIS questionnaire had mean scores above average and it signifies good usability of the CEUR Make Graphical User Interface.

6.2 Comparison of CEUR Make Graphical User Interface with CEUR Make

In this section we will compare the usability test results of CEUR Make with CEUR Make Graphical User Interface. We will compare the results step by step in which the usability evaluations were conducted. Statistics and evaluation results for Participants, Qualitative analysis, Quantitative analysis, System Usability Scale questionnaire and Question for User Interaction Satisfaction questionnaire will be presented in this section.

6.2.1 Participants

12 participants participated in both the usability evaluation tests. Participants for both the usability tests were the same as discussed in this chapter and chapter 4. This was done in order to compare the improvement of CEUR Make Graphical User Interface over CEUR Make. In this way participants had a reference point of what to compare with. This was also important for quantitative result analysis tp explore that what was their task completion rate on CEUR Make and what was their task completion rate on CEUR Make Graphical User Interface?

6.2.2 Quantitative Results Comparison

We will compare the task completion time in this section. The comparison is done task by task in order to compare the time required to complete a task with CEUR Make and CEUR Make Graphical User Interface.

TASK 1 Task 1 was to initiate generation of a proceeding. It was simple as in both kind of systems it was one step task. For CEUR Make users were supposed to enter a command and for CEUR Make Graphical User Interface users were supposed to press a button. As it was fairly simple, we don't see a significant difference in task completion time for this task as shown in the Figure 6.7. Average time taken for CEUR Make was 0.10 minute whereas for CEUR Make Graphical User Interface it was 0.13 minute. It was marginally high for the GUI but it can be ignored as GUI always take more time than running a command line utility.

TASK 2 Task 2 was the hardest task, it required creation of workshop.xml file. This was the task where users spent most of their time as we can see from the Figure 6.7. We can see significant reduction in task completion time in case of CEUR Make Graphical User Interface. On an average it took users 2.88 minutes to complete task 2 with CEUR Make Graphical User Interface whereas it took 4.77 minutes on an average with CEUR Make. Hence, we can see it as a significant improvement with our new CEUR Make Graphical User Interface.

TASK 3 Task 3 was similar to task 2 as it required creation of table of contents file creation. Just like task 2, for task 3 also users took less time to complete the task with CEUR Make Graphical User Interface then CEUR Make. We can again see a significant time reduction in task completion with CEUR Make Graphical User Interface as shown in the Figure 6.7.

TASK 4 Task 4 was to search a proceeding published at CEUR Workshop Proceedings. In this case with old portal users took almost 0.76 minute to find a proceeding where as

with CEUR Make Graphical User Interface they took only 0.10 minute. This again shows a significant improvement with new CEUR Make Graphical User Interface.

As discussed above, in general users took significantly less time to complete tasks with CEUR Make Graphical user interface. Hence, we see visible usability improvement with CEUR Make Graphical User Interface.

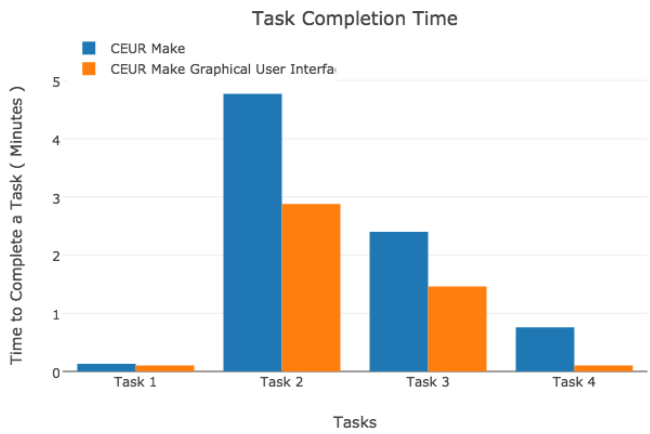


Figure 6.7: Task Completion Time Comparison

6.2.3 Qualitative Results Comparison

For both CEUR Make and CEUR Make Graphical User Interface we recorded notes to understand the user's mental model and the problems user faced while working with the two systems. If we compare the qualitative results of CEUR Make with CEUR Make Graphical User Interface we will see an interesting shift in usability.

As shown in figure 6.8, the things that users found negative in CEUR Make turned into positive things when we introduced CEUR Make Graphical User Interface to the users. With the introduction of CEUR Make Graphical User Interface users found that all the factors that made CEUR Make usability problematic was turned into factors that were positive in CEUR Make Graphical User Interface as shown in figure 6.8.

The positive usability factors in CEUR Make were speed, documentation and task. For CEUR Make Graphical User Interface users also thought that interface allows completion of task easily, as users did not gave feedback on the documentation. That can indicate that the user interface was self explanatory. Regarding speed, CEUR Make was a bit faster then CEUR Make Graphical User Interface but that's so marginal that users did not felt the difference in speed of the two systems. The factors that were reported as negative in CEUR Make Graphical User Interface were either more towards additional features or minor navigation issues.

Hence, we see a major usability improvement with the introduction of CEUR Make Graphical User Interface.

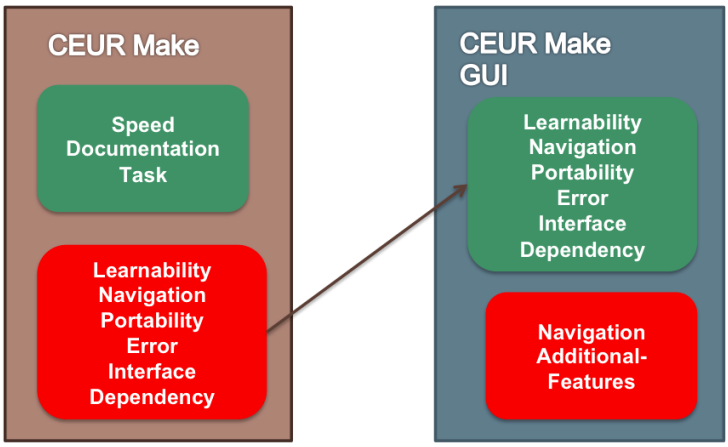


Figure 6.8: Qualitative Feedback Comparison

6.2.4 System Usability Scale Results Comparison

SUS questionnaire was used to measure the overall usability of CEUR Make and CEUR Make Graphical User Interface. System Usability Scale curve in the Figure 6.9 shows the SUS scores of both the systems, CEUR Make and CEUR Make Graphical User Interface. As shown in the Figure 6.9 the SUS score for CEUR Make was 41.25 which was below F grade, hence it means that the usability of the system should be improved immediately. On the other hand,

SUS score for CEUR Make Graphical User Interface was 87.08 which was well above an A grade. A grade in SUS score means that system has a good usability and the users would recommend it to others. Therefore, we can analyse that there is a huge improvement is usability with a web interface on the top of CEUR Make system. To conclude, the System Usability Score signifies that the CEUR Make Graphical User Interface has better usability than the CEUR Make.

