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How to Present Ideas in Idea Crowdsourcing Communities? Pathways for Idea Divergence and Convergence Performances

Short Paper

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Abstract

Currently, idea crowdsourcing communities are widely used for solving problems and fostering innovation. However, when encountering substantial ideas delivered by idea crowdsourcing communities, individuals are hard to generate novel ideas (i.e., idea divergence) and evaluate the appropriateness of the delivered idea (i.e., idea convergence). To address this challenge, platform operators tend to improve the idea presentation design. However, the effectiveness of these idea presentation designs for idea crowdsourcing community users remains unclear. Therefore, we tend to uncover the influencing mechanism of four types of idea presentation design (idea tree, slides, lists, and grids) on idea divergence and convergence outcomes. Accordingly, we adopt dual pathway to creativity model as our theoretical framework and propose an experimental research design. This study will provide insights into platform attribute design and design strategies for improving idea divergence and convergence outcomes.

Keywords: Idea presentation design, idea crowdsourcing, idea divergence, idea convergence, dual pathway to creativity model

Introduction

Currently, idea crowdsourcing communities (e.g., OpenIDEO) have become promising platforms diffusing into cutting-edge industry developments (Cheng et al., 2020). These communities provide task organizers (e.g., personal users, governments, and enterprises) with an effective channel to gather ideas from crowds (Althuizen et al., 2016; Cheng et al., 2020). Drawing on the feature of idea crowdsourcing, Blohm et al. (2016) emphasized the potential of such communities to generate and shortlist the most promising ideas. That is, personal users and groups are motivated to generate novel ideas based on the crowds' ideas (e.g., idea divergence) and select the appropriate ideas in crowdsourcing communities (i.e., idea convergence).

However, researchers noticed that although individuals exerted massive efforts to browse ideas, the large number of ideas would cause cognitive load, causing adverse effects on performances of idea divergence and convergence (Chen et al., 2019; Wang et al., 2023). To increase the effectiveness of idea crowdsourcing community usage, researchers highlighted that platform operators strived to optimize idea presentation designs (Gregor & Hevner, 2013; Ulrich, 2018). Since platform design attributes are deemed important factors influencing users' behaviors (Briggs, 2010; Poser et al., 2022), limited knowledge exists on the distinct effects of idea presentation design on idea divergence convergence performances in idea crowdsourcing communities. Therefore, our research question is as follows:

RQ: How do different idea presentation designs in crowdsourcing communities distinctively influence idea divergence and convergence performances?

To address the research question, we will consult the dual pathway to creativity model to compare influencing mechanisms from four idea presentation designs, including idea trees, slides, lists, and grids, to idea divergence and convergence performances. Specifically, idea trees (e.g., Wikipedia¹, see Figure 1) present the hierarchical relationships among different ideas. Idea trees constitute high-level nodes showing generic and inclusive categories, and low-level nodes representing specific categories and ideas. Idea slides (e.g., Canva², see Figure 1) present ideas through sequential images with illustrated text, and users can click and enlarge the figure of one idea. Idea lists (e.g., OpenIDEO³, Kaggle⁴, see Figure 2) and idea grids (e.g., OpenIDEO³, see Figure 2) all present all ideas in a certain way. Idea lists show the idea consecutively. Differently, idea grids stack the ideas horizontally until ideas fill a column, and then continue with the next row in the column. Regarding the different features of these four designs, this study will further discuss influencing pathways of idea presentation designs on idea convergence and divergence performances.

Literature review

Idea divergence and convergence performances

In idea crowdsourcing communities, individuals from distributed collaboration teams can create, seek, or access diverse ideas, constituting two types of idea collaborating procedures (Althuizen et al., 2016; Nijstad et al., 2010; Briggs et al., 2010). First, idea divergence indicates that individuals generate as many new ideas (numbers of ideas) from different perspectives (depth of generated ideas) inspired by others' ideas in idea crowdsourcing communities (Briggs et al., 2010). To foster idea divergence performance, individuals would be prone to activate and retrieve from existing knowledge (i.e., knowledge activation) and recombine existing knowledge with retrieved ideas (Briggs et al., 2010; Santanen et al., 2004). Second, idea convergence is filtering the unappropriated ideas and focalizing the noteworthy ideas. Idea convergence assumes that individuals will retrieve the ideas linked to the collaborative tasks, leading to an accurate match between tasks and retrieved ideas (Cheng et al., 2020).

