

A Structured Approach to Online Discussion

Emma Lieu

A thesis submitted for the degree of
Doctor of Philosophy



Department of Computer Science
Royal Holloway, University of London
United Kingdom

2023

Declaration of Authorship

I, Emma Lieu, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: Emma Lieu

Date: Friday 15th December, 2023

Acknowledgements

I would like to begin by thanking my supervision team, starting with Professor Chris Watkins who has patiently supported me and my research direction over the years. I would also like to thank Dr Rikke Jensen and Professor Matthew Hague for their wisdom and constructive feedback.

I am grateful to the Leverhulme Magna Carta Doctoral Centre for Individual Freedom for providing the financial support that made this research possible. Similarly, I would like to extend my thanks to the Department of Computer Science at Royal Holloway for generously funding later studies and conference attendances.

I would like to thank my participants from Royal Holloway, University of York, the London Quant Group, the alumni of the World Health Organisation's Informatic Management Training Programme, and Hack Keele for dedicating their time to take part in my studies. Special thanks go to Dr Jennifer Cole and Dr Kaat Smets for their support and collaboration throughout the research process.

I would also like to acknowledge the British Computing Society Human-Computer Interaction group for being a warm and welcoming community. I am grateful to Dr Gordon Rugg, Dr Maddy Steeds, and Richard Rhodes for their generous help and insights.

Lastly, thank you to my family and chosen family for their love and sacrifices. To Lay, for her kindness and patience. To Chloe, for being wise beyond her years. To Dad, for all the support. And to Mum, for being my biggest cheerleader. Without you all, this thesis would not have been possible.

Abstract

Online message boards have transformed public discussion, allowing anyone with internet access to share their thoughts on a broad range of topics. While they present users with a wealth of information, online message boards currently do not provide an effective way to make sense of it. These systems are typically designed as unstructured lists of comments with no overview. This lack of structure provides little incentive for users to interact in ways that benefit the collective, resulting in poor contributions and behaviours that lower the overall quality of discussion. These problems are expected to worsen as the activity on online message boards increase.

This dissertation aims to investigate how online message boards can be designed to structure and facilitate online discussion. To start, a novel structured discussion flow is conceptualised. Each step of the discussion flow increases the affordances and information available to the user. This discussion flow is then implemented into Potluck, a working online message board. Potluck is designed to (1) have users actively participate in the discussion and express their views without social influence; (2) help users make sense of the discussion by automatically collecting and summarising similar viewpoints; and (3) add structure and encourage reflection of different viewpoints by having users recursively answer and ask questions.

This work is evaluated through three field deployments of Potluck in professional, educational, and event-based settings. Results suggest that the proposed discussion flow and system provides support for different forms of engagement; gives users a relevant overview of the discussion; encourages normatively desirable user participation; and is usable by different user groups. The studies also reveal potential applications of the system beyond online discussion to be explored in future work. Ultimately, design considerations are presented for system designers and engineers to build more effective online message boards than are currently available.

Contents

1	Introduction	14
1.1	Motivation	14
1.2	Research Aim and Objectives	17
1.3	Research Scope and Assumptions	18
1.4	Summary of Contributions	20
1.5	Thesis Outline	21
2	Methodology	22
2.1	Research Approach	22
2.2	Research Process	24
2.2.1	Phase I: Contextual	24
2.2.2	Phase II: Technical	25
2.2.3	Phase III: Empirical	26
2.3	Data Collection and Analysis	29
2.3.1	Log Data	29
2.3.2	Questionnaires	31
2.3.3	Contextual Inquiry	34
2.3.4	Interviews	35
2.4	Research Ethics	36
2.5	Summary	36
3	Background and Related Work	38
3.1	Origins and Features of Online Message Boards	38
3.1.1	Evolution of Pre-Web Discussion Tools	40
3.1.2	Emergence of Online Message Boards	42

3.2	Social and Technical Challenges of Online Message Boards	44
3.2.1	Unstructured Discussion Format	44
3.2.2	Limitations of Social Navigation	46
3.2.3	Participation	48
3.2.4	Role of Identity	51
3.3	Towards Structuring and Supporting Online Discussion	53
3.3.1	Scaffolding Discussion Workflows	54
3.3.2	Synthesising Discussion	57
3.3.3	Integrating Communicative Values	61
3.4	Implications	65
3.5	Summary	66
4	Potluck: A System for Scaffolding Online Discussion	68
4.1	Motivation	68
4.2	Design Principles	69
4.3	Design Rationale	72
4.3.1	Pseudonymous and Mandatory Participation	73
4.3.2	Shielded Discussion	73
4.3.3	Automatic Summarisation and Aggregation	74
4.3.4	Recursive Question-and-Answer	74
4.3.5	Question Trail	75
4.4	Usage	75
4.4.1	Guest User	75
4.4.2	Host User	80
4.5	Implementation	81
4.6	Formative Lab-Based Study	84
4.6.1	Pilot	84
4.6.2	Participants	85
4.6.3	Data Collection and Analysis	85
4.6.4	Procedure	85
4.6.5	Results and Discussion	86
4.7	Summary	89

5	Field Deployments of Potluck	90
5.1	Motivation	90
5.2	Field Study I: Professional Setting	91
5.2.1	Pilot	91
5.2.2	Participants	92
5.2.3	Data Collection	93
5.2.4	Procedure	93
5.2.5	Results	95
5.2.6	Discussion	99
5.3	Field Study II: Event Setting	101
5.3.1	Pilot	101
5.3.2	Participants	102
5.3.3	Data Collection	103
5.3.4	Procedure	104
5.3.5	Results	104
5.3.6	Discussion	112
5.4	Field Study III: Educational Setting	113
5.4.1	Pilot	114
5.4.2	Participants	114
5.4.3	Data Collection	115
5.4.4	Procedure	116
5.4.5	Results	117
5.4.6	Discussion	127
5.5	Summary	129
6	Discussion and Conclusion	131
6.1	Key Findings	131
6.1.1	Flexible Support for Different Online Discussions	131
6.1.2	Effective Overview of Discussion	134
6.2	Design Implications	135
6.3	Contributions	136
6.3.1	Design Principles for Structuring and Supporting Online Discussion in Online Message Boards	136

6.3.2	Conceptual Discussion Flow Based on Design Principles . . .	136
6.3.3	Design and Implementation of Potluck: A Novel Working Artefact to Structure and Support Online Discussion	136
6.3.4	Results from Field Deployments of Potluck in Distinct Set- tings for Discretionary Use	137
6.3.5	Design Implications for Online Message Boards from Empir- ical Findings	137
6.4	Limitations and Future Work	137
6.4.1	Refine Navigation and Ordering	137
6.4.2	Evaluate with Larger and Heterogenous Groups	138
6.4.3	Further Explore Design Space of Discussion Flows	138
6.4.4	Motivate Production of Public Goods	139
6.5	Conclusion	139
Appendices		141
A Supplementary Materials for Methodology		142
A.1	Ethics Approval	142
A.2	Sample of Acceptance Test Driven Development	143
A.2.1	User Story and Scenarios	143
A.2.2	Unit Tests	144
A.3	Sample of Coding in NVivo	145
A.3.1	Open Coding	145
A.3.2	Axial Coding	146
B Supplementary Materials for Potluck		147
B.1	Potluck Wireflow	148
B.2	Potluck v0.x and v1.0 User Flow Diagram	149
B.3	Potluck v0.1 Entity-Relationship Diagram	150
C Lab Study Materials		151
C.1	Information Sheet	152
C.2	Pre-study Questionnaire	155
C.3	Post-study Questionnaire	157

C.4 Lab Study I Discussion Prompts	163
D Field Study I Materials	164
D.1 Information Sheet	165
D.2 Post-study Questionnaire	168
E Field Study II Materials	176
E.1 Information Sheet	177
E.2 Post-study Questionnaire	180
E.3 Study Landing Page	197
E.4 Discussion Prompts	198
F Field Study III Materials	199
F.1 Information Sheet	200
F.2 Pre-study Questionnaire	203
F.3 Interim Questionnaire	205
F.4 Post-study Questionnaire	215
F.5 Discussion Prompts	227
F.6 Login Page	228
F.7 Certificate Error Page	228
G Host Questionnaire Data	229
Glossary	236
Acronyms	238
Bibliography	240

List of Figures

3.1	Timeline of launch dates for notable online message boards. Events marked with a grey dotted line are canonical to the evolution of online message boards.	40
3.2	Discussion flow of existing online message boards.	49
4.1	Overview of the proposed structured discussion flow for online message boards with steps labelled 1 to 5: (1) The user answers a discussion prompt; (2) gains access to the discussion area, which contains summaries of the full answers; and (3) selects a summary to read the full answers. (4) On full answers, the user can vote or ask a question. (5) Asking a question creates a new discussion area.	72
4.2	Potluck’s answer summarisation-aggregation mechanism. When a user submits an answer a , it is automatically summarised to 2-3 sentences (a.s). Summary a.s is compared to all existing summaries in the database. If a semantically-similar summary exists (b.s), a.s is discarded and a is assigned b.s . If a summary like a.s does not exist, then a is assigned a.s	74
4.3	Flow diagram for the Guest usage of Potluck v2.1.	76
4.4	Displays of Potluck v2.1 on a mobile interface.	77
4.5	Summaries page in Potluck v2.1.	78
4.6	Full answers page in Potluck v2.1.	79
4.7	Displays of Potluck v2.1 for Host users on a mobile interface.	81
4.8	Server-side architecture of Potluck v2.1.	82
4.9	Entity-relationship diagram for Potluck v2.1 with crow’s foot notation [59].	83

4.10	Box plots for the average user ratings of Potluck v0.1's features in the lab study. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.	86
4.11	Overall impressions of Potluck v0.1 in the lab study.	88
5.1	Discussion trees for Field Study I where \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.	94
5.2	Box plots for the average user ratings of Potluck v1.0's features in Field Study I. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.	96
5.3	Overall Guest user impressions of Potluck v1.0 in Field Study I.	97
5.4	Tree for discussion A in Field Study II. \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.	105
5.5	Box plots for the average user ratings of Potluck v2.0's features in Field Study II. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.	108
5.6	SUS scores for Potluck v2.0 in Field Study II.	109
5.7	Overall Guest user impressions of Potluck v2.0 in Field Study II.	110
5.8	Cumulative frequency of discussion prompts, answers, votes, and questions by study week in Field Study III.	117
5.9	Examples of discussion trees for Field Study III where \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.	118
5.10	Activity traces by study week in Field Study III.	120
5.11	Box plots for the average user ratings of Potluck v2.1's features in Field Study III. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.	122

5.12	SUS scores for Potluck v2.1 in Field Study III.	122
5.13	Overall impressions of Potluck v2.1 and its application in an educational context in Field Study III.	123

List of Tables

2.1	Research phases mapped to the relevant chapter, stages in technical HCI, and research objectives.	23
2.2	Overview of studies conducted in this thesis.	26
2.3	Overview of data collection methods used in each study.	30
3.1	Overview of modes of asynchronous computer-mediated communication.	39
4.1	Potluck version history where + are new features, – are removed features, and * are modified features.	70
4.2	Design principles mapped to relevant sections and related work. . .	71
5.1	Top-level discussion prompts used in Field Study I.	92
5.2	Raw counts of contributions within each top-level discussion prompt in Field Study I. The number of unique participants is given in brackets.	94
5.3	Participant demographics in Field Study II.	102
5.4	Raw counts of contributions in Field Study II. The number of unique participants is given in brackets.	105
5.5	Types of questions asked in Field Study II, based on [141].	105
5.6	Participant demographics and questionnaire completion in Field Study III.	115
5.7	Raw counts of contributions in Field Study III. The number of unique participants is given in brackets.	117
6.1	Overview of results from each field study.	132

Chapter 1

Introduction

THIS CHAPTER:

- ◇ Motivates the research.
 - ◇ Presents the research aim and objectives.
 - ◇ Discusses the research scope and assumptions taken to answer the questions.
 - ◇ Outlines the contributions, related publications, and structure of the thesis.
-

1.1 Motivation

“Now with the increasing ubiquity of computer networks, new spaces for public discussion and exchange are invented, introduced, and updated on an almost continual basis [...] No longer is it only architects, civil engineers, and urban planners who design spaces for public discussion” [175, p. 242].

Much of today’s public discussion is hosted on online message boards. This ubiquitous mode of computer-mediated communication (CMC) comes in various formats, including online discussion forums, social news websites (SNWs), and comment sections on media and blogs. Collectively, they serve as spaces for users

to read and publish asynchronous, reactive messages called comments [164]. Recent statistics demonstrate the popularity of online message boards, with The Guardian accumulating 70 million comments in 2016 [70], and Reddit tallying over 13 billion comments and posts in 2021 [165].

Online message boards have three key properties that differentiate them from other modes of CMC. Firstly, they are *text-based* such that they enable communication through low-bandwidth comments. Secondly, these systems are *asynchronous* which allows users to participate at different times and from different locations. Finally, online message boards are *public*, enabling anyone with internet access to join the discussion.

These properties enable users to communicate in ways that go beyond the capabilities of offline interactions [49]. For instance, the text-based nature of communication removes visual cues from discussants. Researchers have theorised that the absence of visual cues (e.g., indicators of social identity) in text-based communication has an equalising effect among participants [55]. The asynchronous participation on online message boards enables individuals to be a part of multiple discussions at any given time, increasing their capacity for involvement [49]. In order to support asynchronicity, online message boards allow contributions to persist even in the absence of their authors. This archive can then be later browsed, annotated, restructured, and repurposed in ways that cannot be done with ephemeral in-person interactions [58]. Moreover, the public nature of online message boards allows geographically-diverse individuals to contribute to and benefit from the same discussions. Together, these properties enable online message boards to host large-scale, many-to-many discussions that are accessible to a wide range of individuals.

The scale and scope of discussions facilitated by online message boards have a range of societal implications. These systems could promote the sharing of diverse viewpoints and amplify the *long tail* of discussion, i.e., views that were previously overlooked or underserved [106, 164]. Indeed, research has found that the use of online discussion forums, an early form of online message board, can be linked to the greater well-being of members of stigma-related forums [156]. While online message boards commonly facilitate cooperation in the form of mass discussions, these systems also have the potential to support complex forms that

are otherwise infeasible offline, such as large-scale scientific collaboration [38] and online deliberation [172]. Moreover, participation in online message boards has been linked to offline civic engagement [156] and decentralised collective action [185].

The problem is that online message boards suffer from design issues that extend back to pre-web discussion tools. Chapter 3 elaborates on how online message boards typically consist of **unstructured lists of repetitive, disjointed comments**. This format can quickly lead to *information overload*, a state in which individuals struggle to process the available information [99]. This can negatively impact the quality of discourse, as affected users are more likely to post shorter, repetitive, and inaccurate comments [87, 210]. To locate salient comments, online message boards such as SNW and comment sections enable users to reorder comments by time, rating, and scores based on ranking algorithms. However, this **limited ordering** is subject to social influence bias [143] and can only surface a subset of viewpoints. These design limitations provide little incentive for users to interact in ways that benefit the collective, resulting in self-serving behaviours (e.g., spamming) that lower the overall quality of discussion [164]. These problems are expected to worsen as the activity on online message boards increase—and activity is growing rapidly. For instance, Reddit reported a 44 percent increase in daily active users between October 2019 and October 2020 [155]. In other words, there is a pressing concern that the current design of online message boards cannot effectively facilitate online discussion.

Researchers in computer-supported cooperative work (CSCW) and human-computer interaction (HCI) have long recognised the design limitations associated with online message boards [17, 158, 174]. Recent works have sought to improve the display of comments through data modelling and visualisation, employing topic modelling to highlight and group related comments [90–92], and dimensionality reduction to map viewpoints to a vector space [60, 105, 187]. These efforts have mainly focused on the navigation and exploration of viewpoints, rather than the facilitation of online discussion. Researchers have also proposed ways to empower users in manually curating and synthesising online discussions [149, 214] but these solutions provide delayed benefits and raise practicality concerns regarding sustained human effort. Related works on structured group communication processes

(e.g., Delphi [41]) and argumentation systems (e.g., [43, 106]) present ways in which participation can be guided to produce structured outcomes, but these systems are not designed to accommodate online discussion.

This thesis seeks to address the gap in understanding how online message boards can be designed to better structure and facilitate online discussion. This will be investigated through the conceptualisation of a structured design space for online discussion; and the design, implementation, and real-world evaluation of a novel approach to online message boards.

1.2 Research Aim and Objectives

Based on the motivations, the research aim is to investigate how online message boards can be designed to better structure and facilitate online discussion. It will be addressed through the following research objectives (ROs):

RO1: Identify key structural limitations with existing online message boards and their consequences for online discussion. This objective contextualises the research problem. It provides insights into what the technical and associated social challenges are with online message boards, where they originate from, and how they impact online discussion. RO1 is addressed in Chapter 3.

RO2: Review potential strategies to structure and facilitate online discussion in online message boards. Building on RO1, this objective examines strategies to structure and support online discussions through an interdisciplinary review, including research from communication studies, political theory, economics, and management. It situates the research in existing work and identifies promising directions for further inquiry. RO2 is addressed in Chapter 3.

RO3: Derive a design space for online message boards from the strategies identified in RO2. This objective synthesises the strategies from RO2 to establish a novel structured design space to frame the research. It

produces a set of design principles to inform the design of online message boards. RO3 is given in Chapter 4.

RO4: Design and implement a novel online message board based on the design space from RO3. This objective utilises the design principles from RO3 to conceptualise a structured discussion flow for online message boards. It then operationalises the proposed discussion flow into the design and implementation of Potluck, a novel online message board. RO4 is described in Chapter 4.

RO5: Evaluate the proposed online message board through different field deployments. This objective provides empirical evidence to demonstrate the proposed online message board, Potluck. It describes and explores how users engage with and make sense of Potluck in distinct real-world settings. It also assesses the usability of the system with different user groups. RO5 is achieved in Chapter 5.

1.3 Research Scope and Assumptions

This research resides in discourse architecture, the “practice of designing networked environments to support conversation, discussion, and exchange between people” [175, p. 243]. Discourse architecture emerged in the early 2000s [98], along with the rise in online users and web-based public discussion (see Section 3.1). Situated in social computing, discourse architecture overlaps research in CMC, CSCW, and HCI [175]. According to Erickson et al. [57], there are two facets to discourse architecture:

“One meaning has to do with the structure or **architecture of conversation itself**, that is, with the ways in which the utterances which form a conversation interrelate and build upon one another. [...] The second meaning has to do with **architectures for discourse**, with the ways in which the design of CMC systems shapes the conversation that takes place within them” [57, p. 936].

This research will focus on the latter: the architecture for discourse, i.e., the design of systems to scaffold and support online discussion. It seeks to address a subset of challenges with online message boards related to design choices, such as the discussion format, navigation, participation, and the role of identity. As a result, challenges that cannot be appropriately addressed through structure, notably information accuracy [77] and content moderation [72], are outside the scope of this research¹.

There are different types of online discussion that may need to be organised and facilitated in different ways. These forms can be distinguished by their medium, membership, and purpose [42, 191]. For the purposes of this thesis, online discussion will be limited to the following criteria:

Asynchronous communication: Participants will not have to engage in real-time. That is, they will have the ability to participate in discussion at their convenience.

Text-only format: Participants will only use written language to communicate, without the use of audio or video.

Cooperation: The purpose of the discussion will be cooperation, which ranges from information exchange and conversation at its simplest form, to collaboration in its most complex form [185].

Focus: Discussions will be bounded by a subject or topic, such as the content of a news article or a discussion prompt.

Group size: Discussions will involve a group of more than two individuals. The size and demographics of the group will vary depending on the context and purpose of the discussion.

¹To safeguard participants in the empirical studies, content moderation is implemented in Potluck as a *peripheral feature*, i.e., a feature that is irrelevant to the evaluation of the invention but required for robustness [93].

1.4 Summary of Contributions

This research contributes to the literature on discourse architecture by focusing on how online message boards can be designed to better structure and facilitate online discussions. The contributions of this thesis are detailed in Chapter 6 and summarised as follows:

- Design principles for online message boards derived from an interdisciplinary literature review on strategies for structuring and supporting online discussions (see Chapter 4).
- A conceptual discussion flow for online message board based on the identified design principles (see Chapter 4).
- The design and implementation of a novel working artefact for online discussion, Potluck, which operationalises the proposed discussion flow (see Chapter 4).
- Results from field deployments of Potluck in three distinct settings for discretionary use (see Chapter 5).
- Design implications for online message boards based on the empirical findings and lessons from the field deployments (see Chapter 6).

The following works have been published over the course of this research. Their inclusion in this thesis will be indicated in the preface of relevant chapters:

- E. Lieu, “Designing for constructive online discussion,” in Proceedings of the 35th British HCI and Doctoral Consortium 2022, ser. HCI2022, Keele, Staffordshire, UK: BCS Learning and Development, Jul. 2022 [125].
- E. Lieu, J. Cole, and C. Watkins, “Bring something to the Potluck: A system for inclusive and reciprocal online discussion,” in Proceedings of the 35th British HCI and Doctoral Consortium 2022, ser. HCI2022, Keele, Staffordshire, UK: BCS Learning and Development, Jul. 2022 [126].

1.5 Thesis Outline

This thesis is structured into six chapters:

Chapter 2 explains the methodology used for this research. It outlines the research approach and the three-phase research process. It also describes and justifies the methods used for data collection and analysis.

Chapter 3 provides the background for this thesis and situates it in existing work. It provides a chronology of how online discussion has evolved and discusses the challenges and opportunities with current online message boards. It then surveys the landscape of proposed tools and strategies to structure and facilitate online discussion through an interdisciplinary narrative literature review.

Chapter 4 details a set of design principles (DPs) for structuring and facilitating discourse in online message boards. It conceptualises a structured online discussion flow based on the DPs. It describes the design, usage, and implementation of Potluck, a novel online message board that operationalises the proposed discussion flow. It concludes with a description of an early formative lab-based evaluation of Potluck.

Chapter 5 describes a series of field deployments of Potluck in three real-world settings with distinct use cases.

Chapter 6 discusses the key findings and implications of the field deployments. It presents the thesis contributions and concludes with a discussion of limitations and future work.

Chapter 2

Methodology

THIS CHAPTER:

- ◇ Details the research approach and three-phase research process.
- ◇ Describes the methods used for data collection and analysis.
- ◇ Presents the research ethics for the studies in this dissertation.

A summary of Section 2.2 has been published in [125].

2.1 Research Approach

The aim of this research is to investigate how online message boards can be designed to structure and facilitate discussion. To achieve this, **technical HCI** was used as a guiding methodological approach¹. Technical HCI seeks to directly invent (and indirectly enable the invention of) technological solutions to human problems [93, p. 69]. Although the concept was first described in the mid-2010s

¹Research through Design (RtD) [216] was initially considered as the methodological approach for this research. Similarly to technical HCI, RtD focuses on the creation (rather than discovery) of knowledge [215]. However, “RtD researchers who produce the best research results do so by repeatedly investigating the same situation” [215, p. 186]. Ultimately, technical HCI was more suitable than RtD considering the time and resources available.

Research phase	Ch.	Stage in technical HCI	ROs
I: Contextual	3	1. Concept creation	RO1, RO2
II: Technical	4	1. Concept creation 2. Validation (POC implementation)	RO3, RO4
III: Empirical	5	3. Validation (secondary methods)	RO5

Table 2.1: Research phases mapped to the relevant chapter, stages in technical HCI, and research objectives.

[93], traces of technical HCI can be found throughout prior research into online discussion tools (e.g., [2, 17, 149]).

This methodological approach was chosen for its focus on *invention*. Invention is the creation of knowledge and a distinguishing feature of technical HCI. The core value of inventive work is practicality, i.e., whether it works and in what circumstances. For this reason, proof-of-concept (POC) implementation is the main form of validation in technical HCI. Hudson and Mankoff state that “it is the normal practice in technical HCI to give POC implementations separate and stronger consideration than other forms of validation” [93, p. 89]. This separates it from other approaches to HCI and CSCW research, e.g., Participatory Design [145], which focus on *discovery*, the development of new understanding. The validity of discovery work is based on a reliable methodology and a high level of confidence in the results [93], requiring controlled experiments or detailed case study protocols.

Another distinction of technical HCI is its aim to produce *reusable knowledge* [93]. This could be achieved through building the artefact out of publicly available and inexpensive technologies, as well as documenting the design and development process. This emphasis on reusability differentiates it from similar activities outside of research which aim to invent but not necessarily lead to further invention, such as product development.

There are three stages in technical HCI [93, p. 90]:

1. Concept creation, which can stem from a need (e.g., facilitating constructive online discussion) or some potential technology to meet a need.

2. Validation through POC implementation, which Hudson and Mankoff argue is “the most fundamental of validation approaches for inventive work” [93, p. 78].
3. Validation through secondary methods, such as usability testing and field deployments.

These stages have been adapted in this thesis to account for the context building prior to concept creation. As such, this research has been conducted in three phases: contextual, technical, and empirical. As shown in Table 2.1, each stage in technical HCI can be mapped to a phase in the research process discussed in the next section.

2.2 Research Process

A three-phase research process was adopted where the output from one phase was fed into the next. This section describes the research activities completed during each phase.

2.2.1 Phase I: Contextual

The contextual phase was fundamental to the first stage of technical HCI, concept creation. This phase focused on producing a narrative literature review, a flexible method for reinterpreting or joining literature on different topics [11, p. 312]. It began by producing a chronology of asynchronous computer-mediated communication (ACMC), from pre-web ACMC to web-based discussion systems to achieve RO1. This helped the researcher to understand how online message boards have evolved, and understand their ongoing challenges. Next, the landscape of existing tools and techniques to address those challenges was surveyed to situate the research and address RO2. This included a review of literature beyond HCI and CSCW to expand the space of solutions, including research from political theory, management, economics, and communication studies. This enabled the researcher to build the theoretical foundation for the design of an improved online message board. Three strategies to structure and support online discussion emerged from

the narrative literature review: scaffolding participation, synthesising online discussion, and embedding situational norms (see Section 3.3). These findings were fed into the early stages of Phase II, the technical phase.

2.2.2 Phase II: Technical

The technical phase is central to the thesis. It involved two major stages of technical HCI: concept creation, and validation through POC implementation [93]. As discussed in Section 2.1, POC implementation is the most important form of validation in technical HCI.

First, the findings from Phase I were used to derive a set of design principles for online message boards and achieve RO3. The design principles were used to conceptualise a *structured discussion flow* for online message boards. To validate the proposed concept, the structured discussion flow was implemented in POTLUCK, an experimental online message board. The design and implementation activities encompassed RO4. The implementation of Potluck combined two software engineering concepts: acceptance test driven development (ATTD) and iterative and incremental development (IID).

ATTD is a development process that first transforms a requirement of a system into test cases called *acceptance tests* [160]. The requirement is then implemented from and verified by its acceptance tests. Potluck was developed using ATTD for the clarity and maintainability of the resulting codebase, which are determinants of *reusable knowledge*. Specifically, the acceptance tests were written and maintained in a unit testing framework, Python’s `unittest`, which enabled automated regression testing. Moreover, by mapping directly to requirements, the tests acted as in-code documentation of the system. Appendix A.2 presents a sample of the ATTD approach used to develop Potluck.

IID is the concept of building up a system through a series of *iterations*, self-contained rounds of analysis, design, development and testing [116]. There are different variations of IID, but they all share a common goal: “to avoid single-pass sequential, document-driven, gated-step approach” [115, p. 47]. IID was used to structure the overall implementation of Potluck. Each iteration was two-weeks long and produced a working partial system. This meant that between iterations,

Study	Setting	Study location	Participants (N)	Start date	Study duration
Lab Study	Workshop	In-person	6	24 November 2021	1 hour
Field Study I	Professional	Virtual	10	14 March 2022	10 days
Field Study II	Event	In-person	17	5 November 2022	0.5 days
Field Study III	Educational	Virtual	19	13 January 2023	75 days

Table 2.2: Overview of studies conducted in this thesis.

the system could be trialled by actual users.

Formative lab-based usability studies² were conducted with early iterations of the system, named Potluck v0.x where x is the iteration number. Since the lab studies repeated the same procedure, only the first lab study is described in the thesis; see Section 4.6. In lab-based studies, users ‘perform tasks that approximate real-world actions with the technology in an artificial environment (the “lab”)’ [186, p. 120]. Since online discussion is a group phenomenon, participants engaged with discussions on Potluck v0.x in a workshop setting. The lab-based setting allowed for efficient data collection on the feasibility and initial impressions of Potluck’s core features. Although there were only up to six participants in each lab study, researchers have found that most usability problems can be uncovered by the first three to five participants [121, 202, 206]. An iterative test-and-design methodology with small groups is recommended to maximise the return on investment [202]. The results and analyses from these preliminary studies were used to inform the direction of subsequent iterations. The resulting artefact was passed into Phase III, the empirical phase.

2.2.3 Phase III: Empirical

The empirical phase satisfied the final stage of technical HCI, validation through secondary methods [93]. It addressed RO5 through the evaluation of the artefact from Phase II with different real-world communities.

Field deployments, otherwise known as observational field studies, were the main strategy of inquiry. They are “a type of field study, in which the focus is on

²Described in the technical phase rather than the empirical phase because they were formative evaluations.

the trial of a newly developed or created technology (often a prototype) in situ” [186, p. 120]. This strategy is used across HCI and CSCW research, including research on novel discussion tools (e.g., [17, 110, 111]). Unlike lab studies, field deployments can be used to explore “how users *accept, adopt, and appropriate* a system in actual use over time” [186, p. 123].

As shown in Table 2.2, field deployments were separately conducted in three real-world settings: professional, educational, and event-based. This enabled validation through the triangulation of multiple data sources across groups [3]. These settings were chosen for their distinct use cases and unifying need for online and hybrid communication in recent years. The study locations were determined by the setting and the availability of the participating group. For example, the participants in Field Study I were located across different time zones whereas the participants in Field Study II were all based in the location of the event. The study durations were similarly determined, e.g., Field Study II ran during a half-day hackathon, while Field Study III ran for the entirety of an undergraduate module. The number of participants were pre-determined by the group size in each setting (e.g., number of event attendees, number of students in the module). The procedures for each study are detailed in Chapter 5.

The researcher recruited the participating groups by directly approaching group leaders, and by leveraging the professional networks of colleagues. The recruitment process began with the creation or amendment of written materials about Potluck and video demos of the system. Per study, an interest email with links to these materials was sent to the group leader (e.g., event organiser, course convenor). If the group leader responded with interest, an online meeting was set up between the researcher and group leader to demo Potluck in real-time and set expectations of the system. Should the group leader wish to proceed with the study, the researcher prepared a private instance of the experimental system specifically for the study. This involved making additions to the system to accommodate the setting (e.g., authentication by student ID) while keeping the core functionality intact. The instance was then deployed to a server at Royal Holloway with a new database by a member of the departmental IT team. In parallel, the researcher had online meetings and email correspondence with the group leader to prepare study materials; review the study procedure; and update them on the progress of

the deployment.

The organisation of each field deployment—from recruitment to the start of the study—took up to four months end-to-end. While field deployments tend to be more time- and resource-intensive than lab studies, they have the benefit of providing greater ecological validity [27]. This was important for evaluating Potluck because key factors that affect system use, such as social context, cannot be easily replicated in a controlled setting [186]. To identify potentially expensive issues with the study procedure and materials, the researcher ran a pilot study prior to each field study. Field Study I was piloted as a convenience deployment with the researcher and their colleagues, while Field Study II and III were piloted with other groups within the target setting (see Section 5.3.1 and 5.4.1 respectively).

During the field deployments, data was collected with mixed methods described in Section 2.2.3. At its core, field deployments are a “study of system use in context, *regardless of the empirical approach* used for evaluation and understanding” [186, p. 136]. An overview of the data collection methods used are shown in Table 2.3 and elaborated on in Section 2.3. The collected data was analysed shortly after the end of each field deployment using the data analysis methods described in Section 2.3.

Mixed methods

A mixed methods strategy to inquiry was undertaken for data collection and analysis. A combination of methods is ideal for when “either the quantitative or qualitative approach by itself is inadequate to best understand a research problem or the strengths of both quantitative and qualitative research can provide the best understanding” [39, p. 18]. To explore how users engaged with Potluck and evaluate the perceived usability of the system, quantitative data was gathered from log data and numerical responses in questionnaires respectively. However, quantitative data alone could not be used to understand the motivations behind the engagement. Nor could it be used to investigate how usability issues were subjectively and collectively experienced from group to group [26]. This required qualitative data, which was collected from the user submissions to the experimental system stored as log data; long-form text responses in questionnaires; structured

interviews; and contextual inquiries.

Mixed methods addressed the limitations of individual methods through *methodological triangulation*, investigating the same phenomenon (e.g., user experience of Potluck) through multiple methods [3, p. 26]. This improves the overall reliability of the evidence underpinning the thesis. For example, the main method of data collection employed was observational log data (see Section 2.3.1). While log data can provide an objective portrait of user behaviour, it cannot be used to explain user intent, experience, or impressions [56]. To address this limitation, elicitation techniques (e.g., questionnaires, contextual inquiry, interviews) were used in tandem.

2.3 Data Collection and Analysis

As shown in Table 2.3, the lab-based usability study described in Section 4.6 collected log data, and pre- and post-study questionnaires. All field studies in Chapter 5 utilised log data, post-study questionnaires, and structured interviews but additional methods were used in Field Study II and III. This variation arose from the location and availability of the participants, and the duration of the study. For instance, in Field Study II, the researcher had the opportunity to conduct *direct, non-participant observations*, i.e., in-person observation while remaining outside of the group under observation [173]. This enabled additional data collection through contextual inquiry [89], on top of the procedure used in Field Study I. Contextual inquiry could not have been used in Field Study I in which the participants were in different countries, nor Field Study III where participants used the system at variable times outside of class. This section will discuss the employed methods for data collection and data analysis, including why they chosen; how they were used; and their methodological limitations.

2.3.1 Log Data

Log data, or behavioural logs, are “traces of human behavior seen through the lenses of sensors that capture and record user activity” [56, p. 349]. The behaviours can range from low-level keystrokes and clicks, to browsing patterns and user-

Study	Log data	Questionnaire			Contextual inquiry	Interview
		Pre-study	Interim	Post-study		
Lab Study	✓	✓	–	✓	–	–
Field Study I	✓	–	–	✓	–	✓
Field Study II	✓	–	–	✓	✓	✓
Field Study III	✓	✓	✓	✓	–	✓

Table 2.3: Overview of data collection methods used in each study.

generated content [56]. The main advantage of log data is its ability to provide objective insights into user behaviour.

In each study, participants submitted posts, questions, and votes to a private instance of Potluck. Each submission was logged, i.e., captured by the system along with its metadata, and stored in an object-relational database. The objective of capturing log data was to examine actual user behaviour on Potluck without interference from the researcher. Submissions to Potluck were stored as an entry within the relevant database table (e.g., `POST`, `QUESTION`, `VOTE`) along with a timestamp and ID of the associated user. The field study in Section 5.4 also logged button clicks, text box clicks, and pages viewed. These additional user events were stored in the dedicated `LOG` table. Each entry included the timestamp, event name, the object ID (if applicable), request path (if applicable), request referrer, user agent. Combining this log data, the researcher was able to reconstruct and observe the behaviour of participants, at both an individual level and group level.

A log analysis [56] was performed after each study to gain a descriptive understanding of user behaviour. For the field studies, they were also conducted *during* the study so that the researcher could triangulate the log data with other sources of information in real time (e.g., from communication with participants). Per study, the process of log analysis began by exporting the database tables to raw log files. The log files were ported to a spreadsheet in MS Excel for pre-processing. The log entries, i.e., rows, created outside of the study period were discarded, such as data submitted during pre-study demonstrations. The entries logging the researcher’s activity on the experimental system were also removed. A sanity check was then performed where unusual behaviour, such as periods with particularly high activ-

ity, were identified and annotated in the spreadsheet. After pre-processing, metrics on user engagement were extracted from the data to provide descriptive statistics. This included the frequency of submissions; total counts of submissions; depth of answer trees; and length of textual submissions. The metrics were partitioned in different ways (e.g., by individual, time period, device) to compare patterns of engagement.

Basic content analysis [54] was also performed to systematically gain quantitative insights from qualitative log data. It was only used in studies when the log data had well-defined categories because unlike interpretive and qualitative content analyses, basic content analysis “relies mainly on frequency counts of low-inference events that are manifest or literal and that do not require the researcher to make extensive interpretive judgments” [54, p. 24]. For instance, basic content analysis was appropriate in Field Study II, where *a priori* codes for categorising questions could be derived from existing studies and used to deductively code the data set. The flexibility of basic content analysis also enabled additional codes to be surfaced inductively. Due to the small size and low subjectivity of the data set and codes, the researcher coded the data set and reviewed the coding with their supervisors instead of seeking inter-rater agreement [136].

While log data can be used to investigate what users do on the system and when they do it, this data cannot be used to understand *why* they do it [56]. This includes the subjective experience and impressions of participants. To address this limitation, the researcher triangulated the findings using the elicitation techniques described in the following sections.

2.3.2 Questionnaires

Questionnaires can be used to investigate subjective, semi-tacit knowledge [3, 144]. In this research, questionnaires were appropriate for their ability to collect ancillary information in a standardised format [173]. This information was used to contextualise the observations made from the log data.

As shown in Table 2.3, questionnaires were administered to participants in every study. Each questionnaire was trialled by participants in a pilot study to ensure construct validity [39]; refer to Appendix C to F for the questionnaires. In

Chapter 4, the main objective of the questionnaires was to examine the feasibility of Potluck among users with different commenting behaviours. A pre-study and post-study questionnaire were issued to compare the differences in behaviour. In Chapter 5, the objective of the questionnaires was to investigate the perceptions and experiences of using Potluck across study participants. The questionnaires were completed post-study, apart from Field Study III (see 5.4) which had a pre-study, interim, and post-study questionnaire. This decision was based on the longitudinal nature of Field Study III, and feedback of survey fatigue for the pilot questionnaire.

The questionnaires featured numerical, long-form text, and tick responses. A five-point Likert-style scaling was used to measure unipolar constructs [144]. This included perceived ease-of-use, engagement and usefulness of the features in Potluck. Bipolar constructs on the experience of using Potluck were measured similarly but were followed by long-form text responses to gather further insights from the participants. To reduce participant burden, tick responses were available when there were a set of potential answers established from preliminary investigation, such as the reasons for using Potluck. They were used to describe participant demographics, e.g., whether they are typically active or passive participants in online discussion. Dichotomous responses (e.g., yes/no) were avoided where possible to mitigate acquiescence bias [144]. The numerical data was analysed using descriptive statistics as per Section 2.3.1.

The long-form text data was analysed using an often-used derivative of grounded theory called grounded theory lite (GT-lite) [18, 19]. Grounded theory is a *methodology* that allows for the emergence of theory from systematically collecting and analysing qualitative data [73]. It involves an iterative process of data collection using theoretical sampling [28], analysis, and theorising. This process stops when theoretical saturation is reached, i.e., when each new item of data can be fit into existing theory [28]. In contrast, GT-lite is a *method* which aims to identify and link concepts and categories, rather than generate theories [18, Tab. 8.1]. Unlike grounded theory, it is suitable for smaller samples selected through convenience sampling [19]. GT-lite retains the analytic procedures from grounded theory, including open, axial, and selective coding; memo-taking; and constant comparative analysis [18]. The researcher performed GT-lite in NVivo 1.7.1 which enabled sys-

tematic coding and an audit trail; see Appendix A.3 for a sample. It should be noted that the output of GT-lite is comparable to that of reflexive thematic analysis, where themes are similar to categories [19]. However, these research methods differ in their underlying paradigms: in reflexive thematic analysis, themes do not emerge from reflexive thematic analysis, they are actively created by the researcher [20].

Standardised questionnaires

Standardised questionnaires are leveraged in CMC research to measure constructs such as task load (e.g., NASA-TLX [82]), perceived usability (e.g., CSUQ [122], UMUX [63]), and aesthetics (e.g., VisAwi [142], AttrakDiff [83]). They are a viable alternative to creating a new questionnaire because they can typically “benefit from prior validation and allow researchers to compare results with other studies that used the same questionnaire” [144, p. 249]. The post-study questionnaires in Field Study II and III included questions from a standardised usability questionnaire, the System Usability Scale (SUS)³ [21]. SUS features ten questions that aim to measure a system’s effectiveness, efficiency, and user satisfaction [21]. Given its wide adoption, it is the recommended instrument for measuring perceived usability as a unidimensional construct [123]. To mitigate potential measurement error from the use of a standardised questionnaire [144], minor wording changes were made, e.g., the replacement of the word “system” with “Potluck”. For analysis, a SUS score was computed for each respondent following the calculation given in [21]. The mean SUS score among the participants was mapped to the Sauro-Lewis curved grading scale (CGS) [178, Tab. 8.5] to rank the overall perceived usability of the system. It can be argued that usability is better measured through task-based observational research and interviews [144]. However, questionnaires are a practical solution to collect usability data from many disparate users [3].

³SUS was not used in studies with less than 12 participants. According to Tullis and Stenson [201], a minimum of 12-14 participants is required to obtain ‘reasonably reliable results’ from standardised usability questionnaires.

2.3.3 Contextual Inquiry

Contextual inquiry is a user research method with methodological roots in psychology, anthropology, and sociology [163]. It involves observing a user doing some target activity (e.g., using Potluck) while conducting a contextual interview [89]. The contextual interview is unstructured and similar to the think-aloud method [151], in which users articulate their actions while using a system. However, the researcher plays a more active role in a contextual interview, probing and co-interpreting the actions of a participant in a pattern of withdrawal and return [89].

Contextual inquiry was conducted with nine out of 16 participants during Field Study II. The objective was to understand how users experienced Potluck in the context of its use. Contextual inquiry can last up to 180 minutes per user [89] but in this study, only 20 to 30 minutes was required. In that time, the participant used the experimental system while the researcher interrupted their activity to ask questions and hypothesise together on interpretations.

Ideally, the screen and audio of the contextual interviews would have been recorded for validity. However, the observations and findings were noted by hand due to a late-stage change in data collection methods. Changes made to methods and procedures in field deployments do not invalidate research as it would do in a controlled experiment [186]. Rather, “researchers need to be responsive in adjusting the data collection, study plan, or other factors as conditions evolve during the deployment” [186, p. 130]. To verify the accuracy of the data, the researcher used *member checking* [39]. This involved sharing and discussing the interpretations with the participant, while wrapping up the contextual inquiry.

Holtzblatt and Beyer [89] describe modern contextual design models to interpret contextual inquiries, such as affinity diagrams and experience models. The researcher opted for sequence models, a traditional contextual design model which “captures the triggers, intents, and steps of users’ activities” [89]. The resulting sequence models were analysed using basic content analysis (see Section 2.3.1) to identify engagement patterns between participants.

2.3.4 Interviews

A structured interview was conducted at the end of each field study in Chapter 5. The objective of these interviews was to elicit the experiences and perceptions of using Potluck from the participants who had the most interaction with it: the leader or organiser of each participating group. The interviews were structured so that the participants were asked the same pre-determined questions. The questions were grouped into two sections based on their experience as a Host user, and experience as a user on Potluck in general. The consistency was important for data analysis because the field studies were conducted with procedural and methodological differences, as shown in Table 2.2 and 2.3 respectively. Therefore, having the participants respond to the same questions enabled the researcher to later identify themes across the studies. Structured interviews are commonly used with closed questions [18], but these interviews mainly consisted of open-ended questions. This allowed the participants to respond *in their own words*, improving the validity of the responses [18].

Each interview was conducted asynchronously over email. Email interviews, along with other forms of virtual interviews, are an alternative to face-to-face interviews [18]. A key benefit of face-to-face interviewing is the ability to probe answers and adapt the line of questioning. This ability did not concern this research because structured interviews do not require the flexibility afforded by face-to-face interviews. Email interviews have the advantage of allowing participants to reflect, edit, and answer the questions at their convenience. This has the potential to lead to more detailed, reflective answers than could be captured in a live interview [18]. There are different ways to conduct an email interview, from sending participants one question at a time, to sending all the questions at once in an e-mail attachment [97]. The researcher took the latter approach to minimise one of the main risks of asynchronous interviews, nonresponse from participants [97]. Moreover, the former approach would be more appropriate for semi-structured or unstructured interviews in which the line of questioning has variability.