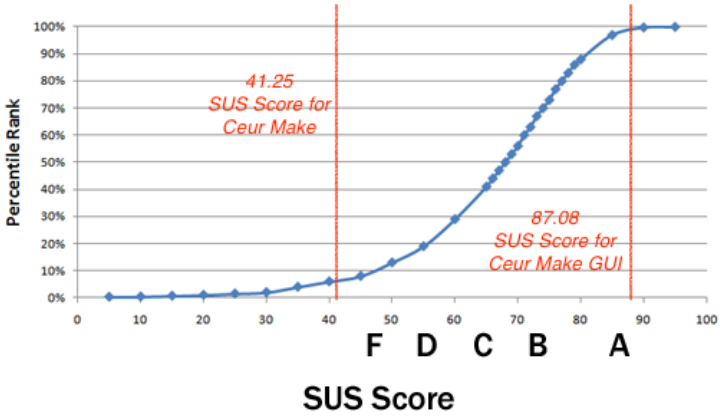


Figure 6.9: System Usability Scale Comparison

6.2.5 Question for user Interaction Satisfaction Comparison

QUIS questionnaire was used to measure the usability in different sections of CEUR Make and CEUR Make Graphical User Interface. Bar chart in the Figure 6.10 shows QUIS questionnaire average score comparison between CEUR Make and CEUR Make Graphical User Interface. The questions compared using the bar chart in the Figure 6.10 are the ones in which CEUR Make had lowest scores. We can see from the bar chart that CEUR Make Graphical User Interface had visible usability improvement in all those areas where CEUR Make had lowest usability scores. From the bar chart we can see that users rated the learning elements of the CEUR Make Graphical User Interface well above the CEUR Make as they felt it was easy to remember the commands, learning to operate the system and trying

new things by trial and error. All these three areas had a QUIS score below 4 whereas in case of CEUR Make Graphical User Interface it was 8 or above. Likewise, users also rated the information representation elements like information organisation, positioning of messages, highlighting of information, prompts and progress of the CEUR Make Graphical User Interface well above the average score that is 5. One of the most important findings from the QUIS score was that the users appreciated the fact that the CEUR Make Graphical User Interface was designed for all types of users, whereas CEUR Make was not designed for all types of users.

QUIS scores reflect a high usability improvement in CEUR Make Graphical User Interface over CEUR Make.

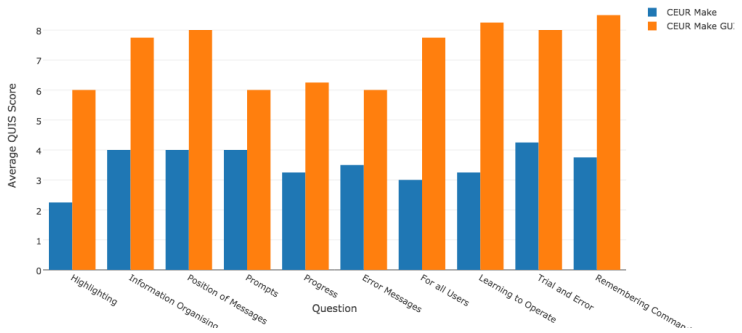


Figure 6.10: Question for User Interaction Satisfaction Comparison

6.3 Summary

In this chapter we presented the usability evaluation results of CEUR Make Graphical User Interface while using the same techniques used to evaluate the usability of CEUR Make in the Chapter 4. Then we compared the results of CEUR Make with CEUR Make Graphical User Interface. Results for time to complete a task for CEUR Make Graphical User Interface were reduced to more than the half of CEUR Make time. Qualitative results showed a major us-

ability shift from CEUR Make to CEUR Make Graphical User Interface as the negative usability metrics in CEUR Make like learnability, navigation, portability, error, dependency and interface were all changed to positive usability metrics of CEUR Make Graphical User Interface. Both usability evaluation questionnaires SUS and QUIS signified a good usability of CEUR Make Graphical User Interface over CEUR Make. Hence, it depicts that CEUR Make Graphical User Interface has a good usability and by adding few more features that we will present in the Chapter 7, it will further improve.

Chapter 7

Summary and future work

This chapter will present a brief summary of the thesis and will focus on highlighting the future work possibilities according to our research results.

7.1 Summary

This thesis aimed at automating the publishing workflow for open access scientific results and it focused on CEUR Workshop proceedings. In this thesis, we presented current approaches to publish workshop proceedings at CEUR Workshop Proceedings. We also conducted usability evaluation tests for CEUR Make, a command line utility that help publishers to publish at CEUR Workshop Proceedings. Three techniques were used to enquire the usability of CEUR Make, which includes task completion time evaluation, qualitative evaluation and post usability survey evaluation. Usability evaluation results of CEUR Make suggested that it had a low usability. Based on heuristic evaluations and user feedback on evaluation of CEUR Make, we present a Graphical User Interface for CEUR Make. Usability evaluation was also conducted for the Graphical User Interface of CEUR Make. The three techniques used to eval-

uate usability of CEUR Make Graphical User Interface were the same as used for CEUR Make. The techniques used were same to determine the usability results with the same environment, users, conditions and methodologies for both the systems because it helps to avoid biases and learning effects.

The comparison of task completion time6.2.2 suggests that CEUR Make Graphical User Interface is more efficient in completing the tasks, as for all four tasks the average task completion time results for CEUR Make Graphical User Interface were quite low when compared to CEUR Make. The comparison of qualitative evaluation6.2.3 based on multiple qualitative metrics also suggests that CEUR Make Graphical User Interface is a big interaction improvement over CEUR Make. Finally, post usability evaluation results4.2.3 also show clear that CEUR Make Graphical User Interface has improved usability over CEUR Make. As the System Usability Scale result of CEUR Make was 41.25 whereas for CEUR Make Graphical User Interface was 87.08. In case of Question for User Interaction Satisfaction questionnaire CEUR Make had poor results as 11 out of 27 questions had results below average and others were also satisfactory. CEUR Make Graphical User Interface again showed good average results for QUESTION for User Interaction Satisfaction questionnaire, as the results were all above average. Results of the usability evaluation of both the systems CEUR Make and CEUR Make Graphical User Interface indicate a noticeable usability improvement of CEUR Make over CEUR Make Graphical User Interface. The results also indicate the user interest in the system as it makes their process of publishing at CEUR Workshop Proceedings effective and efficient. The problematic qualitative metrics in CEUR Make were learnability, navigation, portability, error, interface and dependency. All of these metrics turned into positive ones when CEUR Make Graphical User Interface was tested, hence suggesting a major usability improvement over CEUR Make.

7.2 Future work

In this section we will present several areas in which we can improve the CEUR Make Graphical User Interface interaction with the users. The areas we present are based on the usability evaluations conducted in Chapter 6. Following are the areas, which can improve the efficiency and effectiveness of the CEUR Make Graphical User Interface:

7.2.1 User Profiling

Currently the CEUR Make Graphical User Interface is a web service that doesn't require a signup. Anyone can visit the web address and use the service. By introducing, user profiling[1] that means adding a signup functionality, we can enrich the user experience. This can make the system more efficient in task completion. Creating Index.html file for publishing workshop proceedings requires two main xml format files that are Table of Contents and Workshop file. Both of these store metadata associated with workshop proceedings. As the CEUR Make Graphical User Interface provides a user with step wise form, which requires user to fill the metadata as an input. User profiling can store users record and record of associated users so that each time user requires to fill in the forms he doesn't need to provide as an input from scratch but he gets hinting.

