Appendix: Components and Functions of Crowdsourcing Systems – A Systematic Literature Review

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Abstract. Many organizations are now starting to introduce crowdsourcing as a new model of business to outsource tasks, which are traditionally performed by a small group of people, to an undefined large workforce. While the utilization of crowdsourcing offers a lot of advantages, the development of the required system carries some risks, which are reduced by establishing a profound theoretical foundation. Thus, this article strives to gain a better understanding of what crowdsourcing systems are and what typical design aspects are considered in the development of such systems. In this paper, the author conducted a systematic literature review in the domain of crowdsourcing systems. As a result, 17 definitions of crowdsourcing systems were found and categorized into four perspectives: the organizational, the technical, the functional, and the human-centric. In the second part of the results, the author derived and presented components and functions that are implemented in a crowdsourcing system.

Keywords: crowdsourcing, crowdsourcing system, crowdsourcing application, crowdsourcing platform, systematic literature review.

1 Relevant Studies

ID	Author	Date	Database	Publication type	Contribution type	Research type
1	Hossain [1]	2012	IEEE	Conference	motivational factors and incentives	literature review
2	Hirth et al. [2]	2011	IEEE	Conference	comparison Microworkers and Mturk	evaluation research
3	Hirth et al. [3]	2011	IEEE	Conference	validation mechanisms	validation research
4	Yuen et al. [4]	2011	IEEE	Journal	classification scheme	literature review
5	Zhang and van der Schaar [5]	2012	IEEE	Conference	framework for incentive protocols (simulation)	validation research

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ID	Author	Date	Database	Publication type	Contribution type	Research type
6	Gao et al. [6]	2011	IEEE	Journal	disaster relief crowdsourcing applications	experience paper
7	Karger et al. [7]	2011	IEEE	Conference	model for task assignment and evaluation	solution proposal
8	Zhai et al. [8]	2011	IEEE	Conference	civil engineering crowdsourcing applications (prototype development, experiment)	evaluation research
9	Sharifi et al. [9]	2011	IEEE	Conference	web threats detection crowdsourcing system	solution proposal
10	Chen et al. [10]	2010	IEEE	Journal	quality of experience assessment crowdsourcing system	solution proposal
11	Vukovic [11]	2009	IEEE	Conference	categorization, functions (case example)	solution proposal
12	Doan et al. [12]	2011	Ebsohost	Journal	classification scheme	literature review
13	Corney et al. [13]	2010	ScienceDirect	Journal	geometric problem solving in CAD/CAM (field experiment)	evaluation research
14	Heipke [14]	2010	ScienceDirect	Journal	geospatial data crowdsourcing application	evaluation research

ID	Author	Date	Database	Publication type	Contribution type	Research type
15	Fraternali et al. [15]	2012	ScienceDirect	Journal	water resource management crowdsourcing application	literature review
16	Hirth et al. [16]	2012	ScienceDirect	Journal	validation mechanisms (without gold standard data available)	validation research
17	Schall [17]	2012	ScienceDirect	Journal	expertise ranking	evaluation research
18	Fritz [18]	2012	ScienceDirect	Journal	land cover data crowdsourcing (prototype development, experiment)	solution proposal
19	Kittur [19]	2012	ACM Digital	Conference	workflow prototype	solution proposal
20	Kazai et al. [20]	2011	ACM Digital	Conference	quality control model	evaluation research
21	Zhu et al. [21]	2012	ACM Digital	Conference	quality control model	evaluation research
22	Das and Vukovic [22]	2011	ACM Digital	Conference	theory and models	literature review
23	Bernstein [23]	2008	ACM Digital	Journal	friendsourcing	solution proposal
24	Mashhadi and Capra [24]	2011	ACM Digital	Conference	quality control model in ubiquitous crowdsourcing	solution proposal
25	Jayakantha n et al. [25]	2011	ACM Digital	Conference	examples of crowdsourcing systems	solution proposal