Drawing on the distinct natures of idea divergence and convergence, prior research further articulated different influencing factors (Hua et al., 2022; Ulrich, 2018). Regarding individuals' idea divergence performances, Poser et al. (2022) highlighted that enhancing individuals' intentions regarding others' ideas is conducive to resonating with individuals' existing knowledge and fostering idea generation. Moreover, idea presentation characteristics (e.g., idea lengths and supporting evidence) are deemed important antecedents influencing idea divergence (Liu et al., 2020). Focusing on idea convergence, research indicated that perceived lower cognitive load would be helpful in organizing similar ideas into subsets and choosing more appropriate ideas (Banken et al., 2019; Cheng et al., 2020). de Vreede et al. (2022) further proposed designing strategies for idea convergence as providing the associations of retrieved ideas would decrease the cognitive load. Based on the current literature, we found that although researchers realized that idea presentation is an important factor of idea divergence and convergence (Qin et al., 2022; Yi et al., 2017), most studies have yet to discuss how to design the idea presentation to foster individuals' performances regarding idea divergence and convergence. Accordingly, in the next section, we will further depict and compare the four main types of idea presentation design in idea crowdsourcing communities.

Dual pathway to creativity model

The dual pathway to creativity model proposes that individuals would experience two disparate cognitive processes when attempting to solve problems creatively (Althuizen et al., 2016; De Dreu et al., 2008; Nijstad et al., 2010). First, **the flexibility pathway** indicates that individuals develop creative ideas by widely retrieving broad idea categories, flexibly switching among these categories, and remotely associating the retrieved ideas with tasks. That is, during the flexibility pathway, individuals retrieved ideas from a wide range of perspectives to stimulate novel ideas. Second, **the persistence pathway** suggested that individuals are prone to dig deeper for only a few idea categories and systematically explore the possibility of the chosen idea categories. In other words, persistence represents the degree of sustained and focused