For example, Table of Contents form requires the name of the authors associated with the paper. Based on stored record and artificial intelligence algorithm, the system could suggest the name of the user as an author and people associated with him in previous submissions. Similarly, in case of filling the form for Workshop, name of the editors could be suggested by the system based on editors association in previous submissions.

[1] `https://github.com/ceurws/ceur-make-ui/issues/1`

7.2.2 Collaborative Space for Editors

A collaborative workspace for the editors could be another feature[2] of interest for the users as pointed out by the users in the qualitative results presented in the Appendix D, Section D.1.2. It would also enhance the usability of the system, from a publisher's point of view. Potentially there could be multiple editors of the workshop and they might work collaboratively in parallel to other editors. CEUR Make Graphical User Interface currently supports a single editor workflow. Usability evaluation results pointed out that editors like to work in parallel at the same time. Therefore, it would be a good feature as it can fill in the missing use case in current system and improve the usability of the system.

7.2.3 Automatic Identification of Paper, Titles and Page Numbers

Another area where usability of the system could be enhanced is filling information related to papers metadata. While filling in the fields for creating Table of Contents file, editor needs to add paper associated to a session and related information to that paper. The fields associated to paper that editors require to fill in while using the CEUR Make Graphical User Interface are title of paper, page numbers according to the volume and associated authors.

If system takes a bit more control at middleware, using a PHP script system could go through all the papers uploaded by the editors and do a bit of text scraping[3]. System could in this way able to retrieve title of the paper, total number of pages in the paper and the authors associated to the paper. Therefore, editor won't need to input as text in the fields, rather system would do it for the editor and editor could verify it. This really reduces the amount of data editor needs to input into fields while creating Table of Contents file, hence simplifying the task and making it

[2] `https://github.com/ceurws/ceur-make-ui/issues/2`
[3] `https://github.com/ceurws/ceur-make-ui/issues/3`

more efficient.

7.2.4 System State Saving

CEUR Make Graphical User Interface does not store the state of system[4] at any particular instance. So, it could be frustrating for the editor. As if, while filling in the fields for creating Table of Contents or Workshop file the user could get his page refreshed in which case he would need to fill in the fields once again. Similarly, if a user decides to leave in between of filling the fields and decides to return later, the user would need to do start from scratch. Hence, storing the state of the system at different instances could enhance the user experience of the CERU Make Graphical User Interface.'

7.2.5 Social Scientific Community

The area where open access CEUR Workshop Proceedings is lagging, is the usefulness of the volume published and its impact. This could be improved by introducing a system for rating or commenting on the different volumes published at CEUR Workshop Proceedings. This would make it more effective for the scientists. This would also add more value to the volumes published. A social connect to twitter and facebook could also allow single click sharing of the volume published at the CEUR Workshop Proceedings. In this way the scientific results will reach out to a larger audience and large number of scientists will be able to rate the results which will improve the credibility of the results being shared.

7.3 Conclusion

According to our usability test results CEUR Make Graphical User Interface is more usable than CEUR Make. The

[4] https://github.com/ceurws/ceur-make-ui/issues/4

points discussed in the section 7.2 also highlights the area where we could focus on based on usability issues to improve the usability of CEUR Make Graphical User Interface.

Appendix A

Usability Evaluation Form for CEUR Make

The resources presented in the following sections were used to measure and evaluate the usability of the CEUR Make.

A.1 Letter of Consent[38]

Dear Participant,

I invite you to participate in a research study entitled: *Usability Evaluation of CEUR Make* . I am currently enrolled in the Media Informatics Programme at RWTH Aachen University, Aachen, and am in the process of writing my (i.e., Master's Thesis). The purpose of the research is to determine: *How can the terminal based utility help publishers of proceedings to perform their tasks more efficiently?*

The enclosed questionnaire and task list has been designed to collect information on: *usability measurement and evaluation of CEUR Make.*

Your participation in this research project is completely voluntary. You may decline altogether, or leave blank

any questions you don't wish to answer. There are no known risks to participation beyond those encountered in everyday life. Your responses will remain confidential and anonymous. Data from this research will be kept under lock and key and reported only as a collective combined total. No one other than the researchers will know your individual answers to this questionnaire.

If you agree to participate in this project, please perform the tasks as mentioned in the enclosed evaluation interview for which your time will be recorded to complete the tasks and answer the questions on the questionnaire as best you can. It should take approximately 45 minutes to complete.

If you have any questions about this project, feel free to contact Rohan Asmat (Master Thesis Student) at m.rohan.a.asmat@gmail.com.

Thank you for your assistance in this important endeavor.

Sincerely yours,

Muhammad Rohan Ali Asmat

A.2 Usability Evaluation

For usability evaluation of the CEUR Make, you will have to go through two sets of rounds. In the first round that is Evaluation Interview round, you will be provided with set of tasks that you will have to perform as instructed for which you will be recorded and timed. In the second round that is evaluation questionnaire round you will have to fill up the questionnaire.

A.2.1 Evaluation Interview

In this section you will be required to perform certain tasks for which you will be recorded.The instructions are given

below and each task is described in detail which you would have to perform based on the instructions given.

Instructions

Four tasks are described below which would in total take fifteen minutes. Each task may take a minimum of one minutes and a maximum of five minutes. You have to perform all the tasks in the sequence presented below. All the tasks will be explained thoroughly by the interviewer before the evaluation begins. You are asked to allow questions during the evaluation but try to keep them as minimum as possible in order to simulate the actual user behaviour.

Task 1 - Initiate Generation

- Terminal is opened for you(on site users with evaluators mac and virtual users through screen sharing) please go into the directory as follows:
  - Desktop/usabilitytest/output

Hint: The command is : *cd Desktop/usabilitytest/output*

Task 2 - Generate Workshop and Copyright Form

Workshop Metadata

- Switch to editor opened in another window called sublime text and click on workshop.xml file.
- Use the data presented in the figure A.1 on page 111 for the first step of workshop.xml file i.e Workshop MetaData.

Conference Metadata

```xml
    <title>
        <id>foobar</id>
        <acronym>FooBar</acronym>
        <volume>Bargaining for Food</volume>
        <full>24th International Workshop on Bargaining for Food</full>
    </title>
    <number>XXX</number>
    <homepage>http://foobar2013.org</homepage>
    <language>eng</language>
    <location href="http://en.wikipedia.org/wiki/Bremen">Bremen, Germany</location>
    <date>2013-06-18</date>

    <conference>
        <acronym>FOO 2013</acronym>
        <full>1st International Conference on Abstract Nonsense</full>
        <homepage>http://foo2013.org</homepage>
    </conference>
```

Figure A.1: Workshop Metadata for Usability Test of CEUR Make

- Fill the second step of the xml file using the data presented in the figure A.2 on page 111 for the second step of workshop.xml file i.e Conference MetaData.

```xml
    <conference>
        <acronym>FOO 2013</acronym>
        <full>1st International Conference on Abstract Nonsense</full>
        <homepage>http://foo2013.org</homepage>
    </conference>
```

Figure A.2: Conference Metadata for Usability Test of CEUR Make

Editors Metadata

- Fill in the last step of the workshop.xml file i.e Editors. Use the data presented in the figure A.3 on page 112 to complete the workshop.xml file.

