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# Exploring the Potential of Children in Crowdsourcing

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**Abstract**

Recently, companies and academia have turned to crowdsourcing to stimulate creativity and innovation. Although children's creative nature has been well documented in the design process in co-creation for new products and/or services, this has not yet extended to crowdsourcing. With this paper, we investigate — through crowdsourcing — the gap between children and crowdsourcing. To gather a diverse sample of participants we used CrowdFlower, a crowdsourcing platform, to generate, evaluate and rank ideas and concepts. Results show that 93% of parents and 80% of non-parents would involve children in crowdsourcing. The most valued concept of the crowd was the collaboration between parents and children, who are innovating for companies. This concept involves publishing companies requesting drawings from children for book illustrations.

**Author Keywords**

Crowdsourcing; Interaction Design with Children;

**ACM Classification Keywords**

H.5.3 Group and Organization Interfaces: Computer-supported cooperative work.

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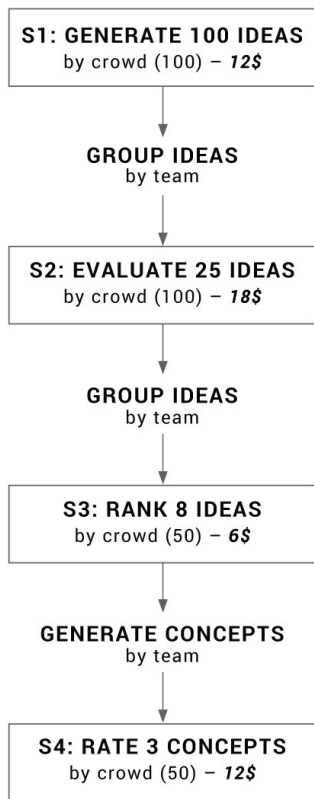


Figure 1: Our study comprised of four stages in engaging the crowd: generating ideas (S1); evaluating and ranking a subset (S2, S3); rating concepts for crowdsourcing applications that would actively engage children (S4)

## Introduction

The last decade has seen a tremendous growth of crowdsourcing both in industry and academia, not just in number of people involved but also in the diverse applications that benefit from it. Such applications are evident from several adjacent terms: open innovation, citizen science, human computation, sharing economy, just to name a few. One application that has particularly seen growth is the use of crowdsourcing for creativity and innovation. Several companies already leverage crowdsourcing for such a purpose, including IBM with the 'Innovation Jams'; Nike with 'Converse Gallery'; Pepsi with 'Pepsi Refresh Project'; IDEO with 'OpenIDEO' and many more [10].

The role of children in the co-creation design process has been extensively explored in the past [2, 11]. An example is Comicboarding [11], which includes children in the creation of comic books, with engaging and productive brainstorming sessions. As in the aforementioned case, one would expect in the near future an active role in crowdsourcing for children. Their creative potential and learning needs could potentially benefit children as workers and as requesters alike. Nevertheless, one could also effortlessly imagine a plethora of ethical and technical challenges and pitfalls for such an endeavor. In this paper we investigate the potential role children can play in crowdsourcing.

## Related Work

Involving children has extended throughout the whole design cycle in an informal approach of cooperative inquiry to engage in open-ended and exploratory activities. Existing design research methods include children in user-centered design (UCD) and

participatory design (PD) as a source of inspiration for companies or institutions [5, 11, 14]. Research shows that innovation is facilitated when children are involved in the design process as much as possible, especially since improvements of certain final designs could not be thought of by adult designers [12]. Additionally, children are not seen as a source for problem solving but rather as a resource for creating solutions for possible use situations [15].

Paradigmatic cases of involving children in the design process were conducted by companies such as IKEA and Lego. IKEA [8] recently opened a competition on their website for children to draw characters. The best drawings were then produced as stuffed toys. Lego has developed a platform called Lego Cusoo [7] for children to submit models of toys they like for the company to turn into products. In academia there has been a great interest in developing co-design approaches in which children participate as design partners in cooperative inquiry [2], as explored by Druin. Methods such as brainstorming used with adults were applied to children, for example to overcome the teacher-student paradigm of co-equal partnerships. Other examples exist in academia, such as Iversen's BRIDGE approach [9], where children are seen as equal participants to adults in the design process. Although there are evident efforts to involve children in the design process, in crowdsourcing, a novel method that is also utilized for co-design purposes, there has been none.