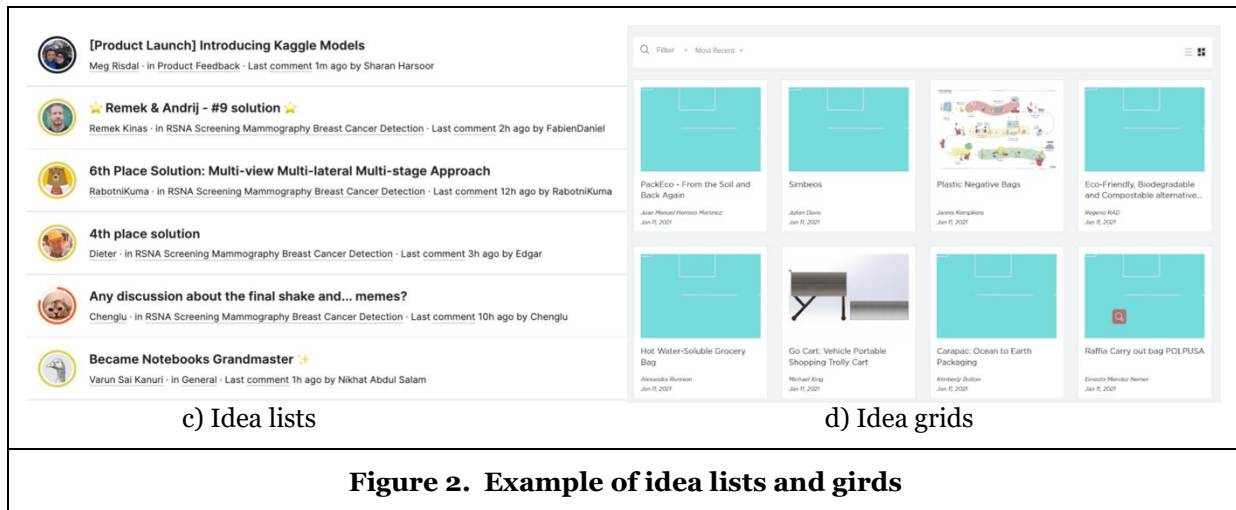
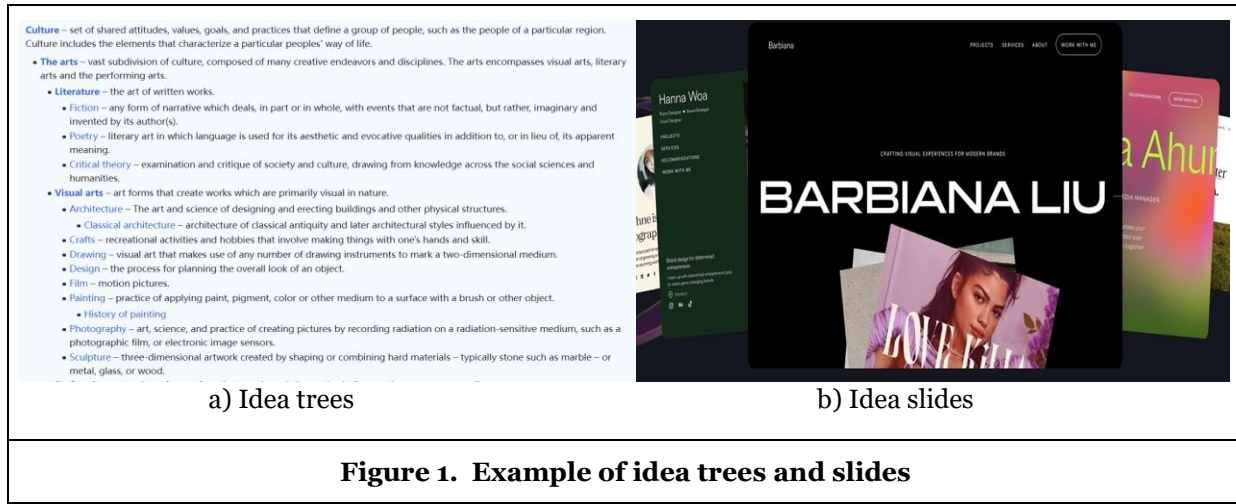
¹Wikipedia https://en.wikipedia.org/wiki/Wikipedia:Contents/Culture_and_the_arts

²Canva <https://www.canva.com/>

³OpenIDEO <https://challenges.openideo.com/challenge/designing-for-digital-thriving?documentId=1790cd198f6ad0426990e3afd3267dbc&documentTableId=1297037819786018909>

⁴Kaggle <https://www.kaggle.com/competitions/house-prices-advanced-regression-techniques/discussion>

specific idea categories relevant to tasks. Following the logic of dual pathway to creativity model, we further proposed the association among idea presentation design, idea divergence performances, and idea convergence performances.



Hypothesis development

The impact of idea trees on idea divergence and convergence performances

As aforementioned, idea trees are designed with tree structures and present different idea categories. Pertaining to the diverse idea categories, idea trees further show interrelationships among ideas via different text indentations, sizes, or colors (Zhang et al., 2019). On the one hand, by delivering inclusive idea categories, idea trees allow individuals to investigate ideas from different perspectives, which resonating the flexibility pathway. Focusing on previous literature, Müller-Wienbergen et al. (2011) and McCay - Peet et al. (2015) revealed that in a tree structure, the comprehensive categories will foster the priming effects, stimulating individuals to recall the relevant experience. Qin et al. (2022) further revealed that via diverse categories delivered by tree structures, individuals can assimilate serendipitous ideas by connecting these ideas with previous knowledge. We hence proposed that idea trees can foster idea divergence performances via a flexibility pathway.

On the other hand, as hierarchical classification schemes, idea trees can provide the relationships of ideas and categories. Specifically, idea trees form the backbone of a hierarchical idea logical structure allowing individuals to choose an idea category and further investigate the relevant sub-categories and ideas. Müller-

Wienbergen et al. (2011) indicated that idea trees provide a top-down idea retrieval strategy by revealing the inheritance relations among ideas. Shneiderman (2007) proposed that idea trees provide a dynamic filtering mechanism as individuals can rapidly eliminate unwanted ideas by choosing specific categories without the overload of inappropriate ideas. Therefore, we proposed that idea trees can assist individuals in deeply investigating one specific idea category via the persistency pathway, leading to a high level of idea convergence performance. Based on the discussion, we hypothesized that:

Hypothesis 1(a-b): Idea trees can foster a higher level of idea divergence performance via a flexibility pathway (a) and a higher level of idea convergence performance via a persistence pathway (b).