Generate Workshop.xml

- Switch back to terminal and run the following command:
    - Desktop/usabilitytest/output

```xml
<editors>
    <editor>
        <homepage>www.alicecarroll.com</homepage>
        <name>Alice Carroll</name>
        <affiliation>University of Wonders</affiliation>
        <country>United Kingdom</country>
    </editor>
    <editor>
        <homepage>www.langec.wordpress.com</homepage>
        <name>Christoph Lange</name>
        <affiliation>University of Bonn</affiliation>
        <country>Germany</country>
    </editor>
</editors>
```

Figure A.3: Editors Metadata for Usability Test of CEUR Make

Task 3 - Generate TOC and and Zip Archive

- Switch to editor called sublime text and click on toc.xml file which is an empty template table of contents file.
- Use the data presented in the figure A.4 on page 112 to complete the tableofcontents.xml file.

```xml
<toc>
    <session>
        <title>title of first session</title>
    <paper>
            <title>title of first paper</title>
            <pages from="2" to="6"/>
            <authors>
                <author>Alice Carroll</author>
                <author>Bob Lewis</author>
            </authors>
        </paper>
    </session>
    <session>
        <title>title of second session</title>
    <paper>
            <title>title of second paper</title>
            <pages from="7" to="10"/>
            <authors>
                <author>Alice Carroll</author>
                <author>Bob Lewis</author>
            </authors>
        </paper>
    </session>
</toc>
```

Figure A.4: Table of Contents Metadata for Usability Test of CEUR Make

- Switch back to terminal and run the following command:

- make ceur-ws/index.html
- make zip

Task 4 - Search a Proceeding

- Go to the proceedings page at ceur-ws.org
- Search the proceeding by the following name:
  - Cultures of Participation in the Digital Age 2015

A.2.2 Evaluation Questionnaire

Evaluation questionnaire is divided into three sections that are presented below:

System Usability Scale

Please rate the usability of the system by filling in the SUS form shown in figure A.5. For each question shown in figure A.5, circle a number from 1-5. The number should best represent your feelings about today's session experience.

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	○	○	○	○	○
2. I found the system unnecessarily complex	○	○	○	○	○
3. I thought the system was easy to use	○	○	○	○	○
4. I think that I would need the support of a technical person to be able to use this system	○	○	○	○	○
5. I found the various functions in this system were well integrated	○	○	○	○	○
6. I thought there was too much inconsistency in this system	○	○	○	○	○
7. I would imagine that most people would learn to use this system very quickly	○	○	○	○	○
8. I found the system very cumbersome to use	○	○	○	○	○
9. I felt very confident using the system	○	○	○	○	○
10. I needed to learn a lot of things before I could get going with this system	○	○	○	○	○

Figure A.5: System Usability Scale Questionnaire for CEUR Make

Questionnaire for User Interaction Satisfaction

Please rate the usability of the system by filling in the QUIS form shown in figure A.6 and figure A.7.For each question shown in figure A.6 and figure A.7, circle a number from 0-9. The number should best represent your feelings about today's session experience.

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA
1.	terrible	○	○	○	○	○	○	○	○	○	○	wonderful	○
2.	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
3.	frustrating	○	○	○	○	○	○	○	○	○	○	satisfying	○
4.	inadequate power	○	○	○	○	○	○	○	○	○	○	adequate power	○
5.	dull	○	○	○	○	○	○	○	○	○	○	stimulating	○
6.	rigid	○	○	○	○	○	○	○	○	○	○	flexible	○
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
7. Reading characters on the screen	hard	○	○	○	○	○	○	○	○	○	○	easy	○
8. Highlighting simplifies task	not at all	○	○	○	○	○	○	○	○	○	○	very much	○
9. Organization of information	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
10. Sequence of screens	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
11. Use of terms throughout system	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
12. Terminology related to task	never	○	○	○	○	○	○	○	○	○	○	always	○
13. Position of messages on screen	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
14. Prompts for input	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
15. Computer informs about its progress	never	○	○	○	○	○	○	○	○	○	○	always	○
16. Error messages	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○

Figure A.6: Questionnaire for User Interaction Satisfaction for CEUR Make part 1

Demographic Questionnaire

We would like to know little about you in order to evaluate the results of our research more accurately. Hence, fill in the form shown in figure A.8.

A.3 End Note

Thank you very much for taking out time to participate in the usability evaluation of CEUR Make. Your feedback was quite valuable. In case of any further queries, you can reach me at m.rohan.a.asmat@gmail.com and in case you have any suggestions or improvements for the current system, please feel free to write us.

LEARNING		0	1	2	3	4	5	6	7	8	9		NA
17. Learning to operate the system	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
18. Exploring new features by trial and error	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
19. Remembering names and use of commands	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
20. Performing tasks is straightforward	never	○	○	○	○	○	○	○	○	○	○	always	○
21. Help messages on the screen	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
22. Supplemental reference materials	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
23. System speed	too slow	○	○	○	○	○	○	○	○	○	○	fast enough	○
24. System reliability	unreliable	○	○	○	○	○	○	○	○	○	○	reliable	○
25. System tends to be	noisy	○	○	○	○	○	○	○	○	○	○	quiet	○
26. Correcting your mistakes	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
27. Designed for all levels of users	never	○	○	○	○	○	○	○	○	○	○	always	○
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**

List the most **negative** aspect(s):

1.
2.
3.

List the most **positive** aspect(s):

1.
2.
3.

Figure A.7: Questionnaire for User Interaction Satisfaction for CEUR Make part 2

1. **What is your gender ?**
   a. Male
   b. Female
2. **What is your age ?**
   _____
3. **What is your current occupation ?**
   _____
4. **What is the highest level of education you have completed ?**
   a. Bachelors
   b. Masters
   c. Phd
   d. Post-Doc
   e. Professional Degree
5. **Do you have experience publishing a proceeding ?**
   a. Yes
   b. No
6. **Do you have experience publishing at ceur-ws.org ?**
   a. Yes
   b. No
7. **Do you have experience using ceur make for publishing proceedings?**
   a. Yes
   b. No

Figure A.8: Demographics Questionnaire for CEUR Make

Appendix B

Usability Evaluation of CEUR Make Web Interface

The resources presented in the following sections were used to measure and evaluate the usability of the CEUR Make Web Interface.

B.1 Letter of Consent[38]

Usability Evaluation of CEUR Make Web Interface

Dear Participant,

I invite you to participate in a research study entitled: *Usability Evaluation of CEUR Make Web Interface* . I am currently enrolled in the Media Informatics Programme at RWTH Aachen University, Aachen, and am in the process of writing my (i.e., Master's Thesis). The purpose of the research is to determine: *How can the web interface help publishers of proceedings to perform their tasks more efficiently?*

The enclosed questionnaire and task list has been designed to collect information on: *usability measurement and evaluation for CEUR Make Web Interface.*

Your participation in this research project is completely voluntary. You may decline altogether, or leave blank any questions you don't wish to answer. There are no known risks to participation beyond those encountered in everyday life. Your responses will remain confidential and anonymous. Data from this research will be kept under lock and key and reported only as a collective combined total. No one other than the researchers will know your individual answers to this questionnaire.

If you agree to participate in this project, please perform the tasks as mentioned in the enclosed evaluation interview for which your time will be recorded to complete the tasks and answer the questions on the questionnaire as best you can. It should take approximately 45 minutes to complete.