ID	Author	Date	Database	Publication type	Contribution type	Research type
26	Witkowski and Parkes [26]	2012	ACM Digital	Conference	incentive mechanism (model)	solution proposal
27	Dow et al. [27]	2012	ACM Digital	Conference	instant self-assessment and real-time external assessment (field experiment)	evaluation research
28	Konomi [28]	2011	ACM Digital	Conference	ubiquitous crowdsourcing	solution proposal
29	Ahmad et al. [29]	2011	ACM Digital	Conference	crowdsourcing framework	solution proposal
30	Tomlinson et al. [30]	2012	ACM Digital	Conference	collaborative authoring	experience paper
31	Zhang et al. [31]	2012	ACM Digital	Conference	itinerary planning	evaluation research
32	Kulkarni et al. [32]	2011	ACM Digital	Conference	task decomposition	solution proposal
33	Gupta et al. [33]	2012	ACM Digital	Conference	mobile crowdsourcing platform via SMS (mClerk)	evaluation research
34	Marcus et al. [34]	2011	ACM Digital	Conference	declarative query processing system (Qurk)	evaluation research
35	Hossfeld et al. [35]	2011	ACM Digital	Conference	model of the population growth	validation research
36	Treiber et al. [36]	2011	ACM Digital	Conference	twitter	solution proposal
37	Ross et al. [37]	2010	ACM Digital	Conference	demographics (MTurk)	evaluation research
38	Bigham et al. [38]	2011	ACM Digital	Conference	crowdsourcing systems for disabilities	solution proposal
39	Liu et al. [39]	2010	ACM Digital	Conference	mobile image translation	solution proposal
40	Bigham et al. [40]	2011	ACM Digital	Journal	crowdsourcing systems for disabilities	solution proposal

ID	Author	Date	Database	Publication type	Contribution type	Research type
41	Franklin et al. [41]	2011	ACM Digital	Conference	crowdsourcing database (CrowdDB)	solution proposal
42	Heimerl et al. [42]	2012	ACM Digital	Conference	communitysourcing	solution proposal
43	Yu and Nickerson [43]	2011	ACM Digital	Conference	crowdsourcing add-on	evaluation research
44	Archak [44]	2010	ACM Digital	Conference	reputation mechanism	evaluation research
45	Kazai et al. [45]	2011	ACM Digital	Conference	quality control	evaluation research
46	Kulkarni et al. [46]	2012	ACM Digital	Journal	tool for designing workflows through the crowd	solution proposal
47	Liu et al. [47]	2011	ACM Digital	Conference	gamification	evaluation research
48	Horten and Chilton [48]	2010	ACM Digital	Conference	incentive mechanism	validation research
49	Ipeirotis et al. [49]	2010	ACM Digital	Conference	quality measurement	validation research
50	Aparicio et al. [50]	2012	ACM Digital	Conference	designing a crowdsourcing system	solution proposal
51	Antin and Shaw [51]	2012	ACM Digital	Conference	motivation	evaluation research
52	Bozzon et al. [52]	2012	ACM Digital	Conference	social search engine (by using the crowd)	evaluation research
53	Venetis et al. [53]	2012	ACM Digital	Conference	max algorithm	validation research
54	Bernstein [54]	2011	ACM Digital	Conference	real-time crowdsourcing algorithm	solution proposal
55	Dow et al. [55]	2011	ACM Digital	Conference	prototype system for visualizing crowd work	solution proposal
56	Bernstein et al. [56]	2010	ACM Digital	Conference	proof-read word plugin	solution proposal
57	Stewart [57]	2010	ACM Digital	Conference	33-66-1 in enterprise crowdsourcing	evaluation research

ID	Author	Date	Database	Publication type	Contribution type	Research type
58	Kochhar et al. [58]	2010	ACM Digital	Conference	crowdsourcing system (RABJ)	experience paper
59	Yan et al. [59]	2010	ACM Digital	Conference	image search crowdsourcing system	validation research
60	DiPalantino and Vojnovic [60]	2009	ACM Digital	Conference	relationship between participation and incentives	evaluation research
61	Zhao and Zhu [61]	2012	SpringerLink	Journal	current research status	literature review
62	Liu et al. [62]	2012	SpringerLink	Journal	image-based mobile translation (case studies)	evaluation research
63	Lofi et al. [63]	2012	SpringerLink	Journal	information extraction	philosophical paper
64	Schall [64]	2011	SpringerLink	Journal	framework	solution proposal
65	Barbier et al. [65]	2012	SpringerLink	Journal	crowdsourcing data	philosophical paper
66	Eickhoff and de Vries [66]	2011	SpringerLink	Journal	quality control model	evaluation research
67	Shao et al. [67]	2012	SpringerLink	Journal	impact of project attributes	evaluation research
68	Klinger and Lease [68]	2011	Wiley	Journal	identity management	solution proposal
69	Govindaraj et al. [69]	2011	Wiley	Journal	mobile crowdsourcing platform	solution proposal
70	Bojin et al. [70]	2011	Sage	Journal	crowdsourcing in smaller groups	solution proposal
71	Anastasiou and Gupta [71]	2011	Sage	Journal	crowdsourcing for translation	evaluation research
72	Kim et al. [72]	2011	Sage	Journal	crowdsourcing of complex tasks	evaluation research