Although there are different definitions of what crowdsourcing is, in this paper we adopt the following encompassing definition: "*crowdsourcing is an umbrella term for a variety of approaches that harness the potential of large crowds of people by issuing open calls*

S	#P	Time	Cost
1	100	3h5m	\$12
2a	20	2h11m	\$3.60
2b	20	2h3m	\$3.60
2c	20	2h35m	\$3.60
2d	20	1h37m	\$3.60
2e	20	1h35m	\$3.60
3	50	1h11m	\$6
4	10	1h36m	\$12
Total	300	15h	\$48

Table 1: Overview of stages (S), number of participants (#P), time it took for the task to be completed and total costs (US\$) in the crowdsourcing platform.

Category	Idea
Learning	Learning to improve intellectual skills
Collaboration	Collaborating with other children, parents or other adults
Playfulness	Using their creativity to solve a task in a playful way
Testing and tasks	Providing feedback for games, books or other digital products
Inspiration	Adults benefit from children's perspective

Table 2: Overview of the 5 categories of ways in which children can potentially engage in crowdsourcing and an example of a proposed idea within each category.

for contribution to particular tasks" [3]. This definition includes paid crowdsourcing but does not restrict other platforms such as social networking systems or websites such as the one for the IDC conference [6]. In this paper we report a crowdsourcing study in which we investigate what would the potential role of children be in crowdsourcing itself.

## Method

We used CrowdFlower, a crowdsourcing platform, to perform our study as it allows an easy and rapid collection of survey data from a diverse crowd, with a reassuring level of quality in results [4]. From the outset we wanted the crowd's involvement for both ideation and evaluation of ideas on our topic. We explored the potential of introducing children to crowdsourcing and to conceive a concrete example of a platform that would cater to children.

In our process we adopted the work of Nickerson and Sakamoto [13]. In this method, the crowd is approached first for idea generation (divergent thinking) and then for idea evaluation and synthesis (convergent thinking) [1]. We decided to have only one divergent idea generation stage instead of several iterations — akin to the traditional brainstorming method described by Nickerson and Sakamoto, but to incorporate the crowd. In this study, we reached out to the crowd four times ("stages", Figure 1). Between the stages, we facilitated by analyzing and preparing the data for the next stage.

### S1. Generate Ideas – Divergent Thinking

At this stage we provoked creative thinking towards possible ways to bridge the gap between children and crowdsourcing. We asked 100 workers one open-ended

question: "On an engaging crowdsourcing platform, how would you involve children?". For additional context, we also inquired whether participants were parents themselves: "Do you have kids?"

### S2. Evaluate Ideas – Convergent Thinking

Next, we classified all the ideas we received from the previous stage into five categories of possible roles children could play in crowdsourcing. Each category (Table 2) contained a subset of five specific ideas drawn from S1. We sent out a different questionnaire for each category, to avoid asking participants to rate a large number of ideas.

We now turned to the crowd and asked participants to rate each of the five ideas within a category (Table 2) on a 1 to 5 scale (1-low preference, 5-high preference). For each category, we recruited 20 workers (total of 100). Additionally, an open-ended question was added: "Do you have any comments or tips regarding this topic?"

### S3. Rank Ideas

As facilitators, we calculated a mean rating for each idea that was evaluated in S2. We then determined a cutoff threshold to reduce the number of ideas to evaluate in S3. In this case, we kept the 8 ideas that had an average rating of at least 4, to select only the best ones and proceed to the next stage. We noticed that two of these ideas were similar in nature so they were combined into one before moving to S3.