If you have any questions about this project, feel free to contact Rohan Asmat (Master Thesis Student) at m.rohan.a.asmat@gmail.com.

Thank you for your assistance in this important endeavor.

Sincerely yours,

Muhammad Rohan Ali Asmat

B.2 Usability Evaluation

For usability evaluation of the ceur make, you will have to go through two sets of rounds. In the first round that is Evaluation Interview round, you will be provided with set of tasks that you will have to perform as instructed for which you will be recorded and timed. In the second round that is Evaluation Questionnaire round you will have to fill up the questionnaire.

B.2.1 Evaluation Interview

In this section you will be required to perform certain tasks for which you will be recorded.The instructions are given below and each task is described in detail which you would have to perform based on the instructions given.

Instructions

Seven tasks are described below which would in total take twenty minutes. Each task may take a minimum of two minutes and a maximum of eight minutes. You have to perform all the tasks in the sequence presented below. All the tasks will be explained thoroughly by the interviewer before the evaluation begins. You are asked to allow questions during the evaluation but try to keep them as minimum as possible in order to simulate the actual user behaviour.

Task 1 - Initiate Generation

- Go to Publishing Page and Generate Resources using Ceur Make Web Interface

Task 2 - Generate Workshop and Copyright Form

- Generate Workshop.
- Workshop.xml file is supposed to be created in three steps that are described below:
    - Fill in the first step i.e Workshop Metadata. Use the data provided to you in table B.1 on page 119 to fill in the form.
    - Go to second step by pressing next and fill in the second step of the form i.e Conference Metadata. Use the data provided to you in table B.2 on page 119 to fill in the form.
    - Go to the last step by pressing next and fill in the last step of the form i.e Editors. Use the data

Table B.1: Metadata for Workshop

Workshop Metadata	
Id	foobar
Acronym	Foobar
Volume	Bargaining for Food
Full Title	24th International Workshop on Bargaining for Food
Volume Number	Vol-123
Homepage	http://foobar2013.org
Language	English
Date	2013-06-18
Location of Event	Bremen, Germany
Link to Location of Event	http://en.wikipedia.org/wiki/Bremen

Table B.2: Conference Metadata for Workshop

Conference Metadata	
Acronym	FOO 2013
Full Name of the Conference	1st International Conference on, Abstract Nonsense
Homepage of the Conference	http://foo2013.org

provided to you in table B.3 on page 119 to fill in the form.

- Press Finish

Task 3 - Generate TOC and and Zip Archive

- Generate TOC (table of contents).
- Add the following session names in the first step

Table B.3: Data for Workshop Editors

	Editor One	**Editor Two**
Name	Alice Carroll	Christoph Lange
Affiliation	University of Wonders	University of Bonn
Country	United Kingdom	Germany
Homepage	www.alicecarroll.com	www.langec.wordpress.com

Table B.4: Data for Table of Contents

	Paper One	**Paper Two**
Session	title of first session	title of second session
Paper Title	title of first paper	title of second paper
Pages	2 - 6	7 - 10
Authors	a) Alice Carroll b) Bob Lewis	a) Alice Carroll b) Bob Lewis

  - title of first session
  - title of second session

- Go to the second step i.e (Add Papers and Associated Details for Table of Contents) and fill in the form using data provided to you in table B.4 on page 120.
- Press Finish

Task 4 - Search a Proceeding

- Go to Proceedings page.
- Search the proceeding by the following name
  - Cultures of Participation in the Digital Age 2015

B.2.2 Evaluation Questionnaire

Evaluation questionnaire is divided into three sections that are presented below:

System Usability Scale

Please rate the usability of the system by filling in the SUS form shown in figure B.1. For each question shown in figure B.1, circle a number from 1-5. The number should best represent your feelings about today's session experience.

	Strongly disagree				Strongly agree
1. I think that I would like to use this system frequently	○	○	○	○	○
2. I found the system unnecessarily complex	○	○	○	○	○
3. I thought the system was easy to use	○	○	○	○	○
4. I think that I would need the support of a technical person to be able to use this system	○	○	○	○	○
5. I found the various functions in this system were well integrated	○	○	○	○	○
6. I thought there was too much inconsistency in this system	○	○	○	○	○
7. I would imagine that most people would learn to use this system very quickly	○	○	○	○	○
8. I found the system very cumbersome to use	○	○	○	○	○
9. I felt very confident using the system	○	○	○	○	○
10. I needed to learn a lot of things before I could get going with this system	○	○	○	○	○

Figure B.1: System Usability Scale Questionnaire for CEUR Make Web Interface

Questionnaire for User Interaction Satisfaction

Please rate the usability of the system by filling in the QUIS form shown in figure B.2 and figure B.3.For each question shown in figure B.2 and figure B.3, circle a number from 0-9. The number should best represent your feelings about today's session experience.

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA
1.	terrible	○	○	○	○	○	○	○	○	○	○	wonderful	○
2.	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
3.	frustrating	○	○	○	○	○	○	○	○	○	○	satisfying	○
4.	inadequate power	○	○	○	○	○	○	○	○	○	○	adequate power	○
5.	dull	○	○	○	○	○	○	○	○	○	○	stimulating	○
6.	rigid	○	○	○	○	○	○	○	○	○	○	flexible	○
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
7. Reading characters on the screen	hard	○	○	○	○	○	○	○	○	○	○	easy	○
8. Highlighting simplifies task	not at all	○	○	○	○	○	○	○	○	○	○	very much	○
9. Organization of information	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
10. Sequence of screens	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
11. Use of terms throughout system	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
12. Terminology related to task	never	○	○	○	○	○	○	○	○	○	○	always	○
13. Position of messages on screen	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
14. Prompts for input	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
15. Computer informs about its progress	never	○	○	○	○	○	○	○	○	○	○	always	○
16. Error messages	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○

Figure B.2: Questionnaire for User Interaction Satisfaction for CEUR Make part 1

LEARNING		0	1	2	3	4	5	6	7	8	9		NA
17. Learning to operate the system	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
18. Exploring new features by trial and error	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
19. Remembering names and use of commands	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
20. Performing tasks is straightforward	never	○	○	○	○	○	○	○	○	○	○	always	○
21. Help messages on the screen	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
22. Supplemental reference materials	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
23. System speed	too slow	○	○	○	○	○	○	○	○	○	○	fast enough	○
24. System reliability	unreliable	○	○	○	○	○	○	○	○	○	○	reliable	○
25. System tends to be	noisy	○	○	○	○	○	○	○	○	○	○	quiet	○
26. Correcting your mistakes	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
27. Designed for all levels of users	never	○	○	○	○	○	○	○	○	○	○	always	○
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**

List the most **negative** aspect(s):

1.
2.
3.

List the most **positive** aspect(s):

1.
2.
3.

Figure B.3: Questionnaire for User Interaction Satisfaction for CEUR Make part 2

Demographic Questionnaire

We would like to know little about you in order to evaluate the results of our research more accurately. Hence, fill in the form shown in figure B.4.

B.3 End Note

Thank you very much for taking out time to participate in the usability evaluation of CEUR Make Web Interface. Your feedback was quite valuable. In case of any further queries, you can reach me at m.rohan.a.asmat@gmail.com and in case you have any suggestions or improvements for the current system, please feel free to write us.