The interviews were analysed using GT-lite, detailed in Section 2.3.2. After the researcher analysed the interview, a copy of the results and analysis was sent to the interviewee for member checking [39].

2.4 Research Ethics

All studies included in the thesis received approval from the College Research Ethics Committee through self-assessment. Research submitted through this route requires the researcher to complete an ethical review form, providing detailed descriptions of the research aims, methods, potential risks and mitigations. Copies of the study materials (e.g., participant information sheet, consent form, questionnaires) are also attached to the ethical review form. Before the form can be submitted, it must be approved by a member of the researcher’s supervision team. Research submitted through self-assessment is subject to audits by the Research Ethics Committee in order to comply with the Concordat to Support Research Integrity. The studies in this dissertation and their corresponding Ethics ID are shown in Appendix A.1. The materials for the lab studies and field studies are in Appendix C–F.

2.5 Summary

In this thesis, technical HCI was used as a guiding methodological approach. The research process was divided into three parts—conceptual, technical, and empirical—which map to the stages of technical HCI. Phase I, the conceptual phase, built the groundwork for this thesis using a narrative literature review. The results of Phase I were fed into Phase II, the technical phase, where it was used to inform the design of a novel structured online discussion flow. This design was implemented into Potluck, an experimental online message board which was built incrementally and iteratively. Results from formative lab-based studies of prototypes were used to evaluate the feasibility and usability of the proposed system. The resulting artefact, a robust version of Potluck, was passed into Phase III, the empirical phase. In Phase III, three field deployments of Potluck were conducted to describe and explore how users engage with Potluck in distinct, real-world settings. Per field deployment, a pragmatic, mixed methods approach to inquiry was taken. The data collection methods included log data, questionnaires, contextual inquiry, and structured interviews. Data analysis through log analysis, descriptive statistics, basic content analysis, and GT-lite was conducted on a

study-by-study basis.

The next chapter provides the background for this thesis and addresses RO1 and RO2. It will discuss the history of ACMC; the challenges with online message boards; and tools and techniques proposed in existing work.

Chapter 3

Background and Related Work

THIS CHAPTER:

- ◇ Provides a chronology of how asynchronous computer-mediated communication has evolved and influenced online message boards (RO1).
 - ◇ Discusses the challenges with current online message boards (RO1).
 - ◇ Surveys the landscape of proposed tools and strategies to structure and facilitate online discussion (RO2).
-

3.1 Origins and Features of Online Message Boards

The legacy of early asynchronous computer-mediated communication (ACMC) can be seen in contemporary online message boards. Features such as vertical lists of comments, threading, and moderation were first implemented in ACMC predating the Internet; see Table 3.1 for an overview. The purpose of this section is to understand the ways in which current online message boards structure and facilitate discussion in the context of its predecessors. It will describe how ACMC, specifically for group discussions, has evolved over time and how each iteration has influenced the features of online message boards today.

Mode	Access	Content	Organisation	Structural features
Discussion list	Email	Topic-based messages from subscribers	Depends, messages distributed via listserv	Flat
bulletin board system (BBS)	Dial-up modem	Depends, often topic-based messages	Centralised, managed by sysop	Flat
Usenet news-group	Newsreader	Topic-based messages	Decentralised, each managed by moderator	Threaded
Online discussion forum	Web browser	Topic-based messages	Centralised, managed by admin	Flat
Social news website	Web browser	Links to (and discussions of) outgoing links	Centralised, may feature community-specific management (e.g., Reddit)	Threaded; rating; dynamic ranking of content
Comment section	Web browser	Messages related to host content	Centralised, managed by admin	Flat or threaded; rating; portability

Table 3.1: Overview of modes of asynchronous computer-mediated communication.

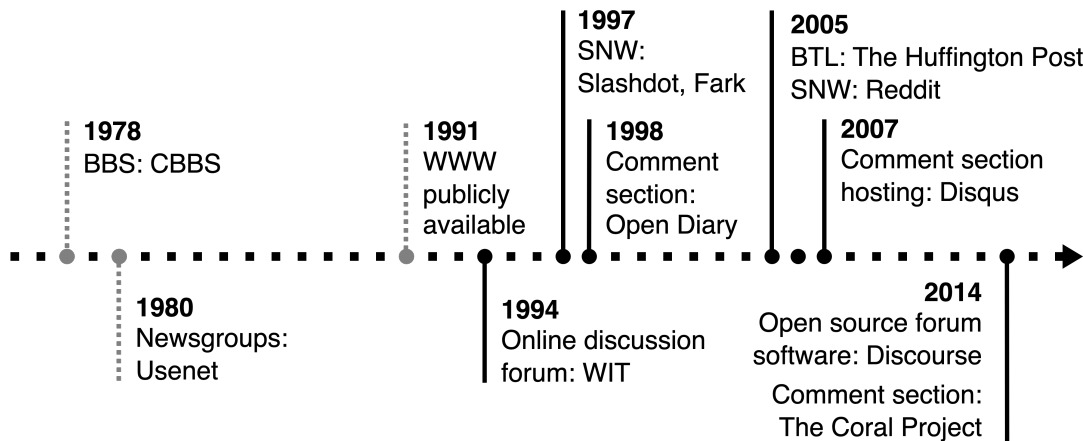


Figure 3.1: Timeline of launch dates for notable online message boards. Events marked with a grey dotted line are canonical to the evolution of online message boards.

3.1.1 Evolution of Pre-Web Discussion Tools

From as early as 1969, there were technologies that allowed disparate groups to connect, share, and discuss online [86]. There were *virtual publics*, such as discussion lists and newsgroups, “whose membership and existence are fairly open for both observation and user participation” [99, p. 195]. There were also privately-hosted bulletin board systems whose membership and existence were not as openly observable outside of hobbyists.

Discussion Lists

Advanced Research Projects Agency Network (ARPANET), funded by the United State’s Department of Defence, was a precursor to the Internet that connected government contractors and participant universities [119]. Although ARPANET was intended to facilitate remote resource transfer [168], by 1973, emailing had become the most popular activity on the network [86]. Email is the earliest mode of ACMC, conceptualised for one-to-one communication, i.e., sharing information between two people.

Emailing led to the emergence of the social discussion lists in the mid-1970s. Discussion lists—also called mailing lists or distribution lists—are email-based interest group discussions [86]. They are notable for being the first ACMC to support

many-to-many communication¹. In a discussion list, messages are distributed to multiple participants through a listserv, a mailing list server [86]. Listservers include features to manage the community and content, some of which are present in contemporary online message boards. For example, it could archive messages and provide a persistent record of the discussion. It could also manage subscriptions so that only those subscribed to the discussion list could receive and post messages. This also allowed the list owner to moderate the discussion by approving or removing subscribers and messages.

Through discussion lists, communities were being formed online for the first time in what could be thought as early online social networks [22]. Examples include SF-LOVERS for science fiction fans and HUMAN-NETS for discussing the social side of computing [168].

Bulletin Board Systems

Outside of ARPANET, a grassroots ACMC for group discussion was developed in 1978²: the BBS [32]. BBSes were decentralised, computer-based message boards operated via telecommunication. Each BBS was hosted by a system operator (sysop) running host software, and users who wanted to read or post a message to a certain BBS would have to connect their personal computer to their telephone line and dial into the BBS [168]. Depending on their host software, sysops could employ moderation features [112], but they “by and large embraced a hands-off approach to what users were saying and sharing, supported by a political stance that they should not be interfering” [72, p. 435].

At its peak, BBSes were set up around the world, bringing together dozens to thousands of users in discussions on a variety of topics [168]. Some of the oldest online communities started out on BBS, such as the Whole Earth 'Lectronic Link (WELL) [168] and East Coast Hang Out (ECHO) [193].

¹Distinct from modern mailing lists which typically support *one-to-many* communication.

²The first computer-based bulletin board was Computer Memory which was introduced in 1973, but it was centralised such that users had to access it through one mainframe computer [52].

Usenet Newsgroups

The concepts of discussion lists and topic-based message boards were brought to public attention with the introduction of Usenet, a globally distributed public discussion system [86]. Dubbed ‘the poor man’s ARPANET’, Usenet was implemented in 1979 by graduate students at Duke University [84]. It consisted of a hierarchy of topic-based message boards called newsgroups. Users accessed newsgroups through a newsreader client in which they could read, post, and reply to messages [86]. The messages could be viewed in threads, a structure in which replies to the original message are nested below it [86]. Until newsgroups, ACMC mainly displayed messages in a flat format, i.e., sequentially by time of posting.

Usenet is no longer in popular use. Towards the end of the 1990s, it had been ‘overrun with spam, and by the mid-2000s, it was widely reported as “dead.”’ [62, p. 6]. Regardless, Usenet played an important role in the research, design, and adoption of ACMC and its legacy can be seen through the features of many online message boards today.

3.1.2 Emergence of Online Message Boards

As shown in Figure 3.1, the availability of the World Wide Web from 1991 led to a proliferation of web-based ACMC. This section will focus on online message boards, a mode of ACMC intended to support online discussion. These include online discussion forums, social news websites, and comment sections.

Online Discussion Forums

In 1994, the W3 Consortium introduced W3 Interactive Talk (WIT) as an alternative to the ‘mayhem’ of discussion lists and newsgroups [131]. WIT was an early iteration of web-based forums or online discussion forums, one of the most extensively studied modes of ACMC [132, 148]. An online discussion forum is a centralised message board with a specific theme or interest. It has inherited several structural features from its predecessors, such a topic-based discussion areas, i.e., categories and a flat, chronological display of posts. Online discussion forum software such as Discourse also offer modern features such as tagging as an alternative

to categories.

Online discussion forums are known for hosting large online communities and the “inexpensive and convenient provision of help they offer” [180, p. 2478]. Despite dating back to the early days of the Web, online discussion forums continue to host active communities, e.g., MumsNet, GaiaOnline, Jedi Council Forums. They have been widely employed in the field of computer-supported collaborative learning (CSCL), for example, to encourage learner discussion [30] and support argumentation [179]. In online courses, they play an important role in promoting active learning, course engagement, and knowledge construction; see [61] for an overview.

Social News Websites

In 1997, the first social news websites (SNWs), Fark and Slashdot, were launched. SNW, also known as social news aggregators, are platforms that allow users to “discuss, comment, share, recirculate, tag and rate news from various sources” [181, p. 1134]. They differ from previous ACMC by leveraging ratings to organise and filter posts. A rating is a compressed form of expression towards an online comment [164]. The aggregation of ratings from users to crowdsource measures of quality is called community rating or distributed moderation [113]. Users can positively rate (henceforth, upvote³) or negatively rate (i.e., downvote) comments.

Reddit, founded in 2005, is a popular example of a SNW. Similar to Usenet newsgroups, Reddit consists of topic-based discussion areas called subreddits. Within subreddits, users can submit topic-relevant textual posts or external web links. The display of a post within a subreddit is determined by its *hot score*, which reflects its recency and reception. It is computed by the hot score algorithm, which uses the time of posting and the ratio of upvotes to downvotes [195]. Users can engage with posts by rating them or submitting comments. The comments under each post can become extensive deep trees of comments with conversations at different levels of the tree. Comments are default ranked using the *best ranking* algorithm, which calculates a confidence score based on even a limited number of votes [146].

³Different platforms use different terminology to refer to upvotes, for example, The Guardian calls them recommendations, while Medium employs claps.

Comment Sections

In 1998, an early online diary community called Open Diary pioneered comment sections [164]. Unlike prior ACMC, comment sections are portable message boards embedded on the same page as other media, such as blog entries and social media posts. The comments are displayed in a vertical list format, either as flat or threaded comments. Like online discussion forums, they are typically ordered in reverse chronological order but can also be reordered on demand, commonly by time and rating. They also employ community rating in a similar way to SNW in order to crowdsource quality. These design choices are found across commenting platforms, from Disqus founded in 2007 to The Coral Project in 2014, which was relaunched in 2019 as Coral by Vox Media [208].

An important arena of public discussion can be found in the comment sections under news articles. The rise of below-the-line comments (BTL) began in 2005 with the news aggregator The Huffington Post, now HuffPost [189]. Their opening of site-wide BTL meant that news readers were no longer only consumers of information, but publishers annotating and shaping the story below the article [190]. BTL are placed on the same page as news articles but are clearly demarcated, differentiating comments from formal journalistic content.

3.2 Social and Technical Challenges of Online Message Boards

The preceding section has shown that the features of online message boards are grounded in earlier modes of ACMC. Consequently, they have inherited the issues that came with them. This section will examine design limitations and social factors that affect user interactions on online message boards. The purpose is to understand these challenges and the impact they can have on online discussion.

3.2.1 Unstructured Discussion Format

As shown in Table 3.1, online discussions are typically presented as a vertical list of flat or threaded comments. The list is unstructured such that comments—

which can be of variable length, content, and quality—are added in the order that they were posted. While this format may be manageable for a few short comments, popular online discussions can quickly grow to a disorienting number of comments, with a word count comparable to that of a novel [42]. For example, the comment section in [157] received over 21,000 comments across 8500 comment threads in just 12 hours. As the length of an online discussion grows, users may experience information overload [99]. This can manifest as *conversational overload* where “participants have to filter large numbers of messages to find relevant information” [210, p. 263] and *information entropy* “whereby incoming messages are not sufficiently organized by topic or content to be easily recognized as important” [87, p. 682].

This format can have a significant impact on the quality of online discussion. Overwhelmed by conversational overload, users may be more likely to post or reply with shorter comments [210], and respond incorrectly or less accurately than they would have otherwise [87]. Moreover, the same ideas tend to be repeated at different points of the discussion list. This could be unintentional, especially in an online discussion with many comments, since the list view does not provide an overview of the discussion [149]. Regardless, the fragmentation of ideas affects the *coherence* of the discussion, ‘the “glue” of text and conversation’ [57, p. 937]. A lack of coherence can negatively affect the comprehension of the discussion, exacerbating the problem of information entropy.

The unscalable list format also has consequences for user participation. Some users may choose not to participate at all in response to information overload [87, 99] while others may be incentivised to participate in ways that negatively affect online discussion. From economics, the *tragedy of the commons* [81] describes the situation where individuals exploit and eventually deplete a publicly shared resource in their own self-interest. Online discussion can be framed as a commons where the shared resource is *bandwidth*, the limited time and attention that users have available to engage with the discussion [109]. Given a long, unstructured list of online discussions, the bandwidth is severely limited. This incentivises behaviours that monopolise bandwidth, such as spamming⁴, which is the

⁴The term originates from a Monty Python sketch in which spam was included on every menu item of a cafe, making it impossible to avoid.

repeated posting of unwanted and unavoidable messages, and the *rush-and-slash effect*, where users hurriedly post a comment to maximise the readership of their comment [164]. Moreover, longer comments or those with complex sentences or words may get overlooked because they require more cognitive effort [5, 210]. This could discourage future participation from the comment author since receiving a response is one determinant as to whether users return to an online discussion, especially newcomers [5]. With this design, there is little incentive to act in the interest of the collective good and contribute well-written comments. If there are too many dull, uninformative, or irrelevant posts, users will be driven away [49].

Overall, the unstructured list format of online message boards contributes to shallow, low-quality, and disjointed discussions. This undermines the many potentials of online message boards explained in Section 1.1. The next section will explain the mechanisms currently used by online message boards to help users allocate bandwidth in large online discussions.

3.2.2 Limitations of Social Navigation

Many online message boards aggregate ratings from their users to crowdsource measures of quality; see Table 3.1. Introduced in Section 3.1.2, ratings are leveraged by the system and its users to sort comments within a discussion list. This is intended to help users navigate the discussion and allocate their bandwidth on high-quality, salient comments [31, 113]. Time of posting and number of upvotes are common sorting options, with some platforms offering more sophisticated options. For example, Reddit’s *best ranking* orders comments by a confidence score, which can be calculated from even a small number of votes via statistical sampling of a hypothetical full vote [146]. There is also the *controversial ranking*⁵, which surfaces comments with a more balanced number of upvotes and downvotes. The combination of community rating and sorting can be described as *social navigation*, in which “movement from one item to another is provoked as an artefact of the activity of another or a group of others” [53].

However, social navigation presents a number of limitations. More exposure is given to the comments at the extreme ends of the sorting, such as the ones

⁵github.com/reddit-archive/reddit

posted earliest or the ones with the most upvotes. Although best ranking is able to surface comments with a limited amount of votes, it can only apply to comments on the same level of the comment tree. For example, even if a comment in the fifth level of a comment tree is more well-received than a comment in the second level, best ranking cannot allow the former to surpass the latter in position. This means that comments contributed midway through the discussion are less likely to receive feedback or readership, even if they offer valuable insights. This is concerning since research indicates that a lack of feedback, be it upvotes or downvotes, discourages commenters from posting future comments [31].

On a user level, social navigation can have a negative impact on user behaviour. Cheng et al. [31] investigated the social feedback effect of ratings on individuals by analysing 42 million comments and 140 million votes from 1.8 million different users across four news websites. The results found that authors of downvoted comments were more likely to post subsequent comments of low quality. These authors were also more likely to downvote other users in the week following their negative evaluation. This creates negative social feedback loops that ‘percolate’ throughout the community.

On a community level, social navigation is subject to social influence bias, undermining its purpose as a measure of quality. Muchnik et al. [143] conducted a five-month randomised experiment on a social news website to understand how social influence from seeing prior comment ratings affected individual rating behaviour. The researchers randomly gave over 100,000 comments their first upvote (up-treated comments), downvote (down-treated comments), or no rating at all (control). The findings revealed that the up-treated comments had a 32 percent higher chance of receiving an upvote from the following user, suggesting that positive social influence bias increased a user’s likelihood to upvote. The effect accumulated into ratings bubbles, which increased the final ratings by 25 percent on average. This has implications on the reliability of using ratings as a measure of quality, and in the worst case, it could leave the online message board vulnerable to disinformation engineering.

Social navigation is also subject to underprovision, which is when too many individuals rely on others to rate without doing so themselves [71]. This relates to the *free rider problem*; Hume stated that it would be infeasible for a thousand

people to cooperate in the interest of the group because individuals would rather “free himself of the trouble and [...] lay the whole burden on others” [94, p. 538]. Gilbert [71] investigated underprovision on Reddit by examining page view data and duplicate submissions in a 17 day period. The results revealed that Reddit users overlooked 52 percent of the most popular links the first time they were submitted, which suggests that many valuable links were being ignored. The author suggested reasons for the underprovision, including the unsocial nature of community rating mechanisms and Reddit’s design choice to show popular content by default.

Online message boards often rely on social navigation to assist users in navigating and identifying salient information. However, this solution may produce suboptimal results as social navigation only allows a subset of comments and ideas to be paid attention. The visibility of a comment depends on its position in a potentially long list of comments. As shown in prior research, social navigation can also negatively impact user behaviour [31] and participation [143]. Ultimately, social navigation cannot alleviate the problems introduced by unstructured lists of online discussion. These problems highlight the need to investigate alternative designs for online message boards. Section 3.3 will discuss methods proposed in existing work to synthesise and structure online discussion.

3.2.3 Participation

There are two main ways to participate in online message boards. Active participation (or commenting) is the writing and posting of comments in an online discussion [190]. Passive participation (or lurking) is the reading of online discussion without commenting [109]. While Kollock and Smith [109] describe lurking in terms of the aforementioned free rider problem, other scholars have acknowledged that reading comments is a distinct form of participation that permits inclusion [153, 190]. Reading comments and writing comments are interdependent activities such that “writing has no value without readers, and reading is not possible if no one writes” [49, p.171].

Online message boards typically have multiple pathways of participation. As shown in Figure 3.2, upon entering the online message board, a user can perform

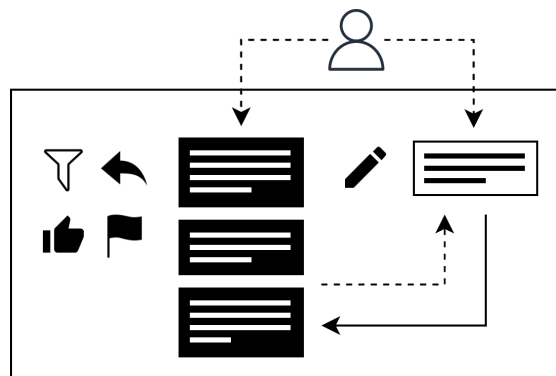


Figure 3.2: Discussion flow of existing online message boards.

any permutation of reading, writing, and—on some online message boards—sorting and rating comments. This flexible approach to participation could be a reason for the popularity of online message boards [149].

In addition to a commons of bandwidth as discussed in Section 3.2.1, online discussion could also be viewed as a site to produce *public goods* [49, p. 171]. In economics, public goods are things that are nonexcludable, which means that their benefits are available to all [103]. Unlike bandwidth, they are also nonrivalrous such that consumption by one individual does not detract from its availability to others [103]. Examples of public goods include knowledge [194], open source software, and fireworks. In the context of online discussion, public goods would be ratings, and shared information such as ideas and perspectives. The challenge is to motivate their production [49]. However, the flexible participation in social systems such as online message boards leads to a power law distribution of contribution [69, 185]. This means that a majority of public goods are contributed by a minority of users.

This skewed participation can be detrimental to online discussion in several ways. Research indicates that reading comments can affect individual perceptions of public opinion [118]. If the majority of comments come from a small number of individuals, then their viewpoints and ideas will be disproportionately amplified. This could be mistaken as popular opinion and discourage other users from expressing dissenting opinions [209]. The *spiral of silence* theory posits that people are less likely to share their opinion when they perceive their views to be in the

minority in order to avoid social isolation and harassment [152]. Thus, uneven participation could lead to a distorted perception of general opinion and discourage open discussion.

To promote more inclusive participation, it is important to understand what motivates active and passive participation on online message boards. From communication research, the uses and gratifications theory (UGT) proposes that users actively seek out certain media to satisfy their needs, including information, social interaction, entertainment, and personal identity [101]. These four dimensions have been used to categorise motives for participation in online discussions [45, 190]. Social-integrative motives, such as discussion and exchange with other users, have been found to be a key motivator for active participation [34, 190]. Passive participation may also be encouraged by social-integrative motives, for example, to see perspectives or views from the community, and to gauge political response [45]. Personal identity motives can also foster active participation, with motivations including the desire to express opinions and emotions, and to receive recognition [8, 196]. Entertainment motives may be a strong motivator for passive participation, with some lurkers enjoying reading low-quality discussions [114, 190]. Finally, cognitive motives, those relating to needs for information, have been found to motivate both active and passive participation in socio-technical systems. Lurkers tend to be motivated by information seeking, while commenters tend to be motivated by information dissemination such as adding to the discussion or correcting errors [6, 45, 114].

Inhibitors to participation should also be considered in order to lower barriers to participation. For lurkers, deterrents to commenting have been found to include wanting to protect their personal data and no desire to engage with people they do not know [190]. The ‘textual authority’ from other comments and one’s own lack of confidence in answering may also discourage lurkers from actively participating [8]. For non-participants, or users who do not read nor comment in online discussion, inhibitors include the reluctance to register, the view that comments are not worthwhile, and perceived low quality in online discussion [190].

Promoting inclusive participation in online message boards is required for a diverse and balanced exchange of ideas. This involves strengthening the motivations of active participation; addressing inhibitors to participation; and incentivising

a wider range of users to contribute to the production of public goods. Section 3.3 will present how prior research have approached these challenges, specifically through communicative values and scaffolded discussion flows.

3.2.4 Role of Identity

The concept of identity can be defined by two interconnected phenomena:

“One is **individual identity**: who you are as opposed to any other person. This is the identity of social security numbers, fingerprints, passports, DNA testing, face recognition, and the like. The other is **social identity**: the type of person you are and your role in society” [49, p. 228].

There are several key differences between online and offline identity. In offline settings, individuals can do little to control or hide aspects of their individual identity. Social identity can be engineered to an extent but this is often expensive in terms of time and effort. Online identity, however, can be a “configuration of the defining characteristics of a person” [104, p. 1762]. Designers of online message boards can decide what elements of identity (e.g., comment history, profile picture) are hidden, conveyed, and emphasised. These elements in turn shape the kinds of interactions that can occur on the system [24, 49].

An important element for online message boards is the degree of identification required from users in order to comment. This can be viewed as a continuum that runs from full anonymity⁶ to real name [50, p. 20]. It can also be described in terms of *durability*, or the ease of acquiring and changing an online identity, and *connectedness*, the ability to link comments to individuals across different contexts [139].

At one end of the spectrum is full anonymity or *technical anonymity*, when no identifying information is required [85]. This form of identification is neither durable nor connected [139]. This means that users can easily create disposable

⁶In this thesis, the term anonymity is limited to anonymity *within* the system, which involves “the accessibility of identifiable information of one user by other users of the same system” [35, p. 73]. Anonymity *from* the system, which relates to “identifiable information which is collected, retained and made accessible by the system” [35, p. 73], is not within the scope of this research.

identities and interact publicly in a way that is indistinguishable from other users. Examples of online message boards that allow full anonymity include 4chan and Slashdot⁷. Research on online message boards has found that anonymity fosters commenting and interactivity between users [45, 120]. It may also increase one’s willingness to express thoughts and opinions [190], a phenomenon described by psychologists as *benign disinhibition* [198]. However, anonymity is also associated with low-quality, uncivil comments⁸ [33, 182]. For example, Santana [177] examined 4800 BTL comments from 30 U.S. news websites on the 2016 presidential election, finding that 54.9 percent of anonymous comments were uncivil, compared to 32.8 percent of non-anonymous comments. This relates to the phenomenon of *toxic disinhibition*, which manifests as “rude language, harsh criticisms, anger, hatred, even threats” [198, p. 321]. The anonymous comments were also less reciprocal and more off-topic than non-anonymous comments, indicating lower discursive quality [177]. While anonymity can encourage participation, the lack of accountability may have consequences on the overall quality and civility of online discussion.

On the other end of the spectrum is real name identity, which is both durable and connected [139]. Online message boards that require this degree of identification leverage the real name policies of social networking websites, such as Facebook or Google+, to link users to their comments. Real name identity had been previously used by news websites, such as HuffPost [140], in an attempt to manage incivility in BTL sections. Research suggests that the use of real name identity leads to more topic-focused discussion and reduced incivility [65, 177]. However, this level of identification has been criticised for suppressing the participation of those who rely on anonymity for legitimate reasons, such as privacy concerns and protection from harassment [134, 164]. On Reddit, women are far more likely than men to adopt throwaways, which are one-time-use accounts mainly used for a ‘momentary disclosure’ of personal or sensitive information [117]. Donath argues

⁷Slashdot features both pseudonymous users and anonymous users. The comments from anonymous users appear under the common name of Anonymous Coward.

⁸The concept of online incivility is fuzzy, both conceptually and operationally [133]. For example, Rossini [169] defines incivility as rude, impolite discourse that breaks shared norms, while Chen [29] defines it as a spectrum from impoliteness to hate speech; see [133] for an overview.

3.3. TOWARDS STRUCTURING AND SUPPORTING ONLINE DISCUSSION

that using real names online is different to using them in offline situations, where the spatial and temporal conditions offer privacy: “Online, words persist forever, in vast searchable databases. Anything you say or do using your real name is permanently attached to it” [51]. Real name identity may add accountability to online discussion but it introduces serious barriers to participation.

Pseudonymity provides a middle ground between anonymity and real name identity. This is when “commenters have stable identities that are not their real names and are not easily linked to other social contexts” [140, pp. 48-49]. Reddit and The Guardian are examples of platforms with pseudonymous users. Like anonymity, pseudonymity has been found to encourage participation and diversity of viewpoints in online discussion [135], indicating an online disinhibition effect. However, unlike anonymity, pseudonymity has also been associated with high-quality comments, sometimes surpassing those made by individuals using their full name [48]. For example, Moore et al. [140] found that the cognitive complexity of comments, measured by reason-giving and argumentation, was higher for pseudonymous commenters than identified commenters. This quality has been attributed to the accountability offered by pseudonyms. The durability of pseudonymity enables history and reputation to be accumulated [51]. In this way, pseudonymity has the potential to combine the privacy of anonymity with the accountability of real name identity.

The degree of identification required on an online message board is a key design decision that involves several trade-offs. Ultimately, the choice of identification level depends on the specific purpose and goals of the system. Chapter 4 will explore the use of pseudonymity in the design of a tool to support and facilitate online discussion as per the criteria in Section 1.3.

3.3 Towards Structuring and Supporting Online Discussion

The previous section highlighted key social and technical challenges across online message boards. It emphasised that the unstructured formatting of comments without overview can lead to information overload, and at times, even incentivise

low-quality, disruptive comments. This section will review the landscape of strategies, tools, and theories proposed to structure and facilitate online discussion.

3.3.1 Scaffolding Discussion Workflows

As discussed in Section 3.2, a popular discussion hosted on existing online message boards can quickly become a large body of unorganised information. The structure of online discussion could be improved through guided pathways of participation. Existing research on structured group communication processes and argumentation tools reveal ways in which participation can be scaffolded to produce coherent outcomes.

Delphi

Delphi, also known as the Delphi method or the Delphi technique, was created in the 1950s at the RAND Corporation and introduced to the public in 1963 [41]. It is a well-established “method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem” [127, p. 3].

There are two main categories of Delphi: conventional and real-time. Conventional Delphi involves a series of rounds in which a facilitator or “monitor team” sends a questionnaire to expert panelists to be completed anonymously; aggregates and summarises their responses; and shares the summary with panelists in a subsequent questionnaire [127]. In contrast, real-time Delphi uses APMC to replace or assist the monitor team in certain parts of the process, such as compiling and sharing the responses, and may even be “round-less” [75, 127].

In early publications, Delphi was used to obtain expert opinion and minimise estimation variance on forecasting problems, e.g., predicting the capacity of nuclear weapons and strategies of the Soviet Union [41]. Variations of the method have since been introduced to facilitate different group communication processes. For example, the policy Delphi variant is designed to handle social and political questions [203]. It does not seek consensus from experts, but definition and clarification of perspectives from lobbyists [203]. The decision Delphi is a variation that aims to scaffold a decision-making process and help make (rather than forecast or

describe) decisions [162].

A more recent variant of the Delphi method is Sequential Online Delphi [192], which is used to explore issues where little is known or understood. This dissensus-based online variant aims to maximise the range of opinions rather than minimise estimation variance. Within a set timeframe, each expert user anonymously inputs data or insights to the research question into the system, which are continuously displayed to all users. The main condition is to avoid duplicating contributions that have already been made. At the end of the dissensus Delphi rounds, the facilitator analyses and synthesises the results, and sends them back to the experts for feedback before the final version is prepared. Sequential Online Delphi was deployed with 19 participating experts to explore the barriers to the adoption of mobile data services. The deployment yielded 91 factors that underwent logistic regression to guide 294 Swiss companies in adopting relevant mobile data services.

Delphi presents several design considerations that can be explored in the design of online message boards. All variants commonly feature anonymity⁹, feedback, and a structured information flow. These key features are employed to mitigate social influence biases (e.g., the bandwagon effect) and elicit open, independent contributions [127]. Although anonymity in online message boards is often associated with uncivil behaviour (see Section 3.2.4), Delphi has combined anonymity with scaffolded and mediated processes to create a recommended method for when “disagreements among individuals are so severe or politically unpalatable that the communication process must be refereed and/or anonymity assured” [127, p. 6]. Moreover, Delphi processes create *evolving summaries of knowledge* based on the responses from the panel, which may mitigate information overload [87]. For these reasons, this research considers features from Delphi in the design of structured discussion flow in Chapter 4.

Argumentation Tools

Argumentation support systems have been researched for decades in computer-supported cooperative work (CSCW) [36, 138] and have been designed to support domains from education to public policy [25]. Unlike online message boards, argu-

⁹There may be variation in the level of anonymity. For example, decision Delphi features “quasi-anonymity” where the participants are known but all contributions are anonymous [162].

mentation tools tend to feature structured discussion flows or *formalisation*. That is, they require users to categorise information within a prescriptive framework [184]. One such framework is the popular Issue-Based Information System (IBIS) method, a process of argument mapping in which users ‘unbundle’ and classify a contribution as an issue, position, or argument [36].

The interface design of argumentation tools generally fall into one of three structured views: outline, network, and two-column [43]. The outline view is demonstrated by the MIT Deliberatorium [106]. In the system, users contribute to a deliberation map, i.e., indented tree of posts, where each post must represent one unique issue, idea or argument. The author of a post must locate the most logical place to put their post in the deliberation map. Moderators are required to ensure that the posts adhere to these structural rules. Next, LiteMap [43] is one example of an argumentation tool with a network view. It features an interactive canvas for community leaders to build visual argument maps, where each node in the map represent an issue, idea or argument as per the IBIS method. Finally, ConsiderIt [110] is an example of an argumentation tool that features a two-column view. Users create items to place into one of two columns (e.g., for/against, pro/con). Unlike systems with the outline and network views, users do not have to unbundle their contributions into composite parts.

Argumentation tools have several practical issues that limit their adoption. These include the cost and complexity of: learning how to work within the prescribed argumentation framework [184]; problems with classification [96]; and the training required [37]. Moreover, argumentation systems largely do not allow direct discussion between participants which can affects users’ ability to find common ground [95] and introduce an overhead of having to coordinate outside of the system [43].

Regardless, argumentation tools have contributed to the design space of computer-mediated communication (CMC), offering alternative views to the traditional list of comments. Prior research has demonstrated that structured discussion flows can facilitate cooperation and sense-making [106, 110]. Despite the limitations, it has been found that users are able to work with scaffolded workflows in the context of argumentation tools, even without training [43]. It has also been suggested that scaffolding can guide users to create better contributions [214]. However, these

design lessons have not been extended to online discussion where the purpose is not consensus nor decision-making, but social exchange. This research will explore this gap by utilising scaffolding in the context of designing and facilitating online discussion.

3.3.2 Synthesising Discussion

In addition to scaffolding discussion in Section 3.3.1, a synthesis or *distillation* [2] of discussion can help to make the information easier to navigate and make sense of. This process involves filtering, restructuring, and fitting the information into a more concise space [149]. Researchers have employed both automated and crowdsourced methods to achieve this.

Summarisation

One approach is summarisation, which reduces the size of a given text (e.g., a comment or group of comments) while preserving the original meaning [161]. The computational approach is called automatic text summarisation (ATS), which has been studied in natural language processing (NLP) research since the 1950s [130]. Recent advancements enabled by the Transformer architecture [205] have led to increased attention towards abstractive summarisation techniques. Abstractive summarisation is an approach to ATS that uses new words or rephrases the most important sentences in the text to produce a new summary [78]. Methods have been proposed in NLP research to summarise comments in BTL [199] and microblog posts [124].

However, abstractive summarisation techniques suitable for online discussion are a recent development. Earlier techniques were limited in their ability to handle the complexity, brevity, and sparsity of user-generated content [80]. As a result, researchers have often relied on human-based summarisation methods to synthesise online discussions. For example, Nam and Ackerman [149] implemented Arkose, a platform that has users incrementally create summaries for a online discussion forum archive. They called the process *incremental diagenesis*, i.e., the distillation of a large unorganised information space into a smaller summary space [149]. A formal evaluation had not been described so the efficacy of the proposed system

is not known. A recent example is Wikum [214], a platform for synthesising and exploring ideas within an online discussion thread. The system has users recursively build summaries out of the thread, producing a summary tree artefact that overlays the original discussion. The artefact is an example of Erickson and Kellogg’s concept of *discourse bases*, which are “conversations that have been restructured (or have had new elements like summaries, glossaries, and edited paths added on)” [58, p. 79]. In a lab study with 20 participants, Wikum was found to be easier to use than the control condition when summarising a discussion. However, in both conditions, users were reluctant to edit the summaries of others. Editing is a core wiki feature for crowdsourcing high-quality, up-to-date content so the underutilisation of this feature could undermine the quality of the summaries produced on the system. In a further lab study with 13 participants, Wikum was helpful in providing a quick overview but it was not significantly more helpful than the other conditions. The system can only support static discussions which limits its usage as an online discussion tool. Wikum+ [200] later addressed this limitation by combining synchronous discussion with summarisation to support collaborative teamwork.

While human-based summarisation can produce high-quality summaries, it can also be time- and resource-intensive process. One approach is to distribute the effort between multiple participants, as demonstrated by citizen science projects such as Galaxy Zoo [128] and The ESP Game [207]. However, only a few of these projects have successfully motivated participation over long periods of time [170]. This raises concerns about the practicality of relying on human effort to structure online discussion. Moreover, most of the discussed solutions perform this activity after the discussion is already complete. This is known as *incremental formalisation* [184], the deferral of structuring information (e.g., comments) until later. The incremental formalisation of a discussion does not immediately benefit discussants nor alleviate the issues discussed in Section 3.2.1 and 3.2.2. In response, this research will explore the use of abstractive ATS instead of human summarisation to efficiently synthesise online discussion. The summarisation will occur while the discussion is in progress in order to provide structural benefits to participants at any point of the discussion.

Data Modelling and Visualisation

A key approach to synthesise online discussion is to identify and use patterns in the comments (e.g., semantic content, sentiment, social structure) to organise the information space. NLP and computational linguistics present statistical and machine-based approaches to achieve this, several of which have been employed in the fields of information retrieval, human-computer interaction (HCI), and CSCW to design CMCs.

Early research in discourse architecture produced graphical interfaces to explore unstructured archives of online discussion. These employed simple statistical models to identify themes in the discussion and cluster similar comments. For example, Sack et al. [174] presented Conversation Map, a Usenet browser that provides a graphical overview of the content and social structure of discussions in the form of graphs. The system takes in a newsgroup message archive as input, and uses statistical analysis to compute social and semantic networks of the messages, and discussion themes shared between messages. Dave et al. [42] introduced ForumReader, a discussion tool that presents a thumbnail view of a discussion thread. To navigate the view and locate salient parts of the discussion, users can highlight the thumbnail view by property, such as topic similarity. ForumReader performs this by employing an out-of-the-box package for comment clustering and similarity detection. A 2x2 between-subject experiment with 16 participants was conducted to evaluate the impact of two specific navigation features (thumbnail view and text analytics) on engagement, comprehension, and information retrieval. The results found that although the features were helpful individually, combining them was counterproductive.

More recent work have utilised topic modelling, a statistical approach to identify themes or topics in a collection of text [14]. Topic modelling algorithms have been used by researchers to highlight and group texts, such as emails or blog comments, with similar themes. For instance, Liu et al. developed TIARA [129], a tool for exploring and analysing large collections of text including as email archives. The system uses Latent Dirichlet Allocation (LDA) [15] to extract topics from the corpora (e.g., email archive), as well as a set of keywords for each document in the corpora (e.g., email). This data is then visualised in a time-based stacked graph,

where each layer represents a topic annotated with keywords. To evaluate the system, an experiment with 10 participants was conducted in which each participant used TIARA pre-loaded with an email archive to answer questions across three analysis tasks. The results found that TIARA was useful in completing high-level tasks that required an overview of the email archive. However many participants expressed a need for the system to identify semantic entities, such as people and events, in order to perform more detailed analyses. Hoque and Carenini [90] introduced a system called ConVis which allows for navigation and analysis of blog comment sections. In addition to the standard threaded list of comments, the system features an interactive overview of the discussion, which allows users to browse by facets such as topic or comment author. The topics are computed using a Fragment Quotation Graph for topic modelling [100]. An informal user evaluation with 5 participants was conducted in which each participant used ConVis to read and navigate three discussions. The results revealed that users navigated ConVis by using the topic data along with the list of comments, and that the topic facet was helpful in finding salient comments. Conversely, the comment author facet was not useful, raising questions about what information visualisations should or should not retain and in what contexts. The authors later developed ConVisIT [91] which extends ConVis by allowing interactive topic modelling, and MultiConVis [92] which allows users to navigate multiple blog comment sections in one interface.

Another technique is dimensionality reduction, which transforms data into a meaningful representation in a smaller dimensional space [204]. In prior CMC work, principal component analysis (PCA) [1] has been used to map the semantic differences between comments and profiles, and spatially fit more comments into view. For example, Faridani et al. [60] implemented Opinion Space, an online discussion tool that visualises opinions as points in space. The system elicits opinions from users on a set of statements to create a multi-dimensional ‘opinion profile’. It then applies dimensionality reduction to project the profile onto a 2D space. Points with similar profiles are clustered closer together and vice versa, providing an overview of the diversity of opinions. A within-subject study with 12 participants found there was more engagement, agreement, and respect for the comments read in the Opinion Space condition than the two control conditions: a

list of comments and a grid of opinion profiles. However, Opinion Space was only marginally more conducive to finding useful comments. Similarly, Kim et al. [105] developed StarryThoughts, an online discussion platform that projects the opinions of users onto 2D space and arranges them by users' stance on a given issue. The system features identity-based filtering and content-based recommendation of opinions. Lab studies with 56 participants were conducted to investigate the impact of StarryThoughts on participants' opinion exploration, opinion strength and quality, and attitude changes. The results indicated that the system helped participants to explore a range of opinions, be more informed on the various arguments, and express opinions concretely. However, some participants were concerned that they might develop stereotypes or biases from associating opinions with identities.

Visualisations can enable new ways to navigate and make sense of comments in ACMC. However, visualisations both accentuate and remove certain facets from textual comments. This can conflict with a user's informational needs, as shown in prior work [90, 105, 129]. Text-based views can provide a richer, nuanced understanding of the discussion in which users can draw their own conclusions. In addition, text-based views have dominated the design of ACMC since its conception, discussed in Section 3.1. The novelty of visualisations may affect usability and user comprehension as demonstrated with ForumReader [42]. As a result, this research will focus on organising and displaying comments in a text-based view using clustering and similarity detection, which will be later discussed in Chapter 4.

3.3.3 Integrating Communicative Values

Technology cannot be neutral because it is inevitably influenced by the values of its designers [66]. Experimental research on commenting behaviour suggests that the design features of online message boards can induce situational norms [197]. To encourage and facilitate constructive discussion, one approach is to design online message boards grounded in communicative values. Some researchers have stated their guiding communicative ideals, such as deliberative norms and active listening, and how they have designed their platform to encourage these ideals.

Deliberative Ideals

Several ACMC have been designed to facilitate deliberation, a process that seeks consensus and mutual understanding on public issues through rational discourse [68]. While its conceptualisation is debated by political scholars [7], the normative view of deliberation—and thus the design criteria for these systems—tends to align with the conditions of the *public sphere*. The public sphere was coined by philosopher Jürgen Habermas to describe an ideal “realm of our social life in which something approaching public opinion¹⁰ can be formed” [79, p. 49] that is accessible to all citizens but separate from the state. The outcome of the deliberation, *reasoned public choice*, can then be used to inform decision-making, and to identify issues and the search for their solutions [107]. Some normative conditions of the public sphere include [40]:

- Ideal role-taking, trying to understand the argument from another person’s perspective;
- Reflexivity, critically examining one’s values and assumptions; and
- Discursive equality and inclusion, enabling all participants affected by the outcome of the deliberation to introduce or challenge any assertion.

For example, Semaan et al. [183] designed a prototype called Poli to help users engage in political discourse. The system aggregates political information from various online sources, such as social media, in a single environment. The authors sought to facilitate conditions of the public sphere, including information access, information dissemination, and rational discourse. This is reflected in the functionality of Poli in the way that it displays information from different political ideologies in a random order, and allows users to comment on information anonymously. That being said, Poli had yet to be evaluated outside of the prototype phase. Kriplean et al. [110] implemented ConsiderIt, a platform where users personally deliberate on a topic by composing their own pros and cons list. Each

¹⁰Public opinion in a political context is a product of the eighteenth century [107]. It refers to the “tasks of criticism and control which a public body of citizens informally—and, in periodic elections, formally as well—practices *vis-à-vis* the ruling structure organized in the form of a state” [79].

user performs ideal role-taking by authoring points to include in their list, and by including points from the lists of others. Results from a field deployment with 468 participants revealed that users generally engaged in a reflexive manner by creating lists that included both pros and cons. However, users on ConsiderIt are unable to directly interact with others. While this may mitigate uncivil behaviour directed at other participants, it ultimately restricts the depth of deliberation and opportunities to provide more information, e.g., clarifications. Detailed in Section 3.3.2, Opinion Space [60] operationalises deliberative polling, an alternative to conventional polling that integrates rounds of deliberation [64]. Among its key findings was that there was higher engagement and respect for the comments read in Opinion Space than the control conditions.