The impact of idea slides on divergence and convergence performances

Idea slides present a series of idea images and depict textual information of ideas. When browsing ideas slides, individuals can slide the screen left or right to adjust the sequence of different categories and related ideas. Slide structures are made for information visualization, allowing individuals to screen the conclusive information via images in a short time (Kaplan, 2011; Knight et al., 2018). Typically, slide structures are used to highlight visual cues of recommended ideas, which can pique individuals' interest and activate the individuals' memory of ideas in web investigation (Lin et al., 2012). In other words, through slide structure, individuals can conveniently flexibly slide the overarching idea figures from different idea categories, which can stimulate individuals' ideation effectively. Therefore, we theorized that the idea delivery pattern of idea slides is fitted with the flexibility pathway, fostering idea divergence. However, idea slides are unable to provide appropriate idea filtering mechanisms, and individuals can solely view the ideas from various categories through idea slides, rather than deeply investigating a specific idea category. Accordingly, we theorized that idea slides would impede the persistence pathway, resulting in a lower level of idea convergence.

Hypothesis 2(a-b): Idea slides can foster a higher level of idea divergence performance through fostering a flexibility pathway (a) and a lower level of idea convergence performance by impeding a persistence pathway (b).

The impact of idea lists on divergence and convergence performances

Idea lists present substantial ideas presented consecutively, typically one below the other. The list structure enables individuals to scroll the page and discover ideas (Althuizen et al., 2016; Qin et al., 2022; Qin et al., 2019). Typically, idea lists constitute substantial ideas from only a few categories rather than presenting inclusive idea categories to individuals (Yu et al., 2017). Thus, idea lists are conducive to deeply investigating and evaluating ideas from a specific category based on individuals' filtering conditions. Accordingly, we theorized that the idea retrieval pattern of idea lists is matched with the persistence pathway, leading to idea convergence. However, by simply listing ideas, the list structure is hard to provide diverse idea categories simultaneously. Qin et al. (2019) revealed that compared with the tree structure, the inflexible list structure is less likely to provide diverse perspectives of information and trigger individuals' perceived serendipity of received information. Therefore, we proposed that idea lists would cause a lower level of idea divergence performance by impeding a flexibility pathway. Based on the discussion, we hypothesized that:

Hypothesis 3(a-b): Idea lists can foster a higher level of idea convergence performance through a persistence pathway (a) and a lower level of idea divergence performance by impeding a flexibility pathway (b).

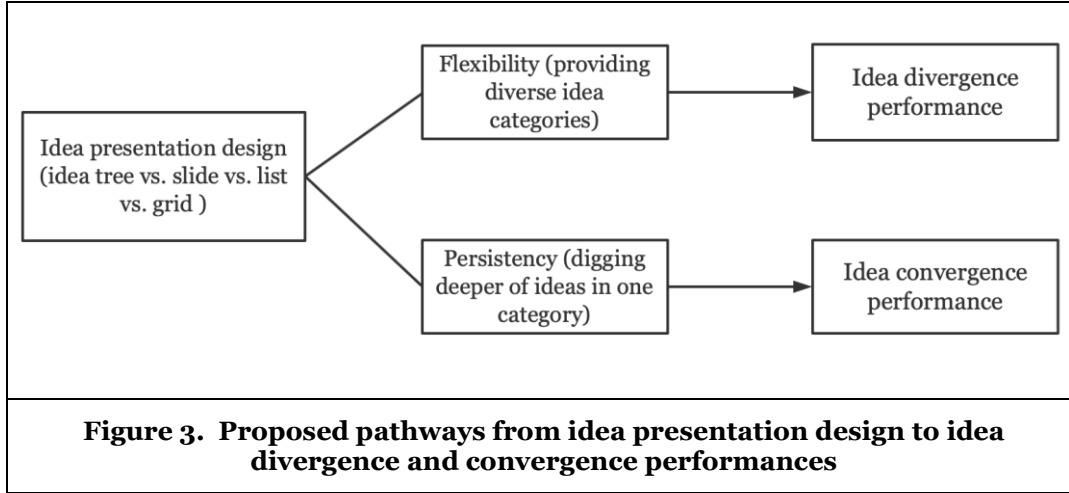
The impact of idea grids on divergence and convergence performances