1. **What is your gender ?**
   a. Male
   b. Female
2. **What is your age ?**
   _____
3. **What is your current occupation ?**
   _____
4. **What is the highest level of education you have completed ?**
   a. Bachelors
   b. Masters
   c. Phd
   d. Post-Doc
   e. Professional Degree
5. **Do you have experience publishing a proceeding ?**
   a. Yes
   b. No
6. **Do you have experience publishing at ceur-ws.org ?**
   a. Yes
   b. No
7. **Do you have experience using ceur make for publishing proceedings?**
   a. Yes
   b. No

Figure B.4: Demographics Questionnaire for CEUR Make

Appendix C

Usability Evaluation Results for CEUR Make

As discussed in Chapter 4 in section 4.1.2 our evaluation results can be divided into two design setups that are think aloud design setup and question asking design setup. Results from both the design setups are presented in this part. Twelve(12) people participated in total, from which six(6) people participated in the think aloud design setup and six(6) people participated in the question asking design setup.

C.1 Think Aloud Design Setup Results

As discussed in Chapter 4 in section 4.1.2 each user test is divided into three major parts demographics, evaluation interview and evaluation questionnaire. Results from all three are presented below:

C.1.1 Demographics

The demographic results of the users who participated in think aloud design setup is shown in figure D.1.

Demographic Result - Think Aloud Design Setup						
	User 1	**User 2**	User 3	**User 4**	**User 5**	**User 6**
Gender	Male	Female	Male	Male	Female	Female
Age	28	30	27	32	30	29
Occupation	Researcher	Researcher	Researcher	Researcher	Researcher	Researcher
Highest Level of Education	Masters	Phd Student	Phd Student	Masters	Phd Student	Phd Student
Experience in publishing Proceeding	Yes	Yes	Yes	Yes	Yes	Yes
Experience in publishing at CEUR-WS	Yes	Yes	No	No	No	Yes
Experience in publishing using CEUR Make	Yes	Yes	No	No	No	Yes

Figure C.1: Demographics for the users who participated in the Think Aloud Design Setup

C.1.2 Usability Evaluation Interview

The results of the usability evaluation interview could be divided into two sections:

- Quantitative: Task Completion Time
- Qualitative: Notes, Feedback

Both of these results are presented in following sections:

Quantitative: Task Completion Time

Task Completion time for the tasks that are presented in Appendix A, section A.2.1 is given in figure: C.2.

Task Completion Time Evaluation Result							
	User 1	User 2	User 3	User 4	User 5	User 6	Average of Each Task
Task 1	00.09	00.10	00.19	00.16	00.15	00.11	0.13
Task 2	03.20	04.20	05.30	05.50	06.01	04.40	4.77
Task 3	01.46	02.09	02.50	03.01	03.09	02.23	2.40
Task 4	00.40	00.45	00.57	1.03	1.07	01.01	0.76

Figure C.2: Task Completion Time Results for Ceur Make

Qualitative: Notes, Feedback

Qualitative notes were recorded in a think aloud session, while users thought aloud while performing the tasks. The notes are presented in figure C.3.

User 1

+ It makes thing easy.

- It involves too much preparation.
- It has a lot of standards

User 2

+ It generates all the resources required to be submited at CEUR-WS.org
+ It is customizable as it is open source.

- It requires a lot of learning. so lot of hassle

User 3

+ Does the job
+ Formatting according to CEUR-WS standards.

- Not easy to use.
- No graphical interface.
- Have to program.

User 4

+Open Source
+Development Community
+updated regularly

- complex setup.
- old school
- only linux based

User 5

+ very fast
+ good documentation

- have to manage lots of screens at the same time.
- lots of dependencies

User 6

+ It is well programmed software, as the tasks are neatly performed.

- Requires a lot of learning.
- I don't like to keep setup at my end. Why couldn't it be availible as online?

Figure C.3: Qualitative Notes for Think Aloud Design Setup

C.1.3 Evaluation Questionnaire

After the think aloud experiment users were asked to fill in evaluation questionnaire. The results of the evaluation questionnaire could be divided into two sections:

- System Usability Scale(SUS)
- Question for User Interaction Satisfaction(QUIS)

Both of these results are presented in following sections:

System Usability Scale(SUS)

The results of SUS for think aloud design setup are presented in figure C.4.

Question for User Interaction Satisfaction(QUIS)

The results of QUIS for think aloud design setup are presented in figure C.5. The results of think aloud correspond to users shown in figure C.5 from 1 to 6.

C.2 Question Asking Design Setup Results

As discussed in Chapter 4 in section 4.1.2 each experiment is divided into three major parts demographics, evaluation interview and evaluation questionnaire. Results from all three are presented below:

SUS Results Think Aloud												
Users	U1		U2		U3		U4		U5		U6	
Question 1	3	2	3	2	4	3	2	1	2	1	4	3
Question 2	3	2	2	3	4	1	5	0	4	1	3	2
Question 3	3	2	4	3	2	1	1	0	2	1	3	2
Question 4	2	3	3	2	4	1	5	0	4	1	3	2
Question 5	3	2	2	1	3	2	2	1	3	2	2	1
Question 6	2	3	3	2	2	3	3	2	3	2	2	3
Question 7	1	0	2	1	1	0	1	0	1	0	3	2
Question 8	3	2	4	1	3	2	4	1	5	0	3	2
Question 9	3	2	2	1	2	1	1	0	3	2	2	1
Question10	3	2	4	1	4	1	2	3	3	2	3	2
SUS Score	50		42.5		37.5		20		30		50	

Figure C.4: System Usability Scale Results for Think Aloud Design Setup

C.2.1 Demographics

The demographic results of the users who participated in question asking design setup is shown in figure D.6.

C.2.2 Usability Evaluation Interview

Qualitative notes were recorded in a think aloud session, while users saw experimenters performing the task.The notes are presented in figure C.7.

Question for User Interaction Satisfaction																													
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Think Aloud	User 1	3	3	6	7	6	7	6	1	5	4	4	6	0	4	3	2	3	4	4	6	5	9	8	4	6	3	2
	User 2	4	4	7	6	5	6	5	1	5	5	7	4	4	3	3	0	2	5	3	7	4	8	6	5	5	4	3
	User 3	3	4	5	6	6	4	7	0	4	4	4	4	3	5	2	4	0	4	2	7	2	7	9	5	7	5	2
	User 4	6	5	5	8	5	4	5	0	4	3	5	6	3	4	4	4	1	4	2	8	3	7	9	6	6	5	3
	User 5	5	3	4	6	5	3	6	3	3	6	5	6	4	4	4	2	3	3	6	6	5	9	7	4	6	8	2
	User 6	4	5	3	7	4	4	4	2	2	3	6	8	6	5	3	3	4	6	3	7	4	7	8	3	5	4	4
Question Asking	User 7	8	8	8	8	8	8	5	5	8	5	8	8	5	5	5	8	7	8	8	7	5	8	9	9	9	8	7
	User 8	4	4	3	6	3	4	4	3	2	6	4	6	7	4	4	7	6	4	4	1	4	6	8	4	4	3	5
	User 9	3	3	2	8	1	2	8	0	1	4	4	4	4	4	4	2	2	4	2	6	4	2	8	5	5	3	0
	User 10	5	4	5	3	5	6	3	0	3	3	4	5	0	0	0	0	4	0	6	6	0	0	4	4	6	7	6
	User 11	7	5	6	9	7	8	9	9	7	7	8	8	8	8	3	6	3	3	3	6	6	9	9	9	9	7	1
	User 12	5	6	6	7	2	1	4	3	4	4	7	4	4	2	4	4	4	6	2	2	3	6	8	5	4	6	1
AVERAGE QUIS PER QUES		4.75	4.5	5	6.75	4.75	4.75	5.5	2.25	4	4.5	5.5	5.75	4	4	3.25	3.5	3.25	4.25	3.75	5.75	3.75	6.5	7.75	5.25	6	5.25	3

Figure C.5: Question for User Interaction Satisfaction Results for Think Aloud Design Setup

C.2.3 Evaluation Questionnaire

After the question asking experiment users were asked to fill in evaluation questionnaire. The results of the evaluation questionnaire could be divided into two sections:

- System Usability Scale(SUS)
- Question for User Interaction Satisfaction(QUIS)

Both of these results are presented in following sections:

System Usability Scale(SUS)

The results of SUS for question asking design setup are presented in figure C.8.