Fifty workers were asked to pick the three ideas they liked most, which we named "core values". Our question was: "If there would be a platform for children to participate in a safe crowdsourcing community, what

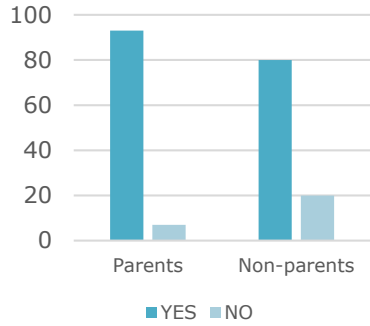


Figure 2: Parents and non-parents, who are in favor (YES – 93% & 80% respectively) or against (NO) involving children in crowdsourcing.

Themes	Votes
Testing and tasks	25%
Playfulness	22%
Inspiration	17%
Collaboration	17%
Learning	16%

Table 3: Stage 2. Categorization the input from workers into general themes

would you like to be the core values of this platform? Please check 3 options”.

#### S4. Rate Concepts

Before the last stage, based on the result of the previous stage, we brainstormed and envisioned possible concepts for crowdsourcing applications that would involve children, incorporating the highest voted core values from S3. For each concept, we came up with a brief (3-4 sentence) description that outlined the roles of requester and worker — at least one of which would be children — and how all participants could potentially benefit from the platform. We then asked workers to choose the one concept they liked the most and gave them the opportunity to elaborate on their choice with an open-ended question.

### Results

#### S1. Generate Ideas – Divergent Thinking

For the first question of S1, out of the 100 responses we received, 92 of them were relevant to the project. The other 8 were meaningless such as: “Lego” and “blabla”. In this stage the large majority of participants (73%) were enthusiastic about the idea of involving children in the crowdsourcing process. Participants saw a place for children’s creativity in businesses, especially when giving feedback about digital platforms, books and games. Some characteristic responses:

- “I would ask them to draw anything their fantasy can create things that we can’t even imagine sometimes” (Worker 1, Greece)
- “I think children can be important source of new ideas and innovations for any kind of business you make. They’re looking the life from others eyes,

their eyes, they ‘live’ in a different world.” (Worker 2, Bulgaria)

- “It could be that they are included in projects involving the creation of new toys or comics and thus companies would have views of children worldwide.” (Worker 3, Venezuela)

The 27% minority of the participants was against using children in crowdsourcing. Responses were either generic or expected, concerning legal aspects, such as:

- “I would not involve children since it is wrong” (Worker 4, Ukraine)
- “Children are too young to contribute” (Worker 5, Italy)

Out of the 60% participants that were parents, 93% responded that they would involve their children in crowdsourcing for several reasons: for collaborating with them; for hobby; for some extra income. From the 40% that were not parents, 80% stated they would involve children as an external source of inspiration (Figure 2). An example statement:

- “I would make them participate along with their parents in tasks meant for them.” (Worker 6, India)

#### S2. Evaluate Ideas – Convergent Thinking

As aforementioned, all answers from S1 were sorted out in categories and ideas. The category that had most proposed ideas was *Tasks and Testing*, with 25% of ideas (Table 3). Results from the rating poll, where participants were asked to rate ideas (1–low preference, 5–high preference) within a certain category, are presented in Table 4. The crowd helped

Category	Votes
Kids collaborating with other kids	16%
Kids learn and grow intellectually by using the platform	15 %
Kids contributing to game creation	15%
Kids help companies by testing games	14%
Kids provide input for creation of books and comics	12%
Kids help companies in the creative process by sharing thoughts without embarrassment	11%
Kids collaborating with their own parents	8%
Allowing companies to tap into the kids' way of looking at things	8%

Table 5: Stage 3. Preferable ideas chosen by workers for involving children in crowdsourcing platforms.

Concept	Votes
Illustration for books	42%
Unsolved mysteries	34%
Future Professions	24%

Table 6: Final stage. Rating of concepts for crowdsourcing applications that would actively involve children

further refine the ideas with answers from the open-ended question, such as:

- "Kids giving input for surveys would be a little hard, since I think it would be hard to get them to sit down and focus" (Worker 7, USA)

### S3. Rank Ideas

Results show that workers mostly prefer the idea of *Kids collaborating with other kids* (16%) followed by both *Kids contributing to game creation* and *Kids learn to grow intellectually by using the platform* (15%) and lastly *Kids help companies by testing games* (14%) (Table 5).