Facilitating reasoned debate and deliberation is not the aim of this research. Regardless, previous work indicates that designing ACMC with deliberative ideals can lead to inclusive, respectful, and reflexive participation¹¹ [60, 110]. Researchers have argued that it may also provide a valid theoretical framing for HCI and CSCW research conducted outside of political and civic contexts [150]. As such, this research will consider deliberative ideals in the design of a more constructive online message board.

Active Listening

Active listening is another communicative ideal that can be used to facilitate online discussion. Active listening includes non-verbal and verbal behaviours that demonstrate attention, understanding, and empathy [16]. Verbal behaviours include acknowledgement, restatement, and asking questions [16]. Active listening is employed in various settings such as therapy [147] and conflict resolution [13] in which it has been shown to establish common ground, good faith and reciprocity between speaker and listener. Although typically associated with face-to-face settings, studies conducted in an educational setting have found that verbal behaviours of active listening could be appropriately communicated through CMC

¹¹It is important to note that some political theorists have criticised deliberative norms for reflecting the communicative style of those in power [12] and systematically excluding those who are underrepresented [176]. This relates to the norms of rationality and consensus respectively, both of which are not relevant to this research.

[9, 10].

HCI and CSCW researchers have utilised active listening in different online discussion tools. One such application has been to facilitate more effective human-computer interactions in conversational agents. For example, Xiao et al. [212] produced an interview chatbot that was able to respond with active listening skills such as restatement, summarisation, and encouragement. They compared its efficacy as an interview chatbot to a baseline chatbot without such skills through a between-subject study where 206 participants were interviewed by a chatbot for around 10 minutes. The results found that the chatbot with active listening skills outperformed the baseline chatbot in aspects such as user engagement and user response quality.

Another application of active learning has been to encourage reflective online participation. Listening interfaces describe mechanisms that empower users to perform acts of active listening [111]. These mechanisms can be as minimal as an upvote on a comment as a sign of acknowledgement, or as maximal as restating the content in a comment [111]. For instance, Dickey-Kurdziolek et al. [46] developed ThoughtSwap, a discussion system designed for inclusive and deeper discourse in collocated settings. In the system, all users anonymously contribute an answer to a discussion prompt and are then tasked with restating the ideas of another answer. Versions of ThoughtSwap have been evaluated by different groups in educational settings, totalling 43 participants. The results revealed that the restatement or ‘re-presenting’ activity allowed participants to see their ideas in relation to others. Another example is Reflect [111], a tool that augments online message boards. Next to each comment, users are able to restate the points being made in the comment in the form of bullet points. To understand how users would engage in Reflect, three field deployments were conducted in the contexts of community discussion and deliberation. The main deployment with Slashdot stories had 247 participants contributing 734 bullet points. Content analysis revealed that most of the bullet points were normatively used to reflect back the meaning of their original comment. This suggests that restatement is an activity that users might engage in and presents an potential way to synthesise discussion (see Section 3.3.2).

The results from previous work indicate that designing for active listening may have a positive impact on user behaviour and engagement in CMC. Restatement

has been frequently employed in previous work [46, 111, 212], and acts of acknowledgement (e.g., upvoting a post) are commonplace in existing online message boards. One underutilised mode for active listening in existing work is question-asking. Questions are regularly used in community question and answering (CQA) for the purpose of information seeking but not as a device for active listening in ACMC. Researchers have found that question asking can lead to more interactivity in online discussions groups. For instance, Arguello et al. [5] found that in a sample of 6,174 posts from different online discussions groups, posts that contained a question were 6 percent more likely to receive a response than those that did not. They posit that questions are more likely to get a reply than other speech forms because linguistic norms encourage a response to a question [5]. As a result, this work will explore the use of asking questions in structuring and facilitating online discussion.

3.4 Implications

Researchers of CMC have recognised the design limitations of online message boards and have proposed tools and strategies to structure and support online discussion over the past two decades. The previous section reviewed three promising strategies that can be applied to the design of online message boards: scaffolding participation, synthesising online discussion, and embedding situational norms. This section brings together the implications that these strategies will have on this research.

The first strategy, scaffolding online discussion, has a long history in the research of Delphi and argumentation tools; refer to Section 3.3.1. Scaffolded discussions have not been commonly applied in the design of online message boards, opting instead for flexible pathways of participation shown in Figure 3.2. But as discussed in Section 3.2.3, this had led to a minority of users contributing the majority of comments. This research will use the lessons learned from these research areas in the design a structured online discussion flow.

The second strategy is to synthesise online discussion; see Section 3.3.2. Previous research in HCI and CSCW have focused on employing human summarisation to provide an overview of online discussion [149, 200, 214]. Recent advancements

in NLP research present accessible pre-trained models suitable for abstractive ATS which will be employed in this research. Moreover, the summarisation has been typically applied after the discussion is over, which may require significant effort and does not provide immediate benefits for discussants. This research will apply summarisation throughout the online discussion in the implementation of the proposed online message board. Data modelling and visualisation techniques have also been proposed to organise the information space, but this has been found conflict with a user's informational needs [90, 105, 129]. Therefore, this research will focus on organising and displaying comments in a text-based view using clustering and similarity detection.

The final strategy is to integrate communicative ideals into the design to facilitate online discussion; see Section 3.3.3. Researchers have introduced systems for debate and deliberation based on the normative conditions of the public sphere [60, 110, 183]. This research will leverage these norms for the purpose of online message board through design principles. Active listening has also been employed by HCI and CSCW researchers to improve user engagement [46, 111, 212]. In the conceptualisation of a novel discussion flow, this research will use question asking, an underutilised form of active listening.

Although these three strategies have been proposed in isolation, there is a gap in their combined application for facilitating online discussion. There are also operational differences in the application of these strategies. This thesis seeks to explore this design space by proposing an online discussion flow based on a combination of these strategies. It will operationalise the online discussion flow in Potluck, a novel online message board designed to structure and facilitate online discussion.

3.5 Summary

This chapter fulfilled RO1 and RO2. It reviewed the background, challenges of and strategies for implementing online message boards that better structure and facilitate online discussion.

The historical overview of online discussion revealed that the design of current online message boards do not noticeably differ from the design of pre-web ACMC,

which were not designed to support the scale of modern-day online discussions. This design has led to a number of consequences for online discussion, from a breakdown in comprehension to behavioural issues. The interdisciplinary literature review of strategies to structure or support online discussion surfaced three potential strategies that can be applied to the design of online message boards: scaffolding participation, synthesising online discussion, and embedding situational norms. These strategies create a design space in which they can be combined into a structured online discussion flow, and implemented in a novel online message board.

The next chapter begins by addressing RO3, outlining design principles derived from the implications of the narrative literature review. It then conceptualises a novel discussion flow for online message boards and addresses RO4 by detailing the design and implementation of Potluck, the main contribution of this thesis.

Chapter 4

Potluck: A System for Scaffolding Online Discussion

THIS CHAPTER:

- ◇ Conceptualises a structured discussion flow based on design principles derived from Chapter 3 (RO3).
- ◇ Explains the design rationale behind Potluck, the proposed message board (RO4).
- ◇ Presents the usage and implementation details of Potluck (RO4).
- ◇ Describes a formative lab-based evaluation of an early design iteration.

A summary of this chapter has been published in [126].

4.1 Motivation

The previous chapter described the background and limitations of current online message boards. It explained that the unstructured discussion format, limited social navigation, and flexible participation of online message boards are unable to effectively support online discussion. It then reviewed the landscape of related work, including tools and techniques, for supporting and structuring online discussion. This highlighted three key strategies to explore in the design space of

online message boards: scaffolding participation, synthesising online discussion, and embedding situational norms.

To facilitate constructive online discussion, this chapter describes design principles derived from this set of strategies (RO3). Based on the design principles, a discussion flow for online message boards is conceptualised and implemented in POTLUCK¹, a novel working online message board (RO4). The system is named after potluck-style gatherings where each participant must contribute something to be shared by everyone. To evaluate the feasibility of the proposed discussion flow in Potluck, lab-based user studies were conducted on early design iterations, Potluck v0.x. One of these user studies are described in Section 4.6. Later iterations, Potluck v1.0 and above, were evaluated through field deployments described in Chapter 5. Table 4.1 provides an overview of the iterations described in this thesis.

4.2 Design Principles

This section describes a set of design principles (DPs) derived from the literature in Chapter 3. They can be used to guide the design of online message boards that structure and facilitate online discussion. See Table 4.2 for a mapping of the design principles to relevant sections of Chapter 3 and related work.

1. **Encourage active participation:** On social platforms, a small percentage of users make up most of the contributions [69, 185]. As discussed in Section 3.2.3, this skewed participation can distort perceptions of general opinion [118] and discourage open discussion [209]. To have a diverse and balanced exchange of ideas, more users should be encouraged to participate. This will require lowering the barriers to active participation for passive participants and non-participants. Inhibitors and motivators to participation described in Section 3.2.3 will both need to be considered.
2. **Provide guided pathways of participation:** Current online message boards mostly produce unorganised, disjointed lists of comments; see Section

¹potluck.cim.rhul.ac.uk

Ver.	Features	Study
0.1	<ul style="list-style-type: none"> + Summary, answer, question and vote entities + Session-based users + Top-level discussion prompt creation (unprotected) + Top-level discussion prompt answering + Hidden discussion area + Lower-level questions on answers + Linking of similar questions + Answer voting + Question trail + Abstractive summarisation of similar answers + Answer resummarisation by most respected + Answer hidden above flag threshold + Help tooltip 	Lab Study
1.0	<ul style="list-style-type: none"> + User entity + Guest and Host user authentication + Notification entity + Visibility toggle for questions and answer (Host) + Validation of Guest input by toxicity + Instant access to discussions (Host) + Top-level discussion prompt pinning (Host) * Answer and question minimum length requirements * Summarisation model with faster inference * Summary similarity score decrease * Answer masked above toxicity and flag threshold * Top-level discussion prompt creation (Host) * Vote validation – Answer hidden above flag threshold – Session-based users 	Field Study I
2.0	<ul style="list-style-type: none"> + Option to add context to questions + Help via guided tour and how-to-use modal + Instant access to lower-level discussions after answering top-level discussion prompt (Guest) – Help tooltip – Answer and question minimum length requirements – Linking of similar questions 	Field Study II
2.1	<ul style="list-style-type: none"> + Log entity (for click, focus, page load events) 	Field Study III

Table 4.1: Potluck version history where + are new features, – are removed features, and * are modified features.

ID	Design principle	Relevant sections	Related work
DP-1	Encourage active participation	3.2.3 3.2.4 3.3.3	[6, 8, 34, 45, 69, 114, 118, 185, 190, 196, 209]
DP-2	Provide guided pathways of participation	3.2.1 3.2.2 3.3.1	[5, 36, 43, 49, 75, 106, 109, 110, 127, 192, 210, 214]
DP-3	Organise contributions by similarity	3.2.1 3.3.1 3.3.2	[36, 43, 87, 106, 109]
DP-4	Display contributions at different levels of detail	3.2.1 3.2.2 3.3.2	[99, 149, 164, 200, 210, 214]
DP-5	Embed communicative values	3.3.3	[5, 46, 60, 110, 111, 183, 197, 212]

Table 4.2: Design principles mapped to relevant sections and related work.

3.2.1. Formal discussion flows can be used to add structure to the output of online discussion. They could also mitigate social influence biases and guide users to provide better input; refer to Section 3.3.1. Therefore, user participation should be guided through the system.

- 3. Organise contributions by similarity:** Repetitive comments is a consequence of the unstructured discussion format featured in many existing online message boards. This can worsen the issue of information entropy [87] and waste bandwidth [109]; refer to Section 3.2.1. Argumentation systems such as the MIT Deliberatorium [106] have sought to solve this issue through structural rules. However, structural rules impose training costs and complexity on the end user, which can limit its adoption for online discussion; see Section 3.3.1. A more efficient approach would be for the system to group the comments based on their semantic similarity. To help users allocate bandwidth, the groups should be displayed in way to expose differing viewpoints.
- 4. Display contributions at different levels of detail:** As discussed in Section 3.2.1, conversational overload [210] in online message boards may deter participation [99] or incentivise users to act in self-interest [164]. To mitigate conversational overload, users should be presented the discussion at

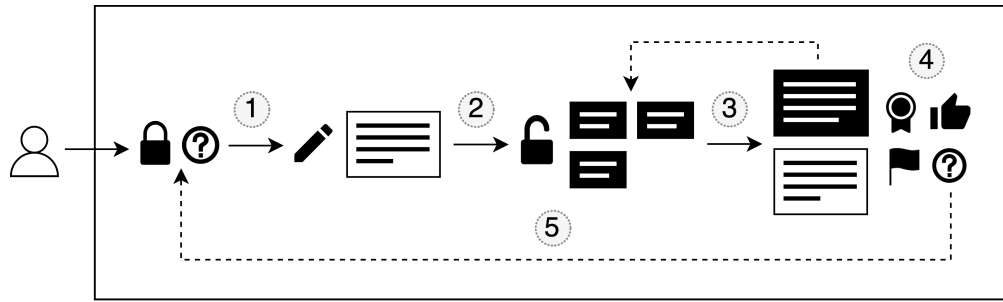


Figure 4.1: Overview of the proposed structured discussion flow for online message boards with steps labelled 1 to 5: (1) The user answers a discussion prompt; (2) gains access to the discussion area, which contains summaries of the full answers; and (3) selects a summary to read the full answers. (4) On full answers, the user can vote or ask a question. (5) Asking a question creates a new discussion area.

increasing levels of detail instead of all at once. This is in line with previous work on systems for online discussion where distillation has been used to reduce the information space [149, 214]; see Section 3.3.2.

5. **Embed communicative values:** Section 3.3.3 showed that communicative values can be promoted in ACMC by operationalising normative conditions of the public sphere [60, 110, 183] and modes of active listening [46, 111, 212]. This could provide a prosocial alternative to content moderation when it comes to regulating online participation [197]. Therefore, the system design should embed communicative ideals that encourage constructive discussion. For example, acts of acknowledgement, such as upvoting a comment, are a quick way to demonstrate active listening. One underutilised mode of active listening in online message board is question-asking. It has been found to increase reciprocity in online discussion groups, which is a determinant of ongoing participation [5]. Thus, question-asking should be considered to expand the design space for facilitating online discussion.

4.3 Design Rationale

The previous section outlined five DPs (labelled DP-1 to DP-5). These guided the conceptualisation of a novel discussion flow for structuring and facilitating online

discussion. Figure 4.1 displays an overview of the proposed online discussion flow demonstrated through Potluck. This section describes and motivates Potluck’s core design features with regards to the DPs.

4.3.1 Pseudonymous and Mandatory Participation

Potluck has users register with a system-generated username before they can start engaging pseudonymously² on the system (DP-1). As explained in Section 3.2.4, the use of pseudonyms provides a middle-ground between the civility associated with real-name identities, and the self-disclosure afforded by anonymity [76, 140, 171]. Moreover, privacy concerns have been found to be an inhibitor to participation for passive participants of online discussion [190]. To maintain the privacy of anonymous participation and encourage active participation from typically passive participants, the system does not ask for any identifying information (DP-1).

A first-time user of Potluck is only shown a discussion prompt, which can be a question or a topic. To advance through to the discussion area, the user must actively participate by contributing a written answer to the discussion prompt (DP-1, DP-2). This appeals to the motives of passive participants, described in Section 3.2.3. In order to fulfil their social-integrative, entertainment, and cognitive motives, passive participants will have to become active participants. Further answers are required in the same way for the user to advance through the discussions.

4.3.2 Shielded Discussion

Reading the existing comments before posting can influence how users proceed. For example, lack of representation in the comments might inhibit participation, causing users to self-censor and fragment off to other systems [190, 209]. To retain

²High-quality comments made in existing online message boards have been attributed to the durability of pseudonymity, established through system features such as a visible user comment history [51]. Potluck does not display comment history of its users, which makes the pseudonyms on Potluck more akin to a temporary technical identities [117] with low durability. Friedman and Resnick [67, p. 173] argued that such pseudonyms allow users to “misbehave without paying reputational consequences” and sow distrust in online groups. Future work could implement durable pseudonymity by displaying comment history in Potluck, allowing reputation-building.

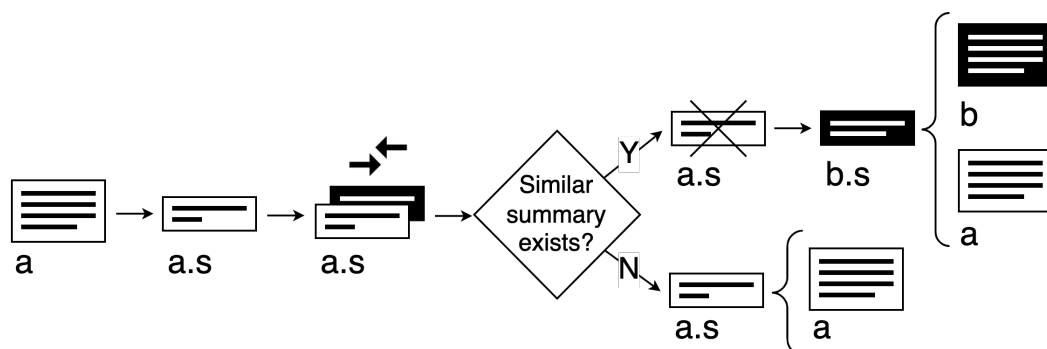


Figure 4.2: Potluck’s answer summarisation-aggregation mechanism. When a user submits an answer **a**, it is automatically summarised to 2-3 sentences (**a.s**). Summary **a.s** is compared to all existing summaries in the database. If a semantically-similar summary exists (**b.s**), **a.s** is discarded and **a** is assigned **b.s**. If a summary like **a.s** does not exist, then **a** is assigned **a.s**.

users, the user must post before they can read the answers already submitted to Potluck (DP-1). This design could potentially increase the balance and diversity of views expressed by ensuring that a user’s answer is not influenced by the answers submitted by others (DP-1). This complements the feature of active participation in Section 4.3.1 by attempting to lower the barrier to participation.

4.3.3 Automatic Summarisation and Aggregation

Users cannot see what answers have already been submitted to a discussion prompt. Since each answer is submitted without knowing what has already been said, the same information may be repeated. Without a way to organise the answers, the discussion area would suffer from redundant and disjointed comments seen in existing systems (see Section 3.2.1). Potluck synthesises the information by automatically summarising and grouping similar answers as depicted in Figure 4.2 (DP-3, DP-4). Each summary is displayed in the discussion area, thus presenting the user with an overview of unique viewpoints briefly.

4.3.4 Recursive Question-and-Answer

Potluck allows users to interact with each other by recursively asking and answering questions (DP-5). Users cannot advance through the system without doing so. By

asking a question, users create a new lower-level discussion area within the system. This was implemented with the aim of adding structure to the system (DP-2), while encouraging deliberative norms such as active listening, ideal turn-taking, and reciprocity between users (DP-5).

4.3.5 Question Trail

After several rounds of recursive question-and-answer, the user may get lost within the system. To address this concern, users can use the *question trail* (see Figure 4.4c) stickied to the top of each page. The question trail is a navigational feature that displays the prompt for the current top-level discussion area and the prompts for lower-level discussion areas (if any) in a tree. The links indicate whether the user has already answered the discussion prompt. From the question trail, the user can jump back into the discussion area where they already have access or contribute an answer to a locked discussion prompt to gain access to a new area (DP-2). The user can also contribute a new answer to a question they have already answered before.

4.4 Usage

Potluck has two types of users: Hosts and Guests. Both Hosts and Guests can partake in the system as outlined in Section 4.4.1; the flow chart in Figure 4.3; and the wireflow with mockups in Appendix B.1. However, Hosts have additional capabilities as described in Section 4.4.2.

4.4.1 Guest User

View Discussion Prompts

When a user registers or logs in, they are directed to the home page (see Figure 4.4a) where links to top-level discussion prompts are displayed in descending chronological order.

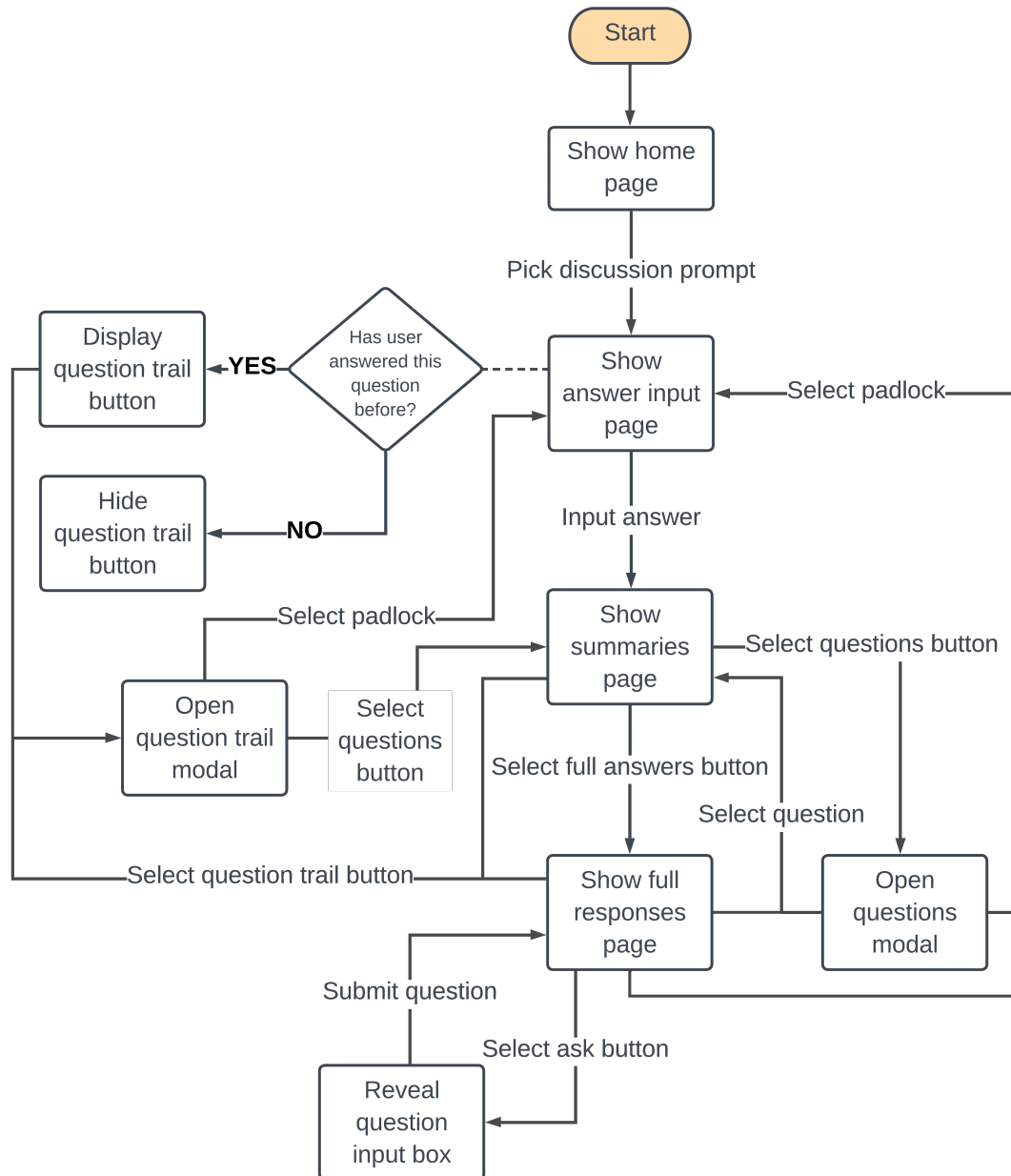
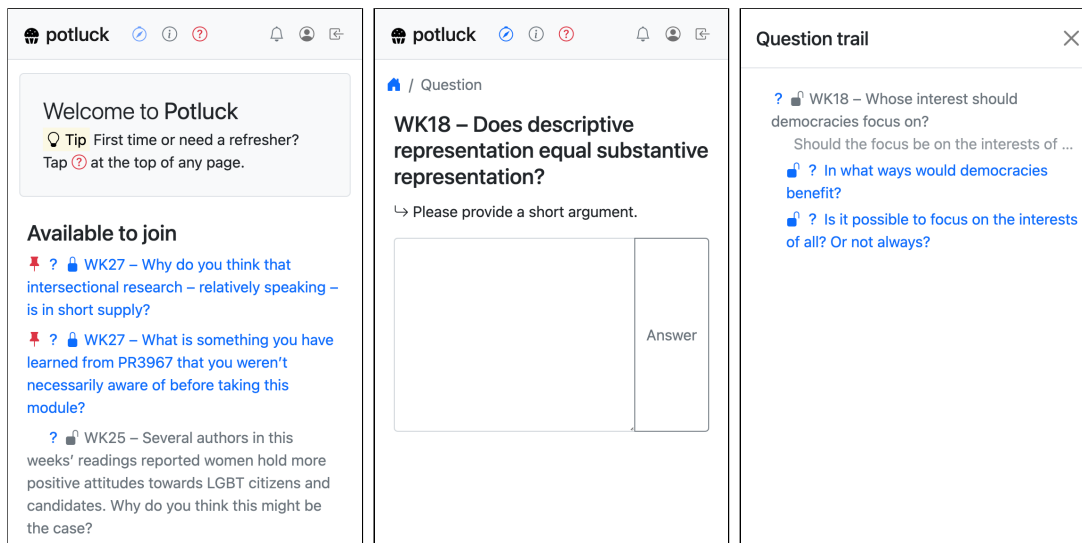


Figure 4.3: Flow diagram for the Guest usage of Potluck v2.1.



(a) Home page.

(b) Answer page.

(c) Question trail.

Figure 4.4: Displays of Potluck v2.1 on a mobile interface.

Answer Discussion Prompts

Selecting a discussion prompt from the home page directs the user to the answer input page (see Figure 4.4b) where they must pseudonymously contribute an answer to access the discussion. When the user submits their answer to the discussion prompt, the system processes it with summarisation-aggregation as per Figure 4.2. The answer is automatically screened for toxicity—“rude, disrespectful, or unreasonable comment that is likely to make someone leave the discussion [74]”—as described in Section 4.5. If the answer’s toxicity is above a certain threshold, the answer is posted but hidden behind a *mask*: an opaque layer that requires users to tap to reveal the answer (see Figure 4.5).

View Summaries

After the system assigns a summary to the submitted answer, the user is directed to the summaries page (see Figure 4.5) which displays cards for each of the summaries associated with the discussion prompt. Each summary has two buttons: one with an answer count, and one with a question count. The answer count button indicates how many answers are under that summary. Tapping the answer count

potluck Question trail About Help

whipped-salad-729 Logout

Question / Summaries

WK18 – Does descriptive representation equal substantive representation?

↳ Please provide a short argument.

Descriptive representation does not equal substantive representation, but most would contend that descriptive representation matters over and above arguments of justice for substantive reasons. 9 0

not in all cases. with descriptive the group is choosing someone who resembles them and their experiences whereas with substantive the legislator is not directly part of the group. maybe in the case of substantive representation it may lead to the elected person having characteristics that mirror the group. 1 0

For young girls of colour with immigrant back grounds Priti Patel would have been an inspiration to dream and aspire to be able hold a position of power. People who look like her or have similar life experiences have different political ideas and values in comparison to what she represents or what she believes. 2 0

Descriptive representation can exist without Substantive representation. Political parties might have more female candidates to increase their attractiveness to voters, but these candidates might not want to or have influence to change issues that concern women. For example political parties have more women to increase attractiveness to voters. 1 0

Reveal ?

Figure 4.5: Summaries page in Potluck v2.1.

button takes the user to the full answers page (see Figure 4.6) where the user can read and interact with each answer under that summary. The question count button displays the number of questions asked on the answers under that summary. Selecting this button opens a question modal similar to Figure 4.4c, where the user can take a shortcut to an answer input page (see Figure 4.4b) or full answer page (see Figure 4.6).

View and React to Full Answers

Answers with the same summary are aggregated and displayed on the full answers page (see Figure 4.6) where the user can read and interact with a grid of answers. Each answer has four buttons, labelled by a handshake, a thumbs-up, a flag, and a question mark.

The screenshot displays the Potluck v2.1 interface. At the top, there is a navigation bar with the Potluck logo, links for 'Question trail', 'About', and 'Help', and user information for 'whipped-salad-729' with a 'Logout' button. Below the navigation, a breadcrumb trail shows 'Home / Question / Summaries / Responses'. The main content area features a question: 'they should focus on the interests of all however, paying more attention to the interests (which may not be getting addressed) of certain minority groups. they should make sure no group is underrepresented or completely absent of representation as a whole.' Below the question, there are two answer cards. The first card, by user 'zesty-crumble-088', repeats the question text and includes a thumbs-up, thumbs-down, and question mark icon, and a flag icon. Below it is a question: 'Is it possible to focus on the interests of all? Or not always?'. The second card, by user 'smothered-cups-682', states 'Democracies should focus on citizens' interests, but could benefit from putting in more effort with certain under-represented groups.' and also includes the same interaction icons and a question: 'In what ways would democracies benefit?'. To the right of the answer cards is a form titled 'Ask one question with context:'. It has two input fields: 'Question' and 'Context (e.g. background, assumptions)', and an 'Ask' button. Above the form are icons for thumbs-up, thumbs-down, question mark, and a flag.

Figure 4.6: Full answers page in Potluck v2.1.

If the user finds an answer constructive to discussion, they can ‘respect’ it by tapping the handshake button, as implemented in previous work [60]. Only the representative answer (the first answer in the grid of cards) is used to create the summary but this is subject to change to reflect the most respected answer. For example, if answer A receives more respect votes than the current representative answer B, then A swaps places with B to become the representative answer. The summary is regenerated using A and a notification is sent out to the author of A to commend them.

The thumbs-up button can be used if the user agrees with a comment. Inappropriate and non-constructive answers can be acknowledged with the flag button. If an answer is flagged above a threshold number of times, it is automatically hidden. The respect, agreement, and flag counts of an answer are not displayed to

the user³.

Ask Questions

Tapping the question mark button under a full answer reveals an input area that allows the user to enter a question to the author of the answer (see Figure 4.6). The user is also prompted to enter context, such as background information or assumptions, to support the question. Note that these lower-level questions, i.e., questions asked on answers, are children of the discussion prompt at the top-level. The question is appended to the bottom of the answer (see Figure 4.6) and the author is notified that a new question has been asked. The system then creates a new discussion area from the new question. Tapping a question under an answer takes the user directly to the summaries page (see Figure 4.5).

Alternatively, the user can tap the question mark next to the question to go to its answer page and contribute as per Section 4.4.1 (see Figure 4.4b). This enables recursive question-and-answer, described in Section 4.3.4.

4.4.2 Host User

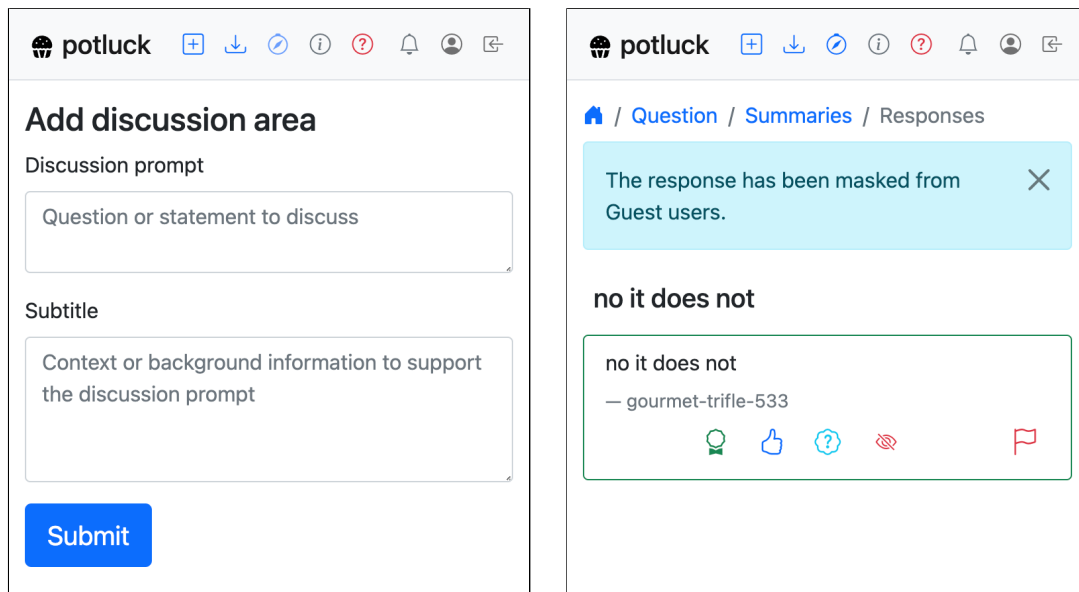
Set Discussion Prompts

The user can create top-level discussion prompts with context (see Figure 4.7a). These are subsequently displayed on the home page in descending chronological order (see Figure 4.4a). The user can pin prompts that they wish to prioritise or archive prompts that are no longer relevant.

Override moderation

The user can hide Guest user-submitted questions and mask answers that are not conducive to discussion. The user can also override the decisions of the auto- or crowd-sourced moderation and reveal answers that were hidden (see Figure 4.7b).

³As of Potluck v2.1, the respect and flag counts are used as internal metrics to determine what answers should be displayed and in what order. In future work, the agreement and respect count will be used together to calculate the salience of each answer.



(a) Add discussion prompt page.

(b) Mask on full answers page.

Figure 4.7: Displays of Potluck v2.1 for Host users on a mobile interface.

4.5 Implementation

This section presents the implementation details of the latest version of Potluck (v2.1). Based on previous work [212], the technical decisions for Potluck were guided by the following criteria:

1. Adoption: Other researchers and practitioners should be able to extend the system.
2. Maintainability: The system should feature automatic regression testing.
3. Practicality: The system should be scalable and use technologies that demand minimal set up and resources.
4. Reproducibility: The system should be built using freely available libraries and application programming interfaces (APIs).

Figure 4.8 displays the architecture of Potluck with the chosen technologies for each component. Potluck is a web application built with Flask⁴, a lightweight

⁴flask.palletsprojects.com

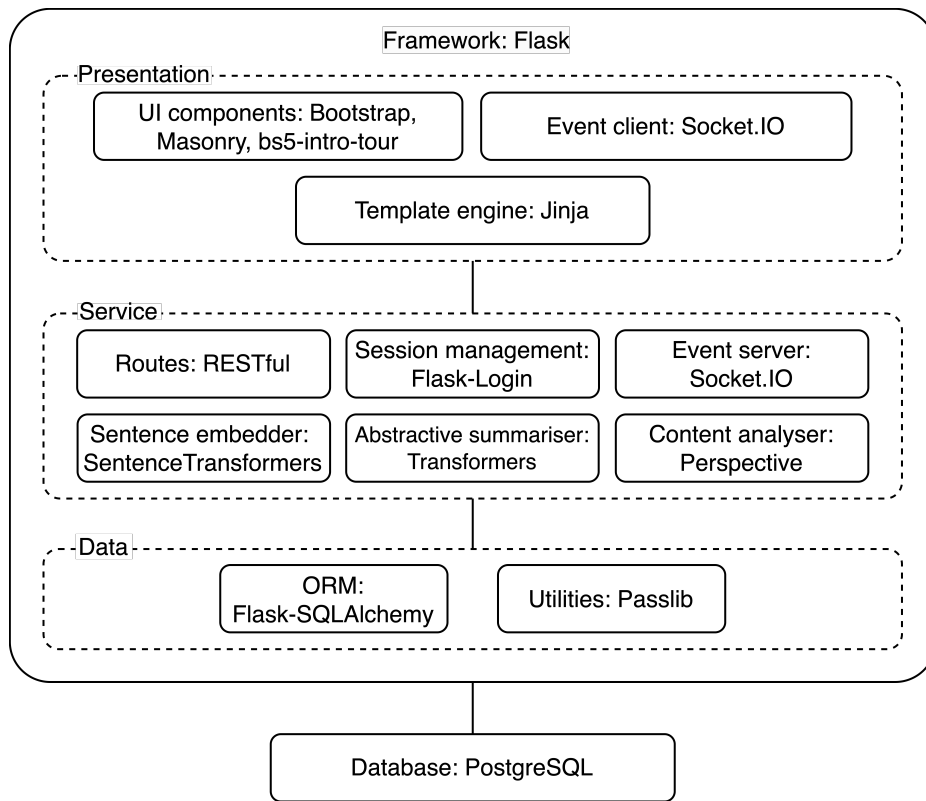


Figure 4.8: Server-side architecture of Potluck v2.1.

Python framework. For maintainability, the application features a standard three-tier layered architecture to separate data, service, and presentation concerns. The data is stored in a PostgreSQL database, an open source object-relational database management system (ORDBMS). It was chosen for its ability to model well-structured entities and support object-oriented concepts, such as inheritance, required by the data model presented in Figure 4.9.

The Transformers library⁵ is used with a pre-trained DistilBART model⁶ to generate abstractive summaries. To compare the semantic similarity between new and existing user input (such as summaries and questions), Potluck converts the input into sentence embeddings using the SentenceTransformers library [166] with the pre-trained all-MiniLM-L6-v2 model⁷ and then measures the cosine similarity

⁵huggingface.co/docs/transformers

⁶huggingface.co/sshleifer/distilbart-cnn-12-3

⁷huggingface.co/sentence-transformers/all-MiniLM-L6-v2

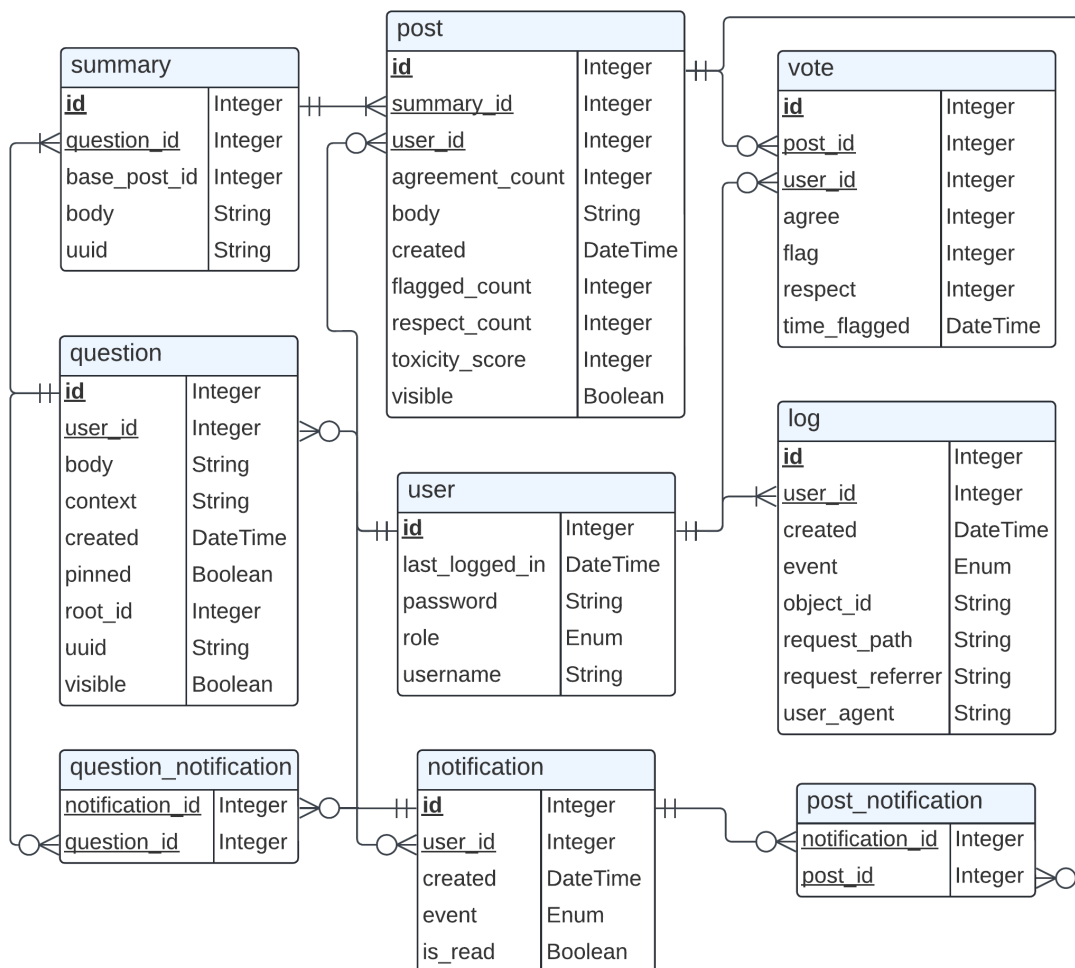


Figure 4.9: Entity-relationship diagram for Potluck v2.1 with crow's foot notation [59].

between the embeddings to determine whether aggregation is needed. The auto-moderation of user input is powered by Perspective⁸, a machine learning API that returns an estimated toxicity score for textual inputs.

4.6 Formative Lab-Based Study

As explained in Section 2.2.2, lab-based studies were conducted with early iterations of Potluck to evaluate the feasibility and initial impressions of Potluck’s core features. The results were used to inform the development of following iterations. The final output from these lab-based studies was Potluck v1.0, a production-ready release which was used in the first field deployment of Potluck described Chapter 5.

This section presents the first lab-based study, conducted in November 2021 with Potluck v0.1. As shown in Table 4.1, Potluck v0.1 operationalised the proposed structured discussion flow but without the user entity; see Appendix B.3 for the entity-relationship diagram (ERD). As a result, participation was session-based and stored on a local browser cookie, while all contributions, such as answers, questions, and votes, were made anonymously within the system. The purpose of conducting the study without the user entity was to gather early impressions of the core functionality of Potluck, the structured discussion flow.

4.6.1 Pilot

Since this was the first lab-based study of Potluck, the researcher ran a pilot study to evaluate the initial study procedure and materials. Two undergraduate students were recruited using convenience sampling. The experimental system, Potluck v0.1, was deployed on a departmental server accessible within the college network. The researcher and participants were situated in a computer lab at individual machines. Participants were provided with a study itinerary outlining a set of tasks and were guided on when to transition to the next task. Based on the findings from the pilot study, adjustments were made to the study procedure. To allow more time for the task completion, the consent form and pre-study questionnaires

⁸perspectiveapi.com

were emailed to participants for completion before the study. The timings on the itinerary were also updated to allocate more time for the main task involving the use of the experimental system.

4.6.2 Participants

Six participants (Computer Science undergraduate students, aged 18-19, five men, one woman) were recruited through campus mailing lists. Two participants identified as passive participants of online discussion, i.e., lurkers, while four participants identified as active participants, i.e., commenters. The participants are labelled P1-P6 in the results.

4.6.3 Data Collection and Analysis

All participants were assigned the same instance of the experimental system, Potluck v0.1; see Table 4.1 for the feature list. The experimental system was initialised with four top-level discussion prompts (see Appendix C.4) related to an NPR article about Web3 [4]. The system logged user submissions, e.g., posts, questions, and votes. Basic content analysis was conducted on the posts as per Section 2.3.1. Participants provided long-form text responses and 5-point Likert responses in pre- and post-study questionnaires (see Appendix C.2 and C.3 respectively). The questionnaires were analysed using the methods described in Section 2.3.2.