Question for User Interaction Satisfaction(QUIS)

The results of QUIS for question asking design setup are presented in figure C.5. The results of question asking correspond to users shown in figure C.5 from 7 to 12.

Demographic Result - Question Asking Sesign Setup						
	User 7	User 8	User 9	User 10	User11	User12
Gender	Male	Male	Male	Male	Female	Female
Age	41	29	35	28	38	33
Occupation	Associate Professor	Postdoctoral Researcher	Academic Stuff	Researcher	Scientist	Research Associate
Highest Level of Education	Post-Doc	Phd	German Diplom-Informatiker	Masters	Phd	Phd
Experience in publishing Proceeding	Yes	Yes	Yes	Yes	Yes	Yes
Experience in publishing at CEUR-WS	Yes	Yes	Yes	Yes	Yes	Yes
Experience of CEUR Make	Yes	Yes	Yes	Yes	Yes	Yes

Figure C.6: Demographics for the users who participated in the Question Asking Design Setup

User 7

+ simplified my life
+ GUI simplify these aspects. I cannot understand how people still do it without CEUR-make.

- It still has a learning curve, and can still be improved with more feature.

User 8

+ I don't have to manually create multiple files that would take a lot of time.
+ It reduces a lot of steps to generate workshop proceedings.

- It is only availible for linux envoirnment

User 9

+ Fast.
+ generates semantic annotations

- It is complex to understand.
- I have to install saxon to run (dependency)

User 10

+ Straight Forward
+ very flexible
+ good documentation

- The task requires a lot of switching between windows
- customization support

User 11

+ open source
+ generates additional beneficial files such as a bib-tex-file

- script-based, not for all types of users
- dependency on Easychair

User 12

+ It helps to generate workshop proceedings. Does a lot of formattings.

- Can't control errors. Error feedback is not understandable.
- documentation is not descriptive.

Figure C.7: Qualitative Notes for Question Asking Design Setup

SUS Results Question Asking												
Users	U7		U8		U9		U10		U11		U12	
Question 1	4	3	2	1	2	1	2	1	4	3	1	0
Question 2	2	3	3	2	3	2	3	2	4	1	4	1
Question 3	4	3	2	1	2	1	3	2	2	1	2	1
Question 4	5	0	3	2	3	2	3	2	2	3	5	0
Question 5	5	4	2	1	2	1	1	0	2	1	3	2
Question 6	1	4	2	3	2	3	2	3	3	2	3	2
Question 7	3	2	1	0	1	0	2	1	3	2	2	1
Question 8	2	3	3	2	4	1	3	2	4	1	3	2
Question 9	4	3	3	2	2	1	4	3	3	2	2	1
Question10	1	4	3	2	4	1	3	2	3	2	3	2
SUS Score	72.5		40		32.5		45		45		30	

Figure C.8: System Usability Scale Results for Question Asking Design Setup

Appendix D

Usability Evaluation Results for CEUR Make Web Interface

As discussed in Chapter 4 in section 4.1.2 our evaluation results can be divided into two design setups that are think aloud design setup and question asking design setup. Results from both the design setups are presented in this part. Twelve(12) people participated in total, from which six(6) people participated in the think aloud design setup and six(6) people participated in the question asking design setup.

D.1 Think Aloud Design Setup Results

As discussed in Chapter 4 in section 4.1.2 each user test is divided into three major parts demographics, evaluation interview and evaluation questionnaire. Results from all three are presented below:

D.1.1 Demographics

The demographic results of the users who participated in think aloud design setup is shown in figure D.1.

Demographic Result - Think Aloud Design Setup						
	User 1	**User 2**	User 3	**User 4**	**User 5**	**User 6**
Gender	Male	Female	Male	Male	Female	Female
Age	28	30	27	32	30	29
Occupation	Researcher	Researcher	Researcher	Researcher	Researcher	Researcher
Highest Level of Education	Masters	Phd Student	Phd Student	Masters	Phd Student	Phd Student
Experience in publishing Proceeding	Yes	Yes	Yes	Yes	Yes	Yes
Experience in publishing at CEUR-WS	Yes	Yes	No	No	No	Yes
Experience in publishing using CEUR Make	Yes	Yes	No	No	No	Yes

Figure D.1: Demographics for the users who participated in the Think Aloud Design Setup

D.1.2 Usability Evaluation Interview

The results of the usability evaluation interview could be divided into two sections:

- Quantitative: Task Completion Time
- Qualitative: Notes, Feedback

Both of these results are presented in following sections:

Quantitative: Task Completion Time

Task Completion time for the tasks that are presented in Appendix B, section B.2.1 is given in figure: D.2.

Task Completion Time Evaluation Result							
	User 1	User 2	User 3	User 4	User 5	User 6	Average of Each Task
Task 1	00.10	00.08	00.13	00.11	00.09	00.07	0.10
Task 2	02.85	02.40	03.30	03.10	03.40	02.22	2.88
Task 3	01.17	01.33	01.50	02.10	01.40	01.26	1.46
Task 4	00.11	0.10	0.11	0.13	0.14	0.09	0.10

Figure D.2: Task Completion Time Results for Ceur Make GUI

Qualitative: Notes, Feedback

Qualitative notes were recorded in a think aloud session, while users thought aloud while performing the tasks. The notes are presented in figure D.3.

D.1.3 Evaluation Questionnaire

After the think aloud experiment users were asked to fill in evaluation questionnaire.The results of the evaluation questionaire could be divided into two sections:

- System Usability Scale(SUS)
- Question for User Interaction Satisfaction(QUIS)

User 1

+ good design
+ automates all the stuff
+ no complex setup required
  - multiple user workbench
  - indicate the overall workflow and the current step, new feature

User 2

+ easy chair integration.
+ feedbacks good.
  - would like option to review metadata automatically generated. Preview with option to go back to fill in, would be useful for esp. generating contents page

User 3

+ error validation on frontend with good feedback.
+ Search functionality
  - maintaining status - so navigating backwards and forwards without losing information.

