

CS 5306
INFO 5306:
Crowdsourcing and
Human Computation

Lecture 16
10/26/17
Haym Hirsh

Can a crowd be creative?

What does “creative” mean?

Creativity

Creativity

(Robert Sternberg)

the production of "something original and worthwhile"

Creativity

(Wikipedia)

Creativity is a phenomenon whereby something new and somehow valuable is formed.

Creativity

(Wikipedia)

Creativity is a phenomenon whereby **something** new and somehow valuable is formed.

Creativity

(Wikipedia)

Creativity is a phenomenon whereby something new and somehow valuable is formed.

The created item may be intangible (such as an idea, a scientific theory, a musical composition, or a joke) or a physical object (such as an invention, a literary work, or a painting).

Creativity

(Wikipedia)

Scholarly interest in creativity involves many definitions and concepts pertaining to a number of disciplines: engineering, psychology, cognitive science, education, philosophy (particularly philosophy of science), technology, theology, sociology, linguistics, business studies, songwriting, and economics, covering the relations between creativity and general intelligence, mental and neurological processes, personality type and creative ability, creativity and mental health; the potential for fostering creativity through education and training, especially as augmented by technology; the maximization of creativity for national economic benefit, and the application of creative resources to improve the effectiveness of teaching and learning.

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Creativity

Related concepts:

- Brainstorming
- Discovery
- Innovation
- Invention
- Lateral thinking

Crowds and Creativity

Crowds and Creativity

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ELECTRONIC BRAINSTORMING AND GROUP SIZE

R. BRENT GALLUPE

Queen's University

ALAN R. DENNIS

University of Georgia

WILLIAM H. COOPER

Queen's University

JOSEPH S. VALACICH

Indiana University

LANA M. BASTIANUTTI

Government of Ontario

JAY F. NUNAMAKER, JR.

University of Arizona

Two concurrent experiments were conducted with groups of varying size; there were 2-, 4-, and 6-person groups in one and 6- and 12-person groups in the other. We compared the number and quality of unique ideas generated by groups of each size using electronic and nonelectronic, verbal brainstorming. Groups used both techniques in a counterbalanced within-group design. The larger groups in both experiments generated more unique ideas and more high-quality ideas, and members were more satisfied when they used electronic brainstorming than when they used verbal brainstorming. There were fewer differences between the two techniques for the smaller groups in each experiment. We interpret these results as showing that electronic brainstorming reduces the effects of production blocking and evaluation apprehension on group performance, particularly for large groups.

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Crowds and Creativity

Karim R. Lakhani and Jill A. Panetta

The Principles of Distributed Innovation

“No matter who you are, most of the smartest people work for someone else” is known as Joy’s Law in the high-tech industry. Attributed to Sun Microsystems co-founder Bill Joy, this “law” emphasizes the essential knowledge problem that faces many enterprises today, that is, that in any given sphere of activity most of the pertinent knowledge will reside outside the boundaries of any one organization, and the central challenge for those charged with the innovation mission is to find ways to access that knowledge.

The causal explanation of Joy’s Law is provided in the seminal work of economists Friedrich Hayek and Eric von Hippel on the distributed and sticky nature of knowledge and innovation. Hayek¹, in 1945, arguing for the importance of the market economy, emphasized that at the macro level knowledge is unevenly distributed in society, and that centralized models for economic planning and coordination are prone to failure due to an inability to aggregate this distributed

Crowds and Creativity

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The Principles of Distributed Innovation

- 1: Self-Organizing Communities (think open source software)
- 2: Blending Community and Commerce (think Threadless)
- 3: Getting outsiders to innovate (think Innocentive)

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Crowds and Creativity

The Wisdom of Consumer Crowds

Collective Innovation in the Age of Networked Marketing

Robert V. Kozinets

York University

Andrea Hemetsberger

University of Innsbruck

Hope Jensen Schau

University of Arizona

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Past theories of consumer innovation and creativity were devised before the emergence of the profound collaborative possibilities of technology. With the diffusion of networking technologies, collective consumer innovation is taking on new forms that are transforming the nature of consumption and work and, with it, society and marketing. We theorize, examine, dimensionalize, and organize these forms and processes of online collective consumer innovation. Extending past theories of informationalism, we follow this macro-social paradigm shift into grassroots regions that have irrevocable impacts on business and society. Business and society need categories and procedures to guide their interactions with this powerful and growing phenomenon. We classify and describe four types of online creative consumer communities—Crowds, Hives, Mobs, and Swarms. Collective innovation is produced both as an aggregated byproduct of everyday information consumption and as a result of the efforts of talented and motivated groups of innovative e-tribes.