4.6.4 Procedure

The one-hour study was conducted in a workshop format where the researcher and all participants were collocated in a computer lab. First, participants were given five minutes to complete a pre-study questionnaire about their commenting habits. The researcher then gave the participants a 10-minute tutorial on how to use the experimental system. After, participants had 10 minutes to read the aforementioned NPR article. They were then presented the same instance of the experimental system on individual machines and given 25 minutes to freely participate on the system. The researcher was available to answer questions and assist

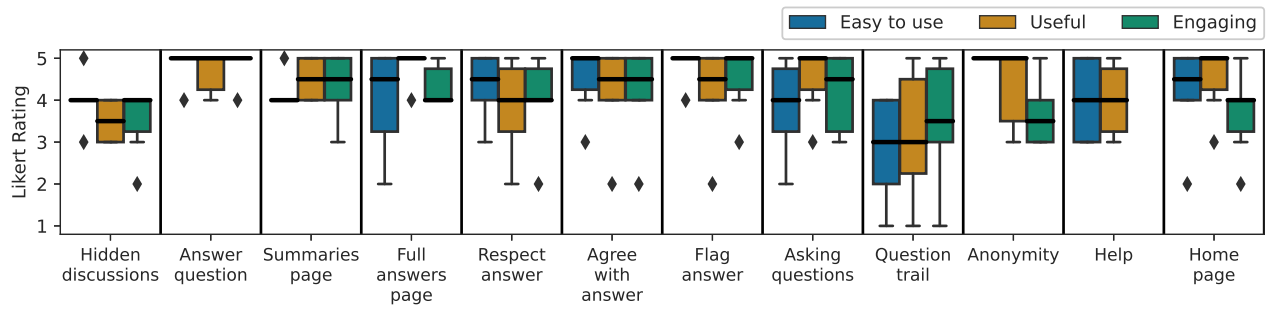


Figure 4.10: Box plots for the average user ratings of Potluck v0.1’s features in the lab study. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.

participants in the use of the experimental system if required. Finally, participants were given ten minutes to complete a post-study questionnaire about their impressions of Potluck’s features and the system overall.

4.6.5 Results and Discussion

Usability

In the post-study questionnaire, participants evaluated Potluck’s features in terms of ease-of-use, usefulness and engagement to identify pain points in the system. Participants also rated the ease-of-use and comprehensibility of the system overall.

The results suggest that the core functionality of Potluck is feasible for online discussion. In the feature evaluations, participants rated the ease-of-use, usefulness and engagement of the features with an average Likert rating of four or five; see Figure 4.10. Question-answering, the main method of active participation, was notably well-received as easy to use, useful and engaging. The question trail received mixed feedback across all three constructs. For example, P2 rated it as not at all useful, which may be because they found it difficult to use: “*The question trail was not very intuitive but the rest of Potluck was very easy to navigate and understand.*” To help users locate discussions on the system, future iterations updated the question trail and provided alternative navigational methods. Regarding the system overall, five out of six participants found Potluck easy to use and all participants found it easy to understand (see Figure 4.11).

Usage

The results preliminarily suggest that Potluck could foster normatively-desirable active participation in online discussion. 5 out of 6 participants perceived changes from their usual commenting behaviour when using Potluck. Several mentioned increased active engagement attributed to the system’s mandatory participation. For example, P4 said: “*I’m not exactly used to submitting a healthy amount of comments when online—in [Potluck], I had to contribute a lot more.*” The shielded discussions also affected how participants contributed on the system. This could be due to the lack of situational norms, which are typically observed in the behaviour of others through their comments [197]. For instance, P6 contributed more sincerely:

“I felt like I had to be a lot more formal, concise and honest with my answers when answering on Potluck, since I couldn’t see anyone else’s response.”

P3 found themselves critically reflecting on their answer because: “*I couldn’t view other people’s comments whilst writing my own, so I couldn’t take part of their ideas into my own answers or comments.*” P1 shared this sentiment: “*I really like the fact that I have to think about [my] opinion on a matter before I can engage with other [people’s] submissions.*”

However, not all usage was in the interest of discussion. P2 said: “*Anonymity meant that I just typed whatever I wanted as it couldn’t be traced back to me.*” As discussed in Section 3.2.4, the lack of accountability that comes with anonymity can lower discursive quality [177, 182]. Indeed, a basic content analysis of the answers revealed that nearly half of the answers were off-topic. This result emphasises the importance of a durable user entity in the next iteration of Potluck. It also motivated the implementation of a peripheral feature: a layer of automatic content moderation (see Section 4.5). Moreover, one user exploited the crowdsourced moderation feature to hide innocuous answers, which they could do anonymously. In the next iteration of Potluck, a separate vote entity was implemented to enable a user to flag each answer only once.

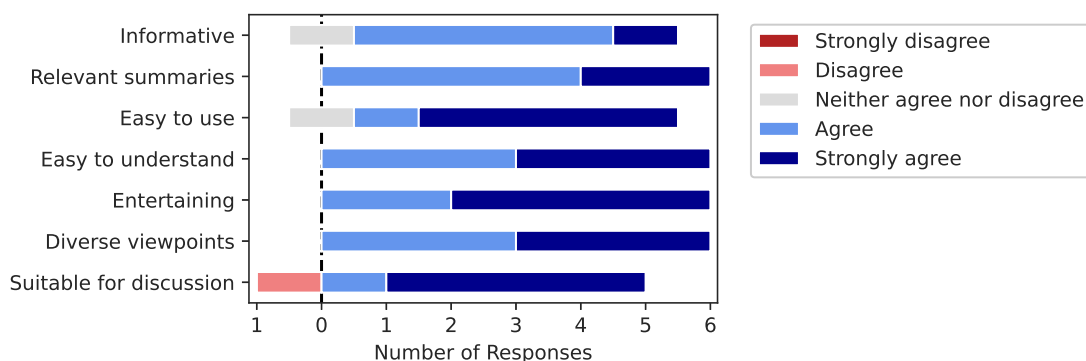


Figure 4.11: Overall impressions of Potluck v0.1 in the lab study.

Overall impressions

All participants reported having a positive experience overall, motivating the current research direction. The majority of participants found Potluck to be informative, and all agreed that it presented relevant summaries and diverse viewpoints (see Figure 4.11). To this effect, P6 said: *“It makes it a lot easier to read and get general feelings about what people think about certain articles and topics.”* All participants agreed that Potluck was entertaining to use and expressed having fun. P5 enjoyed particularly enjoyed voting by respect:

“[Potluck was] very fun and easy to use. I feel like even a tech novice could use this system with ease. It’s fun to essentially promote the comments I liked/resonated with.”

P3 did not find Potluck suitable for online discussion due to the anonymity: *“I am not too sure how suitable it is for an online discussion as you can’t go back to your own comments easily, you have to go back to everything as a different user pretty much (that’s how it feels) as it’s anonymised.”* This further motivated the implementation of durable pseudonyms for users in following iterations.

Some participants mentioned delays on the experimental system which affected their overall experience. For example, P3 said: *“It was quite good, engaging and fun to use, did start to slow down when many answers were popping up.”* The researcher later found that the embeddings model and abstractive summariser were using the CPU (instead of the GPU) for inference, resulting in degraded

performance. This was resolved and tested before the formative lab-based study with Potluck v0.2.

4.7 Summary

This chapter addressed RO3 by presenting design principles for structuring and facilitating online discussion. These design principles were subsequently used to conceptualise a structured discussion flow for online message boards which is implemented in Potluck, a novel working artefact for online discussion (RO4). The usage and implementation for Potluck were also outlined for adoption and reproducibility. Finally, the first lab-based study of Potluck was described to demonstrate how early design iterations of the system were evaluated and used to inform subsequent iterations. The output of these formative studies was Potluck v1.0, a stable release for field deployment.

The next chapter describes the field deployments of Potluck in distinct user settings to address the last objective of this thesis, RO5.

Chapter 5

Field Deployments of Potluck

THIS CHAPTER:

- ◇ Describes a 10-day field deployment with 10 participants to investigate the use of Potluck for *ideation* (RO5).
- ◇ Presents a 12-hour field deployment with 17 participants to examine the use of Potluck for *engagement* and *peer support* (RO5).
- ◇ Presents a longitudinal 10-week classroom deployment with 19 participants which explores the use of Potluck for *collaborative learning* (RO5).

A summary of the study presented in Section 5.2 has been published in [126].

5.1 Motivation

The lab-based user study in the previous chapter was formative in the development of Potluck. The results suggested that the system's structured discussion flow is feasible for group discussion and has the potential to promote normatively-desirable user behaviour. However, the addition of organisational constraints and removal of distractions in the lab-based setting may have created ecological gaps with the real world [186]. To understand how users might realistically use and make sense of Potluck, this chapter evaluates the system through field deployments, a type of field study described in Section 2.2.3. The following sections

present field deployments in three different contexts: professional, event-based, and educational. An overview of the field deployments is shown in Table 2.2.

Together, these studies address RO5 in which the main objective is to describe and explore how users engage with Potluck in distinct real-world settings. The secondary objective is to evaluate the usability of Potluck among different user groups.

5.2 Field Study I: Professional Setting

In March 2022, a 10-day field deployment of Potluck v1.0 was conducted with alumni of the first infodemic management training programme (IMTP) of the World Health Organisation (WHO). The researcher received this opportunity from JC¹, an alumna of the IMTP. An infodemic is an excessive amount of information spread online and offline during a disease outbreak, including false or misleading information [211]. The alumni of the IMTP include professionals with backgrounds from risk communication and community engagement, to policy making in health. The discussions held on Potluck were intended to bring together their expertise to better define the field of infodemiology. The objective of this field study was to explore how professionally-homogenous users would engage with and make sense of Potluck v1.0. As this user demographic had not trialled the system before, the study also sought to evaluate the usability of Potluck’s main features.

5.2.1 Pilot

Prior to the field deployment, a pilot study in the form of a convenience deployment [186] was conducted with the researcher, their supervision team, and JC. The experimental system was deployed to a departmental server and the participants followed the initial study procedure. JC provided six discussion prompts to initialise the discussions. The pilot study led to refinements in the study procedure and data collection methods. The initial number of discussion prompts was reduced to the four given in Table 5.1 to not overwhelm participants. Due to

¹Credited after the study as the second author of [126] for their valuable contribution to participant recruitment and data collection.

ID	Discussion prompt
A	What do you think has been the biggest infodemic challenge during the COVID-19 pandemic?
B	Do you think social media (e.g., Facebook, WhatsApp and Reddit) or traditional media (e.g., newspapers, TV broadcasts and radio shows) are more problematic for misinformation? Why?
C	Do you think there is too strong an emphasis in infodemic management on mis- and disinformation compared with other issues?
D	Where do you think the field of infodemiology can have the most impact?

Table 5.1: Top-level discussion prompts used in Field Study I.

the small user base, the design decision was made to seed the discussion prompts with two answers. Seeding has been employed in previous work to give early users something to engage with [187]. The pre- and post-study questionnaires, based on the ones used in Appendix C.2 and C.3 respectively, were merged into one post-study questionnaire (see Appendix D.2) to remove the friction in the study’s onboarding process.

5.2.2 Participants

To take part, participants had to be available to use Potluck for at least five minutes a day during the first five days of the study, and have access to a desktop Chrome, Safari, or Firefox browser.

In addition to JC who was assigned the Host role² (Host user), there were nine participants assigned the Guest role (Guest users). They were recruited from a rolling invitation to alumni of the IMTP through WhatsApp groups in which alumni stay in touch with one another and with the WHO. Two of these participants did not complete the post-study questionnaire by the deadline so their responses were omitted from the results in Section 5.2.5. The remaining seven participants (45-54 median age group; four men, three women) are labelled P1 to P7.

²[126] described the experience of the nine participants with the Guest role. The experience of the user with the Host role will be introduced in this thesis.

5.2.3 Data Collection

The experimental system was an instance of Potluck v1.0, deployed to a departmental server. The list of features in Potluck v1.0 are given in Table 4.1. The endpoint was made accessible outside of the college network due to the disparate locations of the participants: five in Europe, one in Africa, one in Asia, and one in North America. The system was initialised with the four discussion prompts given in Table 5.1. Each discussion prompt was initialised with two seed answers. The system logged user submissions, e.g., posts, questions, and votes, along with timestamps and associated user ID's.

A 10-minute post-study questionnaire (see Appendix D.2) was distributed online to the participants who assumed the Guest role. The questions asked about participant demographics, impressions of specific features of Potluck, and impressions of Potluck overall.

As per Section 2.3.4, a structured interview was conducted via email with the participant assigned the Host role, JC. The responses to the interview are given in Appendix G.

5.2.4 Procedure

Before the study, participants were emailed a video on how to use Potluck as a Guest user. The researcher also had a meeting with JC to demonstrate how to use the system as a Host user. At the start of the study, participants were given access to the experimental system, an instance of Potluck v1.0. Through the participant information sheet (see Appendix D.1), participants were instructed to spend at least five minutes a day using Potluck for the first five days of the study³. They could spend their time on the system freely, for example, by actively engaging in discussion or passively reading posts in the discussions that they had already engaged in. After the fifth day, this requirement was removed up until the end of the study on day 10. After the study, participants who assumed the role of Guest user were invited to complete a questionnaire about their demographic and

³The reason was to generate enough activity for observation given the low number of participants. However, this may have created ecological gaps by encouraging an initial surge of participation. For higher ecological validity, this instruction was not included in the field studies in Section 5.3 and 5.4, both of which had a higher number of participants.

experience using Potluck. A structured email interview was conducted with JC to gather insights into the experience of the Host user.

	Answers	Questions	Votes
Discussion A	9 (9)	8 (1)	2 (2)
Discussion B	9 (8)	7 (2)	1 (1)
Discussion C	9 (9)	4 (2)	3 (3)
Discussion D	11(9)	3 (2)	2 (1)

Table 5.2: Raw counts of contributions within each top-level discussion prompt in Field Study I. The number of unique participants is given in brackets.

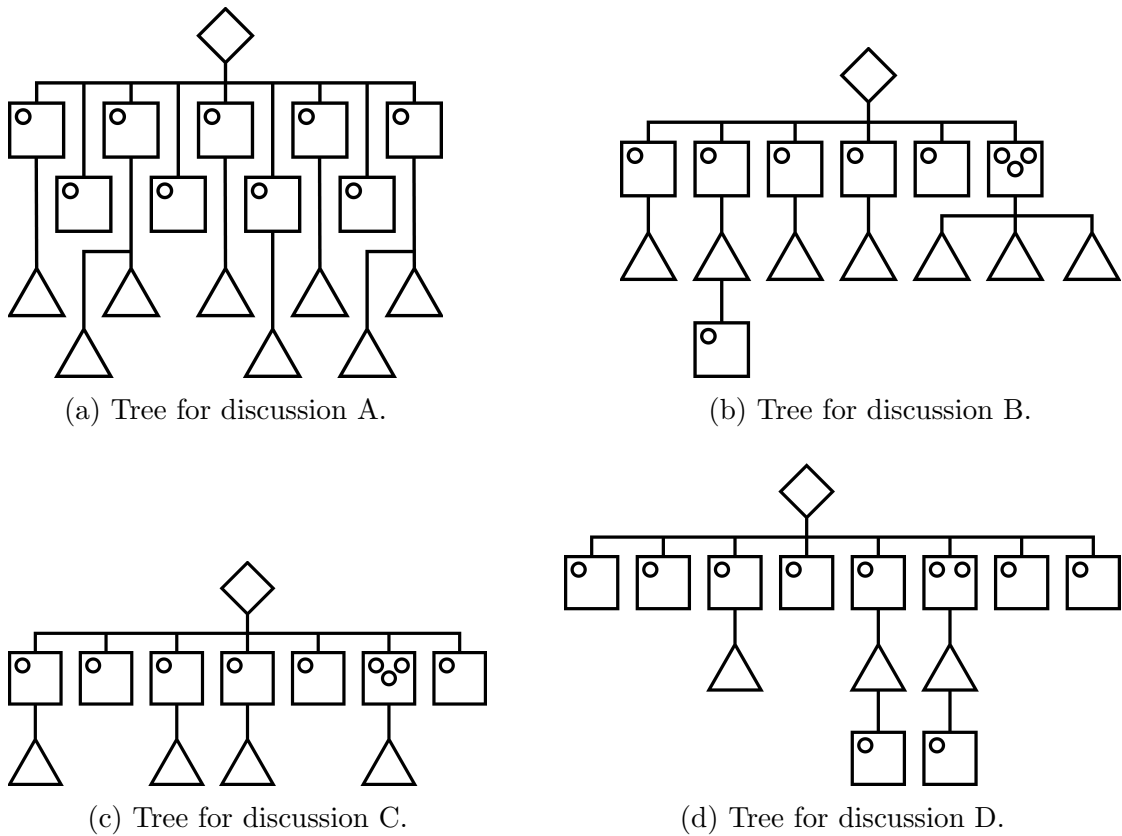


Figure 5.1: Discussion trees for Field Study I where \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.

5.2.5 Results

Engagement

An analysis of the log data was conducted for insights into user engagement. Table 5.2 provides total counts of the contributions made on the system. The participants assigned the Guest role contributed 29 answers in total, all contributed within the first five days of the study. Each of these participants gave one to seven answers ($M=3.63$, $SD=1.77$). The remaining eight answers were from JC, who provided two seed answers per top-level discussion. The least used method of contribution was the system's voting mechanism, which was used eight times by three distinct participants. Out of the three types of voting (respect, agreement, and flagging), only agreement (75 percent) and flagging (25 percent) were employed.

Figure 5.1 depicts the discussion trees that resulted from all top-level discussion prompts. The breadth of answers in the first level of the discussion trees show that participants were actively engaged with the top-level discussion prompts. The maximum depth of the trees was three, as illustrated by the following sample:

Branch from discussion D

pounded-cookies-139: “[Where] Infodemiology will have [the] most impact [is] on the flow [of] health-related information around the world. Clarifying where information comes from, how it propagates, who is affected and how to prevent the harm.”

↔ **burnt-spaghetti-086:** “How would you clarify where [the] information has come from?”

↔ **warm-pasta-827:** “Factchecking, interrogating the piece of information, context, theme, design, image etc. Identifying the sharing of the piece of information and how it has flowed through social media - social listening, platforms like Pulsar etc. that can aggregate data from different platforms.”

As shown in the sample, participants answered lower-level questions that were not addressed to them, resulting in multi-way discussion. However, the logs revealed that after answering a top-level discussion prompt, participants with the Guest role would largely proceed to answer another top-level discussion prompt rather than engage with other answers or lower-level questions. The main contributor to the second level of the tree, i.e., the question layer, was JC who asked 19

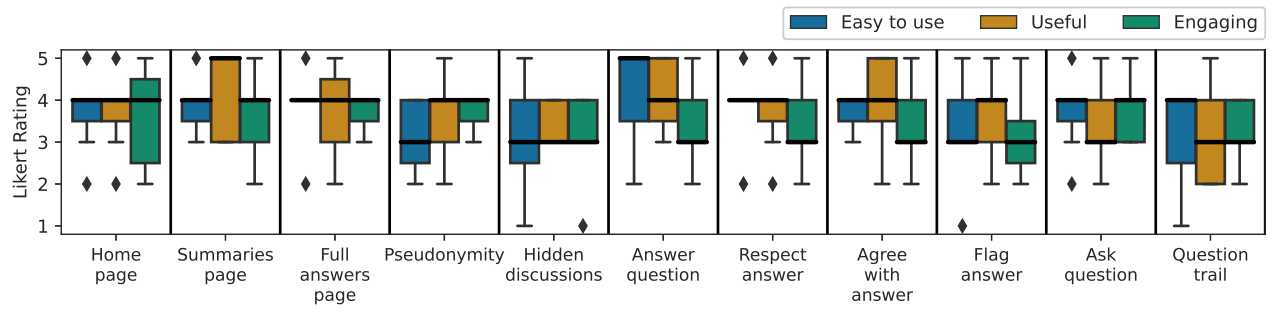


Figure 5.2: Box plots for the average user ratings of Potluck v1.0’s features in Field Study I. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.

out of the 22 lower-level questions.

Usability

Participants P1-P7 rated the ease-of-use, usefulness and engagement of Potluck v1.0’s features, and the ease-of-use and comprehensibility of the system overall.

The results from feature evaluations suggest that the usage of Potluck is feasible (see Figure 5.2). Notably, the summaries screen was rated highly for usefulness, and it was perceived as easy to use and engaging. Five out of seven participants agreed that the summaries presented on Potluck were relevant (see Figure 5.3). The answering of questions was also perceived as easy to use and useful (see Figure 5.2). The most divisive feature in term of perceived usefulness was the question trail.

Five out of seven participants agreed that Potluck was overall easy to use (see Figure 5.3). P6 said: “*It is very simple to use and everyone having basic knowledge and IT can use it.*” However, only three out of seven participants agreed that the system was overall easy to understand. P2 said: “*I can see what it is trying to do, but overall, I found it a bit confusing*” but also noted that they did not think they had enough time to evaluate it.

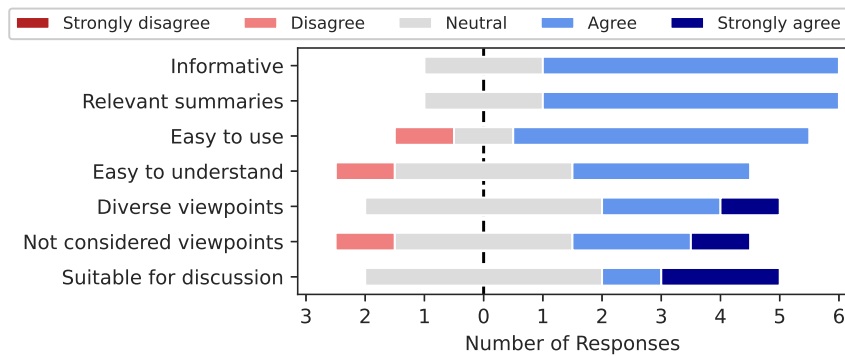


Figure 5.3: Overall Guest user impressions of Potluck v1.0 in Field Study I.

Guest Impressions

Participants P1-P7 provided their impressions of Potluck v1.0 by rating statements and writing long-form responses in the post-study questionnaire.

Only three out seven participants agreed that Potluck presented diverse viewpoints, with the same participants agreeing that the system presented viewpoints that they had not previously considered before (see Figure 5.3). The participants were professionally homogenous and from these results we can infer that they likely had the same ideas on the discussed topics. Nevertheless, participants recognised the potential of Potluck to expose differing opinions. P4 said: “*Very useful idea which needs more field testing in the intended environment, eg. covering topics where people disagree the most.*”

Overall, six out of seven participants reported a positive experience on Potluck. Notably, the system was found to be informative (see Figure 5.3). P6 described the system as “*very user friendly, educative and informative*” and P5 said that it was a “*good tool to navigate.*” Participants agreed or were neutral that Potluck was suitable for online discussion (see Figure 5.3).

Host Impressions

JC provided impressions of Potluck v1.0 from the perspective of a Host user by providing long-form responses in a structured email interview. The following themes were identified using grounded theory lite (GT-lite) described in Section 2.3.2 with a focus on the potential and limitations of Potluck v1.0.

Facilitating large-scale opinion sharing and consensus building: When asked about the kinds of discussions that Potluck can facilitate, JC described large-scale opinion sharing and exploration due to system’s “*structure for gathering and ordering a large number of potentially diverse opinions*”:

“Discussions where opinions need to be canvassed from a large number of people, to see each one’s view, but without necessarily protracted discussion. [...] In particular for discussions where there is no ‘right’ or ‘wrong’ answer but for which consensus needs to be reached, and on which people can see the reasons others give for their choice.”

Regarding unsuitable discussions for Potluck, JC mentioned: “*community building where people might want to discuss shared interests [...] because it seemed hard to get discussions going and to have a dialogue rather than a question-and-answer session.*”

Usability challenges: The interview revealed problems with the perceived usability of the discussion flow. During the study, JC participated daily on the system by asking follow-up questions to Guest-submitted answers. In Potluck v1.0, users could only interact to other answers with a question. JC commented on this feature and posited an explanation for the lack of reciprocity between participants:

*“I didn’t find the system particularly intuitive or easy to use. [...] I also found it awkward that a comment had to be in the form of a question, rather than a **statement or additional information** that might add to or answer a previous comment/question. This didn’t seem to help the flow of discussions or two-way dialogue, whether the users were agreeing or disagreeing.”*

JC noted that although she did not find it intuitive, “*users would learn it through practice if there was a strong reason to do so.*”

Redefining online discussion: JC speculated on applications of Potluck that go *beyond being there* [88], specifically for synthesising large-scale participation on

contentious topics. JC remarked that with Potluck, “*you can’t hear everyone simultaneously but the platform can, and can filter and summarise all their views for you.*” This could mean facilitating interactions that cannot take place in existing online discussion systems:

*“People don’t tend to want to argue – they want to talk to people they agree with/agree with them, so why would any platform appeal to people if it tried to keep them in conversation with people they disagree with/dislike? This is why I think **short engagements to give your opinion on something** for which opinions need to be canvassed might be more realistic than as a discussion forum.”*

5.2.6 Discussion

The objectives of this field study were to explore how professionally-homogenous users would engage with and make sense of Potluck v1.0, and to evaluate the usability of the system.

The study revealed different motives and patterns for engagement between the Host and Guest users. The participants with the Guest user role were shown to mainly use Potluck for the cognitive purpose of information seeking and dissemination. Meanwhile, the Host user sought to engage others in discussion, a social-integrative purpose. This mismatch led to wide but shallow interactions (see Figure 5.1), where Guest users answered the top-level discussion prompts in order to navigate, not probe, the opinions of others.

Although the system was not successful in facilitating reciprocity between participants, the results suggest that Potluck could support a *new* form of interaction from existing ACMC. Potluck was notably able to provide Guest users with relevant summaries of information. The Host user’s responses supported these claims and further suggested that Potluck may be suitable for facilitating brief engagements between those with differing opinions. These properties are conditions for supporting *ephemeral interest groups*, which are low-cost, short-lived, ad hoc online group discussions [23]. This potential will be explored in Field Study II in Section 5.3.

There was an underprovision of voting on Potluck, even though it was perceived as useful on average (see Figure 5.2). For the same phenomenon on Reddit, Gilbert [71] posited that it may be because voting is not a social process and therefore not engaging for users. While Potluck does not rely on voting in the same sense as SNWs, this could undermine the purpose of the mechanism. In future work, it would be interesting to explore alternative feedback mechanisms that achieve the same desired effect as voting.

Regarding the usability of Potluck, Guest users found the system and its features easy to use overall. However, the results highlighted problems in the intuitiveness of Potluck v1.0 for both Host and some Guest users. This version of the system strictly limits the exchange between participants to the asking and answering of questions. As noted in Section 5.2.5, this made it unintuitive to communicate certain types of information. A similar frustration was expressed about ThoughtSwap v1 [46] in which the researchers posited that the system limited participants' *coordinative agency*, i.e., the means to adjust the activity to meet their needs [46].

To address this limitation, the discussion flow will be reviewed before the next field study to enable the communication of additional information. Potluck's help functionality will also be revisited since training can help users work with embedded formalisms [184]; see Potluck v2.0 in Table 4.1 for a full list of changes. The System Usability Scale (SUS) [21] will be integrated into the post-study questionnaire of the following field studies to standardise the measurement of perceived usability.

Overall, this study suggests that Potluck v1.0 is able to provide an overview of small to medium-sized discussions. It also has the potential to facilitate new forms of online interactions that are currently not supported through other means. It is important to note that these claims are based on preliminary results with a small user base. The impact of Potluck and specific features cannot be observed until the system reaches critical mass, such as the usefulness of summaries when presented with many answers, or the display of many differing opinions. This motivates further field studies with longer durations and higher participation.

5.3 Field Study II: Event Setting

In November 2022, a field deployment of Potluck v2.0 was conducted at a 12-hour hackathon. The hackathon was hosted by a computing society at a university in the UK. This field study opportunity was received from RR, one of the event organisers. RR described the hackathon as “*the first major event of the year for the society, setting a precedent for the rest of the year*” and was motivated to trial Potluck to support delegates, e.g., with their project ideas and team formation, as well as encourage ad hoc discussions relating to the hackathon and technology during the event. The objective of this study was to (1) explore how users engage with and make sense of Potluck v2.0 and (2) evaluate the usability of the system in an event-based setting.

5.3.1 Pilot

In August 2022, a pilot study was conducted with delegates at a two-day London Quant Group seminar using the following procedure. Before the study, the experimental system, a private instance of Potluck v2.0, was pre-populated with 16 discussion prompts proposed by seminar speakers. To limit access to the system to delegates only, Potluck’s user registration was removed, and a unique access code was generated for each delegate. All delegates were invited to take part through an email sent out by the event organiser, which contained their access code and a link to the experimental system. The landing page of the experimental system instructed participants to read the participant information sheet and complete the consent form if they wished to participate. During the seminar, the researcher was present to assist participants in the use of Potluck where necessary. Participants gave the researcher ad hoc feedback in person and through email. At the end of the study, participants were invited to complete a post-study survey via email.

The procedure and study materials were modified in response to the issues raised by the pilot study. To avoid overloading participants at the start of the event, the Host user was instructed to freely release discussion prompts over the duration of the event. The barriers to study participation were lowered by embedding previously external links to the study landing page (see Appendix E.3), and

ID	Age	Gender	Typical participation in online discussion
P1	19	Non-binary	Passive
P2	20	Man	Passive
P3	25	Woman	Passive
P4	25	Man	Passive
P5	30	Man	Active
P6	23	Man	Passive
P7	32	Woman	Active
P8	24	Man	Active
P9	23	Woman	Active
P10	22	Woman	Passive
P11	20	Man	Active
P12	23	Woman	Active
P13	23	Non-binary	Passive

Table 5.3: Participant demographics in Field Study II.

not pre-setting access codes. It was also decided to give participants advance access to the system before the event to give them time to familiarise themselves with the system. Described in Section 2.3.3, contextual inquiry [89] was added to the study procedure to collect rich data on the usage of Potluck. Some participants were unable to access the experimental system because they did not possess a device with a web browser. Therefore, access to a web browser on a laptop or desktop device was added to the inclusion criteria of the study. The post-study questionnaire was made available before the end of the event to increase the response rate. To avoid ad hoc feedback from participants and thus improve the validity of the data collection methods, participants were invited to provide feedback in a long-form text field at the end of the post-study questionnaire.

5.3.2 Participants

There were 17 participants, where 16 were assigned the Guest role (Guest users) and RR was assigned the Host role (Host user). The participants were organisers or delegates of the hackathon. Before the hackathon, participants were recruited from an advertisement distributed through the computing society mailing list and Discord. During the hackathon, delegates were recruited through an announcement at the start of the hackathon and through a publicly displayed QR code to the

experimental system. Participating delegates could opt into a draw for a £20 Amazon gift voucher upon completion of the post-study survey. Three participants did not complete the post-study questionnaire for Guest users in time, so their responses have not been included in the results in Section 5.3.5. The remaining 13 participants (six men, five women, two non-binary people) aged between 19 to 32 ($M=23.77$, $SD=3.72$) are labelled P1 to P13. 53.85 percent of participants identified as typically passive participants of online discussion and the remaining 46.15 percent of participants identified as active participants. See Table 5.3 for participant demographics.

5.3.3 Data Collection

The experimental system was an instance of Potluck v2.0 deployed to a departmental server; see Table 4.1 for the system features. The endpoint was made accessible outside of the college network due to the location of the event. Before the event, RR initialised the system with three discussion prompts; see A to C in Appendix E.4. Each discussion prompt was seeded with 2-3 answers and questions. The system logged user submissions as described in Section 5.2.3.

Since the researcher was on-site for the field study, contextual inquiries were conducted with nine out of 16 Guest users. As described in Section 2.3.3, the contextual inquiries lasted between 20 to 30 minutes per individual. All observations, quotes, and interpretations were taken down by hand and shared with participants at the end of the contextual inquiry to review for accuracy.

Guest users were given an online post-study questionnaire (see Appendix E.2). It included the SUS to measure the perceived usability of the system in a standardised format, in addition to the questions outlined in Section 5.2.3. The Likert-style scaling statements on ease of use and comprehensibility of Potluck included in the post-study questionnaire of Field Study I (see Appendix D.2) were removed from this questionnaire. This decision was made because the SUS can be viewed as a bidimensional construct of usability and learnability [123]. Questions about online message board usage were added to understand how the experience of using Potluck may have differed between participants with different commenting habits. Statements specific to the setting were also added to the Likert-style scaling state-

ments, e.g., “Potluck was entertaining to use” and “Potluck was suitable in an events-based setting”.

As per Section 5.2.3, a structured email interview as explained in Section 2.3.4 was conducted with the Host user, RR. See Appendix G for the responses.

5.3.4 Procedure

Guest users were given the link to the experimental system, an instance of Potluck v2.0, through the event’s promotional materials before the hackathon. Before Guest users could use the system, they were shown a study landing page (see Appendix E.3) which instructed them to read the participant information sheet (see Appendix E.1); complete the consent form; and watch a video on how to use Potluck as a Guest user. During the study, all participants were located in the same computer lab for 12 hours⁴. The Host user posted discussion prompts related to the hackathon and technology to the experimental system throughout the study (see Appendix E.4). The use of Potluck was supplementary to the main activity, i.e., creating a submission for the hackathon, so participants were free to participate on the system as and when they wanted to. The usage of Potluck was observed in-situ by the researcher through contextual interviews with individual Guest users. After the study, Guest users were invited in person to complete a questionnaire about their demographic and experience using Potluck. A structured email interview was conducted with RR, as per Section 5.2.4.

5.3.5 Results

Engagement

Two data sources were analysed to objectively understand the engagement on the experimental system: log data and contextual inquiries.

The total counts of contributions on the system are presented in Table 5.4. Guest users contributed 111 answers in total, ranging from one to 18 answers per person ($M=6.61$, $SD=4.83$). The other eight answers were from the Host user, RR,

⁴The experimental system was made available to participants two weeks before the event to allow for familiarisation and hackathon preparation. However, the post-study questionnaire revealed that most participants were unaware of its availability.

Discussion prompts	Answers	Questions	Votes
10 (1)	119 (17)	25 (8)	19 (7)

Table 5.4: Raw counts of contributions in Field Study II. The number of unique participants is given in brackets.

Question type	Percent	Sample
Factual knowledge	24	Is Go useful for anything specific?
Rhetorical	24	Are there any languages that you want to learn?
Clarification	20	What, more specifically, as it is a quickly changing field?
Suggestion	20	Have you tried looking at the API?
Opinion	12	[Why] so much hatred towards Java?

Table 5.5: Types of questions asked in Field Study II, based on [141].

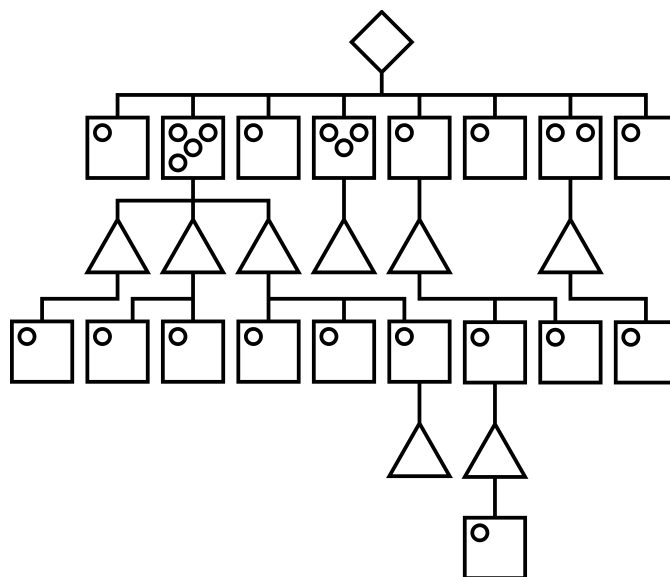


Figure 5.4: Tree for discussion A in Field Study II. \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.

who provided seed answers for the first three top-level discussion prompts. 23 out of 111 (20.72 percent) answers received at least one question from another participant. 64 percent of these questions were asked by Guest users. In the contextual interviews, this activity was found to be triggered by the purposes of clarification, information-seeking, and rhetoric, i.e., conversation and humour. Conversely, the Host user asked lower-level questions mainly for the purpose of helping others (see Section 5.3.5). These motivations align with the types of questions submitted, shown in Table 5.5. The question types were revealed from a basic content analysis [54] (see Section 2.3.1) of the submitted questions. Prior to analysis, eight *a priori* codes were generated from the question types found in social question and answering (SQA) [141]. However, not all were relevant to the data set and two new codes emerged inductively. This resulted in five question types: factual knowledge, rhetorical, clarification, suggestion, opinion. As shown in Table 5.5, most questions were rhetorical or requested factual information, closely followed by questions for clarification and with suggestions. 52 percent of the lower-level questions included contextual information from the author.

As observed from the contextual inquiries, the main pattern of engagement for Guest users mirrored the intended user flow depicted in Figure 4.1. That is, participants answered top-level discussion prompts; browsed through the summaries; and viewed the full answers of summaries of interest. However, instead of using the question trail to find questions to answer, participants tended to return to and locate questions from the summaries page. When asked about this activity, most participants reported not noticing the question trail in the navigation bar⁵.

The voting mechanism was exclusively used by Guest users. The majority of the votes were for agreement (47 percent), followed by respect (42 percent) and flagging (11 percent). 62.5 percent of the posts respected by participants did not receive an agreement vote from the same participant.

The Host user added a new top-level discussion prompt to the system every one to two hours; see Appendix E.4 for all discussion prompts. The resulting depth of the top-level discussion trees ranged from one to five ($M=3$, $SD=1.58$). Figure 5.4 displays the tree for discussion A, the most active top-level discussion prompt. The breadth of the first three levels shows high engagement with both question

⁵Future work could investigate this phenomenon through an eye-tracking study [159].

answering and asking. Level one included similar answers collated under the same summary. Level three reveals that several participants provided answers to the same lower-level questions, showing that communication extended beyond one-to-one interactions. The following sample illustrates the many-to-many interactions that occurred on the experimental system:

Branch from discussion A

garlic-rolls-445: “Python as the syntax is simple”

↔ **sugary-crumble-320:** “Have you considered go?” (Context: “Go’s syntax is pretty similar to python’s, yet it can run significantly faster”)

↔ **rotten-loaf-993:** “No go... yet”

↔ **basic-pretzels-068:** “<https://fasterthanli.me/articles/i-want-off-mr-golangs-wild-ride>”

↔ **rotten-loaf-993:** “Is go useful for anything specific?” (Context: “If there’re bad parts of go, what’s go useful for?”)

↔ **basic-pretzels-068:** “every language has flaws, go is good for simple scripting at reasonable execution speeds”

The responses to the post-study questionnaire provide perceptions of engagement from participants. Seven out of 13 participants perceived changes to their usual commenting patterns on Potluck. Among these participants, some noted that due to Potluck’s hidden discussion, they contributed to the discussion when they would have not otherwise. For example, P2 said:

“In order to view what other people had said, I would have to make a comment of my own. This differs from my usual social media habits, which is to only view what other people have written.”

Similarly, P7 said: “As I’m not a big commenter, having to respond before reading others’ comments felt strange, but it definitely made me engage more.” P1 attributed Potluck’s mandatory participation to their increased contribution, noting that they were “more happy writing answers when everyone does.” Pseudonymity was also mentioned as a contributing factor to participation, for example, P6 wrote: “I liked how it was completely anonymous and it meant that no one knew it was you.” The participants who did not perceive changes in their commenting patterns were mainly contributors to online discussion. Some participants found the fea-

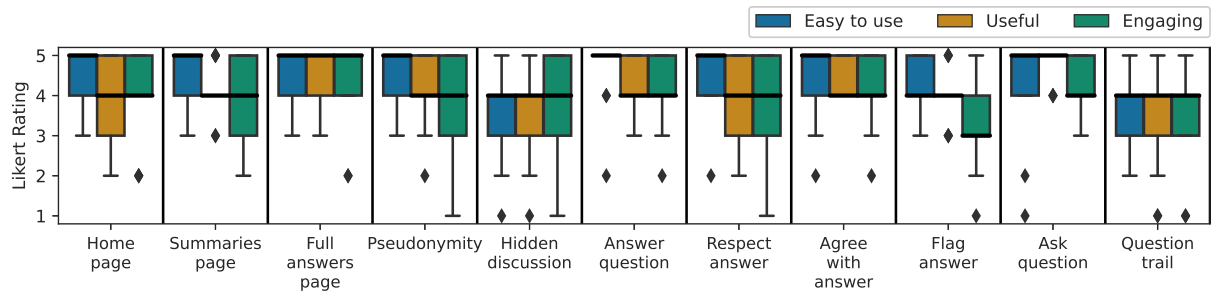


Figure 5.5: Box plots for the average user ratings of Potluck v2.0’s features in Field Study II. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.

tures familiar, for example, P5 said that “*the overall structure on commenting is the same as any other platform*”.

Usability

Participants P1-P13 rated the ease of use, usefulness and engagement of Potluck’s main features. Additionally, they rated the overall usability of the system through the SUS.

In the feature evaluations, participants rated the ease of use and usefulness of all features with an average Likert rating of four or five (see Figure 5.2). The full answers screen and the answering of questions were particularly well-received as easy to use, useful and engaging (see Figure 5.2). The least engaging feature on average was the flagging of answers with a median of 3. As mentioned in the previous section, flagging was the least used voting mechanism.

Overall, the results suggest that Potluck v2.0 was usable for participants. Figure 5.6 displays the individual usability scores for the SUS. The scores range from 52.5 to 97.5, with an average of 79.62 (SD=11.67). This equates to an A- grade for usability on the Sauro-Lewis curved grading scale (CGS) [178, Tab. 8.5]. P3, the participant with the lowest SUS score of 52.5, agreed that the system was unnecessarily complex and found the hidden discussions somewhat difficult to use. However, P3 also agreed that Potluck was easy to use and that most people would learn to use it very quickly.

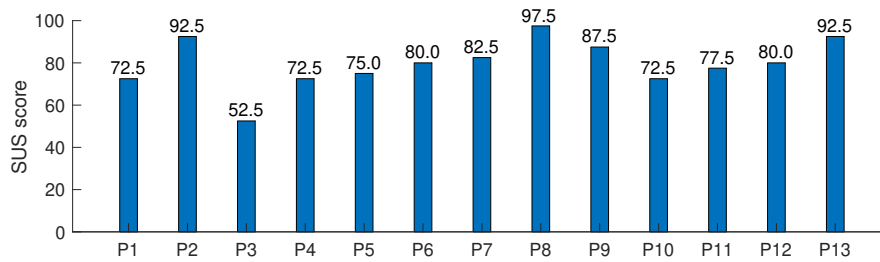


Figure 5.6: SUS scores for Potluck v2.0 in Field Study II.

Guest Impressions

Participants P1-P13 gave their impressions of Potluck by rating statements and writing long-form responses in the post-study questionnaire.

While 11 out of 13 participants (84.62 percent) agreed that Potluck presented diverse viewpoints, only seven participants (53.85 percent) agreed that Potluck presented viewpoints they had not considered before (see Figure 5.7). The questions on Potluck were focused on technology and the event itself. On this discrepancy, P8 said: *“I only wish there were more people at the event so we would’ve had more diverse viewpoints.”*

84.62 percent of participants also found Potluck suitable for engaging in discussion (see Figure 5.7). P6 reasoned that the system promoted inclusivity: *“it was suitable for those students who struggle to talk to people as it allowed them to engage.”* This view was supported by P2, a typically passive participant in online discussion:

“It was a very positive experience using Potluck as it requires users like myself to make posts before seeing what other people had written, which resulted in me using Potluck in a very different way as to how I would use other social media. This system encourages user participation and engagement in a way that is unique to Potluck.”