### S4. Rate Concepts

In the final stage we envisioned three possible concepts for crowdsourcing applications that would involve children: 1. *Illustrations for books*, where children and parents together help out publishing companies for drawing tasks; 2. *Future professions*, involving other professionals for children to learn about future work from a first person perspective; 3. *Unresolved Mysteries*, with children helping scientists brainstorm about unresolved mysteries on a digital platform.

The concept that workers voted the most was the scenario of *Illustration for books* (Table 6). One of the reasons why workers chose the first concept was, in the words of a participant:

- "This concept allows the children to stay children. In my opinion, children should not be bothered by grown-ups problems. The first concept also offers the best business model, because the parents could receive a copy of

*the finished book or receive small amounts of money for it. It will keep users involved with the software."* (Worker 8, Denmark)

Category	Idea	Mean	SD
Collaboration	Children with parents	4.4	0.99
	Children with other Children	4.45	0.83
Playfulness	Children help in game creation	4.15	0.88
	Children play to learn digital skills	4.4	0.75
Task and Testing	Children give input for books	4.15	1.02
	Children give input for games	4.25	0.85
	Children give input for comics and cartoons	4.5	0.85
Inspiration	Following the children's mentality	4.00	1.08

**Table 4:** Eight ideas with a crowd mean rating of at least 4.0 on a scale of 1-5, including the category they belong to, Mean and Standard Deviation (SD).

## Discussion

Designing a platform that engages children in crowdsourcing is not without potential threats and limitations. Besides privacy and security issues that may arise, there is an issue of age requirement. Existing crowdsourcing platforms demand members to be at least 18 years of age. Future work should include research into the reasoning behind this age limitation and ways to lower it without introducing risks. Examining the terms and conditions of existing platforms, we discover aspects that cater to children, specifically the freedom to stop and resume

participation at any time.

To counteract several of the potential threats, parents could be asked to co-participate instead of involving children directly. They could form a proxy between the child and the crowd, delivering tasks and results from the children to the platform and vice versa. In our future plans we will directly involve children in a creative session to find out their opinion. Additionally, we want to explore different roles that children could have, with or without involving parents.

An interesting point that we discovered while running crowdsourcing campaigns is the difference in results when structuring and presenting the same topic differently. An example of such a topic is *children collaborating with parents* from the S3 stage, which the crowd rated with the lowest preference of 8%. In S4, the crowd voted for it with almost half of votes (45%). We consider re-launching polls to different crowds on the same platform as well as exploring different platforms to see if and how our findings are affected.

### **Conclusion**

Participatory processes for involving children in design have been explored extensively in the last twenty years, as is evidenced by a whole research community dedicated to the topic. Nevertheless, the logistics, economics and ethics of involving children in design processes that span weeks, pose several challenges. Accessing a crowd of children could mitigate some of these challenges and create new opportunities, though it could itself bring challenges and pitfalls that need to be addressed carefully. Our study has taken the form of a design exploration supported with crowdsourcing. We surveyed opinions of crowdworkers regarding the

potential involvement of children in crowdsourcing activities. The crowd generated and evaluated ideas and supported the involvement of children in crowdsourcing activities. More specifically there are five categories that we observed in the data, with *Task and Testing* having the leading preference among crowdworkers. Task and Testing consisted of children giving input for books, games, comics, etc.

That is not to say that there aren't major threats and challenges for such a platform that a thoughtful design process has to address in more depth — building on the positive reaction of the crowd. Specifically, the main challenges relate to the ethics of using children's labor, and the risks children would be exposed to by contacting adults in an online setting. Nevertheless, these risks are not new and are not exclusive to crowdsourcing: they are true for any involvement of children in research and design activities, though the scale and modality of such involvement modulates these risks.

We will continue to explore how children could be involved in crowd sourcing. An important consideration is to understand how children would experience involvement in crowdsourced activities, what would motivate them and what would be their concerns. Future research should engage in participatory design activities with children that will help provide the children's perspective in this topic.

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