2 Concept Map

ID	Author	Crowd Management				Task Management		Contribution Management		Workflow Management	
		Register User	Evaluate User	Form User Group	Enable Coordination	Design Task	Assign Task	Evaluate Contribution	Select Contribution	Define Workflow	Manage Workflow
1	Hossain [1]					1					
2	Hirth et al. [2]							1			
3	Hirth et al. [3]							1			
4	Yuen et al. [4]										
5	Zhang and van der Schaar [5]					1					
6	Gao et al. [6]				1						
7	Karger et al. [7]		1				1	1			
8	Zhai et al. [8]		1							1	
9	Sharifi et al. [9]										
10	Chen et al. [10]					1					
11	Vukovic [11]	1				1					
12	Doan et al. [12]										
13	Corney et al. [13]		1			1					
14	Heipke [14]			1				1			
15	Fraternali et al. [15]			1		1	1				
16	Hirth et al. [16]							1	1		
17	Schall [17]		1								
18	Fritz [18]		1		1						
19	Kittur [19]										1
20	Kazai et al. [20]							1			
21	Zhu et al. [21]							1			
22	Das and Vukovic [22]							1			
23	Bernstein [23]										
24	Mashhadi and Capra [24]							1			
25	Jayakanthan et al. [25]				1						
26	Witkowski and Parkes [26]					1					
27	Dow et al. [27]							1			
28	Konomi [28]						1				

ID	Author	Crowd Management				Task Management		Contribution Management		Workflow Management	
		Register User	Evaluate User	Form User Group	Enable Coordination	Design Task	Assign Task	Evaluate Contribution	Select Contribution	Define Workflow	Manage Workflow
29	Ahmad et al. [29]										
30	Tomlinson et al. [30]				1						
31	Zhang et al. [31]									1	
32	Kulkarni et al. [32]									1	
33	Gupta et al. [33]										
34	Marcus et al. [34]								1	1	
35	Hossfeld et al. [35]					1					
36	Treiber et al. [36]									1	
37	Ross et al. [37]										
38	Bigham et al. [38]					1					
39	Liu et al. [39]	1			1			1			
40	Bigham et al. [40]					1					
41	Franklin et al. [41]										
42	Heimerl et al. [42]										
43	Yu and Nickerson [43]										
44	Archak [44]					1					
45	Kazai et al. [45]							1			
46	Kulkarni et al. [46]									1	
47	Liu et al. [47]										
48	Horten and Chilton [48]					1					
49	Ipeirotis et al. [49]				1						
50	Aparicio et al. [50]					1					
51	Antin and Shaw [51]					1					
52	Bozzon et al. [52]										
53	Venetis et al. [53]								1		
54	Bernstein [54]					1					
55	Dow et al. [55]										
56	Bernstein et al. [56]										
57	Stewart [57]										
58	Kochhar et al. [58]		1			1					
59	Yan et al. [59]					1					
60	DiPalantino and Vojnovic [60]					1					
61	Zhao and Zhu [61]										
62	Liu et al. [62]				1		1				
63	Lofi et al. [63]										

ID	Author	Crowd Management				Task Management		Contribution Management		Workflow Management	
		Register User	Evaluate User	Form User Group	Enable Coordination	Design Task	Assign Task	Evaluate Contribution	Select Contribution	Define Workflow	Manage Workflow
64	Schall [64]		1		1						
65	Barbier et al. [65]								1		
66	Eickhoff and de Vries [66]					1					
67	Shao et al. [67]					1					
68	Klinger and Lease [68]	1									
69	Govindaraj et al. [69]	1					1				
70	Bojin et al. [70]					1					
71	Anastasiou and Gupta [71]									1	
72	Kim et al. [72]										

generic papers that address several concepts and functions

papers with little contribution to any of the introduced concepts und functions

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