Overall, all participants reported a positive experience on Potluck. A majority of the participants (84.62 percent) agreed that Potluck was suitable for the event setting, mainly for entertainment purposes (see Figure 5.7). P13 wrote that *“the ideas [on the system] were fun and it was good distraction”* while P4 said: *“I*

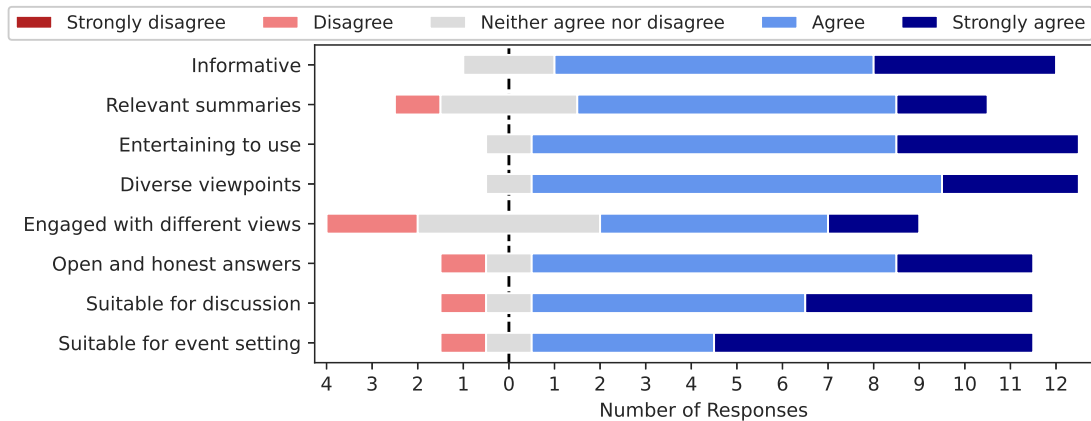


Figure 5.7: Overall Guest user impressions of Potluck v2.0 in Field Study II.

enjoyed seeing funny answers to questions, and replying to topics that I found interesting.” 84.62 percent of participants also found Potluck informative (see Figure 5.7) and a useful complement to the event. For example, P6 wrote:

“I liked Potluck, it was fun and it allowed everyone to have a laugh and get some serious answers too. Normally people are too scared to write on forums because they are scared of being wrong or someone might judge them but with the anonymous side it’s fine.”

While suitable for an event setting, P4 noted that the pseudonymity might not be helpful for community-building:

“I think it works really well for specific events to facilitate discussion, but less well as a general online platform where the anonymity hurts the community feeling that people look for. At specific events or conferences I can see this being a very useful tool.”

Host Impressions

RR provided their impressions of Potluck from the perspective of a Host user in a structured interview via email. The following themes were identified regarding Potluck v2.0 in an event setting.

Designing prompts for engagement: RR created discussion areas on Potluck to give delegates an alternative way to engage at the event. Over the study period, he devised 10 discussion prompts on the experimental system, using different question types, topics, and tone; see Appendix E.4. From this experience, he found that while Potluck is generally “*useful for all types of discussions*”, a good discussion prompt is one that is straightforward, open-ended and “*easily lends itself to asking follow-up questions.*” He found that the opposite did not lead to discussion as often, and described an unsuitable prompt:

“For example, if you’re asking, “What operating system do you use?”. If the options are GNU/Linux, Windows or FreeBSD, you can see how that doesn’t really invite discussion...”

Encouraging peer support: RR was motivated to use Potluck to fairly dedicate time to helping delegates, as well as provide a platform to crowdsource help. When asked whether the features available were able to support this, e.g., follow-up questions and answering Guest-submitted questions, RR said they were “*very useful and easy to use.*”

Facilitating focused discussions: Regarding the kinds of online discussions that Potluck can facilitate, RR described **focused, constructive discussions** “*instead of what usually happens on the internet, where a discussion will usually devolve into name-calling and other insults.*” He also suggested an industry use for Potluck that takes advantage of the structured discussion flow:

“In my opinion, Potluck is incredibly useful for open-ended question and answer discussions. I can see it being useful for applications such as market research, where if you demonstrate a product, you can use Potluck to ask several questions, and you can ask follow-up questions if more information is needed.”

Conversely, RR said that “*I don’t think it would be best used for discussions with a limited selection of options*”. He pointed to the need for critical mass: “*I think that Potluck really needs to get bigger and be used more widely before we find out what its limits are.*”

5.3.6 Discussion

The objectives of this field study were to explore how users engage with and make sense of Potluck, and to evaluate the usability of the system in an event setting.

Although users were restricted to engaging through questions and answers, the Host user was able to generate discussion and provide help through the sole use of questions. Moreover, Guest users were able to successfully use this discussion flow to fulfil different informational needs: clarification, information-seeking, peer support, and rhetoric. This aligns with the cognitive, social-integrative, and entertainment motives to participate in online discussion [45, 190]; see Section 3.2.3. These results suggest that users can exercise coordinative agency on Potluck and fulfil the gratifications sought in online message boards.

However, while all users engaged in answering questions, less than half of the users asked lower-level questions and submitted votes. In response to the lack of coordinative agency in Potluck v1.0 (see Section 5.2.6), Potluck v2.0 enables users to access all lower-level discussion areas after answering the top-level question. This may have inadvertently introduced the free rider problem. Kollock [108] described potential motivators for the production of digital public goods, such as prestige, and a sense of efficacy. In future work, these motivators could be operationalised on Potluck through reputational cues (e.g., badges) and immediate feedback (e.g., flash messages) to show the effect of one's contributions.

Potluck was able to encourage participation from both lurkers and commenters. While it seems counterintuitive to require active participation in order to lower barriers to participation, the combination of mandatory participation, hidden discussion and pseudonymity helped to overcome inhibitors to participation. This result indicates the potential of Potluck to promote inclusive participation, a requirement for a balanced exchange of ideas as discussed in Section 3.2.3. However, this study did not include non-users of online discussions, who have different inhibitors to participation from lurkers [190]. This could be investigated in a future trial of Potluck, that includes commenters, lurkers, and non-users.

Guest users found the system and its features to be highly usable overall. However, the participants were technologically proficient, given their participation in a hackathon. As a result, they may have found it easier to learn and use the

system. To address this limitation, the usability of Potluck is measured by different user groups in different settings in this thesis to triangulate this result.

This study suggests that Potluck v2.0 can facilitate focused online discussions in a time-boxed setting. As observed by the Host user, Potluck could be used to aggregate and probe opinions, similar to variations of Delphi described in Section 3.3.1. Participants were able to adapt to the discussion flow and use the system to engage in short, informal online discussions for entertainment and peer support. Potluck was also intended to be used to support delegates in team organisation. To facilitate this, the duration of the study was initially set to two-weeks before the event. However, most delegates were unaware that they could use Potluck prior to the event so this application of the system could not be investigated. Future work will continue to explore applications for the system, and its ability to structure and support online discussions.

5.4 Field Study III: Educational Setting

From January 2023, a field deployment of Potluck v2.1 was conducted across a 10-week academic term with a third-year undergraduate Politics module at a UK university. This field study is the longest deployment of Potluck to date, providing longitudinal data on usage patterns. The opportunity was provided by KS, the course convenor. KS was interested in trialling the system with her students as a *scaffold*, which is an instructional tool or procedure to support students in completing complex tasks [167]. In this case, Potluck was to be used to critically summarise assigned readings, and develop ideas for seminar discussions. ACMC such as online discussion forums are commonly used in CSCL, for example, to support argumentation, course engagement, and knowledge construction; refer to Section 3.1.2. This provides an important setting for the trial of Potluck. The objectives of this study in an educational setting were to (1) explore how users engage with and make sense of Potluck v2.1 and (2) evaluate the usability of the system in an educational setting.

5.4.1 Pilot

Since a 10-week study in this context may present different issues from the ones encountered in Section 5.2 and 5.3, a pilot study was conducted in another educational setting before the main study. In September 2022, a six-week pilot study of Potluck v2.0 was run during a first-year undergraduate Psychology in Education course in a UK university. Before the study, the researcher introduced the study to the students enrolled on the course. It was explained that participation was voluntary and did not impact course assessment. The students were then invited to take part in the study as a Guest user. Students who agreed to participate were given a link to a combined information sheet, consent form, and pre-study questionnaire, which was available on the course’s virtual learning environment (VLE). Participants were then directed a video tutorial on how to use Potluck. Over the course of the study, the course convenor assumed the role of the Host user and created a new discussion prompt on Potluck every week, related to the course content. Guest users could freely participate in as little or as many discussions as they wanted to. At the end of the study, a post-study survey was distributed to Guest users through the VLE.

The pilot study raised several issues that were addressed before the main study. To encourage participation from students, the procedure was changed so that Potluck was integrated into a weekly course activity. Moreover, the Host user was to notify students when the next discussions were available on Potluck. Event logging was implemented in the experimental system to capture user flows without the need for in-person observation. User authentication by student ID was also implemented to limit system access to enrolled students and the course convenor; see Appendix F.6 for the login page. Since the study involves long-term data collection, an interim questionnaire was added to gather early feedback for analysis and to address potential issues or concerns.

5.4.2 Participants

19 participants signed up to take part in the study, with 18 participants assigned the Guest role (Guest users) and KS assigned the Host role (Host user). Guest users were recruited through a rolling invitation to students enrolled on the course

ID	Age	Gender	Typical participation in online discussion	Interim impressions and SUS	Interim features	Post-study
P1	21	Woman	Passive	✓	✓	–
P2	22	Man	Passive	✓	✓	–
P3	22	Man	Passive	✓	✓	–
P4	22	Woman	Passive	✓	✓	–
P5	20	Non-binary	Passive	✓	✓	✓
P6	21	Woman	Passive	✓	✓	–
P7	21	Woman	Passive	✓	✓	✓
P8	20	Prefer not to say	Passive	✓	–	–
P9	21	Woman	Active	✓	–	–
P10	22	Woman	Active	✓	✓	✓
P11	21	Woman	Active	✓	✓	✓

Table 5.6: Participant demographics and questionnaire completion in Field Study III.

convened by KS. This was sent in a weekly notification via the course VLE, before and during the study. Of the 18 Guest users, seven did not complete the interim or post-study questionnaire so their responses are not included in Section 5.4.5. The remaining 11 participants, labelled P1 to P11, consisted of seven women, two men, one non-binary person, and one undisclosed participant, all between the ages of 20 and 22 ($M=21.18$, $SD=0.75$). 72.72 percent of participants identified as passive participants of online discussion, while the remaining participants identified as active participants. Demographic information and questionnaire completion per participant is given in Table 5.6.

5.4.3 Data Collection

The experimental system used in this study was an instance of Potluck v2.1, deployed on a departmental server. Potluck v2.1 retains the features from v2.0 with additional event logging; see Table 4.1 for the version history. The system endpoint was made accessible outside of the college network so that participants could access it conveniently outside of seminars. For demonstration purposes, the system was initialised with two discussion prompts along with one seed answer and question for each. The system logged user submissions (e.g., posts, questions, and votes) and events (e.g., page views, clicks, and focus) along with timestamps and

associated user IDs.

Guest users were asked to complete three questionnaires over the course of the study. The first was an online pre-study questionnaire (see Appendix F.2) with questions about participant demographics and usage of online message boards. The second was an online interim questionnaire (see Appendix F.3) distributed in week five of the study. As per Section 5.3.3, it included the SUS along with questions about the impressions of specific features and Potluck overall. The Likert-style scaling statements for the impressions of Potluck were counterbalanced to mitigate potential item non-differentiation, i.e., straight-lining [144]. Statements specific to the educational setting were also added, such as “Potluck helped me summarise readings for the seminar”. The third questionnaire was an online post-study questionnaire (see Appendix F.4) distributed on the penultimate week of the study. It featured open-ended questions to investigate the results from the interim questionnaire and observations from the log data. It also integrated the questions from the interim questionnaire for participants who had not completed it in week five.

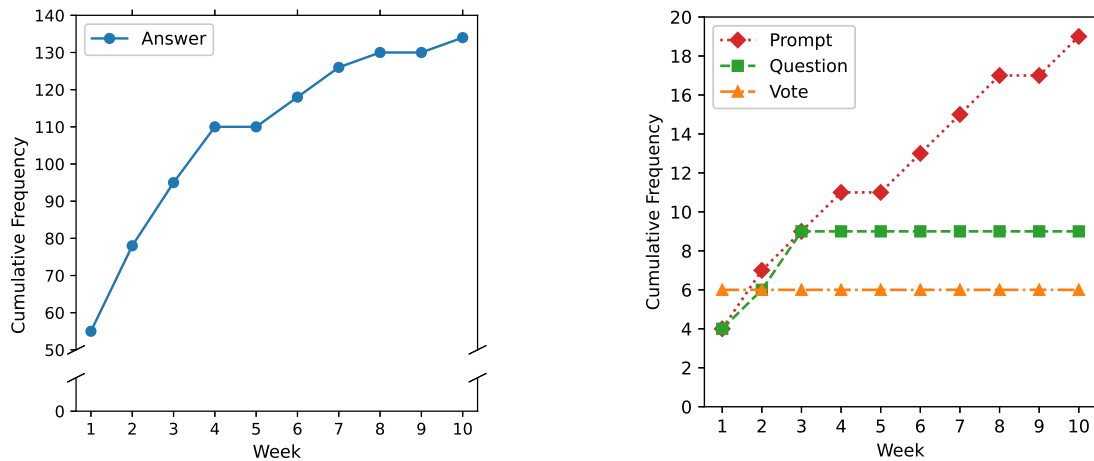
As per Section 5.2.3 and 5.3.3, a structured email interview was conducted with the Host user, KS; see Appendix G for the responses.

5.4.4 Procedure

Before the study, the researcher demonstrated the experimental system together with participants during the first class of term. Each Guest user completed the pre-study questionnaire and was given a login to the system using their student ID. Throughout the 10-week study, participants were free to engage on the system at any time. Every Tuesday of the study, except for weeks five and nine when there was no assigned reading, KS added new discussion prompts (along with one seed answer for each) to the system related to the assigned reading for that week; see Appendix F.5 for a full list. She then instructed the other participants via VLE to submit their answers to the discussion prompts before the following class on Friday. KS accessed Potluck in-class to review the summaries and full answers along with students. During week five, participants were asked to complete the interim questionnaire in-class. In week eight, participants were issued the post-

Discussion prompts	Answers	Questions	Votes
19 (1)	134 (12)	9 (2)	6 (2)

Table 5.7: Raw counts of contributions in Field Study III. The number of unique participants is given in brackets.



(a) Answers to discussion prompts and questions.

(b) Discussion prompts, votes, and questions.

Figure 5.8: Cumulative frequency of discussion prompts, answers, votes, and questions by study week in Field Study III.

study questionnaire to complete. After the study, a structured email interview was conducted with KS to understand her experience as the Host user.

5.4.5 Results

Engagement

Log data was analysed as per Section 2.3.1 to objectively understand how users engaged with Potluck v2.1. Long-form answers in the post-study questionnaire were used to make sense of the observations from the log analysis. The engagement will be described in three parts: submissions, activity, and usage patterns.

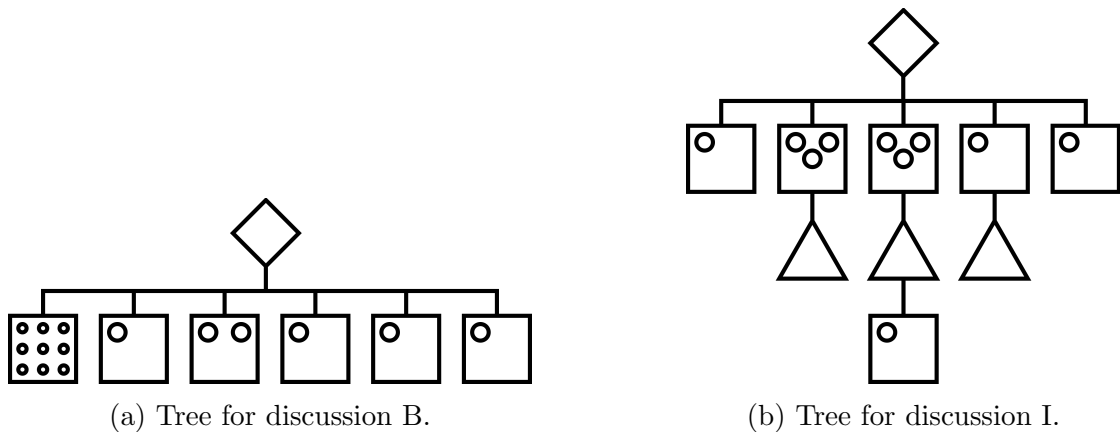


Figure 5.9: Examples of discussion trees for Field Study III where \diamond is a discussion prompt, \square is a summary, \circ is a full answer under a summary, and \triangle is a question asked on an answer.

Submissions: Table 5.7 gives the total counts of user submissions on the experimental system, while Figure 5.8 displays the distribution of these submissions over the 10-week study period.

In total, 19 discussion prompts with context were created by KS; see Appendix F.5. Two to four discussion prompts were added per week, excluding weeks five and nine (see Figure 5.8). KS provided 19 out of 134 answers (14.18 percent), one seed answer for each prompt. Guest users submitted the remaining 115 answers (85.82 percent), ranging from three to 20 per person ($M=9.58$, $SD=4.68$). The majority of answers (98.51 percent) were contributed to the top-level discussion prompts instead of lower-level questions. As a result, the discussion trees for the discussion prompts had a wide breadth at the first level, as shown in Figure 5.9. Guests submitted answers with up to 3751 characters ($M=554.50$, $SD=606.63$, $IQR=310.5$). Moreover, basic content analysis of the answers found that 39.13 percent included citations to support answers. The following discussion branch exemplifies this:

Branch from discussion I

whipped-salad-729: “Socially, it matters that underrepresented groups turn out to vote, especially for example in the case of women. The social normative structures of society have meant “women experience disadvantages” from “having lower employment opportunities” (Liu, 2022, p.211). [...] Advising women “that their underrepresentation” is led by “discrimination” and not from inner inadequacy “can boost ambition” (Piscopo, 2019, p.819). However more is needed to be done on an intersectional level for ethnic minority women to validate their political participation.”

↔ **whole-casserole-940 (KS):** “You make a good point about the perceptions in relation to non-voting. What can be done about this?”

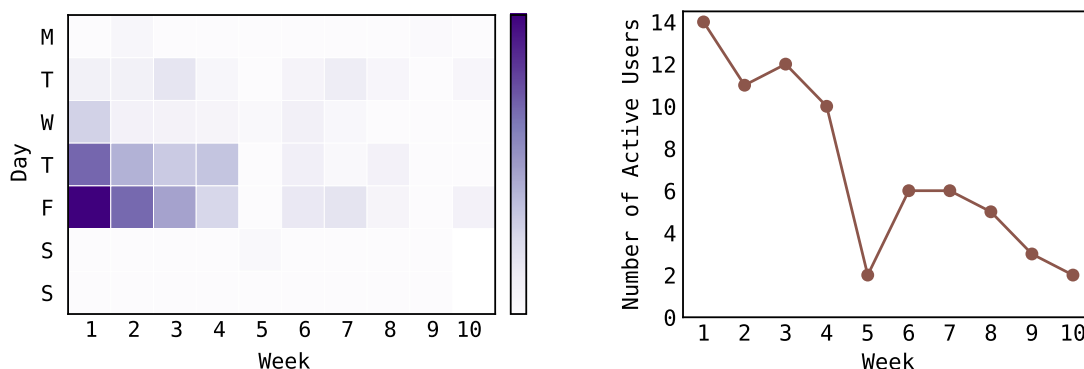
↔ **whipped-salad-729:** “Perhaps generating more intersectional campaigning and manifestos to further any non-voting, which will allow for more citizen’s needs to be met and challenge some of the pre-existing beliefs which lead to non-voting.”

Two to four questions were asked on answers each week until week three (see 5.8b). However, only 22.22 percent of these lower-level questions were answered. The user event logs reveal that Guest users viewed lower-level questions through the question trail and summaries page but did not provide answers to them. This led to shallow discussion trees for discussion prompt, shown in Figure 5.9b in which three questions were asked at the second level, but only one received an answer. Post-study questionnaire respondents did not explain why they did not engage with this feature but acknowledged its potential. For example, P10 said: *“It’s a great way to communicate ideas and share thoughts with others with confidence, without feeling awkward or anxious.”*

All votes on the system were contributed by two Guest users in week one (see 5.8b). Four votes were in agreement with an answer, while two votes respected an answer, one of which was not in agreement. Although they did not all engage in voting, all respondents to the post-study questionnaire appreciated the option, such as P7 who said that it was *“nice for appreciating [others’] work”*.

Activity: In addition to user submissions, a total of 4335 user event logs⁶ were recorded. They captured button clicks, page views, and focus events, i.e., tapping

⁶49 out of 4335 of user event logs (1.13 percent) did not correctly track the request path, showing in the logs as `\x` instead. They were excluded from analysis.



(a) Heat map of user event logs per day. Darker shades represent days with more user events.

(b) Active users per week.

Figure 5.10: Activity traces by study week in Field Study III.

on a text field. Figure 5.10a depicts the engagement on the experimental system based on the total number of user events recorded per day. As shown, the first four weeks had the highest engagement from participants. Figure 5.10b shows that the number of active participants ranged from 10 to 14. During this initial four-week period, all of the votes and lower-level questions were contributed, along with 82.09 percent of the total answers (see Figure 5.8a).

In week five of the study, there was a decline in engagement due to a one-week break where no teaching took place and no new discussion prompts were added (see Figure 5.10a). However, two participants continued to access the system in week five to review the summaries and full answers to discussion prompts from previous weeks (see Figure 5.10b). From week six onwards, the number of active users ranged between two to six participants per week. In the Host questionnaire, KS explained that seminar attendance had also decreased from the second half of term (see Section 5.4.5). Another break occurred in week nine of the study during which no new discussion prompts were added (see Figure 5.8b).

Usage patterns: KS, as the Host user, consistently accessed the system on Tuesdays and Fridays. On Tuesday, KS created new discussion prompts and pinned them to the top of the home page. On Friday, up to 30 minutes before the seminar,

KS would browse the summaries and full answers. Up to week three, KS also asked questions on the answers submitted by Guest users. Then during the two-hour seminar, KS accessed the summaries and full answers on Potluck during the first half and/or last half of the seminar.

The majority of Guest users accessed the system between Tuesday and Friday. Log analysis of the user event logs revealed two main patterns of engagement for Guest users. The most common pattern was to answer discussion prompts before the seminar and only view the summaries before answering the next discussion prompt. Another notable pattern was to answer a discussion prompt, view the summaries, and then proceed to view the full answers before moving onto the next discussion prompt. In both patterns, the participant would view the full answers during the seminar, which explains the higher activity on Fridays shown in Figure 5.10a. Several participants also reviewed summaries and full answers to the discussion prompts from previous weeks.

Limitations: There were two incidents that affected user engagement. In week two, the experimental system was down from 20:45 on Thursday 26 January until 11:30 on Friday 27 January. This was caused by the LOG table in the database exceeding the available space. KS informed the researcher on Friday morning and more space was allocated to the database by the departmental IT team.

In week eight, participants reported to KS that they did not use the system because of an expired certificate warning (see Appendix F.7). Note that the warning did not prevent access to the system but did deter some users with security concerns. This was resolved by a member of the departmental IT team by updating the certificate on the day of the report. However, in email correspondence, KS said that she first noticed the warning two weeks prior so it may have affected participants in previous weeks.

Usability

Participants P1-11 rated the overall usability of the system using the SUS. As shown in Table 5.6, nine out of 11 participants completed the interim questionnaire, giving their impressions of Potluck's main features in terms of ease-of-use, usefulness and engagement.

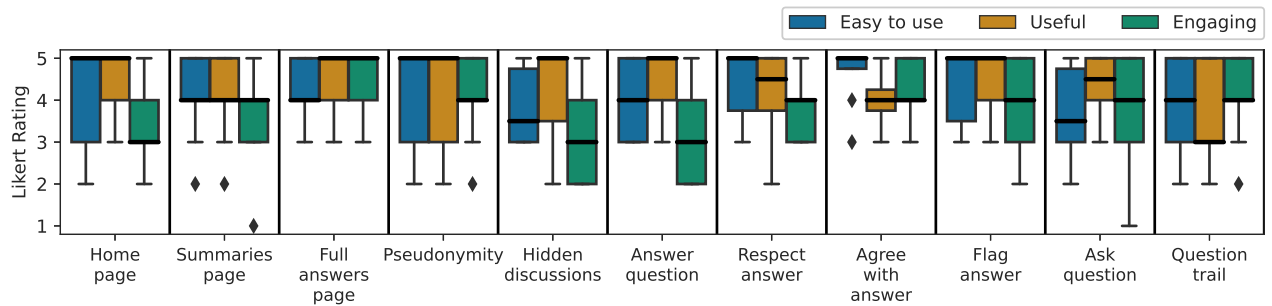


Figure 5.11: Box plots for the average user ratings of Potluck v2.1's features in Field Study III. The averages are shown on a 5-point Likert scale where 1 is not at all {easy to use, useful, engaging} and 5 is very {easy to use, useful, engaging}.

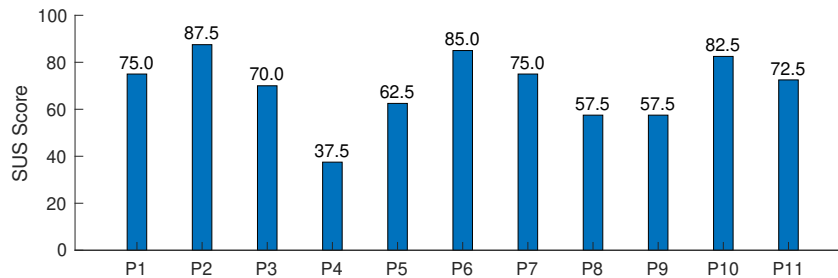


Figure 5.12: SUS scores for Potluck v2.1 in Field Study III.

The feature evaluations suggest that Potluck's features were easy to use and useful overall (see Figure 5.11). Most features were viewed as engaging, though the ratings were mixed when it came to the home page, hidden discussions, and asking questions. Notably easy to use and useful features include the summaries, full answers, and pseudonymity. Although the hidden discussions were rated as one the more difficult features to use, it was also perceived as one of the most useful. Asking questions was also perceived as the least easy to use on average. Questions were also one of the lowest contributions on the system (see Table 5.7). The question trail was the least useful feature on average. The events log revealed that participants tended to read questions through the summaries page rather than through the question trail.

Overall, the perceived usability of Potluck was mixed. The SUS scores ranged from 37.5 to 87.5, with an average of 69.32 (SD=14.71). This equates to a C grade for usability on the Sauro-Lewis CGS [178, Tab. 8.5]. The SUS responses revealed

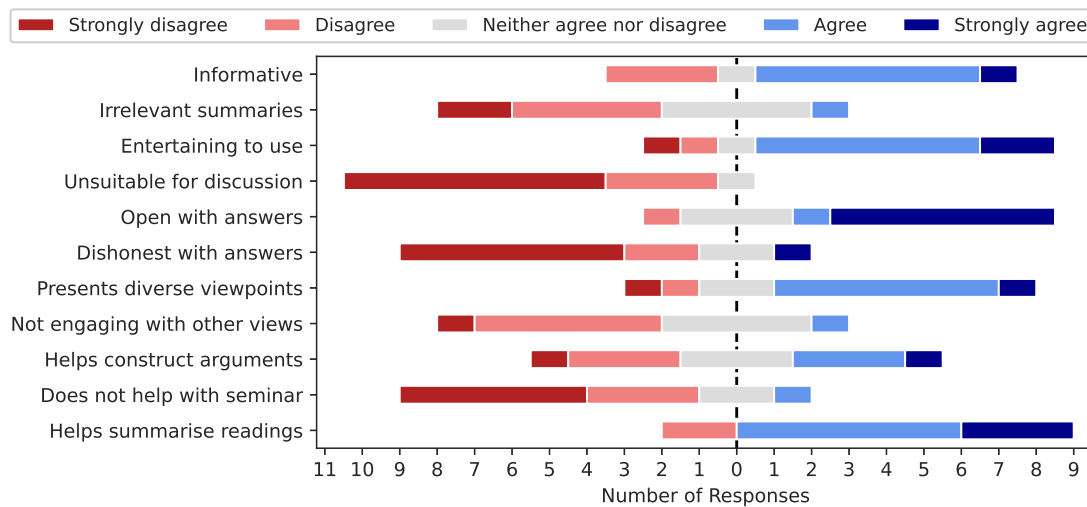


Figure 5.13: Overall impressions of Potluck v2.1 and its application in an educational context in Field Study III.

that six out of 11 participants (54.55 percent) neither agreed nor disagreed that they would like to use Potluck frequently. Similarly, only 54.55 percent agreed that they felt very confident using Potluck and disagreed that there was too much inconsistency in Potluck. Nevertheless, over 80 percent of participants agreed that it was easy to use and learn without the need of technical support. Eight out of 11 participants (72.73 percent) also found that the various functions in Potluck were well integrated.

Guest Impressions

Participants P1-P11 gave their impressions of Potluck by rating statements; see Figure 5.13 for the results. They also had the option to write long-form responses to open-ended questions in both the interim and post-study questionnaire; refer to Table 5.6 for respondents.

Participants reported an overall positive experience with Potluck v2.1 in an educational setting. As shown in Figure 5.13, a majority of participants (63.64 percent) agreed that Potluck was informative. It enabled seven out of 11 participants (63.64 percent) to learn diverse viewpoints from their peers. For example, P7 said: “[Potluck] was great for collecting the ideas of lots of different people in the

class.” P5 had a similar sentiment and found it “*intriguing to see if answers were similar across different people*”. Responses indicate that Potluck encouraged independent thought, although it may have also had an adverse effect on confidence. Regarding hidden discussion and mandatory participation, P5 expressed:

“This meant that I was thinking of my own answer rather than accidentally copying others. It made me think for myself but equally I was worried that my answer may not be as good as [other] answers.”

Only 54.54 percent of participants found themselves engaging with different viewpoints to their own. This could be attributed to answer similarity, as noted by P7: “*Sometimes it meant I wrote something very similar to someone else.*”

Eight out of 11 participants (72.73 percent) believed that Potluck helped them with the seminar discussions as shown in Figure 5.13, particularly in terms of in-class engagement. P10 stated: “*I was more inclined to enter discussion knowing other people’s point of view.*” It also helped nine out of 11 participants (81.82 percent) summarise the seminar readings. P5 explained: “*It helped to make sense of the readings because I was able to tailor what I read to answer the questions.*” Ten out of 11 participants (90.91 percent) found Potluck suitable for discussion. P10 explained:

“It’s a great way to communicate ideas and share thoughts with others with confidence without feeling awkward or anxious.”

Indeed, a majority of participants strongly agreed that they could be open and honest with their answers on Potluck (see Figure 5.13).

While it was found to be suitable for discussion, the participants were divided on whether Potluck helped them to construct arguments (see Figure 5.13). P7 expressed that it aided in idea formation and preparation: “*[Potluck] made me more confident in my ideas/arguments and what sort of challenges there might be.*” Conversely, P2 said: “*Potluck’s features are very useful in terms of discussion, but not [so] much in arguments.*”

Participants raised concerns that affected their overall experience on Potluck. There were differences in expectations when it came to answering discussion prompts, such as the expected level of detail. To address this, P6 suggested: “*A word count*

on answers could be given by seminar leads to show how much they expect from a specific question so that you don't get some people answering in full and others in short." The need for clearly defining questions and answers was also mentioned. For example, P5 said that Potluck *"feels most useful when the questions are worded clearly enough otherwise it makes the learning trickier than it already is"*. P7 suggested that it *"might be nice to have an example answer"*. Some participants were affected by the technical issues discussed in Section 5.3.5, for example, P1 said *"I enjoy it [...] just sometimes doesn't let me login or [has] security issues."*

Participants also provided directions for future improvements of Potluck. Some related to navigational issues, e.g., P6 said that it *"can sometimes be confusing to know where to look to find answers"* and P7 suggested to *"make it easier to find your answer once you've submitted it"*. While only one participant found the summaries on Potluck to be irrelevant, P6 suggested giving users autonomy in organising the summaries:

"...maybe all answers should be presented and there should be a further option to put answers into categories of similarity so that everyone's answers are relevant rather than just the main ones you see at face value after answering."

Most participants (72.73 percent) found Potluck entertaining to use but suggested UI improvements to make it more appealing, e.g., P7: *"Useful and functional, could be more fun and colourful."*

Host Impressions

KS gave their impressions of Potluck as a Host user through a structured email interview. The following themes emerged for Potluck v2.1 in an educational setting.

Setting boundaries in open-ended discussion prompts: To generate discussion, KS exclusively created discussion prompts using questions to ill-structured problems. These types of questions are "complex, ill defined, open ended, and real world" [213, p. 5]:

“I never tried closed prompts, because they wouldn’t be conducive to a seminar discussion. If I wanted to use closed prompts, then I probably wouldn’t use Potluck. It’s a discussion system, not a survey platform.”

However, this approach sometimes resulted in differing expectations between KS and the Guest users when it came to answering the prompts. This tension was also observed among Guest users in Section 5.4.5. To address this, KS emphasised the importance of clarity and described a good discussion prompt as:

“[One] that sets clear boundaries as to what sort of answers are expected. In my case, I wanted students to avoid common sense and for them to answer questions based on their knowledge of the readings. This was trickier than I expected. I usually had an idea of what I roughly wanted the answer to be, but then found students coming up with all sorts of (more or less) relevant things.”

Augmenting offline discussion: According to KS, Potluck enhanced in-class discussions in two ways. First, it helped students “*learn to develop and present arguments*”, thereby fostering discussion. Second, it assisted KS in identifying topics to “*expand upon and/or tie together*” during seminars:

“...on many occasions the students brought up interesting and relevant topics that allowed further discussion in class. On these occasions Potluck really did a fantastic job at augmenting the seminar discussion.”

However, Potluck was less effective in the latter half of the study when participation decreased:

“[Potluck] works well and has great potential. In my case, lack of participation from the students did hamper this potential somewhat. We were a small group [...] where less than half (but often far less than that) used the platform. If only 2-4 students participate, then it is difficult to use the platform as a discussion tool—just like it is difficult to have a good in-class seminar discussion with 2-4 students.”

Probing opinions and knowledge-based discussions: When asked about the type of discussions Potluck is suitable for facilitating, KS described:

“Discussions that are opinion-based or knowledge-based. Potluck is good for questions that ask people to justify and/or explain their opinion.”

This was primarily achieved through setting discussion prompts. As discussed in Section 5.3.5, KS also asked follow-up questions up to week three. In the interview, KS explained:

“I did this in the beginning when engagement with Potluck was still good. The functions were very easy to use and students also sometimes replied to follow up questions. Sadly turnout was very low in the second half of term, and as a result engagement with Potluck also dropped drastically.”

Functionality versus aesthetics: KS used all the functionality exclusive to the Host user apart from the moderation features *“as there was no need for it. All contributions were polite and helpful to some extent”*. KS commented on the functionality she used, as well as impressions she received from Guest users:

“In terms of functionality, I think Potluck did what it was supposed to do very well. It’s a relatively simple and intuitive system. That said, I think students thought the interface didn’t look very appealing.”

5.4.6 Discussion

In an educational setting, the main objectives of this field study were to explore how users engage with and make sense of Potluck v2.1, and to evaluate the usability of the system.

The Host user effectively used Potluck as a scaffold for Guest users to summarise seminar readings through ill-structured questions, and develop ideas for seminar discussions. The engagement of Guest users declined in the latter six weeks of the study due to non-attendance to seminars and technical limitations

that hindered participation. Nonetheless, most Guest users consistently engaged with the system in the first four weeks of the study. These results suggest that Potluck is useful in an educational context for both students and educators beyond the initial novelty effect.

The observed patterns of engagement for Host and Guest users deviated from the intended user flow depicted in Figure 4.1. Specifically, users were expected to engage more with other answers by asking and answering questions to facilitate further discussion. Asking questions was found to be the most difficult feature to use, which may have impacted its frequency of use. Despite this deviation, the results indicate that Potluck was still able to fulfil, to varying degrees, the four individual motives of participation in online discussion [45, 190]; see Section 3.2.3. For example, Potluck addressed cognitive motives such as information dissemination and seeking for both Host and Guest users. It also facilitated personal identity motives by enabling Guest users to express, compare, and validate answers with peers. Despite limited interactivity, Potluck satisfied social-integrative motives for the Host user by providing topics to follow up and for Guest users, it helped to further discussions *during* the seminars. Moreover, the majority also found Potluck to be entertaining to use, a stable motive for participating in online discussion [190]. These findings highlight the versatility of Potluck in engaging and motivating user participation, supporting its adoption in educational contexts.

While Potluck was found to be functional and easy to use overall, concerns were raised regarding its visual appeal. Visual aesthetics can influence constructs such as user satisfaction and pleasure [142], which are influential to system adoption. The scope of this research focused primarily on the functionality of a novel online message board to structure and facilitate online discussions. Future work could investigate visual aesthetics and its impact on user experience through a user-centred design approach involving diverse demographics. Standardised questionnaires such as VisAwi [142] and AttrakDiff [83] can be employed to evaluate the visual appeal of the resulting system.

One notable challenge identified in the study was navigation. In Potluck v2.1, users are able to navigate between questions in several ways: the question trail, summaries page, or full answers page. This led to confusion in locating specific answers. Similarly, in the evaluation of ForumReader [42], the combination of two

navigation features were perceived by participants as detrimental to performance. The authors posited that there may have been a tradeoff between navigational features and learnability. Future work will attempt to resolve this problem by reducing and simplifying navigation options.

Another concern was the consistency of the system, which was affected by two issues in this study. First, technical problems arose during the main study which were not observed in the pilot study. Conducting a pilot study that more closely reflects the length and timing of the main study, or conducting multiple pilot studies can help mitigate such technical issues in future work [186]. Second, inconsistencies were observed in users' expectations of answers to discussion prompts. For example, the hidden discussions led to some Guest users answering in more detail than others. The phrasing of the discussion prompts was also sometimes misinterpreted. Participants suggested ways to address this in future work, such as sample answers and expected word counts as guidance.

Overall, this study suggests that Potluck v2.1 can be realistically used in an educational setting by instructors and students alike. For instructors, it may be used as a learning scaffold to augment classroom discussions. For students, it may potentially help them to openly contribute ideas; understand the viewpoints of their peers; and better engage during seminars. It is important to note that these claims are based on the experience of a single cohort. Future work should expand the deployment to more educational settings for further validation.

5.5 Summary

In this chapter, Potluck underwent field deployments with a total of 46 users across distinct real-world settings: professional, event, and educational. The studies addressed RO5 by describing and exploring how field users engaged with and made use of Potluck. The studies also evaluated the system usability across these different user groups. Each field deployment collected, analysed, and triangulated objective data (e.g., observational log data, contextual inquiries) and subjective data (e.g., questionnaires, interviews). This provided empirical evidence to demonstrate the main contribution of this thesis, a novel structured approach to online message boards. Despite the varying use cases, Potluck was found to be adaptable

and effective in supporting and scaffolding online discussions for its users.

The next chapter highlights the key findings presented in this chapter, and presents design implications for structuring and facilitating online discussion. It concludes with an outline of the contributions and a discussion of limitations and future work.

Chapter 6

Discussion and Conclusion

THIS CHAPTER:

- ◇ Presents the key findings from Chapter 5 and the design implications for online message boards.
 - ◇ Outlines the thesis contributions.
 - ◇ Discusses limitations and future work.
-

6.1 Key Findings

The previous chapter presented the results and discussion for each field deployment; see Table 6.1 for an overview. This section highlights the key findings that have the most impact on discourse architecture and the broader scope of social computing, CSCW and HCI. Specifically, Potluck’s flexible support for different online discussions and the effective overview of discussion it provides.

6.1.1 Flexible Support for Different Online Discussions

The results revealed that field users accepted, used, and appropriated the system in three different settings. As shown in Table 6.1 Potluck was also found to fulfil

Result	Field study		
	I Professional	II Event-based	III Educational
Potluck supported multi-way discussion.	✓	✓	–
Potluck was suitable for opinion-based discussion.	✓	✓	✓
Potluck was suitable for knowledge-based discussion.	–	✓	✓
Potluck was used to fulfil cognitive motives.	✓	✓	✓
Potluck was used to fulfil entertainment motives.	–	✓	✓
Potluck was used to fulfil social-integrative motives.	–	✓	✓
Potluck was used to fulfil personal identity motives.	–	–	✓
Guest users appreciated different views on Potluck.	–	–	✓
Guest users felt confident in sharing ideas and arguments on Potluck.	–	✓	✓
Use of Potluck influenced offline behaviour.	–	–	✓
Lurkers participated on Potluck.	–	✓	✓
Commenters participated on Potluck.	–	✓	✓
Potluck provided relevant summaries.	✓	✓	✓
Voting was under-provisioned.	✓	✓	✓
Questions from Guest users were under-provisioned.	✓	✓	✓
Potluck was perceived as usable overall.	✓	✓	✓
Potluck was not perceived as visually appealing.	–	–	✓
Asking questions was perceived as difficult to use.	–	–	✓
Navigation was perceived as unintuitive.	✓	–	✓
Inconsistencies in users' expectations of Potluck usage.	✓	–	✓
Wide and shallow discussion trees on Potluck.	✓	–	✓
Usage of Potluck deviated from intended user flow.	✓	✓	✓

Table 6.1: Overview of results from each field study.

the four motives of participation in online discussion [190] to varying degrees, encouraging contributions from both typically active and passive participants. These findings demonstrate that Potluck can facilitate actual online discussion for various users and purposes. This has implications for discourse architecture as it supports and encourages further exploration of the structured design space for online message boards introduced in Chapter 3.

Three different usage patterns emerged from the data:

1. Some users answered discussion prompts and only viewed up to the summaries page, which provided an overview of differing viewpoints. This was the dominant pattern in Field Study I, where the alumni of the IMTP appreciated the ability to navigate and gain a quick understanding of viewpoints on Potluck.
2. Many users answered discussion prompts, and proceeded to browse summaries and full answers. This pattern was mostly observed in Field Study III in which the full answers were reviewed in seminar discussions. Potluck's summaries page enabled the course convenor and their students to identify directions for discussion during seminars, while the full answers page allowed them to compare the nuances between answers.
3. Other users closely followed the intended discussion flow depicted in Figure 4.1, in which they engaged in recursive question answering and asking. This was the main usage pattern in Field Study II where delegates of a hackathon used Potluck as a way to engage in ephemeral interest groups in between the main purpose of the event.

This varied use of Potluck between field settings and divergence from the intended discussion flow could be understood through adaptive structuration theory (AST), an organisational theory that models “the interplay between advanced information technologies, social structures, and human interaction” [44, p. 125]. According to AST, the use of technology depends on how people interact with it, which may evolve beyond the designed intent [33]. This motivates future longitudinal studies to further explore the interactions that can be facilitated by Potluck.

The results from Field Study III also have implications for the study of CSCL. For four weeks, students actively engaged on Potluck inside and outside of seminars without remuneration. The results provided early evidence to show that the students' use of Potluck led to critical thinking, an appreciation of different views, and disinhibition in sharing ideas and arguments. The benefits extended offline where students felt more confident and inclined to participate during the seminar. Potluck was also valuable for the instructor who consistently used the system to guide seminar discussions and source relevant topics for further discussion; see Section 5.4.5. These outcomes preliminarily support the use of Potluck in CSCL environments and motivate further studies with other cohorts.

6.1.2 Effective Overview of Discussion

Across all field studies, users perceived Potluck as informative with relevant summaries; see Table 6.1. Recall that summaries on Potluck are generated through automatic summarisation-aggregation described in Section 4.3.3.

This finding has implications on the design of online message boards and facilitation of online discussion. The main design limitation with existing systems is the unstructured list format detailed in Section 3.2.1. It is subject to information overload which can negatively impact the quality of discussion [87, 210] as well as user participation [5, 49, 99]. To address this, researchers have proposed ways for users to manually synthesise comments [2, 149, 214] but this approach incurs end-user costs and does not immediately benefit discussants (see Section 3.3.2).

In contrast, the automated approach to summarisation and aggregation employed in Potluck efficiently synthesises the viewpoints on demand. The use of a pre-trained summarisation model (see Section 4.5) with no additional fine-tuning yielded a relevant overview. Note that automatic summarisation-aggregation, shown in Figure 4.2, has not been previously implemented in online message boards. Therefore, these results provide preliminary evidence in support of its use to add structure online message boards. Further studies could be conducted to evaluate the effectiveness of the resulting overviews in online discussions with a critical mass of users.

It is important to acknowledge drawbacks to this solution which may affect

the quality of output. While automatic summaries are convenient, they may be suboptimal compared to a human-generated summary. Moreover, the similarity detection may overlook or mistakenly group dissimilar cases. Such inaccuracies could lead to *algorithmic aversion*, a phenomenon where people lose confidence in algorithms after seeing them err [47], which could potentially deter user participation. To increase the accuracy of the overview, future work could explore allowing users to edit summaries and the locations of answers. This approach creates a problem-solving ecosystem that leverages both automation and the cognitive processing power of humans [137].