Similar to idea lists, idea grids horizontally present ideas until a column is filled, and then proceed to the next row. Idea grids emphasize the consistency in layout, spacing, and alignment of ideas, which is conducive to creating a visually appealing design. Talia (2002) emphasized that the grid structure assists designers in organizing content in a logical and structured way, which makes it easier for individuals to filter needed information. Therefore, we propose that idea grids are helpful in retrieving ideas in a specific category, resonating with the persistency pathway, and leading to better idea convergence performances. However, presenting ideas in idea grids is also hard to provide diverse idea categories at the same time.

Since idea grids are designed for idea selection rather than showing ideas from different perspectives or categories (Beaird et al., 2020), we hence proposed that idea grid will hinder the flexibility pathway, resulting in a lower level of idea divergence performance. The following hypothesis is therefore proposed:

Hypothesis 4(a-b): Idea grids can foster a higher level of idea convergence performance through a persistence pathway (a) and a lower level of idea divergence performance by impeding a flexibility pathway (b).

Figure 3 presents the proposed model of this research.



Methodology

This study will adopt experiment research design by comparing impacts of these four idea presentation designs (idea trees vs. slides vs. lists vs. grids) on individuals' idea divergence and convergence performance.

Participants

To determine the sample size and ensure a statistical power of 0.8 recommended by Baroudi et al. (1989), we adopted the pwr package in RStudio with input values as 4 for group numbers (k), 0.05 for significant level (α), 0.25 for medium effect size (cohen f), and 0.8 for statistical power ($1-\beta$). The result revealed that the sample size is expected to be around 180, corresponding to 45 samples in each of the four treatments. We will adopt the random sampling to recruit participants from idea crowdsourcing market (e.g., Amazon MTunk, Credamo). We will conduct survey to access participants' personal characteristics before the experiment. The experiments will be conducted without the significant differences among four groups of participants. Experiments will be conducted in Slack, which is an online collaboration application supporting idea crowdsourcing.

Experiment procedure

We will consult the experiment design adopted by Qin et al. (2022) by developing four mockup websites looking like idea crowdsourcing community interfaces (see Figure 4 and Figure 5). We will post 100 ideas randomly scraped from open innovation crowdsourcing communities (e.g., OpenIDEO) in four idea presentation designs on these websites. Prior research highlighted that ideas from open innovation crowdsourcing communities focus on providing creative solutions or addressing specific innovative challenges (Hornuf & Jeworrek, 2023; Seeber et al., 2017). To reduce potential bias in experiments, all four idea presentation designs include the following elements: idea name, contributors, and figures. Moreover, the presented ideas for four groups are the same. To ensure the robustness and heterogeneity of the research results, we will conduct two rounds of experiments.

Distinctively, idea trees will present ideas in the tree structure by classifying 100 ideas into four categories (each category for 25 ideas). Idea slides will randomly present 100 ideas from four categories in one row,

and participants can slide the ideas left or right. Idea lists and grids allow participants to filter 100 ideas in one idea category (that is, we will not classify the idea categories, but participants can filter ideas by keywords).

After developing the mock-up website, we will conduct experiments in Slack, which is a real-time idea collaborating platform. We will conduct four chatrooms (four treatment groups) in Slack and send four links to mock-up websites to participants. In these four chat rooms, participants will be required to idea divergence and convergence tasks regarding one innovative theme (e.g., design strategies for stimulating and encouraging safe outdoor dining and entertainment during cold weather in Chicago). For the idea divergence task, participants need to develop new ideas about this theme. For the idea convergence task, participants would be asked to shortlist 10 ideas that they consider worthy of further consideration.