Keywords: *online community; creativity; innovation; technology; consumer co-creation*

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Crowds and Creativity

OPEN INNOVATION: AN EMPIRICAL STUDY OF ONLINE CONTESTS

Completed Research Paper

Yang Yang

Fox School of Business and Management

Temple University

Philadelphia, PA U.S.A

yangyang@temple.edu

Pei-yu Chen

puchen@temple.edu

Paul Pavlou

paul.pavlou@temple.edu

Abstract

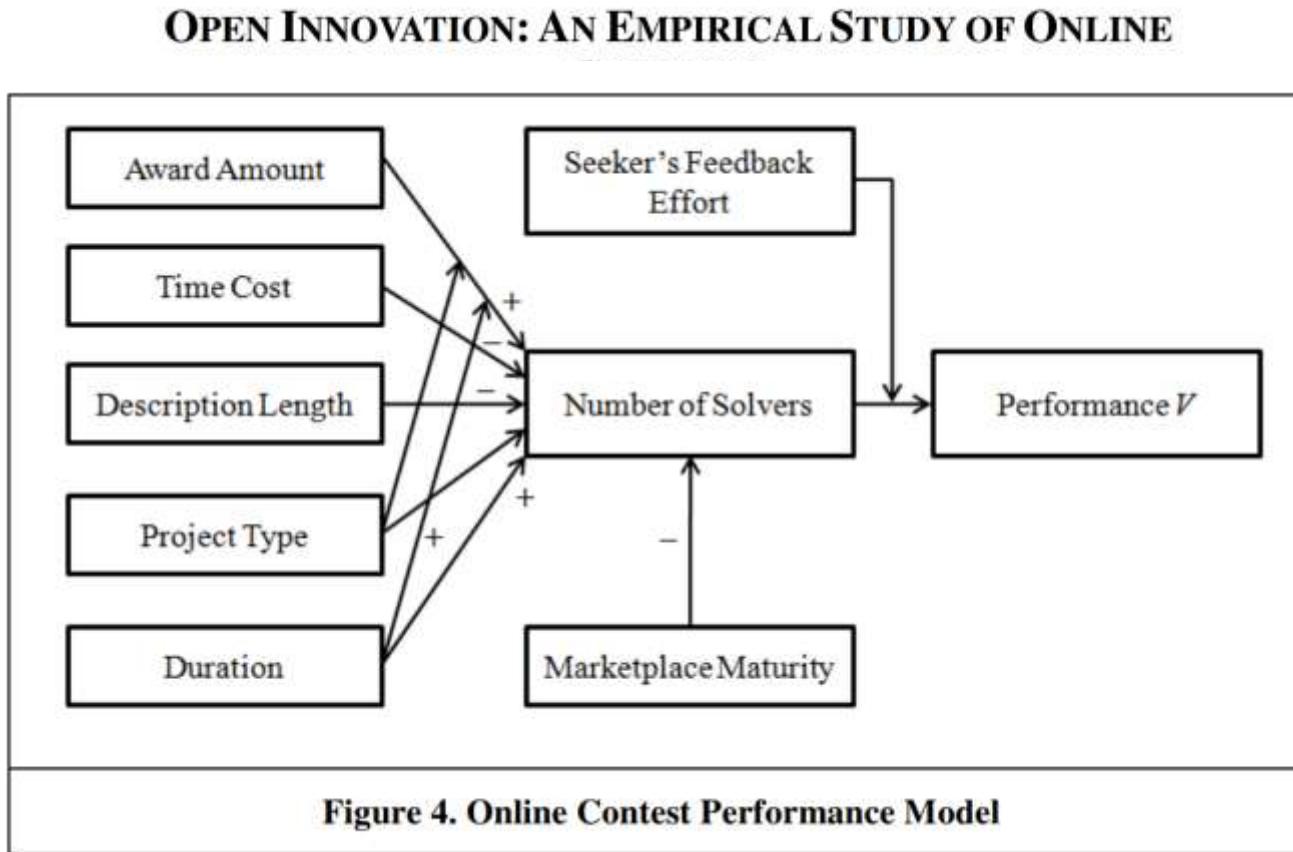
Online contests for open innovation – seekers posting innovation projects to which solvers submit solutions – have been developed into a new online commerce model. This study is one of the first to lift the veil of online contests. We identify that real world online contests are very different from what is assumed by previous studies. A real world online contest has uncertain number of solvers due to dynamic participation process. Feedback can encourage solvers to contribute more than the equilibrium effort. With a given award, if the seeker's feedback effort is high enough, the emerging number of solvers is a proxy measure of contest performance. By examining large-scale data from an online contest marketplace, we find that a contest with higher award, longer duration, shorter description, lower time cost, and higher popularity will attract more solvers. Specifically simple and ideation based projects are the most efficient in capturing solvers.