6.2 Design Implications

The results and discussions in Chapter 5 and key findings in Section 6.1 motivate the following design implications for structuring and facilitating online discussion:

- Set concise, open-ended discussion prompts with context to encourage more engagement in online discussions (Section 5.2.5, 5.3.5 and 5.4.5).
- Balance mandatory actions and coordinative agency when providing pathways through online message boards (Section 5.2.6).
- Hide existing discussions to motivate participation from both active and passive participants of online discussion (Section 5.3.6).
- Motivate the provision of public goods (e.g., comments, replies, votes) through scaffolded workflows (Section 5.3.6 and 5.4.6).
- Model expected participation with situational cues to avoid tensions with expectations, e.g., expected word counts, sample answers (Section 5.4.6).
- Simplify navigational options to produce clear pathways of participation (Section 5.4.6).
- Leverage automation and human cognitive processing to synthesise discussion (Section 6.1.2).

6.3 Contributions

6.3.1 Design Principles for Structuring and Supporting Online Discussion in Online Message Boards

Chapter 4 presents guiding design principles for researchers and practitioners to improve the structure and support of online discussion in online message boards. They were derived from the findings of Chapter 3, which explored the social and technical challenges of online message boards, and the proposed strategies for addressing them. While these design principles focus on online message boards, they could potentially extend to other forms of ACMC designed to support online discussion.

6.3.2 Conceptual Discussion Flow Based on Design Principles

Chapter 4 provides researchers and practitioners with a demonstration of how the derived design principles can be combined in a formalised online discussion flow for online message boards. The proposed discussion flow *facilitates* online discussion by having users actively participate in answering and asking questions to advance through the system. It *structures* online discussion by breaking down participation into a series of steps, where each step increases the amount of information available to the user.

6.3.3 Design and Implementation of Potluck: A Novel Working Artefact to Structure and Support Online Discussion

Chapter 4 presents the main contribution of this thesis. In addition to the conceptual discussion flow, the latest version of Potluck implements peripheral features such as authentication and multi-layered content moderation. This provides the robustness and completeness required for the real-world use of Potluck, enabling communities to use the system out-of-the-box. The design and implementation

details are given to produce reusable, extensible knowledge for system designers and developers of online message boards. Moreover, the lab-based study of Potluck v0.1 in Section 4.6 exemplifies how online message boards can be incrementally evaluated in a workshop-setting.

6.3.4 Results from Field Deployments of Potluck in Distinct Settings for Discretionary Use

Chapter 5 offers evidence of how Potluck could be adapted by real-world groups to meet different needs and use cases. Notably, it demonstrates the impact of Potluck in settings which have relied on online and hybrid communication in recent years. This contribution is also methodological as it details how to systematically run and evaluate systems through field deployments. In recent years, it has been popular to evaluate online discussion systems through lab studies. However, controlled settings cannot be used to understand whether the system would be accepted, nor how it would be appropriated, by actual users [186]. This contribution emphasises the feasibility and value of field deployments in the evaluation of novel discussion tools.

6.3.5 Design Implications for Online Message Boards from Empirical Findings

This practical contribution presented in Section 6.1 gives researchers and industry practitioners recommendations on how to design online message boards to structure and facilitate online discussion.

6.4 Limitations and Future Work

6.4.1 Refine Navigation and Ordering

Chapter 5 found that users favoured alternative navigation methods in Potluck over the feature specifically designed to navigate to different questions, the question trail. While users were still able to navigate Potluck in the field deployments, this

may be not be sufficient when there are many questions on the system. Future work could examine the usability of the question trail and alternative navigational methods and evaluate these methods through think aloud usability studies and eye-tracking studies.

The summaries and answers were ordered by respect votes to surface salient viewpoints. This was found to be sufficient in Chapter 5 where the summaries were found to be relevant by a majority of participants across all three field deployments. However, it may present scalability problems in the future. Future work could investigate existing algorithms employed for social navigation, e.g., Reddit’s hot score [195] and best ranking [146], and utilise the internal metrics of agreement and respect to compute the salience of each answer.

6.4.2 Evaluate with Larger and Heterogenous Groups

In Chapter 5, the participating groups were small to medium sized, and relatively homogenous in terms of profession, interests, and education level. This led to the contribution of often similar viewpoints to the experimental system, a version of Potluck, which participants found to be effectively aggregated into relevant summaries. However, the similarity of answers may have affected the amount of reciprocity, because participants may not have had much to probe on a similar viewpoint. Moreover, the normatively-desirable interactions on Potluck found in the field deployments, although pseudonymous, could have been a partially due to existing group dynamics. Future work could deploy and evaluate Potluck with larger, heterogenous groups where participants largely do not know each other, such as members of reddit, or readers of BTL.

6.4.3 Further Explore Design Space of Discussion Flows

Chapter 4 outlined a set of design principles that can be used to structure and support online discussion. The proposed discussion flow given in Figure 4.1 is one of many possible designs used to explore this previously-unrecognised design space. Future work could modify areas of the proposed discussion flow that were not used as intended, such as lower-level question-asking intended to foster reciprocity. New

discussion flows based on the design principles could also be conceptualised and evaluated in novel online message boards.

6.4.4 Motivate Production of Public Goods

In Chapter 5, public goods such as questions and votes were contributed by a minority of users on Potluck. Unlike question-answering, these public goods were not mandatory. To mitigate the tragedy of the commons and the free rider problem, future work could consider methods to motivate their production. For example, Kollock [108] provides potential motivators for digital public goods that can be operationalised in online message boards; see Section 5.4.6. Ostrom's model [154] for sustainable commons could also be used to review Potluck and the discussion flow in order to motivate the contribution of questions and votes.

6.5 Conclusion

The longstanding design of traditional online message boards struggles to facilitate modern online discussion. This motivated the overarching aim to design and develop a novel online message board that would effectively structure and support online discussion. The thesis described design principles for structuring and facilitating online discussion, derived from an interdisciplinary review of design strategies. These principles were used to conceptualise a scaffolded discussion flow for online message boards. The thesis then detailed the design and implementation of Potluck: a novel approach to online message board that operationalises the proposed formalisms. Potluck was subsequently evaluated in three different field deployments to explore the user engagement and usability of the system in real contexts of use.

The findings suggest that Potluck has traction for real-world adoption. The field users accepted and appropriated the system for different discretionary uses. Notably, Potluck provided users with an overview of viewpoints; facilitated many-to-many, ad hoc discussions; fostered active participation with critical thinking; and effectively augmented in-person discussions. While some features of the discussion flow were underprovisioned, the majority of core features were employed to

successfully structure and fulfil diverse motives for participation. This motivates future work on evaluating Potluck with larger and more diverse groups, as well as further exploration of the proposed design space.

This work contributes to the literature on discourse architecture. It offers theoretical contributions through a novel structured design space for online message boards, including design principles and a conceptual discussion flow. It also presents practical contributions through the design and implementation of Potluck, a novel working artefact for online discussion. Lastly, it provides empirical and methodological contributions through the design and successful conduct of real-world field studies. As online message boards continue to expand and evolve as important arenas of public discourse, this work hopes to inspire the innovation of more effective spaces to support online discussion.

Appendices

Appendix A

Supplementary Materials for Methodology

A.1 Ethics Approval

Study	Section	Ethics ID
Lab Study: Pilot	4.6.1	2801
Lab Study: Main	4.6	2994
Field Study I	5.2	3162
Field Study II: Pilot	5.3.1	3404
Field Study II: Main	5.3	3448
Field Study III: Pilot	5.4.1	3161
Field Study III: Main	5.4	3517

A.2 Sample of Acceptance Test Driven Development

Appendix A.2.1 displays the user story and scenarios for the feature, answer flagging, using a formal template from Behaviour Driven Development (BDD) [188]. Appendix A.2.2 lists the test cases that were subsequently written for each scenario in a unit test framework, `unittest`.

A.2.1 User Story and Scenarios

User story

As a Guest user

I want to be able to flag inappropriate answers

So that only relevant answers are shown.

Scenario 1: User not logged in

Given user is not logged in

When flag endpoint is accessed for an existing answer

Then user is redirected to authorisation page

And warning message “You must be logged in to proceed.” is shown.

Scenario 2: Answer does not exist

Given Guest user is logged in

When flag endpoint is accessed for a non-existing answer

Then user is redirected to the 404 page.

Scenario 3: Flagged by Guest user

Given Guest user logged in

And user is on full answers page

When user taps flag button

Then info message “Thank you - the answer has been flagged.” shown

And answer is flagged.

A.2.2 Unit Tests

```
def test_flag_response_not_logged_in(client, init_database):
    post = create_new_post()
    response = client.post('/flag/{post_id}'.format(post_id=post.id),
                           headers=dict(Referer=full_answers_path),
                           follow_redirects=True)
    assert b'You must be logged in to proceed.' in response.data

def test_flag_response_does_not_exist(client, init_database):
    register_and_login_guest(client)
    response = client.post('/flag/{post_id}'.format(post_id=fake_id),
                           follow_redirects=True)
    assert response.status_code == 404
    assert b'Sorry, the page could not be found' in response.data

def test_flag_response(client, init_database):
    post = create_new_post()
    register_and_login_guest(client)
    answer_question(client, question_uuid, answer_to_question)
    response = client.post('/flag/{post_id}'.format(post_id=post.id),
                           headers=dict(Referer=full_answers_path),
                           follow_redirects=True)
    assert b'Thank you – the answer has been flagged.' in response.data
```

A.3 Sample of Coding in NVivo

GT-lite was conducted in NVivo version 1.7.1 to analyse long-form questionnaire answers and interview transcripts. Appendix A.3.1 presents an example of a codebook produced after open coding questionnaire answers from Field Study III. Appendix A.3.2 depicts the codebook after axial coding.

A.3.1 Open Coding

<input type="radio"/> Positive	1	28
<input type="radio"/> Suggestion	1	9
<input type="radio"/> Question	1	5
<input type="radio"/> Answers	1	4
<input type="radio"/> Neutral	1	4
<input type="radio"/> Voting	1	4
<input type="radio"/> Engagement	1	3
<input type="radio"/> Technical issue	1	3
<input type="radio"/> UI	1	3
<input type="radio"/> Argument	1	2
<input type="radio"/> Confidence	1	2
<input type="radio"/> Duplication	1	2
<input type="radio"/> Informative	1	2
<input type="radio"/> Innovative	1	2
<input type="radio"/> Locating answers	1	2
<input type="radio"/> Multiple choice	1	2
<input type="radio"/> Useful	1	2
<input type="radio"/> Aggregating ideas	1	1
<input type="radio"/> Appreciation	1	1
<input type="radio"/> Comparison	1	1
<input type="radio"/> Curiosity	1	1
<input type="radio"/> Development	1	1
<input type="radio"/> Easy to understand	1	1
<input type="radio"/> Easy to use	1	1
<input type="radio"/> Educational context	1	1
<input type="radio"/> Fun	1	1
<input type="radio"/> Idea formation	1	1
<input type="radio"/> Impactful purposes	1	1
<input type="radio"/> Independence	1	1
<input type="radio"/> Negative	1	1
<input type="radio"/> Pseudonyms	1	1

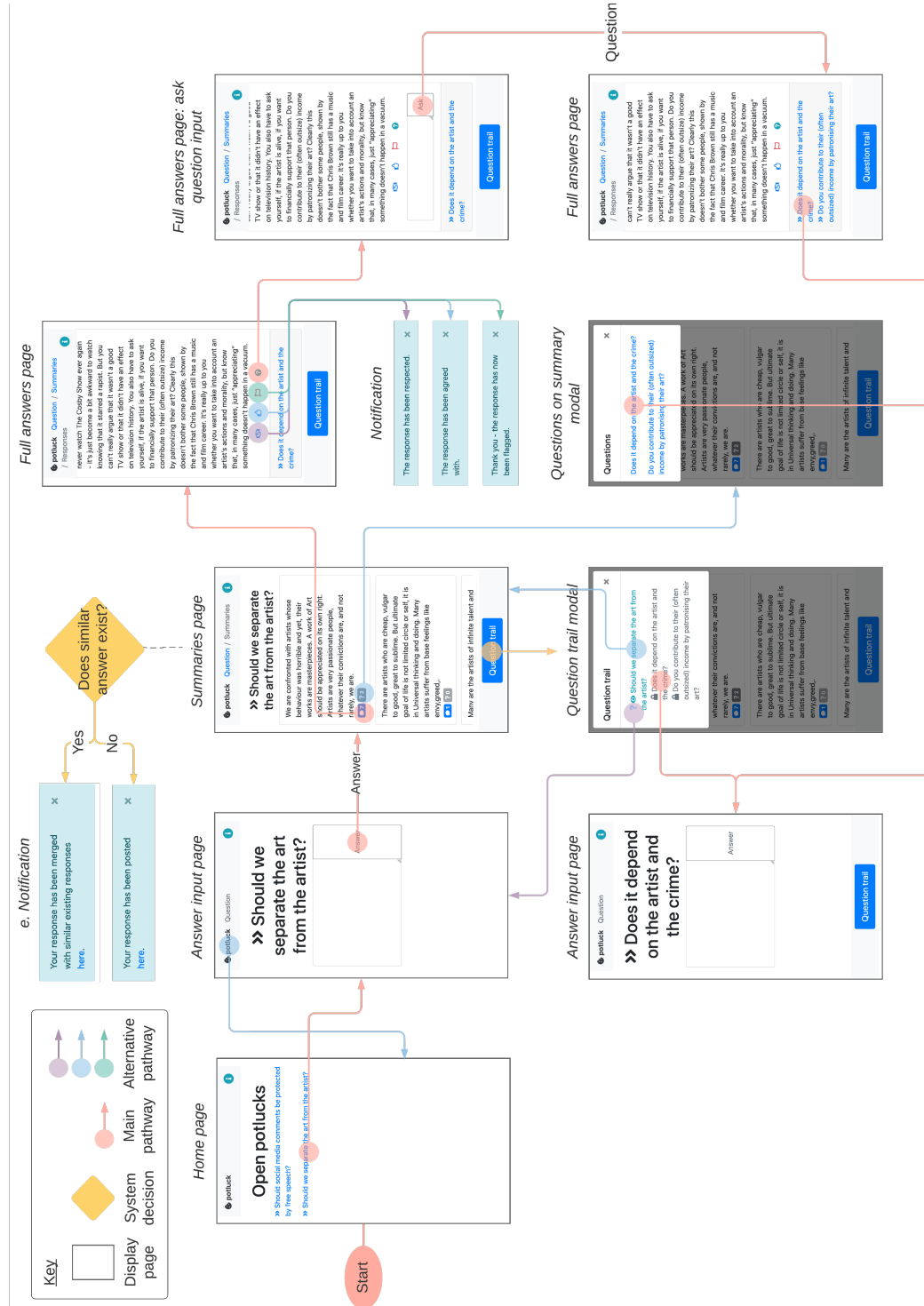
A.3.2 Axial Coding

∨ <input type="radio"/> Suggestion	1	9
<input type="radio"/> UI	1	3
<input type="radio"/> Multiple choice	1	2
<input type="radio"/> Impactful purposes	1	1
<input type="radio"/> Social media	1	1
∨ <input type="radio"/> Feature	0	0
<input type="radio"/> Question	1	5
∨ <input type="radio"/> Answer	1	4
<input type="radio"/> Duplication	1	2
<input type="radio"/> Independence	1	1
> <input type="radio"/> Voting	1	4
<input type="radio"/> Pseudonyms	1	1
∨ <input type="radio"/> Impression	0	0
∨ <input type="radio"/> Positive	1	26
<input type="radio"/> Engagement	1	3
<input type="radio"/> Informative	1	2
<input type="radio"/> Innovative	1	2
<input type="radio"/> Useful	1	2
<input type="radio"/> Aggregating ideas	1	1
<input type="radio"/> Development	1	1
<input type="radio"/> Easy to understand	1	1
<input type="radio"/> Easy to use	1	1
<input type="radio"/> Educational	1	1
<input type="radio"/> Fun	1	1
<input type="radio"/> Idea formation	1	1
<input type="radio"/> Sensemaking	1	1
<input type="radio"/> Summarise readings	1	1
∨ <input type="radio"/> Neutral	1	5
<input type="radio"/> Confidence	1	2
∨ <input type="radio"/> Negative	1	2
<input type="radio"/> Technical issue	1	3

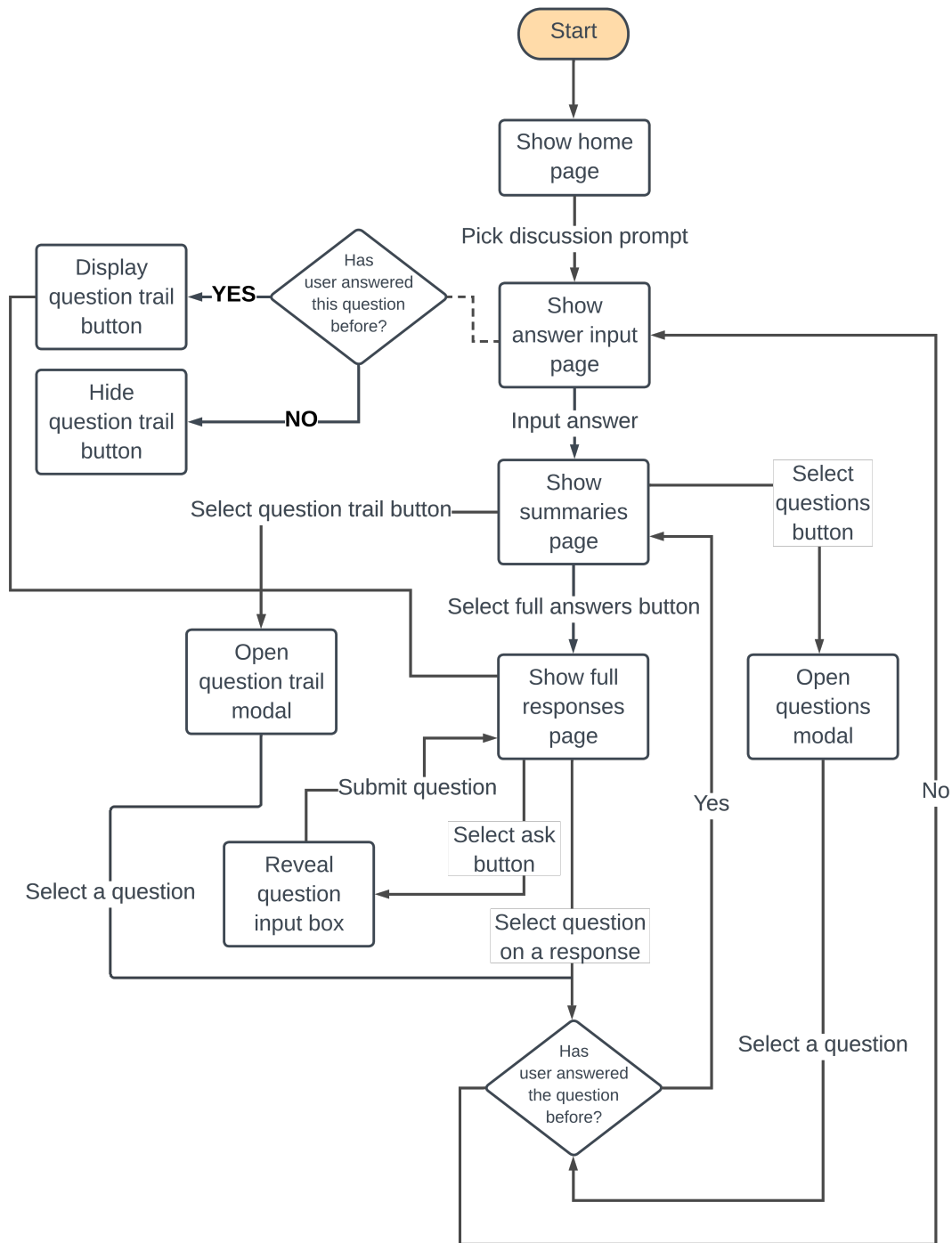
Appendix B

Supplementary Materials for Potluck

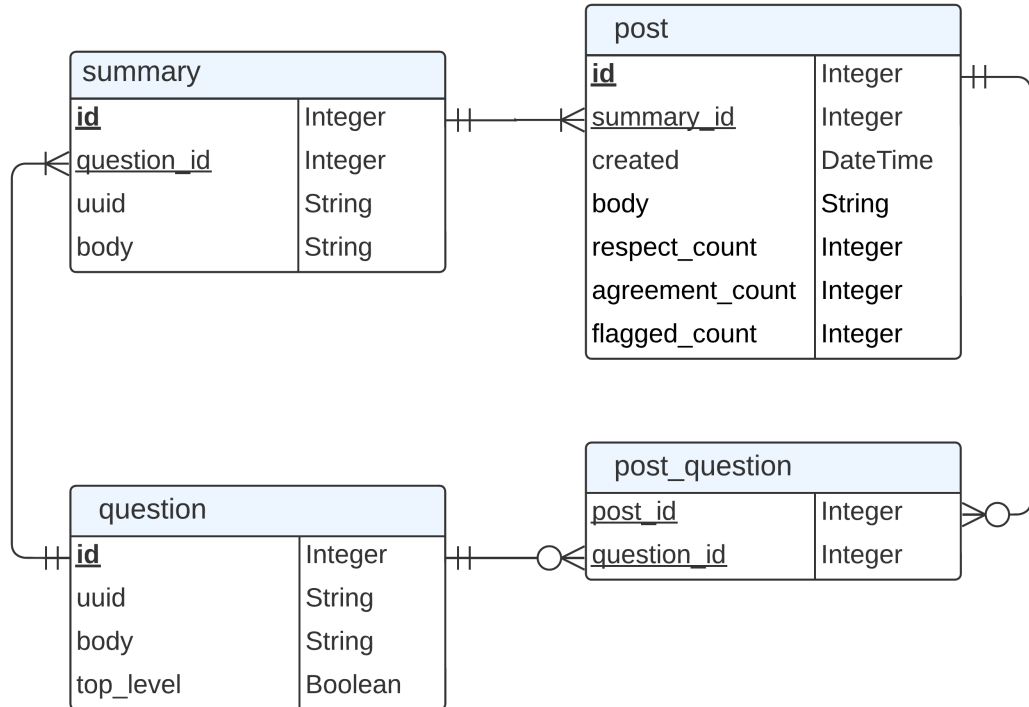
B.1 Potluck Wireflow



B.2 Potluck v0.x and v1.0 User Flow Diagram



B.3 Potluck v0.1 Entity-Relationship Diagram



Appendix C

Lab Study Materials

C.1 Information Sheet



Participant Information Sheet

Department of Computer Science
School of Engineering, Physical, and Mathematical Sciences
Royal Holloway, University of London

Name of study: Study for *Potluck*

Principle investigator: Emma Lieu

Supervisors: Chris Watkins, Rikke Jensen, Matthew Hague

Details of the study

You are being invited to take part in the study for *Potluck*, a prototype of a novel online discussion system. The main aim of this study is to determine the feasibility and usefulness of *Potluck* among users with different online commenting habits. Moreover, the study aims to understand how users engage with and make sense of *Potluck*.

We are looking for a minimum of 6 participants. To take part, you must:

- Be a reader of articles online with a comment section. You do not have to be a commenter to participate.
- Be able to attend on campus.

The study will take place on campus. The principal investigator will be available throughout the study to assist participants in the use of *Potluck* if necessary.

This project is conducted as part of a PhD funded by the Leverhulme Magna Carta Doctoral Centre.

What will your participation involve?

The study duration is 1 hour. Before the study:

1. You will be asked to fill in an online consent form.
2. If you consent to take part in the study, you will be asked to complete a pre-study survey about your online commenting habits and experience.

During the study:

3. You will be given time to read a recent online news article.
4. You will be presented the *Potluck* system with discussions related to the article and be given time to participate in the discussions.
5. You will be asked to complete a post-study survey about *Potluck's* features and your overall experience.

You will provide:

- Long-form text responses in the pre- and post-surveys.
- Numerical responses in the pre- and post-surveys.
- Anonymous user submissions (such as posts, questions, and votes) to *Potluck*.

Benefits and disadvantages of your participation

Whilst there are no immediate benefits for those people participating in the project, your participation will provide valuable feedback to further the development of *Potluck*, and inform research into the design of more inclusive, constructive discussion environments. There are no foreseeable discomforts, disadvantages, and risks for taking part.

What will happen if you decide to take part?

Participation is voluntary; choosing not to take part will not disadvantage you in any way. If you do decide to take part, you will be asked to fill in an online consent form. Your participation will be confidential and will only be made known to the principal investigator.

You can withdraw from the study at any time before the outputs have been published or disseminated. You can do so without giving a reason and without detriment to yourself. If you decide to withdraw, you will be asked what you wish to happen to the data you have provided up to that point.

How will we use your data?

Your personal data (name and email) will be stored for a month after the study, only so that the principal investigator can conduct a follow-up interview with your consent. Your personal data will not be reused outside of this study. From one month after the study, your personal data will be anonymised.

All data is stored in a password protected electronic format.

All data will be collected and stored in accordance with the current data protection act and the General Data Protection Regulation - see page 3 for further details.

How will the results of your participation be used?

Results will be used in the scope of this project. Results may be disseminated in standard academic outlets. You will not be identifiable in any report or publication.

What happens if issues arise during the project?

If you would like to raise any questions or complaints, please contact the principal investigator, Emma Lieu at emma.lieu.2011@live.rhul.ac.uk.

If you feel like your complaint has not been handled to your satisfaction, you can email ethics@rhul.ac.uk.

Ethical Approval

This study has been reviewed by the Research Ethics Committee at Royal Holloway University of London, where it has been submitted for self-certification.

Confidentiality

All the information that we collect about you during the course of the research will be kept strictly confidential by the principal investigator. You will not be able to be identified in any ensuing reports or publications.

Contact details

Principal investigator: Emma Lieu, emma.lieu.2011@live.rhul.ac.uk

Primary supervisor: Chris Watkins, c.j.watkins@rhul.ac.uk

Data protection

This trial will abide by the current data protection act and the [research participant privacy notice](#).

GDPR statement

Important General Data Protection Information (GDPR) Royal Holloway, University of London is the sponsor for this study and is based in the UK. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the study will be stored securely on hosted on servers within the European Economic Area'. Royal Holloway is designated as a public authority and in accordance with the Royal Holloway and Bedford New College Act 1985 and the Statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your personal data from being accidentally lost, used or accessed in any unauthorised way or altered or disclosed. Royal Holloway has also put in place procedures to deal with any suspected personal data security breach and will notify you and any applicable regulator of a suspected breach where legally required to do so. To safeguard your rights, we will use the minimum personally-identifiable information possible (i.e., the email address you provide us). The lead researcher will keep your contact details confidential and will use this information only as required (i.e., to provide a summary of the study results if requested and/or for the prize draw). The lead researcher will keep information about you and data gathered from the study, the duration of which will depend on the study. Certain individuals from RHUL may look at your research records to check the accuracy of the research study. If the study is published in a relevant peer-reviewed journal, the anonymised data may be made available to third parties. The people who analyse the information will not be able to identify you. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/> and if you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk.

NB: You may retain this information sheet for reference and contact us with any queries.

C.2 Pre-study Questionnaire

Pre-study Survey

Please complete this survey before the study for *Potluck*.

Feel free to contact me at emma.lieu.2011@live.rhul.ac.uk if you have any questions.

Thank you for reading this.

* Required

1. Do you read online comments?

- Yes
- No
- Sometimes

2. Briefly describe the reasons why you read the comments: *

3. Briefly describe the reasons why you don't read the comments: *

4. Briefly describe the reasons why you sometimes read the comments:
*

5. Do you post online comments? *

- Yes
- No
- Sometimes

6. Briefly describe the reasons why you post online comments: *

7. Briefly describe the reasons why you don't post online comments: *

8. Briefly describe the reasons why you sometimes post online comments: *

C.3 Post-study Questionnaire

Post-study Survey

Thank you for participating in today's study. Please fill in this survey about your experience using *Potluck*.

Feel free to ask the principal investigator if anything needs clarifying.

* Required

1. How easy to use were the following features? *

	Difficult to use	Somewhat difficult to use	Neither easy nor difficult to use	Somewhat easy to use	Very easy to use
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. How useful were the following features? *

	Not at all useful	Somewhat not useful	Neither useful nor not useful	Somewhat useful	Very useful
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. How engaging were the following features? *

	Not at all engaging	Somewhat not engaging	Neither engaging nor not engaging	Somewhat engaging	Very engaging
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. What are your overall impressions of Potluck's features? *

5. Did your usual commenting habits change when using Potluck? *

Your usual commenting habits are the answers you gave in the pre-study survey.

Yes

No

6. Explain how your commenting habits changed when using Potluck: *

7. Explain how your commenting habits didn't change when using Potluck: *

8. How would you rate the following statements? *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Potluck was informative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck were relevant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to understand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was entertaining to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck presented diverse viewpoints.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable for online discussion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. How was your overall experience using Potluck? *

10. Is there anything else I should have asked? Use this space for any further comments:

C.4 Lab Study I Discussion Prompts

ID	Discussion prompt
A	What are your initial thoughts on Web3?
B	Do you think Web3 will be the future of the Internet - or is it jargon?
C	The article describes Web3 and metaverses as visions of the Internet's future. Which do you predict will be the next generation of the Internet and why?
D	In Web3, the Internet would operate through blockchain technology. What is another existing model/industry that could be disrupted by blockchain technology?

Appendix D

Field Study I Materials

D.1 Information Sheet



Participant Information Sheet

Department of Computer Science

School of Engineering, Physical, and Mathematical Sciences

Royal Holloway, University of London

Name of study: Study for *Potluck*

Principal investigator: Emma Lieu

Supervisors: Chris Watkins, Rikke Jensen, Matthew Hague

Details of the study

You are being invited to take part in the study for *Potluck*, an experimental online discussion system. The main aim of this study is to understand how users engage with and make sense of *Potluck*. To take part, you must:

- Be available to use *Potluck* for at least 5 minutes every day throughout the first half of the study. You can use the system at any time that is convenient for you.
- Have access to a desktop Chrome, Safari, or Firefox browser.

The study will take place online. The principal investigator will be available throughout the study to assist participants in the use of *Potluck* if necessary.

This project is conducted as part of a PhD funded by the Leverhulme Magna Carta Doctoral Centre.

What will your participation involve?

During the study:

1. You will be sent the website link to the *Potluck* system.
2. In the system, you will be asked to:
 - a. Fill in an online consent form.
 - b. Watch a short video on how to use the system.
3. If you consent to take part in the study, you will spend at least 5 minutes every day using the system.

At the end of the study:

4. You will be asked to complete a post-study questionnaire about your demographic and your overall experience using *Potluck*.

You will provide:

- Long-form text responses in the post-study questionnaire.
- Numerical responses in the post-study questionnaire.
- Anonymous user submissions (such as posts, questions, and votes) to *Potluck*.

Benefits and disadvantages of your participation

Whilst there are no immediate benefits for those people participating in the project, your participation will provide valuable feedback to further the development of *Potluck*, and inform research into the design of more constructive discussion environments and processes. There are no foreseeable discomforts, disadvantages, and risks for taking part.

What will happen if you decide to take part?

Participation is voluntary; choosing not to take part will not disadvantage you in any way. If you do decide to take part, you will be asked to fill in an online consent form. Your participation will be confidential and will only be made known to the principal investigator.

You can withdraw from the study at any time before the outputs have been published or disseminated. You can do so without giving a reason and without detriment to yourself. If you decide to withdraw, you will be asked what you wish to happen to the data you have provided up to that point.

How will we use your data?

Your name and email will be stored for a month after the study, only so that the principal investigator can conduct a follow-up interview with your consent. Your age range, gender, and geographical location will be collected to analyse participant demographics. Your personal data will not be reused outside of this study. From one month after the study, your personal data will be anonymised.

All data is stored in a password protected electronic format.

All data will be collected and stored in accordance with the current data protection act and the General Data Protection Regulation - see page 3 for further details.

How will the results of your participation be used?

Results will be used in the scope of this project. Results may be disseminated in standard academic outlets. You will not be identifiable in any report or publication.

What happens if issues arise during the project?

If you would like to raise any questions or complaints, please contact the principal investigator, Emma Lieu at emma.lieu.2011@live.rhul.ac.uk.

If you feel like your complaint has not been handled to your satisfaction, you can email ethics@rhul.ac.uk.

Ethical Approval

This study has been reviewed by the Research Ethics Committee at Royal Holloway University of London, where it has been submitted for self-certification.

Confidentiality

All the information that we collect about you during the course of the research will be kept strictly confidential by the principal investigator. You will not be able to be identified in any ensuing reports or publications.

Contact details

Principal investigator: Emma Lieu, emma.lieu.2011@live.rhul.ac.uk

Primary supervisor: Chris Watkins, c.j.watkins@rhul.ac.uk

Data protection

This trial will abide by the current data protection act and the [research participant privacy notice](#).

GDPR statement

Important General Data Protection Information (GDPR). Royal Holloway, University of London is the sponsor for this study and is based in the UK. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the study will be stored securely on hosted on servers within the European Economic Area'. Royal Holloway is designated as a public authority and in accordance with the Royal Holloway and Bedford New College Act 1985 and the Statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your personal data from being accidentally lost, used or accessed in any unauthorised way or altered or disclosed. Royal Holloway has also put in place procedures to deal with any suspected personal data security breach and will notify you and any applicable regulator of a suspected breach where legally required to do so. To safeguard your rights, we will use the minimum personally-identifiable information possible (i.e., the email address you provide us). The lead researcher will keep your contact details confidential and will use this information only as required (i.e., to provide a summary of the study results if requested and/or for the prize draw). The lead researcher will keep information about you and data gathered from the study, the duration of which will depend on the study. Certain individuals from RHUL may look at your research records to check the accuracy of the research study. If the study is published in a relevant peer-reviewed journal, the anonymised data may be made available to third parties. The people who analyse the information will not be able to identify you. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/> and if you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk.

NB: You may retain this information sheet for reference and contact us with any queries.

D.2 Post-study Questionnaire

Post-study Survey

Thank you for participating in today's study. Please fill in this survey about your demographic and experience using *Potluck*.

Feel free to ask the principal investigator if anything needs clarifying.

* Required

About you

The answers you provide about you will be anonymous. This information is collected to analyse the diversity of participants.

1. What age range group do you fit into? *

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- Above 65
- Prefer not to say

2. What is your gender? *

- Woman
- Man
- Non-binary
- Prefer to self-describe
- Prefer not to say

3. Please self-describe your gender: *

4. Where do you live? *

- Africa
- Asia
- Australia
- Caribbean Islands
- Europe
- North America
- Pacific Islands
- South America
- Other
- Prefer not to say

5. Please enter where you live: *

About your experience using Potluck

6. How easy to use were the following features? *

	Difficult to use	Somewhat difficult to use	Neither easy nor difficult to use	Somewhat easy to use	Very easy to use
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. How useful were the following features? *

	Not at all useful	Somewhat not useful	Neither useful nor not useful	Somewhat useful	Very useful
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. How engaging were the following features? *

	Not at all engaging	Somewhat not engaging	Neither engaging nor not engaging	Somewhat engaging	Very engaging
Hidden discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answering questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag an answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asking questions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home screen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. What are your overall impressions of Potluck's features? *

10. How would you rate the following statements? *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Potluck was informative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck were relevant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to understand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was entertaining to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck presented diverse viewpoints.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck presented viewpoints I had not previously considered.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable for online discussion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. How was your overall experience using Potluck? *

⋮
12. Is there anything else I should have asked? Use this space for any further comments and suggestions:

Appendix E

Field Study II Materials

E.1 Information Sheet



Participant Information Sheet

Department of Computer Science

School of Engineering, Physical, and Mathematical Sciences

Royal Holloway, University of London

Name of study: Study for *Potluck*

Principal investigator (PI): Emma Lieu

Supervisors: Chris Watkins, Rikke Jensen, Matthew Hague

Details of the study

You are being invited to take part in the study for *Potluck*, an experimental online discussion system. The main aim of this study is to understand how users engage with and make use of *Potluck* in an event-based setting.

To take part, you must have access to a Chrome, Safari, or Firefox browser on a laptop or desktop device. The principal investigator will be available throughout the study to assist participants in the use of *Potluck* if necessary.

This project is conducted as part of a PhD funded by the Leverhulme Magna Carta Doctoral Centre.

What will your participation involve?

During the study:

1. You will be given access to the *Potluck* system.
2. In the system, you will be asked to fill in an online consent form.
3. If you consent to take part in the study, you will participate in discussions related to the hackathon (such as submission ideas) and tech-related subjects on the system.
4. At the main event on Saturday 5th November 2022, your usage of the system in-person will be observed by the PI.

At the end of the study:

5. You will be asked to complete a post-study questionnaire about your demographic and overall experience using *Potluck*.

The following data will be collected from you:

- Long-form text responses in the post-study questionnaire.
- Numerical responses in the post-study questionnaire.
- Pseudonymous user submissions (such as posts, questions, and votes) to *Potluck*.
- Communication (such as verbal feedback) with the PI during the study.
- Observations of your in-person usage of *Potluck*.

Benefits and disadvantages of your participation

Your participation will provide valuable feedback to further the development of *Potluck* and inform research into the design of more constructive discussion environments and processes. There are no foreseeable discomforts, disadvantages, and risks for taking part.

Payments

You can opt into a prize draw for a £20 Amazon gift voucher upon completion of the post-study questionnaire.

What will happen if you decide to take part?

Participation is voluntary; choosing not to take part will not disadvantage you in any way. If you do decide to take part, you will be asked to fill in an online consent form. Your participation will be confidential and will only be made known to the principal investigator.

You can withdraw from the study at any time before the outputs have been published or disseminated. You can do so without giving a reason and without detriment to yourself. If you decide to withdraw, you will be asked what you wish to happen to the data you have provided up to that point.

How will we use your data?

Your name and email will be collected to send you the post-study questionnaire. This information will also be collected if you enter the prize draw (described in above Payments section). Your age and gender will be collected to identify the participant demographics. Your personal data will not be reused outside this study. From one month after the study, your personal data will be anonymised.

All data is stored in a password protected electronic format.

All data will be collected and stored in accordance with the current data protection act and the General Data Protection Regulation - see page 3 for further details.

How will the results of your participation be used?

Results will be used in the scope of this project. Results may be disseminated in standard academic outlets. You will not be identifiable in any report or publication.

What happens if issues arise during the project?

If you would like to raise any questions or complaints, please contact the principal investigator, Emma Lieu at emma.lieu.2011@live.rhul.ac.uk.

If you feel like your complaint has not been handled to your satisfaction, you can email ethics@rhul.ac.uk.

Ethical Approval

This study has been reviewed by the Research Ethics Committee at Royal Holloway University of London, where it has been submitted for self-certification.

Confidentiality

All the information that we collect about you during the course of the research will be kept strictly confidential by the principal investigator. You will not be able to be identified in any ensuing reports or publications.

Contact details

Principal investigator: Emma Lieu, emma.lieu.2011@live.rhul.ac.uk

Primary supervisor: Chris Watkins, c.j.watkins@rhul.ac.uk

Data protection

This trial will abide by the current data protection act and the [research participant privacy notice](#).

GDPR statement

Important General Data Protection Information (GDPR). Royal Holloway, University of London is the sponsor for this study and is based in the UK. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the study will be stored securely on hosted servers within the European Economic Area'. Royal Holloway is designated as a public authority and in accordance with the Royal Holloway and Bedford New College Act 1985 and the Statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your personal data from being accidentally lost, used or accessed in any unauthorised way or altered or disclosed. Royal Holloway has also put in place procedures to deal with any suspected personal data security breach and will notify you and any applicable regulator of a suspected breach where legally required to do so. To safeguard your rights, we will use the minimum personally-identifiable information possible (i.e., the email address you provide us). The lead researcher will keep your contact details confidential and will use this information only as required (i.e., to provide a summary of the study results if requested and/or for the prize draw). The lead researcher will keep information about you and data gathered from the study, the duration of which will depend on the study. Certain individuals from RHUL may look at your research records to check the accuracy of the research study. If the study is published in a relevant peer-reviewed journal, the anonymised data may be made available to third parties. The people who analyse the information will not be able to identify you. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/> and if you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk.

NB: You may retain this information sheet for reference and contact us with any queries.

E.2 Post-study Questionnaire

Post-study Survey

Thank you for participating in the study. Please fill in this survey about you and your experience using *Potluck*.

Please contact Emma Lieu (emma.lieu.2011@live.rhul.ac.uk) if anything needs clarifying.

* Required

1. If you wish to enter the draw for a £20 Amazon gift card, provide your name and email:

Your name and email are independent from the answers you provide in the remainder survey.

You will not be identifiable in any ensuing reports or publications.

About you

The answers you provide are **anonymous**. This information is collected to analyse the diversity of participants.

2. Your Potluck username: *

3. Your age: *

The value must be a number

4. Your gender: *

- Woman
- Man
- Non-binary
- Prefer to self-describe
- Prefer not to say

5. Self-describe your gender: *

About your commenting habits

6. Do you read online comments? *

Online comments are written posts on *public and asynchronous* online discussion platforms.

Platforms include social media, news websites, forums, blogs, discussion websites, and Q&A websites.

- Yes
- No
- Sometimes

7. Briefly describe the reasons why you read the comments: *

8. Briefly describe the reasons why you don't read the comments: *

9. Briefly describe the reasons why you sometimes read the comments:

*

10. Do you write online comments? *

This includes writing replies to comments.

- Yes
- No
- Sometimes

11. Do you write online comments? *

This includes writing replies to comments.

- Yes
- No
- Sometimes

12. Briefly describe the reasons why you post online comments: *

13. Briefly describe the reasons why you don't post online comments: *

14. Briefly describe the reasons why you sometimes post online comments: *

15. Briefly describe the reasons why you don't post online comments: *

16. Did your commenting habits differ on Potluck? *

Your commenting habits are your answers to the above questions.

Yes

No

17. Explain how your commenting habits differed on Potluck: *

18. Explain how your commenting habits did not differ on Potluck: *

About your use of Potluck

19. Did you use Potluck before attending the hackathon? *

Yes

No

20. Why did you not use Potluck before attending the hackathon? *

21. Why did you use Potluck before attending the hackathon? *

Tick all the purposes that apply or type your own purposes in "Other".

To find team members

To help others with their submission idea

To seek help with my submission idea

To receive feedback on my submission idea

To come up with a submission idea

Other

22. How suitable was Potluck for the above purposes? Briefly explain your answer: *

23. Did you use Potluck during the hackathon? *

Yes

No

24. Why did you not use Potluck during the hackathon? *

25. Why did you use Potluck during the hackathon? *

Tick all the purposes that apply or type your own purposes in "Other".

To engage in discussions with other participants

To seek help with my submission

To help others with their submission

Other

26. How suitable was Potluck for the above purposes? Briefly explain your answer: *

About the overall usability of Potluck

27. How would you rate the following statements? *

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I think that I would like to use Potluck frequently.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found Potluck unnecessarily complex.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought Potluck was easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that I would need the support of a technical person to be able to use Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found the various functions in Potluck were well integrated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought there was too much inconsistency in Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would
imagine that
most people
would learn
to use
Potluck very
quickly.

I found
Potluck very
awkward to
use.

I felt very
confident

comfortable
using Potluck.

I needed to
learn a lot of
things before
I could get
going with
Potluck.

About the usability of features in Potluck

28. How useful were the following features? *

	Not at all useful	Somewhat not useful	Neither useful nor not useful	Somewhat useful	Very useful
Home page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. How engaging were the following features? *

	Not at all engaging	Somewhat not engaging	Neither engaging nor not engaging	Somewhat engaging	Very engaging
Home page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

30. How easy to use were the following features? *

	Very difficult to use	Somewhat difficult to use	Neither easy nor difficult to use	Somewhat easy to use	Very easy to use
Home page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers page	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question trail navigation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

About your experience using Potluck

31. How would you rate the following statements? *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Potluck was informative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck were relevant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was entertaining to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck presented diverse posts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I engaged with posts different to my own on Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was open and honest with what I posted on Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable for online discussion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable in an events-based setting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

32. How was your overall experience using Potluck? *

Use this space for any comments or suggestions.