Measurement and data analysis

The independent variable is the idea presentation design. This variable will be coded to four values, that is, idea tree (= 1), idea slide (= 2), idea list (= 3), and idea grid (= 4). The dependent variables are idea divergence performances and idea convergence performances. For idea divergence, we will follow the approach recommended by Bhagwatwar et al. (2018) by measuring the number of generated ideas and the idea depth. The idea depth refers to the number of idea categories generated by participants. We will employ independent coders to code individuals' ideas into different categories. To measure idea convergence performances, we will employ the approach highlighted by Seeber et al. (2015) by measuring the average of idea relevance, which is the degree how one idea potentially addresses a collaborating theme. We will employ RStudio to conduct analysis of variance (ANOVA) test and regression analysis.

Expected contributions

This research will contribute to the current literature in several ways. First, this study will uncover the distinct effects of four types of idea presentation designs (i.e., idea trees, idea slides, idea lists, and idea grids) in individuals' idea divergence and convergence performances. Idea presentation design is identified as an important influencing factor in solving innovative problems (Seeber, 2019). By distinguishing the unique characteristics of idea presentation designs, we further contribute to the dual pathway to creativity model in idea crowdsourcing communities.

Second, our analyses will contribute to idea collaboration research by revealing individuals' idea presentation preferences drawing on the distinct nature of idea divergence and convergence. Distinct from current research which has identified the influencing factors of idea divergence and convergence separately, this study concentrates on how idea presentation designs differently influence these two idea collaboration processes. Jointly investigating idea divergence and convergence is helpful in comprehensively understanding variations of individuals' design preferences in different idea collaboration situations.

Practically, this study will provide insights into idea presentation design strategies for community developers and operators. Improving information visualization design is a vital strategy by which information systems and online communities can foster team collaboration and innovation (Lukyanenko et al., 2020). Since this study is one of the first attempts at idea presentation design, our results will propose platform intervein and design strategies by taking advantage of different designs to jointly enhance the idea divergence and convergence in idea crowdsourcing communities. Moreover, for idea crowdsourcing community users and collaborated teams, our study is conducive to conducting effective strategies fostering idea generation, evaluation, and collaboration. Therefore, this study will offer more practical implications in the promising field of platform attribute design.

We provide several implications for future research. First, we did not consider the filter function of the idea lists and grids for our research design. Future studies could further evaluate the role of the filter function on idea divergence and idea convergence. Second, future studies can consider the idea presentation design in a human-AI collaborating environment. For example, scholars can discuss how AI-driven chatbots can present ideas to foster users' idea divergence.