User 4

+ Straight Forward
+ Easy to use
+ Good Design
+ reporting functionality
+ sorting authors list good feature
  - user profiling

User 5

+ very flexible
+ generates zip archive
+ generates semantic annotations
+ generates additional beneficial files such as a bib-tex-file

User 6

+ Nice visuals
+ easy to follow navigation
+ easy to adapt
+ no learning required
+ no setup
+portable
  - customization of style

Figure D.3: Qualitative Notes for Think Aloud Design Setup

Both of these results are presented in following sections:

System Usability Scale(SUS)

The results of SUS for think aloud design setup are presented in figure D.4.

Question for User Interaction Satisfaction(QUIS)

The results of QUIS for think aloud design setup are presented in figure C.5. The results of think aloud correspond to users shown in figure D.5 from 1 to 6.

SUS Results Think Aloud												
Users	U1		U2		U3		U4		U5		U6	
Question 1	4	3	3	2	5	4	5	4	4	3	3	2
Question 2	1	4	2	3	2	3	1	4	1	4	1	4
Question 3	5	4	4	3	5	4	4	3	5	4	4	3
Question 4	2	3	1	4	1	4	2	3	1	4	1	4
Question 5	5	4	4	3	5	4	3	2	3	2	4	3
Question 6	1	4	2	3	1	4	1	4	1	4	2	3
Question 7	4	3	5	4	5	4	5	4	5	4	4	3
Question 8	1	4	1	4	1	4	1	4	2	3	1	4
Question 9	4	3	5	4	5	4	5	4	4	3	4	3
Question10	1	4	1	4	2	3	1	4	2	3	1	4
SUS Score	90		85		95		90		85		82.5	

Figure D.4: System Usability Scale Results for Think Aloud Design Setup

D.2 Question Asking Design Setup Results

As discussed in Chapter 4 in section 4.1.2 each experiment is divided into three major parts demographics, evaluation interview and evaluation questionnaire. Results from all three are presented below:

D.2.1 Demographics

The demographic results of the users who participated in question asking design setup is shown in figure D.6.

Question for User Interaction Satisfaction																												
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Think Aloud	User 1	7	9	7	7	9	8	9	6	9	9	8	8	9	8	7	8	8	9	9	8	6	5	7	7	9	9	9
	User 2	8	8	9	8	8	7	7	7	8	8	7	6	8	9	6	4	8	8	8	8	7	6	7	6	7	6	7
	User 3	5	9	8	7	7	6	7	7	8	9	8	9	7	6	7	7	7	7	8	8	6	6	7	5	8	8	7
	User 4	9	8	7	7	7	6	9	6	8	8	8	9	9	6	7	7	9	9	8	7	9	9	6	8	8	8	9
	User 5	9	9	7	8	6	8	9	8	8	9	9	8	9	4	8	8	8	8	9	9	8	7	7	8	7	7	8
	User 6	8	8	7	8	9	5	8	5	8	8	7	8	7	3	5	6	9	6	9	9	7	5	6	7	8	8	9
Question Asking	User 7	9	9	9	9	9	8	9	8	9	9	9	9	9	9	7	8	8	9	9	8	9	8	9	8	9	9	9
	User 8	6	7	3	6	6	1	8	1	6	6	7	8	6	4	4	2	8	8	8	8	7	0	6	0	3	7	6
	User 9	7	8	8	5	9	6	6	6	8	8	8	7	8	6	8	6	9	9	9	7	7	5	7	7	5	7	7
	User 10	5	8	5	4	6	6	8	6	6	6	7	8	6	3	3	3	7	6	8	8	3	6	7	7	7	6	9
	User 11	7	8	7	7	7	6	9	7	7	8	9	9	9	8	7	8	9	9	9	8	7	7	6	7	7	7	5
	User 12	7	8	7	8	7	5	7	5	8	8	6	7	9	6	6	5	9	8	8	8	5	5	9	5	9	5	8
AVERAGE QUIS PER QUESTION		7.25	8.25	7	7	7.5	6	8	6	7.75	8	7.75	8	8	6	6.25	6	8.25	8	8.5	8	6.75	5.75	7	6.25	7.25	7.25	7.75

Figure D.5: Question for User Interaction Satisfaction Results for Think Aloud Design Setup

D.2.2 Usability Evaluation Interview

Qualitative notes were recorded in a think aloud session, while users saw experimenters performing the task.The notes are presented in figure D.7.

D.2.3 Evaluation Questionnaire

After the question asking experiment users were asked to fill in evaluation questionnaire. The results of the evaluation questionnaire could be divided into two sections:

- System Usability Scale(SUS)
- Question for User Interaction Satisfaction(QUIS)

Both of these results are presented in following sections:

System Usability Scale(SUS)

The results of SUS for question asking design setup are presented in figure D.8.

Demographic Result - Question Asking Sesign Setup						
	User 7	User 8	User 9	User 10	User11	User12
Gender	Male	Male	Male	Male	Female	Female
Age	41	29	35	28	38	33
Occupation	Associate Professor	Postdoctoral Researcher	Academic Stuff	Researcher	Scientist	Research Associate
Highest Level of Education	Post-Doc	Phd	German Diplom-Informatiker	Masters	Phd	Phd
Experience in publishing Proceeding	Yes	Yes	Yes	Yes	Yes	Yes
Experience in publishing at CEUR-WS	Yes	Yes	Yes	Yes	Yes	Yes
Experience of CEUR Make	Yes	Yes	Yes	Yes	Yes	Yes

Figure D.6: Demographics for the users who participated in the Question Asking Design Setup

Question for User Interaction Satisfaction(QUIS)

The results of QUIS for question asking design setup are presented in figure D.5. The results of question asking correspond to users shown in figure C.5 from 7 to 12.

User 7

+ The system looks absolutely great
+ Will spare hours to editors
· The system will have to mature

User 8

+ wizard-based input is a handy model
· separation CEUR / CEUR make is not necessary

User 9

+Well designed Interface
+ System did not handled easy chair but I think it will be fixed. Final check feedback

User 10

+Everything in one screen
-I would suggest the development of other "intelligent" processes, such as automatic identification of paper titles & authors.

User 11

+ well-organized and easy-to-use interface providing forms for all necessary information
· some parts could be better aligned/button

User 12

+ Clearly laid out, simple layout; good (and restful) colour scheme, would however darken grey text a bit;
Simplifies process

Figure D.7: Qualitative Notes for Question Asking Design Setup

SUS Results Question Asking												
Users	U7		U8		U9		U10		U11		U12	
Question 1	4	3	1	0	4	3	3	2	4	3	5	4
Question 2	1	4	2	3	2	3	2	3	1	4	2	3
Question 3	5	4	3	2	5	4	4	3	5	4	5	4
Question 4	2	3	1	4	1	4	2	3	1	4	1	4
Question 5	5	4	2	1	5	4	3	2	4	3	3	2
Question 6	1	4	1	4	1	4	3	2	1	4	1	4
Question 7	5	4	5	4	5	4	4	3	5	4	5	4
Question 8	1	4	2	3	1	4	2	3	1	4	1	4
Question 9	5	4	4	3	5	4	5	4	4	3	4	3
Question10	1	4	1	4	1	4	2	3	1	4	1	4
SUS Score	95		70		95		70		92.5		90	

Figure D.8: System Usability Scale Results for Question Asking Design Setup

Appendix E

Source Code

The source code of CEUR Make Graphical User Interface is available on the following Github repository: `https://github.com/ceurws/ceur-make-ui`.

The source code is also written on the attached CD.

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