⋮

33. How would you rate the following statements? *

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Potluck was informative.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck were relevant.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was overall easy to understand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was entertaining to use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck presented diverse posts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I engaged with posts different to my own on Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was open and honest with what I posted on Potluck.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable for online discussion.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was suitable in an events-based setting.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

34. How was your overall experience using Potluck? *

Use this space for any comments or suggestions.

E.3 Study Landing Page

Welcome to Potluck

You are about to take part in a study of an experimental system called [Potluck](#).

Access to the system is conditional on your agreement to participate in the study.

Read the [Information Sheet](#) for details and contact Emma Lieu [✉](#) if you have questions.

Before you continue...

Check that you have done the following tasks. You only need to **complete these tasks once**.

1) Fill in the consent form:

Research Participant Consent Form

* Required

1. Participant's full name: *

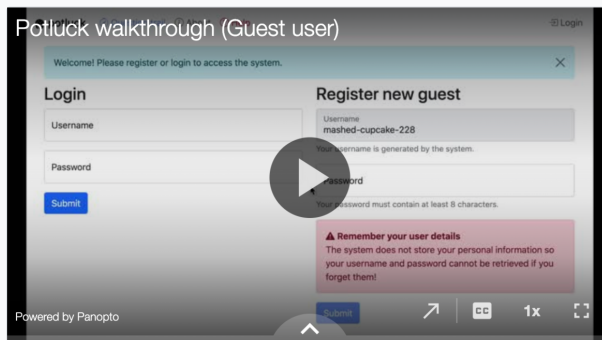
2. Participant's email address: *

3. I confirm that have read and understood the Information Sheet for this study. I have had an opportunity to consider the information and what will be expected of me.

*

Yes

2) Watch the tutorial on how to use Potluck:



I confirm that I completed tasks 1 and 2 and
I agree to take part in this study

E.4 Discussion Prompts

ID	Discussion prompt	Context
A	What is your favourite programming language and what do you like about it?	Maybe it's because it runs quickly, maybe because it's easy to write, maybe you just think it's neat.
B	What is something you want to learn to help with your submission idea?	Alternatively, maybe you already know everything and you're just looking to practice what you know.
C	What is your submission idea?	Write a short ELI5 description of your idea. What technologies are you going to use? What made you choose this specific way? Do you think you'll be able to get it working?
D	Knock knock, who's there?	Icebreaker question to start with, since everyone has a go-to knock knock!
E	What is your favourite piece of recently announced tech?	AMD's RDNA3, Rust being integrated into the Linux kernel, or the slow but long overdue death of Facebook.
F	Do you have any dumb idea suggestions?	These are for ideas that you're probably not going to build, but are willing to share.
G	Meta has lost \$700 billion in market value due to their investment in the metaverse. How funny is this?	
H	How is your submission progressing?	Do you think you'll finish? Do you need any help?
I	Who's your favourite lecturer and why?	Favourite is subjective.
J	Which was your favourite submission?	People's choice!

Appendix F

Field Study III Materials

F.1 Information Sheet



Participant Information Sheet

Department of Computer Science
School of Engineering, Physical, and Mathematical Sciences
Royal Holloway, University of London

Name of study: Classroom study for *Potluck*

Principal investigator: Emma Lieu

Supervisors: Chris Watkins, Rikke Jensen, Matthew Hague

Details of the study

You are being invited to take part in this study for *Potluck*, an experimental online discussion system. The main aim of this study is to understand how users engage with and make sense of *Potluck* in an educational context. To take part, you must have access to a desktop or laptop Chrome, Safari, or Firefox browser. The study will be held online.

This project is conducted as part of a PhD funded by the Leverhulme Magna Carta Doctoral Centre.

What will your participation involve?

This study will run for the duration of PR3967 in the Spring Term of 2022-23. It will involve tasks in the following order:

1. You will be asked to fill in a consent form. If you consent to take part in the study, you will also complete a pre-study questionnaire of your demographic information and online commenting habits.
2. You will be shown how to use the system.
3. During the study, you will be given access to the Potluck system to discuss the readings for PR3967 with your peers and course convenor. You will be asked to complete an interim questionnaire.
4. At the end of the study, you will be asked to complete a post-study questionnaire about your experience using Potluck.

The following data will be recorded for analysis:

- Long-form text responses in the questionnaires.
- Numerical responses in the questionnaires.
- Pseudonymous user submissions (such as posts, questions, and votes) to Potluck. As such you are asked not to share any personally identifiable information on the platform (e.g., your name).
- Logs of activity on Potluck, which includes pages viewed; buttons and input areas clicked; and device and browser type. This will be automatically recorded by the system.
- Communication (such as verbal feedback) with the principal investigator during the study.

Benefits and disadvantages of your participation

Through Potluck, you will engage with your readings, learn to construct arguments, and contribute to seminar discussions. Your participation will also inform research into the design of more constructive discussion environments. There are no foreseeable discomforts, disadvantages, or risks for taking part.

What will happen if you decide to take part?

Participation is optional. If you do decide to take part, you will be asked to complete a consent form.

Participation and non-participation with Potluck will not impact your assessment and marks for PR3967 in any way. While the content on Potluck is not anticipated to be sensitive (as it will focus on the content of the module), participants are free to comment as they wish. There is a content filter to remove harmful or inappropriate content, and you will be able to flag content you find inappropriate.

You can withdraw from the study at any time before the outputs have been published or disseminated. You can do so without giving a reason and without detriment to yourself. If you decide to withdraw, you will be asked what you wish to happen to the data you have provided up to that point.

How will we use your data?

The data that you provide on Potluck will be stored using pseudonyms. Any information that identifies you (e.g., name and email) will be securely stored separately from the data. Your age, gender and module information will be collected to identify the participant demographics. Your personal data will not be reused outside of this study. From two weeks after the study, your personal data will be anonymised.

All data is stored in a password protected electronic format. All data will be collected and stored in accordance with the current data protection act and the General Data Protection Regulation (GDPR) - see page 3 for further details.

Note: If your interactions on Potluck raise concerns about your safety, the safety of others, or about other concerns as perceived by the principal investigator, this may be passed on to the course convenor.

How will the results of your participation be used?

Results will be used in the scope of this project. Results may be disseminated in standard academic outlets. You will not be identifiable in any report or publication.

What happens if issues arise during the project?

If you would like to raise any questions or complaints, please contact the principal investigator, Emma Lieu at emma.lieu.2011@live.rhul.ac.uk.

If you feel like your complaint has not been handled to your satisfaction, you can email ethics@rhul.ac.uk.

Ethical Approval

This study has been reviewed by the Research Ethics Committee at Royal Holloway University of London, where it has been submitted for self-certification.

Confidentiality

All the information that we collect about you during the course of the research will be kept strictly confidential by the principal investigator. You will not be able to be identified in any ensuing reports or publications.

Contact details

Principal investigator: Emma Lieu, emma.lieu.2011@live.rhul.ac.uk

Primary supervisor: Chris Watkins, c.j.watkins@rhul.ac.uk

Data protection

This trial will abide by the current data protection act and the [research participant privacy notice](#).

GDPR statement

Important General Data Protection Information (GDPR). Royal Holloway, University of London is the sponsor for this study and is based in the UK. We will be using information from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Any data you provide during the completion of the study will be stored securely on hosted on servers within the European Economic Area'. Royal Holloway is designated as a public authority and in accordance with the Royal Holloway and Bedford New College Act 1985 and the Statutes which govern the College, we conduct research for the public benefit and in the public interest. Royal Holloway has put in place appropriate technical and organisational security measures to prevent your personal data from being accidentally lost, used or accessed in any unauthorised way or altered or disclosed. Royal Holloway has also put in place procedures to deal with any suspected personal data security breach and will notify you and any applicable regulator of a suspected breach where legally required to do so. To safeguard your rights, we will use the minimum personally-identifiable information possible (i.e., the email address you provide us). The lead researcher will keep your contact details confidential and will use this information only as required (i.e., to provide a summary of the study results if requested and/or for the prize draw). The lead researcher will keep information about you and data gathered from the study, the duration of which will depend on the study. Certain individuals from RHUL may look at your research records to check the accuracy of the research study. If the study is published in a relevant peer-reviewed journal, the anonymised data may be made available to third parties. The people who analyse the information will not be able to identify you. You can find out more about your rights under the GDPR and Data Protection Act 2018 by visiting <https://www.royalholloway.ac.uk/about-us/more/governance-and-strategy/data-protection/> and if you wish to exercise your rights, please contact dataprotection@royalholloway.ac.uk.

NB: You may retain this information sheet for reference and contact us with any queries.

F.2 Pre-study Questionnaire

Pre-study (PR3967)

Start of Block: Demographics

Pre-study Survey

The answers you provide from this point onwards will be stored **separately** from the consent form.

Your participant ID:

<<Your ID is your favourite colour, the day you were born and the month you were born (e.g. Red0302).>>

Your age:

Your gender:

- Man (1)
 - Woman (2)
 - Non-binary (3)
 - Prefer to self-describe (4)
 - Prefer not to say (5)
-

End of Block: Demographics

Start of Block: CommentBehav

How would you rate the following statements?

<<**Online comments** are found on online commenting systems. **Online commenting systems** are *asynchronous* and *public* discussion areas on the Internet. These include online forums, Q&A websites, and comment areas under blogs, articles and other media.>>

	Never (1)	Rarely (2)	Sometimes (3)	Often (4)	Always (5)
I read online comments. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I post online comments. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

Briefly describe the reasons why you

"\${commentStatements/ChoiceGroup/SelectedAnswers/1}" read online comments:

Briefly describe the reasons why you

"\${commentStatements/ChoiceGroup/SelectedAnswers/2}" post online comments:

End of Block: CommentBehav

F.3 Interim Questionnaire

Interim survey (PR3967)

Start of Block: engagement

Interim Survey

Thank you for participation in the study so far. Please fill in this survey about Potluck and your experience to date.

Please ask the principal investigator (emma.lieu.2011@live.rhul.ac.uk) if anything needs clarifying.

Your participant ID:

<<Your ID is your favourite colour, the day you were born and the month you were born (e.g. Red0302).>>

Have you used Potluck at any point of this term so far?

- Yes (1)
- No (2)
-

Display This Question:

If Have you used Potluck at any point of this term so far? = No

Briefly explain why you have not used Potluck to date:

End of Block: engagement

Start of Block: potluckUX

About your experience on Potluck
How would you rate the following statements?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Potluck is informative. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck are not relevant. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck is entertaining to use. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck is not suitable for online discussion. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am open with my answers on Potluck. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am dishonest with my answers on Potluck. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

How would you rate the following statements?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Potluck presents diverse viewpoints. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not engaging with viewpoints different to my own on Potluck. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck helps me learn to construct arguments. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck does not help me with the seminar discussions. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck helps me summarise readings for the seminar. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

How is your overall experience on Potluck so far?

<<Use this space for any suggestions and comments.>>

End of Block: potluckUX

Start of Block: potluckUsability

About the usability of Potluck
 How would you rate the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I think that I would like to use Potluck frequently. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find Potluck unnecessarily complex. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think Potluck is easy to use. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that I would need the support of a technical person to be able to use Potluck. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find the various functions in Potluck were well integrated. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think there is too much inconsistency in Potluck. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would imagine that most people would learn to use Potluck very quickly. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find Potluck very awkward to use. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I feel very confident using Potluck. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I needed to learn a lot of things before I could get going with Potluck. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: potluckUsability

Start of Block: potluckFeatureUsability

About the features on Potluck

Any responses you provide in the remainder of the survey will be used to improve future versions of Potluck.

How **easy to use** are the following features?

	Very difficult to use (1)	Somewhat difficult to use (2)	Neither easy nor difficult to use (3)	Somewhat easy to use (4)	Very easy to use (5)	Not applicable (did not use) (6)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

How **useful** are the following features?

	Not at all useful (1)	Somewhat not useful (2)	Neither useful nor not useful (3)	Somewhat useful (4)	Very useful (5)	Not applicable (did not use) (6)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

How **engaging** are the following features?

	Not at all engaging (1)	Somewhat not engaging (2)	Neither engaging nor not engaging (3)	Somewhat engaging (4)	Very engaging (5)	Not applicable (did not use) (6)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

What are your overall impressions of Potluck's features so far?

End of Block: potluckFeatureUsability

F.4 Post-study Questionnaire

Integrated post-study (PR3967)

Start of Block: engagement

ID Your participant ID:

<<Your ID is your favourite colour, the day you were born and the month you were born (e.g. Red0302).>>

use Did you use Potluck at any point this term?

- Yes (1)
- No (2)

Display This Question:

If Did you use Potluck at any point this term? = Yes

potluckID Have you completed the interim questionnaire yet?

- Yes (1)
- No (2)

Display This Question:

If Did you use Potluck at any point this term? = No

whyEngage Briefly explain why you did not used Potluck:

End of Block: engagement

Start of Block: potluckUX

Display This Question:
 If Have you completed the interim questionnaire yet? = No

potluckImpressions1 About your experience on Potluck
 How would you rate the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Potluck was informative. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries on Potluck were not relevant. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was entertaining to use. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck was not suitable for online discussion. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was open with my answers on Potluck. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was dishonest with my answers on Potluck. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

potluckImpressions2 How would you rate the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
Potluck presented diverse viewpoints. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I did not engage with viewpoints different to my own on Potluck. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck helped me learn to construct arguments. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck did not help me with the seminar discussions. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Potluck helped me summarise readings for the seminar. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

potluckOverall How was your overall experience of Potluck?

<<Use this space for any suggestions and comments.>>

End of Block: potluckUX

Start of Block: potluckUsability

sus About the usability of Potluck

How would you rate the following statements?

	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)
I think that I would like to use Potluck frequently. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find Potluck unnecessarily complex. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think Potluck is easy to use. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think that I would need the support of a technical person to be able to use Potluck. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find the various functions in Potluck were well integrated. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think there is too much inconsistency in Potluck. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would imagine that most people would learn to use Potluck very quickly. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find Potluck very awkward to use. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I feel very
confident
using
Potluck. (9)

I needed to
learn a lot of
things before
I could get
going with
Potluck. (10)

End of Block: potluckUsability

Start of Block: potluckFeatureUsability

featureIntro About the features on Potluck

Any responses you provide in this section will be used to improve future versions of Potluck.

potluckEase How **easy to use** were the following features?

	Very difficult to use (1)	Somewhat difficult to use (2)	Neither easy nor difficult to use (3)	Somewhat easy to use (4)	Very easy to use (5)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

potluckUseful How **useful** were the following features?

	Not at all useful (1)	Somewhat not useful (2)	Neither useful nor not useful (3)	Somewhat useful (4)	Very useful (5)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

potluckEngaging How **engaging** were the following features?

	Not at all engaging (1)	Somewhat not engaging (2)	Neither engaging nor not engaging (3)	Somewhat engaging (4)	Very engaging (5)
Home screen (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summaries screen (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Full answers screen (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pseudonymity (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hidden discussion (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Answer question (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask question (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect answer (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Agree with answer (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Flag answer (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Question Trail navigation (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Page Break

whyReadS What were your overall impressions of Potluck's features?

End of Block: potluckFeatureUsability

Start of Block: impressions

impressionsTitle About your impressions of Potluck

Thank you very much for using Potluck for PR3967.

The following section aims to understand your thoughts on Potluck and your engagement with the system.

q1 Can you summarise your experience of using Potluck?

<<For example, were there any aspects of the platform that you particularly enjoyed or found helpful? Were there any areas where you felt the platform could be improved?>>

Page Break

q2 Did your use of Potluck before the seminar affect your engagement in seminar discussions?
If so, in what ways?

Page Break

q3 Potluck requires you to submit an answer *before* you can view the existing answers of other participants.

How did this affect your contribution to the discussion? Did it impact your engagement or the quality of your answers?

Page Break

q4 Potluck allows you to engage with other participants by asking and answering questions.

What did you think about this process? Please describe your experience with it.

q5 Potluck allows you to vote on other participants' answers by respect or agreement.

What did you think about this feature? Please describe your experience with it.

Page Break

q6 What were your impressions of the questions and answers provided by other participants on Potluck?

Page Break

q7 Would you use Potluck again? Please explain your answer.

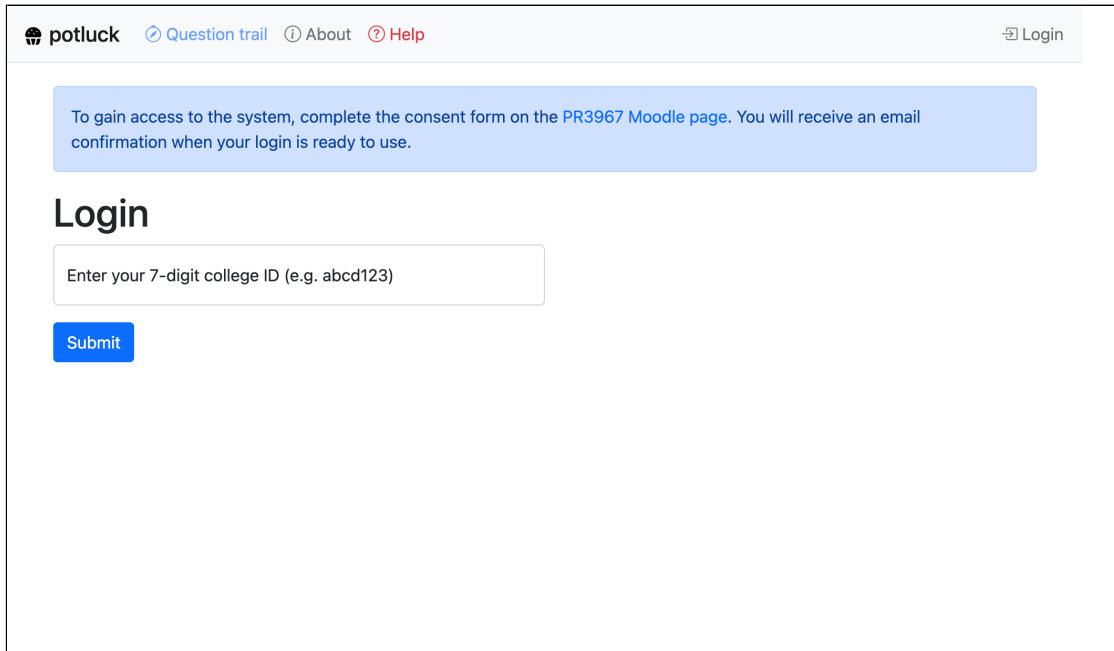
<<This could be for educational purposes or for other types of discussions.>>

End of Block: impressions

F.5 Discussion Prompts

ID	Discussion prompt	Context
A	WK18 – How are symbols used in political representation?	Please give one or two examples of symbols that represent political or social groups.
B	WK18 – Does descriptive representation equal substantive representation?	Please provide a short argument.
C	WK18 – Is modern democracy an elitist system?	Please provide a short argument.
D	WK18 – Whose interest should democracies focus on?	Should the focus be on the interests of all, or on the interests of certain groups?
E	WK19 – Give some examples of supply and demand reasons that lead to the underrepresentation of minorities in legislative assemblies (e.g. parliaments, councils).	Demands refer to voter demands, supply reasons refer to the supply of minority candidates.
F	WK19 – What role do you think racism plays in the underrepresentation of ethnic minorities?	Please explain.
G	WK19 – To what extent does descriptive representation equal substantive representation?	This question is similar to the one asked last week, but this time around base your answer on this week's readings.
H	WK20 – Give some examples of supply and demand reasons that lead to the underrepresentation of women in parliaments around the world.	Demands refer to voter demands, supply reasons refer to the supply of minority candidates. Please base your answers on the readings you have done.
I	WK20 – Does it matter or not whether socially or politically underrepresented groups turn out to vote?	Please explain.
J	WK21 – List as many institutional or systemic factors that influence the level of representation of underrepresented groups.	Base your answer on the readings from all weeks up until now.
K	WK21 – How do parties select candidates?	What do you know about this process?
L	WK23 – Does it matter if political candidates from underrepresented groups are less frequently reported on and/or are reported on more disadvantageously?	Please provide a justification for your answer in relation to the role of candidates in democracies.
M	WK23 – Is news coverage of political candidates gendered?	If so, in what ways?
N	WK24 – Most studies find that those with poor health and/or a disability are less likely to vote in elections. What might be the reasons for this?	Please write down as many reasons as you can think of.
O	WK24 – In recent years a number of so-called convenience voter reforms have been introduced. The idea behind these reforms is that they make voting easier. What forms of voter convenience reforms can you think of?	Please list as many as possible
P	WK25 – Why do you think that – relatively speaking – there is less research on LGBT and political representation?	Please write down as many reasons as you can think of.
Q	WK25 – Several authors in this weeks' readings reported women hold more positive attitudes towards LGBT citizens and candidates. Why do you think this might be the case?	Please base your answers on your knowledge of the literature where possible.
R	WK27 – What is something you have learned from PR3967 that you weren't necessarily aware of before taking this module?	Name whatever comes to mind first.
S	WK27 – Why do you think that intersectional research – relatively speaking – is in short supply?	You may think of multiple reasons.

F.6 Login Page



potluck [Question trail](#) [About](#) [Help](#) [Login](#)

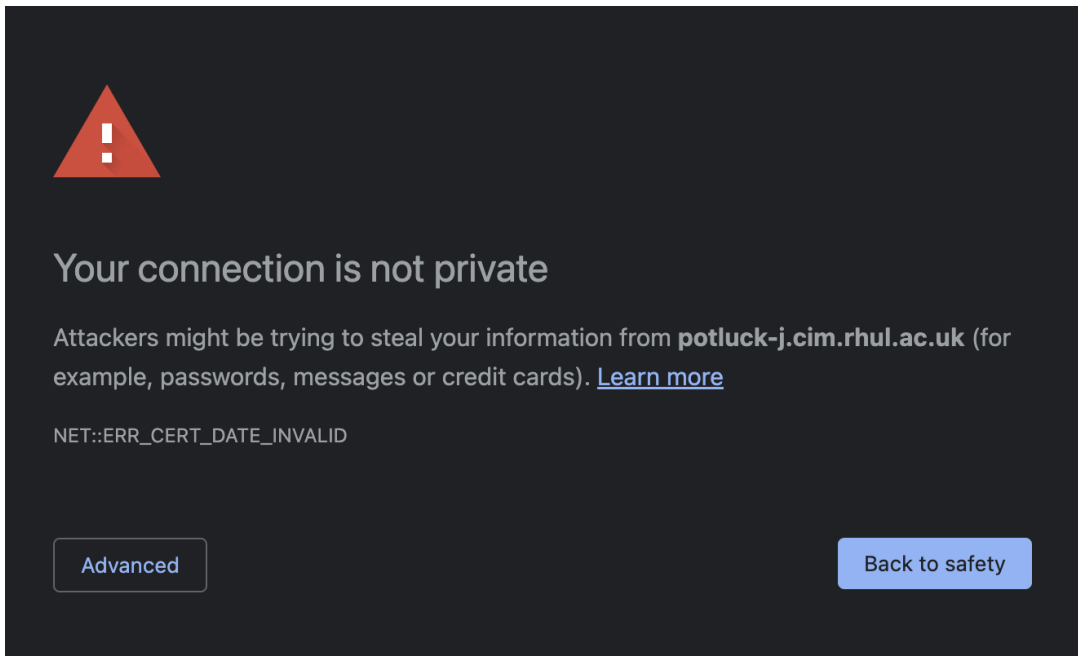
To gain access to the system, complete the consent form on the [PR3967 Moodle page](#). You will receive an email confirmation when your login is ready to use.

Login

Enter your 7-digit college ID (e.g. abcd123)

Submit

F.7 Certificate Error Page



Appendix G

Host Questionnaire Data

1. Based on your experience as a Host on Potluck:

1.1. What makes a good Potluck prompt?

JC: A question that is topical and on which I know there is current discussion and either disagreement or lack of consensus, which needs to be discussed and to draw in different and sometimes opposing views.

RR: A combination of something that is easy to understand and invites discussion. Something that also easily lends itself to asking follow-up questions is good too, but not required.

KS: Once that sets clear boundaries as to what sort of answers are expected. In my case, I wanted students to avoid common sense and for them to answer questions based on their knowledge of the readings. This was trickier than I expected. I usually had an idea of what I roughly wanted the answer to be, but then found students coming up with all sorts of (more or less) relevant things. Setting boundaries is, therefore, important.

1.2. Were there any perceived differences in engagement for prompts with closed vs open questions?

JC: Not that I noticed.

RR: Closed prompts didn't lead to discussion as often.

KS: I never tried closed prompts, because they wouldn't be conducive to a seminar discussion. If I wanted to use closed prompts, then I probably wouldn't use Potluck. It's a discussion system, not a survey platform. Platforms like mentimeter and vevox are better for survey style questions, I think.

1.3. From reading the answers to your prompts, did you come to better understand the views and opinions of the Guest users?

JC: This is an odd case with me as I knew most of the users (and it was pretty easy to guess who was who despite the anonymity). The user group were also fairly homogeneous and likely to have similar views, so it was an awkward set-up for truly testing or observing disagreement to some extent.

RR: Yes.

KS: Yes, I did and on many occasions the students brought up interesting and relevant topics that allowed further discussion in class. On these occasions Potluck really did a fantastic job at augmenting the seminar discussion.

1.4. Hosts have the ability to hide/mask answers and questions that are not conducive to discussion. Did you use this feature? If so, how useful was it? Was it easy to use?

JC: I didn't, but there were no toxic or highly controversial comments, which was due to the nature of the group the user base was drawn from (WHO consultants who, by design, are trained to be diplomatic and measured). If there had been, I do think the functionality would have been easy to use.

RR: I had used the feature in testing leading up to the event, however this was not used during the event. The feature is very easy to use.

KS: I never used the masking/hiding function as there was no need for it. All contributions were polite and helpful to some extent.

1.5. Hosts can engage with Guest users by asking follow-up questions on their answers, and answering Guest-submitted questions. Did you use these features? If so, how useful were they? Were they easy to use?

JC: I did, but I didn't find the system particularly intuitive or easy to use. This was mainly due to the functionality jumping through to a new screen each time - personally would have preferred to see a more drop-down functionality that allowed you to see the other answers/comments at the same time. I also found it awkward that a comment had to be in the form of a question, rather than a statement or additional information that might add to or answer a previous comment/question. This didn't seem to help the flow of discussions or two-way dialogue, whether the users were agreeing or disagreeing. It didn't seem to particularly encourage users to engage in ongoing dialogue.

RR: Yes, this feature is very useful and easy to use.

KS: I did this in the beginning when engagement with Potluck was still good. The functions were very easy to use and students also sometimes replied to follow up questions. Sadly turnout was very low in the second half of term, and as a result engagement with Potluck also dropped drastically.

2. Based on your experience facilitating discussions in general:

2.1. What sort of discussions do you think Potluck would be suitable for and why?

JC: Discussions where opinions need to be canvassed from a large number of people, to see each one's view, but without necessarily protracted discussion. For example, to discuss which is the best of several options and why people think that - e.g. which should the local council prioritise for investment: more cycle lanes, public transport or electric car charging ports? Or what should be the main structure of secondary education in the UK: single-sex, non-selective schools; mixed-sex non-selective schools; single-sex selective schools or mixed-sex selective schools? Or, who should be in the England football squad for the 2022 World Cup? In particular for discussions where there is no 'right' or 'wrong' answer but for which consensus needs to be reached, and on which people can see the reasons others give for their choice. It seems to be a good structure for gathering and ordering a large number of potentially diverse opinions.

RR: In my opinion, Potluck is incredibly useful for open-ended question and answer discussions. I can see it being useful for applications such as market research, where if you demonstrate a product, you can use Potluck to ask several questions, and you can ask follow-up questions if more information is needed.

KS: Discussions that are opinion-based or knowledge-based. Potluck is good for questions that ask people to justify and/or explain their opinion.

2.2. What sort of discussions do you think Potluck would not be suitable for and why?

JC: It didn't seem to be great for community building where people might want to discuss shared interests – e.g. for fans of a particular movie/book franchise, or a sports team, to discuss their interests. This is mainly because it seemed hard to get discussions going and to have a dialogue rather than a question-and-answer session. It would be interesting to see, if the top-level comments were more diverse, if people were more likely to engage with an opinion they disagreed with, in order to change the original poster's mind, or with opinions they agreed with, to reinforce and support that position. This might be interesting to research in future.

RR: I think that Potluck is useful for all types of discussions, however I don't think it would be best used for discussions with a limited selection of options. For example, if you're asking, "What operating system do you use?". If the options are GNU/Linux, Windows or FreeBSD, you can see how that doesn't really invite discussion, and doesn't best utilise what makes Potluck so great.

KS: I wouldn't use Potluck for closed questions. (See question 1.2)

2.3. What impact on the behaviour of participants do you think Potluck might have?

JC: Hard to tell – how easily could it change people's minds or at least explain to them others' positions to bring a consensus to a situation where a decision has to be made or a consensus has to be reached? Could it, for example, allow disgruntled employees to state their grievances to their management anonymously, with explanations of what they are

unhappy about and opportunities to discuss potential solutions? The anonymity levels the playing field in terms of the lowliest employee being able to state their opinion to the CEO in theory but would this happen in practice? How easily could people guess one another's identities in such situations (which might be interesting to research) might impact/influence this.

RR: Potluck can keep a discussion positive. Because moderators are present to hide any post that doesn't contribute to the discussion, the focus of the discussion is kept to the topic, instead of what usually happens on the internet, where a discussion will usually devolve into name-calling and other insults.

KS: I think that Potluck allowed students to learn to develop and present arguments. Some students really used Potluck in a way that fostered seminar discussion and on several occasions they brought up things that were relevant and allowed me to expand upon and/or tie together in the classroom.

2.4. How could Potluck be improved to help facilitate discussion?

JC: I think this depends on what discussion you want to facilitate.

RR: I'm not too sure. I think that Potluck really needs to get bigger and be used more widely before we find out what its limits are. The discussions it was used for during the event were flawlessly facilitated.

KS: In terms of functionality, I think Potluck did what it was supposed to do very well. It's a relatively simple and intuitive system. That said, I think students thought the interface didn't look very appealing. I guess that's a typical Generation Z comment. It needs to look fun like the other applications that they use?!

2.5. What would you change about Potluck and why?

JC: As above, depends on what sort of discussions you want to facilitate, and then what can it add that current platforms can't deliver? I found the functionality not entirely intuitive but users would learn it through practice if there was a strong reason to do so. It would be interesting to see a test with a much larger number of users – so

that the summarising function starts to come into play and we could see how it collates the different opinions/views into a smaller number of summaries and moves towards consensus. Does it pull different views into a common ground or polarise them into echo chambers, with people engaging with views they already agree with to validate/support them rather than engaging with disparate views to understand/learn/debate?

RR: The only thing I'd wish for is to have lower system requirements, so that private instances can be run by event hosts, rather than requiring external hosting. Maybe a Raspberry Pi or a Nvidia Jetson Nano could be used for hosting, however I can foresee that posting would be slower due to running the response generalising network on sub-optimal hardware.

Having said that, it would be good to investigate for future research. Does Potluck require as fast as possible interactions, or is an update when it's ready also fine for a particular use case?

KS: Not much. I think Potluck does what it says on the tin. It works well and has great potential. In my case, lack of participation from the students did hamper this potential somewhat. We were a small group (21 students in theory), where less than half (but often far less than that) used the platform. If only 2-4 students participate, then it is difficult to use the platform as a discussion tool—just like it is difficult to have a good in-class seminar discussion with 2-4 students.

3. Is there anything else I should have asked, or anything you would like to add?

JC: Probably not much above what we've discussed already. A big thing I would say we learnt from reddit during COVID-19 was that it couldn't handle discussion well – comments between people who didn't agree with one another got toxic very quickly and then the subreddits tended to splinter into echo chambers (of people who were very cautious/fully vaccinated/triple-masked/didn't go out, and of people who thought the risk was overblown, lockdowns were unnecessary and it was just a cold, and people who thought it was all a conspiracy and that the government was trying to control them). People don't tend to want to argue – they want to talk to people they agree with/agree with them, so why would any platform appeal to people if it tried to keep them in conversation with people they disagree with/dislike? This is why I think short

engagements to give your opinion on something for which opinions need to be canvassed might be more realistic than as a discussion forum.

One thing to bear in mind about reddit is that reddit is not a single ‘space’ – it’s a collection of subreddits that are sometimes newspapers, sometimes support groups, sometimes helplines, sometimes a special interest group meeting place. . . . What ‘space’ is Potluck recreating online? What offline activity is it taking online? Or is it creating a space that doesn’t/can’t exist offline? It may be doing the latter if you see it as a debating chamber where everyone is shouting at once. You can’t hear everyone simultaneously but the platform can, and can filter and summarise all their views for you. This actually speaks very eloquently to Pierre Lévy’s comments about us needing to order the mass of information online, not simply haul masses of information around with us – it can order more information than we can easily do ‘naturally’. The interesting point would then be how it’s doing that – the WHO infodemic concern is that social media platform algorithms prioritise (a) outrage and (b) popularity regardless of whether it’s true or accurate and (c) stuff similar to what you’ve liked before, creating echo chambers. My big beef with their approach is that people always gravitate towards echo chambers, offline just as much if not more so than online – the Daily Mail, the Telegraph, the Sun. . . all newspapers are much worse echo chambers than any online platform I’ve ever seen but the finger is always pointed at social media. Ironically, what social media actually does is show you a wider range of content than you’d see in a single newspaper/TV channel, not all of which you will agree with and so you associate it more with things you don’t agree with. In other words, I think it does the exact opposite of what it’s usually accused of. Potluck is promising to cut through echo chambers and ensure that (moderately) diverse views are always presented together, while pushing extremism, at either end of the spectrum, off the edges of the ‘front page’. That’s a very valuable functionality if it can actually do it.

RR: You’ve done a fantastic job. My only regret is not thinking of this first.

KS: Not that I can think of. I think Potluck is a great tool for enhancing discussions. I really enjoyed using it and would use it again.

Glossary

bandwidth Limited capacity of time and attention from users of online message boards [109].

contextual inquiry Research method that involves observing and interviewing a user while they are doing some target activity in its intended environment [89].

coordinative agency Means to adjust an activity to meet one's needs [46].

discourse architecture Study and design of computer-mediated communication to support online discussion [175].

ephemeral interest group Low-cost, short-lived, ad hoc online group discussions [23].

free rider problem Situation where individuals benefit from a public good without contributing towards its provision or maintenance [102].

information entropy Form of information overload that occurs when messages are insufficiently organised and difficult to recognise as important [87].

information overload State in which individuals are unable to read and process all available information [99].

online discussion Form of text-based communication where people publicly and asynchronously interact through online message boards; see Section 1.3.

online message board Mode of web-based asynchronous computer-mediated communication that enables users to read, post, and interact with public online messages.

public good Things that are nonexcludable and nonrivalrous [103], e.g., online comments, user ratings.

technical HCI Methodological approach that seeks to directly invent, and enable the indirect invention of, technological solutions to human problems [93, p. 69]; see Section 2.1.

tragedy of the commons Situation where individuals exploit and eventually deplete a publicly shared resource in their own self-interest [81], such as attention in an online discussion.

Acronyms

ACMC asynchronous computer-mediated communication.

API application programming interface.

ARPANET Advanced Research Projects Agency Network.

AST adaptive structuration theory.

ATS automatic text summarisation.

ATTD acceptance test driven development.

BBS bulletin board system.

BTL below-the-line comments.

CGS curved grading scale.

CMC computer-mediated communication.

CQA community question and answering.

CSCL computer-supported collaborative learning.

CSCW computer-supported cooperative work.

DP design principle.

ERD entity-relationship diagram.

GT-lite grounded theory lite.

HCI human-computer interaction.

IBIS Issue-Based Information System.

IID iterative and incremental development.

IMTP infodemic management training programme.

NLP natural language processing.

ORDBMS object-relational database management system.

POC proof-of-concept.

RO research objective.

RtD Research through Design.

SNW social news website.

SQA social question and answering.

SUS System Usability Scale.

UGT uses and gratifications theory.

VLE virtual learning environment.

WHO World Health Organisation.

Bibliography

- [1] H. Abdi and L. J. Williams, “Principal component analysis,” *Wiley interdisciplinary reviews: computational statistics*, vol. 2, no. 4, pp. 433–459, 2010 (cit. on p. 60).
- [2] M. S. Ackerman, A. Swenson, S. Cotterill, and K. DeMaagd, “I-DIAG: From community discussion to knowledge distillation,” in *Communities and Technologies*, M. Huysman, E. Wenger, and V. Wulf, Eds., Dordrecht: Springer Netherlands, 2003, pp. 307–325 (cit. on pp. 23, 57, 134).
- [3] A. Adams and A. Cox, “Questionnaires, in-depth interviews and focus groups,” in *Research Methods for Human-Computer Interaction*, Cambridge, UK: Cambridge University Press, Jan. 2008, pp. 17–34 (cit. on pp. 27, 29, 31, 33).
- [4] B. Allyn, “People are talking about Web3. Is it the Internet of the future or just a buzzword?” *NPR*, Nov. 2021 (cit. on p. 85).
- [5] J. Arguello *et al.*, “Talk to me: Foundations for successful individual-group interactions in online communities,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '06, Montréal, Québec, Canada: Association for Computing Machinery, Apr. 2006, pp. 959–968 (cit. on pp. 46, 65, 71, 72, 134).
- [6] C. Aschwanden, *We Asked 8,500 Internet Commenters Why They Do What They Do*, <https://fivethirtyeight.com/features/we-asked-8500-internet-commenters-why-they-do-what-they-do/>, Nov. 2016 (cit. on pp. 50, 71).

- [7] A. Bächtiger, S. Niemeyer, M. Neblo, M. R. Steenbergen, and J. Steiner, “Disentangling diversity in deliberative democracy: Competing theories, their blind spots and complementarities,” *Journal of Political Philosophy*, vol. 18, no. 1, pp. 32–63, 2010 (cit. on p. 62).
- [8] R. Barnes, “Understanding the affective investment produced through commenting on Australian alternative journalism website New Matilda,” *New Media & Society*, vol. 17, no. 5, pp. 810–826, May 2015 (cit. on pp. 50, 71).
- [9] C. Bauer and K. Figl, ““Active listening” in written online communication - a case study in a course on “soft skills for computer scientists”,” in *2008 38th Annual Frontiers in Education Conference*, Oct. 2008, F2C–1–F2C–6 (cit. on p. 64).
- [10] C. Bauer, K. Figl, and R. Motschnig-Pitrik, “Introducing ‘active listening’ to instant messaging and e-mail: Benefits and limitations,” *IADIS International Journal on WWW/Internet*, vol. 7, no. 2, pp. 1–17, 2010 (cit. on p. 64).
- [11] R. F. Baumeister and M. R. Leary, “Writing narrative literature reviews,” *Review of General Psychology*, vol. 1, no. 3, pp. 311–320, Sep. 1997 (cit. on p. 24).
- [12] S. Bickford, “Emotion Talk and Political Judgment,” *The Journal of Politics*, vol. 73, no. 4, pp. 1025–1037, Oct. 2011 (cit. on p. 63).
- [13] M. Billings and L. A. Watts, “Understanding dispute resolution online: Using text to reflect personal and substantive issues in conflict,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI ’10, Atlanta, Georgia, USA: Association for Computing Machinery, Apr. 2010, pp. 1447–1456 (cit. on p. 63).
- [14] D. M. Blei, “Probabilistic topic models,” *Communications of the ACM*, vol. 55, no. 4, pp. 77–84, 2012 (cit. on p. 59).
- [15] D. M. Blei, A. Y. Ng, and M. I. Jordan, “Latent dirichlet allocation,” *Journal of machine Learning research*, vol. 3, no. Jan, pp. 993–1022, 2003 (cit. on p. 59).

- [16] G. D. Bodie, A. J. Vickery, K. Cannava, and S. M. Jones, “The role of “active listening” in informal helping conversations: Impact on perceptions of listener helpfulness, sensitivity, and supportiveness and discloser emotional improvement,” *Western Journal of Communication*, vol. 79, no. 2, pp. 151–173, Mar. 2015 (cit. on p. 63).
- [17] E. Bradner, W. A. Kellogg, and T. Erickson, “The adoption and use of ‘BABBLE’: A field study of chat in the workplace,” in *ECSCW ’99: Proceedings of the Sixth European Conference on Computer Supported Cooperative Work 12–16 September 1999, Copenhagen, Denmark*, S. Bødker, M. Kyng, and K. Schmidt, Eds., Dordrecht: Springer Netherlands, 1999, pp. 139–158 (cit. on pp. 16, 23, 27).
- [18] V. Braun, *Successful Qualitative Research: A Practical Guide for Beginners*. London: SAGE, 2013 (cit. on pp. 32, 35).
- [19] V. Braun and V. Clarke, “Can I use TA? Should I use TA? Should I not use TA? Comparing reflexive thematic analysis and other pattern-based qualitative analytic approaches,” *Counselling and Psychotherapy Research*, vol. 21, no. 1, pp. 37–47, 2021 (cit. on pp. 32, 33).
- [20] V. Braun and V. Clarke, *Thematic Analysis: A Practical Guide*. Los Angeles: SAGE, 2022 (cit. on p. 33).
- [21] J. Brooke, “SUS: A ‘quick and dirty’ usability scale,” in *Usability Evaluation In Industry*, CRC Press, 1996 (cit. on pp. 33, 100).
- [22] E. T. Brooking and P. W. Singer, “The Very First Social Network,” *Slate*, Oct. 2018 (cit. on p. 41).
- [23] L. Brothers *et al.*, “Supporting informal communication via ephemeral interest groups,” in *Proceedings of the 1992 ACM Conference on Computer-supported Cooperative Work - CSCW ’92*, Toronto, Ontario, Canada: ACM Press, 1992, pp. 84–90 (cit. on pp. 99, 236).
- [24] A. S. Bruckman, *Should You Believe Wikipedia?: Online Communities and the Construction of Knowledge*. New York, UNITED STATES: Cambridge University Press, 2022 (cit. on p. 51).

- [25] S. Buckingham Shum, “Cohere: Towards web 2.0 argumentation,” in *Proc. COMMA’08: 2nd International Conference on Computational Models of Argument*, Toulouse, France: IOS Press, May 2008, pp. 97–108 (cit. on p. 55).
- [26] P. Cairns and A. L. Cox, *Research Methods for Human-Computer Interaction*. Cambridge, UK: Cambridge University Press, 2008 (cit. on p. 28).
- [27] S. Carter, J. Mankoff, S. R. Klemmer, and T. Matthews, “Exiting the clean-room: On ecological validity and ubiquitous computing,” *Human-Computer Interaction*, vol. 23, no. 1, pp. 47–99, Feb. 2008 (cit. on p. 28).
- [28] K. Charmaz, “Grounded theory as an emergent method,” in *Handbook of Emergent Methods*, New York, NY, US: The Guilford Press, 2008, pp. 155–170 (cit. on p. 32).
- [29] G. M. Chen, *Online Incivility and Public Debate: Nasty Talk*. Cham, SWITZERLAND: Springer International Publishing AG, 2017 (cit. on p. 52).
- [30] J. Chen, M. Wang, P. A. Kirschner, and C.-C. Tsai, “The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis,” *Review of Educational Research*, vol. 88, no. 6, pp. 799–843, 2018 (cit. on p. 43).
- [31] J. Cheng, C. Danescu-Niculescu-Mizil, and J. Leskovec, “How community feedback shapes user behavior,” in *Proceedings of the International AAAI Conference on Web and Social Media*, vol. 8, 2014, pp. 41–50 (cit. on pp. 46–48).
- [32] W. Christensen and R. J. Sues, *The Birth of the BBS*, <https://www.chinet.com/html/cbbs.php>, 1998 (cit. on p. 41).
- [33] K. M. Christopherson, “The positive and negative implications of anonymity in Internet social interactions: “On the Internet, Nobody Knows You’re a Dog”,” *Computers in Human Behavior*, Including the Special Issue: Education and Pedagogy with Learning Objects and Learning Designs, vol. 23, no. 6, pp. 3038–3056, Nov. 2007 (cit. on pp. 52, 133).