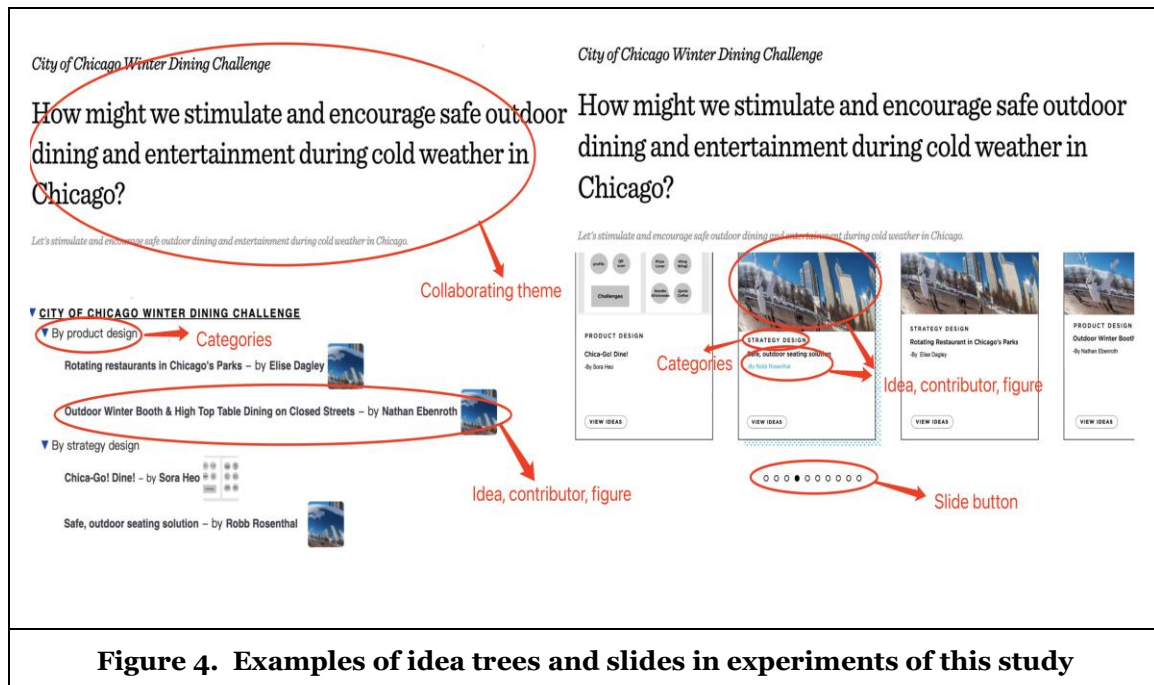


Figure 4. Examples of idea trees and slides in experiments of this study

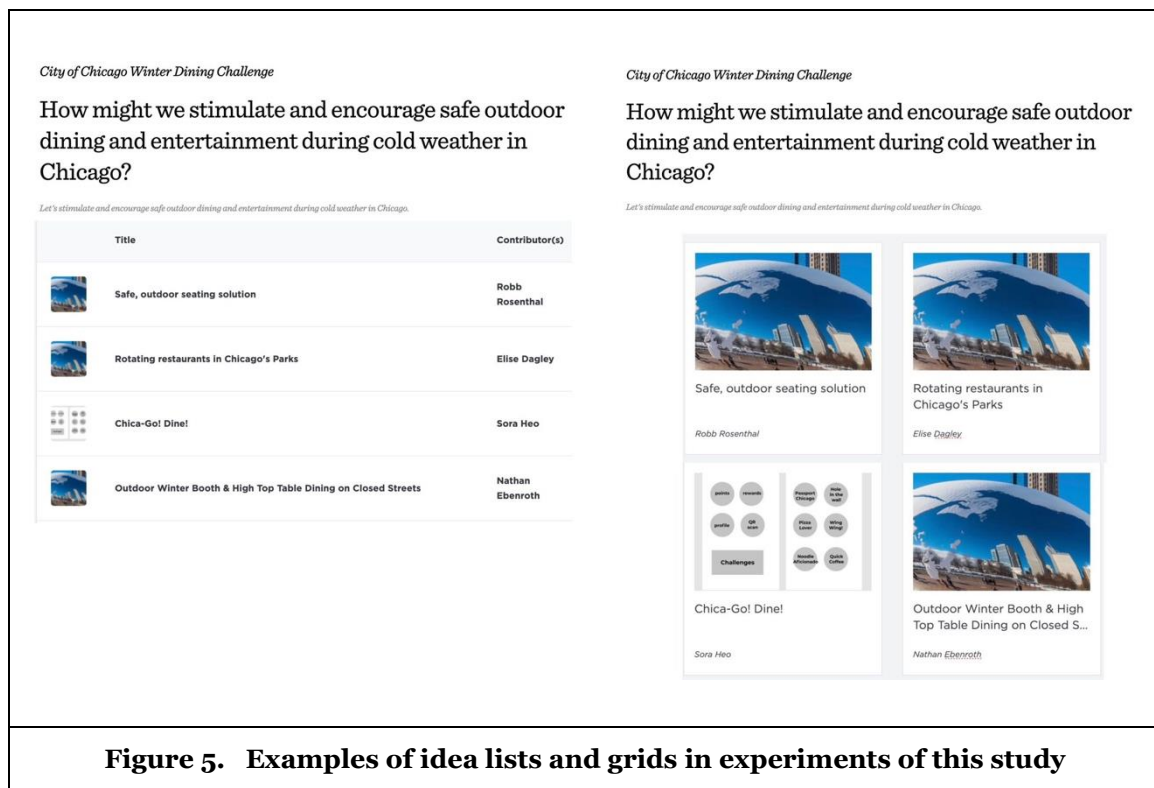


Figure 5. Examples of idea lists and grids in experiments of this study

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