- [34] D. S. Chung and C. Y. Yoo, "Audience Motivations for Using Interactive Features: Distinguishing Use of Different Types of Interactivity on an Online Newspaper," *Mass Communication and Society*, vol. 11, no. 4, pp. 375–397, Oct. 2008 (cit. on pp. 50, 71).
- [35] J. Cole and A. Stickings, "The Future of Crime Reporting," *The RUSI Journal*, vol. 162, no. 1, pp. 68–78, Jan. 2017 (cit. on p. 51).
- [36] J. Conklin and M. L. Begeman, "gIBIS: A hypertext tool for exploratory policy discussion," *ACM Transactions on Information Systems (TOIS)*, vol. 6, no. 4, pp. 303–331, 1988 (cit. on pp. 55, 56, 71).
- [37] J. Conklin, A. Selvin, S. Buckingham Shum, and M. Sierhuis, "Facilitated hypertext for collective sensemaking: 15 years on from gIBIS," in *Proceedings of the 12th ACM Conference on Hypertext and Hypermedia*, 2001, pp. 123–124 (cit. on p. 56).
- [38] J. Cranshaw and A. Kittur, "The polymath project: Lessons from a successful online collaboration in mathematics," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '11, New York, NY, USA: Association for Computing Machinery, May 2011, pp. 1865–1874 (cit. on p. 16).
- [39] J. W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Method Approaches*, 3rd ed. London: SAGE, 2009 (cit. on pp. 28, 31, 34, 35).
- [40] L. Dahlberg, "Computer-mediated communication and the public sphere: A critical analysis," *Journal of Computer-Mediated Communication*, vol. 7, no. 1, Oct. 2001 (cit. on p. 62).
- [41] N. Dalkey and O. Helmer, "An experimental application of the Delphi method to the use of experts," *Management Science*, vol. 9, no. 3, pp. 458–467, Apr. 1963 (cit. on pp. 17, 54).
- [42] K. Dave, M. Wattenberg, and M. Muller, "Flash forums and forumReader: Navigating a new kind of large-scale online discussion," in *Proceedings of the 2004 ACM Conference on Computer Supported Cooperative Work*, ser. CSCW '04, Chicago, Illinois, USA: Association for Computing Machinery, Nov. 2004, pp. 232–241 (cit. on pp. 19, 45, 59, 61, 128).

- [43] A. De Liddo and R. Strube, “Understanding failures and potentials of argumentation tools for public deliberation,” in *C&T '21: Proceedings of the 10th International Conference on Communities & Technologies - Wicked Problems in the Age of Tech*, Seattle WA USA: ACM, Jun. 2021, pp. 75–88 (cit. on pp. 17, 56, 71).
- [44] G. DeSanctis and M. S. Poole, “Capturing the complexity in advanced technology use: Adaptive structuration theory,” *Organization science*, vol. 5, no. 2, pp. 121–147, 1994 (cit. on p. 133).
- [45] N. Diakopoulos and M. Naaman, “Towards quality discourse in online news comments,” in *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work - CSCW '11*, Hangzhou, China: ACM Press, 2011, p. 133 (cit. on pp. 50, 52, 71, 112, 128).
- [46] M. Dickey-Kurdziolek, M. Schaefer, D. Tatar, and I. P. Renga, “Lessons from thoughtswap-ing: Increasing participants’ coordinative agency in facilitated discussions,” in *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*, ser. CSCW '10, Savannah, Georgia, USA: Association for Computing Machinery, Feb. 2010, pp. 81–90 (cit. on pp. 64–66, 71, 72, 100, 236).
- [47] B. J. Dietvorst, J. P. Simmons, and C. Massey, “Algorithm aversion: People erroneously avoid algorithms after seeing them err,” *Journal of Experimental Psychology: General*, vol. 144, pp. 114–126, 2015 (cit. on p. 135).
- [48] Disqus, *Pseudonyms Drive Communities*, <https://web.archive.org/web/20120112025408/http://disqus.com/research/pseudonyms>, Jan. 2012 (cit. on p. 53).
- [49] J. Donath, *The Social Machine: Designs for Living Online*. Cambridge, MA: MIT Press, 2014 (cit. on pp. 15, 46, 48, 49, 51, 71, 134).
- [50] J. S. Donath, “Identity and deception in the virtual community,” in *Communities in Cyberspace*, Routledge, 2002, pp. 37–68 (cit. on p. 51).
- [51] J. S. Donath, “We Need Online Alter Egos Now More Than Ever,” *Wired*, Apr. 2014 (cit. on pp. 53, 73).

- [52] B. Doub, *Community Memory: Precedents in Social Media and Movements*, <https://computerhistory.org/blog/community-memory-precedents-in-social-media-and-movements/>, Feb. 2016 (cit. on p. 41).
- [53] P. Dourish and M. Chalmers, “Running out of space: Models of information navigation,” in *HCI’94*, Glasgow, UK, 1994 (cit. on p. 46).
- [54] J. W. Drisko and T. Maschi, “Basic Content Analysis,” in *Content Analysis*, J. Drisko and T. Maschi, Eds., Oxford University Press, Dec. 2015, p. 0 (cit. on pp. 31, 106).
- [55] V. J. Dubrovsky, S. Kiesler, and B. N. Sethna, “The Equalization Phenomenon: Status Effects in Computer-Mediated and Face-to-Face Decision-Making Groups,” *Human-computer interaction*, vol. 6, no. 2, pp. 119–146, 1991 (cit. on p. 15).
- [56] S. Dumais, R. Jeffries, D. M. Russell, D. Tang, and J. Teevan, “Understanding user behavior through log data and analysis,” in *Ways of Knowing in HCI*, J. S. Olson and W. A. Kellogg, Eds., New York, NY: Springer, 2014, pp. 349–372 (cit. on pp. 29–31).
- [57] T. Erickson, S. Herring, and W. Sack, “Discourse architectures: Designing and visualizing computer mediated conversation,” in *CHI ’02 Extended Abstracts on Human Factors in Computing Systems*, Minneapolis Minnesota USA: ACM, Apr. 2002, pp. 936–937 (cit. on pp. 18, 45).
- [58] T. Erickson and W. A. Kellogg, “Social translucence: An approach to designing systems that support social processes,” *ACM Transactions on Computer-Human Interaction*, vol. 7, no. 1, pp. 59–83, Mar. 2000 (cit. on pp. 15, 58).
- [59] G. C. Everest, “Basic data structure models explained with a common example,” in *Proc. Fifth Texas Conference on Computing Systems*, 1976, pp. 18–19 (cit. on p. 83).
- [60] S. Faridani, E. Bitton, K. Ryokai, and K. Goldberg, “Opinion Space: A scalable tool for browsing online comments,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI ’10, Atlanta,

- Georgia, USA: Association for Computing Machinery, Apr. 2010, pp. 1175–1184 (cit. on pp. 16, 60, 63, 66, 71, 72, 79).
- [61] S. Fehrman and S. L. Watson, “A systematic review of asynchronous online discussions in online higher education,” *American Journal of Distance Education*, vol. 35, no. 3, pp. 200–213, Jul. 2021 (cit. on p. 43).
- [62] B. Fidler, “Eternal October and the End of Cyberspace,” *IEEE Annals of the History of Computing*, vol. 39, no. 1, pp. 6–7, Jan. 2017 (cit. on p. 42).
- [63] K. Finstad, “The usability metric for user experience,” *Interacting with Computers*, vol. 22, no. 5, pp. 323–327, Sep. 2010 (cit. on p. 33).
- [64] J. S. Fishkin and R. C. Luskin, “Experimenting with a democratic ideal: Deliberative polling and public opinion,” *Acta Politica*, vol. 40, no. 3, pp. 284–298, Sep. 2005 (cit. on p. 63).
- [65] R. Fredheim, A. Moore, and J. Naughton, “Anonymity and online commenting: The broken windows effect and the end of drive-by commenting,” in *Proceedings of the ACM Web Science Conference*, ser. WebSci ’15, New York, NY, USA: Association for Computing Machinery, Jun. 2015, pp. 1–8 (cit. on p. 52).
- [66] B. Friedman, P. H. Kahn, A. Borning, and A. Huldtgren, “Value sensitive design and information systems,” in *Early Engagement and New Technologies: Opening up the Laboratory*, N. Doorn, D. Schuurbiens, I. van de Poel, and M. E. Gorman, Eds., Dordrecht: Springer Netherlands, 2013, pp. 55–95 (cit. on p. 61).
- [67] E. J. Friedman and P. Resnick, “The Social Cost of Cheap Pseudonyms,” *Journal of Economics & Management Strategy*, vol. 10, no. 2, pp. 173–199, 2001 (cit. on p. 73).
- [68] D. Friess and C. Eilders, “A systematic review of online deliberation research: A review of online deliberation research,” *Policy & Internet*, vol. 7, no. 3, pp. 319–339, Sep. 2015 (cit. on p. 62).
- [69] J. Galegher, L. Sproull, and S. Kiesler, “Legitimacy, Authority, and Community in Electronic Support Groups,” *Written Communication*, vol. 15, no. 4, pp. 493–494, Oct. 1998 (cit. on pp. 49, 69, 71).

- [70] B. Gardiner, M. Mansfield, I. Anderson, J. Holder, D. Louter, and M. Ullman, “The dark side of Guardian comments,” *The Guardian*, Apr. 2016 (cit. on p. 15).
- [71] E. Gilbert, “Widespread underprovision on Reddit,” in *Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, San Antonio Texas USA: ACM, Feb. 2013, pp. 803–808 (cit. on pp. 47, 48, 100).
- [72] T. Gillespie, *Custodians of the Internet: Platforms, Content Moderation, and the Hidden Decisions That Shape Social Media*. New Haven, UNITED STATES: Yale University Press, 2018 (cit. on pp. 19, 41).
- [73] B. G. Glaser and A. L. Strauss, *Discovery of Grounded Theory: Strategies for Qualitative Research*. 1st ed. Somerset: Taylor & Francis Group, 1999 (cit. on p. 32).
- [74] Google Jigsaw, *Perspective API*, <https://perspectiveapi.com/>, n.d. (Cit. on p. 77).
- [75] T. Gordon and A. Pease, “RT Delphi: An efficient, “round-less” almost real time Delphi method,” *Technological Forecasting and Social Change*, vol. 73, no. 4, pp. 321–333, May 2006 (cit. on pp. 54, 71).
- [76] J. Graf, J. Erba, and R.-W. Harn, “The role of civility and anonymity on perceptions of online comments,” *Mass Communication and Society*, vol. 20, no. 4, pp. 526–549, Jul. 2017 (cit. on p. 73).
- [77] A. M. Guess and B. A. Lyons, “Misinformation, disinformation, and online propaganda,” *Social media and democracy: The state of the field, prospects for reform*, vol. 10, 2020 (cit. on p. 19).
- [78] S. Gupta and S. K Gupta, “Abstractive summarization: An overview of the state of the art,” *Expert Systems with Applications*, vol. 121, pp. 49–65, May 2019 (cit. on p. 57).
- [79] J. Habermas, S. Lennox, and F. Lennox, “The public sphere: An encyclopedia article (1964),” *New German Critique*, no. 3, pp. 49–55, 1974. JSTOR: 487737 (cit. on p. 62).

- [80] N. Hahn, J. Chang, J. E. Kim, and A. Kittur, “The Knowledge Accelerator: Big picture thinking in small pieces,” in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, San Jose California USA: ACM, May 2016, pp. 2258–2270 (cit. on p. 57).
- [81] G. Hardin, “The tragedy of the commons,” *Science*, vol. 162, no. 3859, pp. 1243–1248, 1968 (cit. on pp. 45, 237).
- [82] S. G. Hart and L. E. Staveland, “Development of NASA-TLX (Task Load Index): Results of empirical and theoretical research,” in *Advances in Psychology*, ser. Human Mental Workload, P. A. Hancock and N. Meshkati, Eds., vol. 52, North-Holland, Jan. 1988, pp. 139–183 (cit. on p. 33).
- [83] M. Hassenzahl, M. Burmester, and F. Koller, “AttrakDiff: Ein fragebogen zur messung wahrgenommener hedonischer und pragmatischer qualität,” in *Mensch & Computer 2003: Interaktion in Bewegung*, ser. Berichte des German Chapter of the ACM, G. Szwillus and J. Ziegler, Eds., Wiesbaden: Vieweg+Teubner Verlag, 2003, pp. 187–196 (cit. on pp. 33, 128).
- [84] M. Hauben and R. Hauben, “The evolution of USENET: The poor man’s ARPANET,” *First Monday*, vol. 3, no. 7, p. 11, 1998 (cit. on p. 42).
- [85] S. C. Hayne and R. E. Rice, “Attribution accuracy when using anonymity in group support systems,” *International Journal of Human-Computer Studies*, vol. 47, no. 3, pp. 429–452, Sep. 1997 (cit. on p. 51).
- [86] S. C. Herring, “Computer-mediated communication on the internet,” *Annual Review of Information Science and Technology*, vol. 36, no. 1, pp. 109–168, 2002 (cit. on pp. 40–42).
- [87] S. R. Hiltz and M. Turoff, “Structuring computer-mediated communication systems to avoid information overload,” *Communications of the ACM*, vol. 28, no. 7, pp. 680–689, 1985 (cit. on pp. 16, 45, 55, 71, 134, 236).
- [88] J. Hollan and S. Stornetta, “Beyond being there,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI ’92, New York, NY, USA: Association for Computing Machinery, Jun. 1992, pp. 119–125 (cit. on p. 98).

- [89] K. Holtzblatt, *Contextual Design: Design for Life*, 2nd ed. Cambridge, MA: Morgan Kaufmann, 2017 (cit. on pp. 29, 34, 102, 236).
- [90] E. Hoque and G. Carenini, “ConVis: A visual text analytic system for exploring blog conversations,” *Computer Graphics Forum*, vol. 33, no. 3, pp. 221–230, Jun. 2014 (cit. on pp. 16, 60, 61, 66).
- [91] E. Hoque and G. Carenini, “ConVisIT: Interactive topic modeling for exploring asynchronous online conversations,” in *Proceedings of the 20th International Conference on Intelligent User Interfaces*, ser. IUI ’15, Atlanta, Georgia, USA: Association for Computing Machinery, Mar. 2015, pp. 169–180 (cit. on pp. 16, 60).
- [92] E. Hoque and G. Carenini, “MultiConVis: A visual text analytics system for exploring a collection of online conversations,” in *Proceedings of the 21st International Conference on Intelligent User Interfaces*, Sonoma California USA: ACM, Mar. 2016, pp. 96–107 (cit. on pp. 16, 60).
- [93] S. E. Hudson and J. Mankoff, “Concepts, values, and methods for technical human–computer interaction research,” in *Ways of Knowing in HCI*, J. S. Olson and W. A. Kellogg, Eds., New York, NY: Springer, 2014, pp. 69–93 (cit. on pp. 19, 22–26, 237).
- [94] D. Hume, *A Treatise of Human Nature*. Clarendon Press, 1896 (cit. on p. 48).
- [95] L. Iandoli, I. Quinto, A. De Liddo, and S. Buckingham Shum, “On online collaboration and construction of shared knowledge: Assessing mediation capability in computer supported argument visualization tools,” *Journal of the Association for Information Science and Technology*, vol. 67, no. 5, pp. 1052–1067, 2016 (cit. on p. 56).
- [96] S. Isenmann and W. D. Reuter, “IBIS—a convincing concept. . . but a lousy instrument?” In *Proceedings of the 2nd Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, 1997, pp. 163–172 (cit. on p. 56).

- [97] N. James and H. Busher, "Internet interviewing," in *The SAGE Handbook of Interview Research: The Complexity of the Craft*, 2nd ed., Thousand Oaks, CA: SAGE Publications, Inc., 2012, pp. 177–188 (cit. on p. 35).
- [98] Q. Jones and S. Rafaeli, "Time to split, virtually: 'Discourse architecture' and 'community building' create vibrant virtual publics," *Electronic Markets*, vol. 10, no. 4, pp. 214–223, 2000 (cit. on p. 18).
- [99] Q. Jones, G. Ravid, and S. Rafaeli, "Information overload and the message dynamics of online interaction spaces: A theoretical model and empirical exploration," *Information Systems Research*, vol. 15, no. 2, pp. 194–210, Jun. 2004 (cit. on pp. 16, 40, 45, 71, 134, 236).
- [100] S. Joty, G. Carenini, and R. T. Ng, "Topic segmentation and labeling in asynchronous conversations," *Journal of Artificial Intelligence Research*, vol. 47, pp. 521–573, 2013 (cit. on p. 60).
- [101] E. Katz, H. Haas, and M. Gurevitch, "On the Use of the Mass Media for Important Things," *American sociological review*, vol. 38, no. 2, pp. 164–181, 1973 (cit. on p. 50).
- [102] I. Kaul, I. Grunberg, and M. Stern, *Global Public Goods: International Cooperation in the 21st Century*. Oxford University Press, Jul. 1999 (cit. on p. 236).
- [103] I. Kaul, I. Grunberg, and M. A. Stern, "Defining global public goods," in *Global Public Goods: International Cooperation in the 21st Century*, Oxford University Press, 1999, pp. 2–19 (cit. on pp. 49, 237).
- [104] H.-W. Kim, J. R. Zheng, and S. Gupta, "Examining knowledge contribution from the perspective of an online identity in blogging communities," *Computers in Human Behavior*, 2009 Fifth International Conference on Intelligent Computing, vol. 27, no. 5, pp. 1760–1770, Sep. 2011 (cit. on p. 51).
- [105] H. Kim, H. Kim, K. J. Jo, and J. Kim, "StarryThoughts: Facilitating diverse opinion exploration on social issues," *Proceedings of the ACM on Human-Computer Interaction*, vol. 5, no. CSCW1, pp. 1–29, Apr. 2021 (cit. on pp. 16, 61, 66).

- [106] M. Klein, “How to harvest collective wisdom on complex problems: An introduction to the MIT Deliberatorium,” *Center for Collective Intelligence Working Paper*, 2007 (cit. on pp. 15, 17, 56, 71).
- [107] A. Koller, “The public sphere and comparative historical research: An introduction,” *Social Science History*, vol. 34, no. 3, pp. 261–290, 2010. JSTOR: 40927613 (cit. on p. 62).
- [108] P. Kollock, “The economies of online cooperation,” in *Communities in Cyberspace*, London, UNITED KINGDOM: Taylor & Francis Group, 1999, pp. 219–237 (cit. on pp. 112, 139).
- [109] P. Kollock and M. Smith, “Managing the virtual commons: Cooperation and conflict in computer communities,” in *Computer-Mediated Communication Linguistic, Social, and Cross-Cultural Perspectives*, ser. Pragmatics & Beyond New Series, S. C. Herring, Ed., Amsterdam: John Benjamins Publishing Company, Jun. 1996, pp. 109–128 (cit. on pp. 45, 48, 71, 236).
- [110] T. Kriplean, J. Morgan, D. Freelon, A. Borning, and L. Bennett, “Supporting reflective public thought with ConsiderIt,” in *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work - CSCW '12*, Seattle, Washington, USA: ACM Press, 2012, p. 265 (cit. on pp. 27, 56, 62, 63, 66, 71, 72).
- [111] T. Kriplean, M. Toomim, J. Morgan, A. Borning, and A. Ko, “Is this what you meant? Promoting listening on the web with Reflect,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '12, Austin, Texas, USA: Association for Computing Machinery, May 2012, pp. 1559–1568 (cit. on pp. 27, 64–66, 71, 72).
- [112] M. A. Kuykendall, “A Host is a Host is a Host,” *BBS Magazine*, vol. 5, no. 11, pp. 44–50, Nov. 1994 (cit. on p. 41).
- [113] C. Lampe and P. Resnick, “Slash(dot) and burn: Distributed moderation in a large online conversation space,” in *Proceedings of the 2004 Conference on Human Factors in Computing Systems - CHI '04*, Vienna, Austria: ACM Press, 2004, pp. 543–550 (cit. on pp. 43, 46).

- [114] C. Lampe, R. Wash, A. Velasquez, and E. Ozkaya, “Motivations to participate in online communities,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '10, New York, NY, USA: Association for Computing Machinery, Apr. 2010, pp. 1927–1936 (cit. on pp. 50, 71).
- [115] C. Larman and V. Basili, “Iterative and incremental development: A brief history,” *Computer*, vol. 36, no. 6, pp. 47–56, Jun. 2003 (cit. on p. 25).
- [116] C. Larman, *Agile and Iterative Development: A Manager's Guide* (Agile Software Development Series). Boston: Addison-Wesley, 2004 (cit. on p. 25).
- [117] A. Leavitt, ““This is a throwaway account”: Temporary technical identities and perceptions of anonymity in a massive online community,” in *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, ser. CSCW '15, New York, NY, USA: ACM, 2015, pp. 317–327 (cit. on pp. 52, 73).
- [118] E.-J. Lee and Y. J. Jang, “What Do Others' Reactions to News on Internet Portal Sites Tell Us? Effects of Presentation Format and Readers' Need for Cognition on Reality Perception,” *Communication Research*, vol. 37, no. 6, pp. 825–846, Dec. 2010 (cit. on pp. 49, 69, 71).
- [119] B. M. Leiner *et al.*, “A brief history of the internet,” *ACM SIGCOMM Computer Communication Review*, vol. 39, no. 5, pp. 22–31, Oct. 2009 (cit. on p. 40).
- [120] G. Leshed, “Silencing the clatter: Removing anonymity from a corporate online community,” *Online deliberation: Design, research, and practice*, pp. 243–251, 2009 (cit. on p. 52).
- [121] J. Lewis, “Sample Sizes for Usability Studies: Additional Considerations,” *Human Factors The Journal of the Human Factors and Ergonomics Society*, vol. 36, pp. 368–378, Feb. 1994 (cit. on p. 26).
- [122] J. R. Lewis, “IBM computer usability satisfaction questionnaires: Psychometric evaluation and instructions for use,” *International Journal of Human-Computer Interaction*, vol. 7, no. 1, pp. 57–78, Jan. 1995 (cit. on p. 33).

- [123] J. R. Lewis, “Measuring perceived usability: The CSUQ, SUS, and UMUX,” *International Journal of Human–Computer Interaction*, vol. 34, no. 12, pp. 1148–1156, Dec. 2018 (cit. on pp. 33, 103).
- [124] Z. Liang, J. Du, and C. Li, “Abstractive social media text summarization using selective reinforced Seq2Seq attention model,” *Neurocomputing*, vol. 410, pp. 432–440, Oct. 2020 (cit. on p. 57).
- [125] E. Lieu, “Designing for constructive online discussion,” in *Proceedings of the 35th British HCI and Doctoral Consortium 2022*, ser. HCI2022, Keele, Staffordshire, UK: BCS Learning and Development, Jul. 2022 (cit. on pp. 20, 22).
- [126] E. Lieu, J. Cole, and C. Watkins, “Bring something to the Potluck: A system for inclusive and reciprocal online discussion,” in *Proceedings of the 35th British HCI and Doctoral Consortium 2022*, ser. HCI2022, Keele, Staffordshire, UK: BCS Learning and Development, Jul. 2022 (cit. on pp. 20, 68, 90–92).
- [127] H. A. Linstone and M. Turoff, *The Delphi Method*. Addison-Wesley Reading, MA, 1975 (cit. on pp. 54, 55, 71).
- [128] C. J. Lintott *et al.*, “Galaxy Zoo: Morphologies derived from visual inspection of galaxies from the Sloan Digital Sky Survey,” *Monthly Notices of the Royal Astronomical Society*, vol. 389, no. 3, pp. 1179–1189, Sep. 2008 (cit. on p. 58).
- [129] S. Liu, M. X. Zhou, S. Pan, W. Qian, W. Cai, and X. Lian, “Interactive, topic-based visual text summarization and analysis,” in *Proceedings of the 18th ACM Conference on Information and Knowledge Management*, Hong Kong China: ACM, Nov. 2009, pp. 543–552 (cit. on pp. 59, 61, 66).
- [130] H. P. Luhn, “The automatic creation of literature abstracts,” *IBM Journal of Research and Development*, vol. 2, no. 2, pp. 159–165, Apr. 1958 (cit. on p. 57).
- [131] A. Luotonen and T. Berners-Lee, *WIT: W3 Interactive Talk: User information*, <https://www.w3.org/WIT/User/Overview.html> (cit. on p. 42).

- [132] S. Malinen, “Understanding user participation in online communities: A systematic literature review of empirical studies,” *Computers in Human Behavior*, vol. 46, pp. 228–238, May 2015 (cit. on p. 42).
- [133] G. Masullo Chen, A. Muddiman, T. Wilner, E. Pariser, and N. J. Stroud, “We should not get rid of incivility online,” *Social Media + Society*, vol. 5, no. 3, pp. 1–5, Apr. 2019 (cit. on p. 52).
- [134] J. N. Matias, *The real name fallacy*, <https://coralproject.net/blog/the-real-name-fallacy/>, Jan. 2017 (cit. on p. 52).
- [135] M. McCluskey and J. Hmielowski, “Opinion expression during social conflict: Comparing online reader comments and letters to the editor,” *Journalism*, vol. 13, pp. 303–319, Apr. 2012 (cit. on p. 53).
- [136] N. McDonald, S. Schoenebeck, and A. Forte, “Reliability and Inter-rater Reliability in Qualitative Research: Norms and Guidelines for CSCW and HCI Practice,” *Proceedings of the ACM on Human-Computer Interaction*, vol. 3, no. CSCW, pp. 1–23, Nov. 2019 (cit. on p. 31).
- [137] P. Michelucci and J. L. Dickinson, “The power of crowds,” *Science*, vol. 351, no. 6268, pp. 32–33, Jan. 2016 (cit. on p. 135).
- [138] A. de Moor and M. Aakhus, “Argumentation support: From technologies to tools,” *Communications of the ACM*, vol. 49, no. 3, pp. 93–98, 2006 (cit. on p. 55).
- [139] A. Moore, “Anonymity, pseudonymity, and deliberation: Why not everything should be connected,” *Journal of Political Philosophy*, vol. 26, no. 2, pp. 169–192, 2018 (cit. on pp. 51, 52).
- [140] A. Moore, R. Fredheim, D. Wyss, and S. Beste, “Deliberation and identity rules: The effect of anonymity, pseudonyms and real-name requirements on the cognitive complexity of online news comments,” *Political Studies*, vol. 69, no. 1, pp. 45–65, Feb. 2021 (cit. on pp. 52, 53, 73).

- [141] M. R. Morris, J. Teevan, and K. Panovich, “What do people ask their social networks, and why? A survey study of status message Q&A behavior,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '10, New York, NY, USA: Association for Computing Machinery, Apr. 2010, pp. 1739–1748 (cit. on pp. 105, 106).
- [142] M. Moshagen and M. T. Thielsch, “Facets of visual aesthetics,” *International Journal of Human-Computer Studies*, vol. 68, no. 10, pp. 689–709, Oct. 2010 (cit. on pp. 33, 128).
- [143] L. Muchnik, S. Aral, and S. J. Taylor, “Social influence bias: A randomized experiment,” *Science*, vol. 341, no. 6146, pp. 647–651, Aug. 2013 (cit. on pp. 16, 47, 48).
- [144] H. Müller, A. Sedley, and E. Ferrall-Nunge, “Survey research in HCI,” in *Ways of Knowing in HCI*, J. S. Olson and W. A. Kellogg, Eds., New York, NY: Springer, 2014, pp. 229–266 (cit. on pp. 31–33, 116).
- [145] M. J. Muller and S. Kuhn, “Participatory design,” *Communications of the ACM*, vol. 36, no. 6, pp. 24–28, 1993 (cit. on p. 23).
- [146] R. Munroe, *Reddit’s new comment sorting system*, Oct. 2009 (cit. on pp. 43, 46, 138).
- [147] S. Myers, “Empathic listening: Reports on the experience of being heard,” *Journal of Humanistic Psychology*, vol. 40, no. 2, pp. 148–173, Apr. 2000 (cit. on p. 63).
- [148] T. K. Naab and A. Sehl, “Studies of user-generated content: A systematic review,” *Journalism*, vol. 18, no. 10, pp. 1256–1273, 2017 (cit. on p. 42).
- [149] K. K. Nam and M. S. Ackerman, “Arkose: Reusing informal information from online discussions,” in *Proceedings of the 2007 International ACM Conference on Supporting Group Work*, ser. GROUP '07, New York, NY, USA: Association for Computing Machinery, Nov. 2007, pp. 137–146 (cit. on pp. 16, 23, 45, 49, 57, 65, 71, 72, 134).

- [150] M. Nelimarkka, A. Salovaara, B. Semaan, and G. Jacucci, “Theory-driven collocated CMC: A study of collocated mediated interaction as a public sphere,” in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*, Denver Colorado USA: ACM, May 2017, pp. 4534–4547 (cit. on p. 63).
- [151] J. Nielsen, *Usability Engineering*. Cambridge, Mass.: AP Professional, 1993 (cit. on p. 34).
- [152] E. Noelle-Neumann, “The Spiral of Silence A Theory of Public Opinion,” *Journal of Communication*, vol. 24, no. 2, pp. 43–51, 1974 (cit. on p. 50).
- [153] B. Nonnecke and J. Preece, “Lurker demographics: Counting the silent,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '00*, The Hague, The Netherlands: ACM Press, 2000, pp. 73–80 (cit. on p. 48).
- [154] E. Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Canto Classics). Cambridge: University Press, 2015 (cit. on p. 139).
- [155] S. Patel, “Reddit Claims 52 Million Daily Users, Revealing a Key Figure for Social-Media Platforms,” *Wall Street Journal*, Dec. 2020 (cit. on p. 16).
- [156] L. F. Pendry and J. Salvatore, “Individual and social benefits of online discussion forums,” *Computers in Human Behavior*, vol. 50, pp. 211–220, Sep. 2015 (cit. on pp. 15, 16).
- [157] F. Perraudin, B. Quinn, and K. Rawlinson, “Theresa May resignation: Tories to choose new prime minister by July – as it happened,” *The Guardian*, May 2019 (cit. on p. 45).
- [158] P. Pirolli, P. Schank, M. Hearst, and C. Diehl, “Scatter/gather browsing communicates the topic structure of a very large text collection,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems Common Ground - CHI '96*, Vancouver, British Columbia, Canada: ACM Press, 1996, pp. 213–220 (cit. on p. 16).

- [159] A. Poole and L. J. Ball, “Eye tracking in HCI and usability research,” in *Encyclopedia of Human Computer Interaction*, IGI global, 2006, pp. 211–219 (cit. on p. 106).
- [160] K. Pugh, *Lean-Agile Acceptance Test-Driven Development: Better Software Through Collaboration* (Net Objectives Lean-Agile Series). Addison-Wesley Professional, 2010 (cit. on p. 25).
- [161] D. R. Radev, E. Hovy, and K. McKeown, “Introduction to the special issue on summarization,” *Computational Linguistics*, vol. 28, no. 4, pp. 399–408, Dec. 2002 (cit. on p. 57).
- [162] W. Rauch, “The decision Delphi,” *Technological Forecasting and Social Change*, vol. 15, no. 3, pp. 159–169, Nov. 1979 (cit. on p. 55).
- [163] M. E. Raven and A. Flanders, “Using contextual inquiry to learn about your audiences,” *ACM SIGDOC Asterisk Journal of Computer Documentation*, vol. 20, no. 1, pp. 1–13, Feb. 1996 (cit. on p. 34).
- [164] J. M. Reagle, *Reading the Comments: Likers, Haters, and Manipulators at the Bottom of the Web*. Cambridge, Massachusetts: MIT Press, 2015 (cit. on pp. 15, 16, 43, 44, 46, 52, 71).
- [165] Reddit, *Press - Reddit*, <https://www.redditinc.com/press>, Jan. 2021 (cit. on p. 15).
- [166] N. Reimers and I. Gurevych, “Sentence-BERT: Sentence embeddings using siamese BERT-networks,” in *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)*, Hong Kong, China: Association for Computational Linguistics, Nov. 2019, pp. 3982–3992 (cit. on p. 82).
- [167] B. J. Reiser, “Scaffolding Complex Learning: The Mechanisms of Structuring and Problematizing Student Work,” *The Journal of the Learning Sciences*, vol. 13, no. 3, pp. 273–304, 2004. JSTOR: 1466939 (cit. on p. 113).
- [168] H. Rheingold, *The Virtual Community: Homesteading on the Electronic Frontier*. MIT Press, Oct. 2000 (cit. on pp. 40, 41).

- [169] P. Rossini, “Disentangling Uncivil and Intolerant Discourse in Online Political Talk,” in R. G. Boatright, T. J. Shaffer, S. Sobieraj, and D. G. Young, Eds., New York: Routledge, 2019, pp. 142–157 (cit. on p. 52).
- [170] D. Rotman *et al.*, “Motivations affecting initial and long-term participation in citizen science projects in three countries,” *iConference 2014 Proceedings*, Mar. 2014 (cit. on p. 58).
- [171] I. Rowe, “Civility 2.0: A comparative analysis of incivility in online political discussion,” *Information, Communication & Society*, vol. 18, no. 2, pp. 121–138, Feb. 2015 (cit. on p. 73).
- [172] I. Rowe, “Deliberation 2.0: Comparing the Deliberative Quality of Online News User Comments Across Platforms,” *Journal of Broadcasting & Electronic Media*, vol. 59, no. 4, pp. 539–555, Oct. 2015 (cit. on p. 16).
- [173] G. Rugg, *A Gentle Guide to Research Methods*. Maidenhead: Open University Press, 2007 (cit. on pp. 29, 31).
- [174] W. Sack, “Conversation Map: A content-based Usenet newsgroup browser,” in *Proceedings of the 5th International Conference on Intelligent User Interfaces*, New Orleans Louisiana USA: ACM, Jan. 2000, pp. 233–240 (cit. on pp. 16, 59).
- [175] W. Sack, “Discourse architecture and very large-scale conversation,” *Digital formations: IT and new architectures in the global realm*, pp. 242–282, 2005 (cit. on pp. 14, 18, 236).
- [176] L. M. Sanders, “Against deliberation,” *Political theory*, vol. 25, no. 3, pp. 347–376, 1997 (cit. on p. 63).
- [177] A. D. Santana, “Toward quality discourse: Measuring the effect of user identity in commenting forums,” *Newspaper Research Journal*, vol. 40, no. 4, pp. 467–486, Dec. 2019 (cit. on pp. 52, 87).
- [178] J. Sauro and J. R. Lewis, *Quantifying the User Experience: Practical Statistics for User Research*. Morgan Kaufmann, 2016 (cit. on pp. 33, 108, 122).

- [179] O. Scheuer, F. Loll, N. Pinkwart, and B. M. McLaren, “Computer-supported argumentation: A review of the state of the art,” *International Journal of Computer-Supported Collaborative Learning*, vol. 5, no. 1, pp. 43–102, Mar. 2010 (cit. on p. 43).
- [180] M. Schindler and E. Domahidi, “The growing field of interdisciplinary research on user comments: A computational scoping review,” *New Media & Society*, vol. 23, no. 8, pp. 2474–2492, Aug. 2021 (cit. on p. 43).
- [181] D. Schneider, J. de Souza, and E. M. Lucas, “Towards a typology of social news apps from a Crowd Computing perspective,” in *2014 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, Oct. 2014, pp. 1134–1140 (cit. on p. 43).
- [182] C. R. Scott, S. A. Rains, and M. Haseki, “Anonymous Communication Unmasking Findings Across Fields,” *Annals of the International Communication Association*, vol. 35, no. 1, pp. 299–340, Jan. 2011 (cit. on pp. 52, 87).
- [183] B. Semaan, H. Faucett, S. P. Robertson, M. Maruyama, and S. Douglas, “Designing political deliberation environments to support interactions in the public sphere,” in *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, ser. CHI ’15, New York, NY, USA: Association for Computing Machinery, Apr. 2015, pp. 3167–3176 (cit. on pp. 62, 66, 71, 72).
- [184] F. M. Shipman and C. C. Marshall, “Formality considered harmful: Experiences, emerging themes, and directions on the use of formal representations in interactive systems,” *Computer Supported Cooperative Work (CSCW)*, vol. 8, no. 4, pp. 333–352, Dec. 1999 (cit. on pp. 56, 58, 100).
- [185] C. Shirky, *Here Comes Everybody: The Power of Organizing without Organizations*. London: Allen Lane, 2008 (cit. on pp. 16, 19, 49, 69, 71).
- [186] K. A. Siek, G. R. Hayes, M. W. Newman, and J. C. Tang, “Field deployments: Knowing from using in context,” in *Ways of Knowing in HCI*, J. S. Olson and W. A. Kellogg, Eds., New York, NY: Springer, 2014, pp. 119–142 (cit. on pp. 26–28, 34, 90, 91, 129, 137).

- [187] C. Small, M. Bjorkegren, T. Erkkilä, L. Shaw, and C. Megill, “Polis: Scaling Deliberation by Mapping High Dimensional Opinion Spaces,” *RECERCA. Revista de Pensament i Anàlisi*, vol. 26, no. 2, pp. 1–26, Jul. 2021 (cit. on pp. 16, 92).
- [188] C. Solis and X. Wang, “A study of the characteristics of Behaviour Driven Development,” in *2011 37th EUROMICRO Conference on Software Engineering and Advanced Applications*, Aug. 2011, pp. 383–387 (cit. on p. 143).
- [189] E. Spiers, “A Force Of Nature,” *Forbes*, vol. 186, no. 7, p. 58, Oct. 2010 (cit. on p. 44).
- [190] N. Springer, I. Engelmann, and C. Pfaffinger, “User comments: Motives and inhibitors to write and read,” *Information, Communication & Society*, vol. 18, no. 7, pp. 798–815, Jul. 2015 (cit. on pp. 44, 48, 50, 52, 71, 73, 112, 128, 133).
- [191] K. Stanoevska-Slabeva and B. Schmid, “A typology of online communities and community supporting platforms,” in *Proceedings of the 34th Annual Hawaii International Conference on System Sciences*, Jan. 2001, pp. 1–10 (cit. on p. 19).
- [192] M. Steinert, “A dissensus based online Delphi approach: An explorative research tool,” *Technological Forecasting and Social Change*, vol. 76, no. 3, pp. 291–300, Mar. 2009 (cit. on pp. 55, 71).
- [193] G. M. Stern, “Echo: The virtual salon of NYC,” *Link-Up*, vol. 13, no. 6, pp. 12–14, Nov. 1996 (cit. on p. 41).
- [194] J. E. Stiglitz, “Knowledge as a global public good,” *Global public goods: International cooperation in the 21st century*, vol. 308, pp. 308–325, 1999 (cit. on p. 49).
- [195] G. Stoddard, “Popularity dynamics and intrinsic quality in reddit and hacker news,” in *Proceedings of the International AAAI Conference on Web and Social Media*, vol. 9, 2015, pp. 416–425 (cit. on pp. 43, 138).

- [196] N. J. Stroud, E. V. Duyn, A. Alizor, A. Alibhai, and C. Lang, *Comment Section Survey Across 20 News Sites*, <https://mediaengagement.org/wp-content/uploads/2017/01/Comment-Section-Survey-Across-20-News-Sites.pdf>, 2017 (cit. on pp. 50, 71).
- [197] A. Sukumaran, S. Vezich, M. McHugh, and C. Nass, “Normative influences on thoughtful online participation,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '11, New York, NY, USA: Association for Computing Machinery, May 2011, pp. 3401–3410 (cit. on pp. 61, 71, 72, 87).
- [198] J. Suler, “The online disinhibition effect,” *Cyberpsychology & behavior*, vol. 7, no. 3, pp. 321–326, 2004 (cit. on p. 52).
- [199] I. Tampe, M. Mendoza, and E. Milios, “Neural abstractive unsupervised summarization of online news discussions,” in *Intelligent Systems and Applications*, K. Arai, Ed., ser. Lecture Notes in Networks and Systems, Cham: Springer International Publishing, 2022, pp. 822–841 (cit. on p. 57).
- [200] S. Tian, A. X. Zhang, and D. Karger, “A system for interleaving discussion and summarization in online collaboration,” *Proceedings of the ACM on Human-Computer Interaction*, vol. 4, no. CSCW3, pp. 1–27, Jan. 2021. arXiv: 2009.07446 (cit. on pp. 58, 65, 71).
- [201] T. S. Tullis and J. N. Stetson, “A Comparison of Questionnaires for Assessing Website Usability,” in *Usability Professionals Association (UPA) 2004 Conference*, Minneapolis, MN, 2004 (cit. on p. 33).
- [202] C. W. Turner, J. R. Lewis, and J. Nielsen, “Determining usability test sample size,” *International encyclopedia of ergonomics and human factors*, vol. 3, no. 2, pp. 3084–3088, 2006 (cit. on p. 26).
- [203] M. Turoff, “The design of a policy Delphi,” *Technological Forecasting and Social Change*, vol. 2, no. 2, pp. 149–171, Jan. 1970 (cit. on p. 54).
- [204] L. Van Der Maaten, E. Postma, and J. Van den Herik, “Dimensionality reduction: A comparative review,” *J Mach Learn Res*, vol. 10, no. 66-71, p. 13, 2009 (cit. on p. 60).

- [205] A. Vaswani *et al.*, “Attention is all you need,” in *Advances in Neural Information Processing Systems*, vol. 30, Curran Associates, Inc., 2017 (cit. on p. 57).
- [206] R. A. Virzi, “Refining the test phase of usability evaluation: How many subjects is enough?” *Human factors*, vol. 34, no. 4, pp. 457–468, 1992 (cit. on p. 26).
- [207] L. von Ahn and L. Dabbish, “Labeling images with a computer game,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ser. CHI '04, New York, NY, USA: Association for Computing Machinery, Apr. 2004, pp. 319–326 (cit. on p. 58).
- [208] Vox Media, *Coral by Vox Media relaunches, ready to build better communities for publishers around the world*, Sep. 2019 (cit. on p. 44).
- [209] J. B. Walther and J.-w. Jang, “Communication processes in participatory websites,” *Journal of Computer-Mediated Communication*, vol. 18, no. 1, pp. 2–15, Oct. 2012 (cit. on pp. 49, 69, 71, 73).
- [210] S. Whittaker, L. Terveen, W. Hill, and L. Cherny, “The dynamics of mass interaction,” in *Proceedings of the 1998 ACM Conference on Computer Supported Cooperative Work*, Seattle Washington USA: ACM, Nov. 1998, pp. 257–264 (cit. on pp. 16, 45, 46, 71, 134).
- [211] World Health Organisation, *Infodemic*, <https://www.who.int/health-topics/infodemic> (cit. on p. 91).
- [212] Z. Xiao, M. X. Zhou, W. Chen, H. Yang, and C. Chi, “If I hear you correctly: Building and evaluating interview chatbots with active listening skills,” in *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, Honolulu HI USA: ACM, Apr. 2020, pp. 1–14 (cit. on pp. 64–66, 71, 72, 81).
- [213] GE Xun and S. M. Land, “A conceptual framework for scaffolding ill-structured problem-solving processes using question prompts and peer interactions,” *Educational Technology Research and Development*, vol. 52, no. 2, pp. 5–22, Jun. 2004 (cit. on p. 125).

- [214] A. X. Zhang, L. Verou, and D. Karger, “Wikum: Bridging discussion forums and wikis using recursive summarization,” in *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, Portland, Oregon, USA: ACM Press, Feb. 2017, pp. 2082–2096 (cit. on pp. 16, 56, 58, 65, 71, 72, 134).
- [215] J. Zimmerman and J. Forlizzi, “Research through Design in HCI,” in *Ways of Knowing in HCI*, J. S. Olson and W. A. Kellogg, Eds., New York, NY: Springer, 2014, pp. 167–189 (cit. on p. 22).
- [216] J. Zimmerman, J. Forlizzi, and S. Evenson, “Research through Design as a method for interaction design research in HCI,” in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, San Jose California USA: ACM, Apr. 2007, pp. 493–502 (cit. on p. 22).