Keywords: online contest, open innovation, feedback, contest, online marketplace

Introduction

Investment returns in R&D and innovation are one of the most important sources of future market value for firms today (Hall et al. 2005). Accordingly, the firm's investment strategy for R&D and innovation is very important. The most common approach is *internal R&D projects*, by which teams of developers within the firm seek solutions for

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CHI 2011 • Session: Crowdsourcing

May 7–12, 2011 • Vancouver, BC, Canada

Cooks or Cobblers? Crowd Creativity through Combination

Lixiu Yu

Stevens Institute of Technology
Castle Point on Hudson, Hoboken NJ 07030 USA
lisayu1103@gmail.com

Jeffrey V. Nickerson

Stevens Institute of Technology
Castle Point on Hudson, Hoboken NJ 07030 USA
jnickerson@stevens.edu

ABSTRACT

A sketch combination system is introduced and tested: a crowd of 1047 participated in an iterative process of design, evaluation and combination. Specifically, participants in a crowdsourcing marketplace sketched chairs for children. One crowd created a first generation of chairs, and then successive crowds created new generations by combining the chairs made by previous crowds. Other participants evaluated the chairs. The crowd judged the chairs from the third generation more creative than those from the first generation. An analysis of the design evolution shows that participants inherited and modified presented features, and also added new features. These findings suggest that crowd based design processes may be effective, and point the way toward computer-human interactions that might further encourage crowd creativity.

Author Keywords

Crowdsourcing, creativity, conceptual combination, human based genetic algorithms, social computing, design sketches.

ACM Classification Keywords

H5.3. Group and Organization Interfaces

ACM General Terms

Design

INTRODUCTION

Can a crowd design well? On the one hand, diversity of

variation, followed by selection: several random choices are made, and the results evaluated [6]. Of particular note are genetic algorithms: computer simulations of evolution in which gene-like representations are altered and combined in a search for optimal solutions [7, 11, 15]. Such algorithms, however, don't work well if the candidate solutions cannot be formally represented and computationally evaluated. Because of this, *human based* genetic algorithms have been proposed; these algorithms allocate many or all of the combination and evaluation functions to human labor [19].

Until recently, large-scale experiments to test human-based algorithms were prohibitively complex. But web technologies, and the organizational structures provided by crowdsourcing marketplaces now make it feasible to coordinate large numbers of people: Participants can collaborate with each other by working on parts of an overall task, facilitated by crowdsourcing processes and technology [1, 4, 9, 16, 17, 22, 23]. Some of these techniques are designed so that each member of the crowd functions like a processing node in a computer system [20, 29].

These techniques may not work, because computers and humans are so different. Computers execute the instructions of an algorithm without complaint or caprice. In contrast, while human beings can bring a wealth of alternative perspectives to any task, they may also choose to ignore algorithmic instructions. Will humans participating in such

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Toward Collaborative Ideation at Scale—Leveraging Ideas from Others to Generate More Creative and Diverse Ideas

Pao Siangliuue¹ Kenneth C. Arnold¹ Krzysztof Z. Gajos¹ Steven P. Dow²

¹Harvard School of Engineering and Applied Sciences
Cambridge, MA USA
{paopow, kcarnold, kgajos}@seas.harvard.edu

²Carnegie Mellon University
Pittsburgh, PA USA
spdow@cs.cmu.edu

ABSTRACT

A growing number of large collaborative idea generation platforms promise that by generating ideas together, people can create better ideas than any would have alone. But how might these platforms best leverage the number and diversity of contributors to help each contributor generate even better ideas? Prior research suggests that seeing particularly creative or diverse ideas from others can inspire you, but few scalable mechanisms exist to assess diversity. We contribute a new scalable crowd-powered method for evaluating the diversity of sets of ideas. The method relies on similarity comparisons (is idea A more similar to B or C?) generated by non-experts to create an abstract spatial *idea map*. Our validation study reveals that human raters agree with the estimates of dissimilarity derived from our idea map as much or more than they agree with each other. People seeing the diverse sets of examples from our idea map generate more diverse ideas than those seeing randomly selected examples. Our results also corroborate findings from prior research showing that people presented with creative examples generated more creative ideas than those who saw a set of random examples. We see this work as a step toward building more effective online systems for supporting large scale collective ideation.

than if each person ideated alone, and this diversity can lead to more creative overall solutions [23, 27].

Various online platforms have emerged as spaces where people can share their ideas and get inspired by other people's ideas. For example, AllOurIdeas.org hosts more than 200,000 ideas addressing 4,500 problems, Quirky.com receives hundreds of new product ideas every day from its 500,000 inventors, and OpenIDEO.com hosts an archive of more than 1,000 ideas to solve 24 pertinent societal problems. Contributors to these platforms can browse other people's ideas in search of inspiration. The mix of perspectives and expertise among the participants allows creative solutions to emerge in a way unimaginable in the lone-innovator or small-group settings.

But the large-scale idea generation paradigm also introduces a new challenge: how to find the most inspiring ideas in a sea of hundreds? Existing approaches are to either help people parametrically browse and search for examples [19, 17] or extract schemas from examples and search for the schema that allows analogical transfer for a new idea [38, 36]. Even with such strategies, the users still have to wade through many examples to either find an inspiring idea or to find the right set of ideas to allow schema induction. Ideators may get overwhelmed by a large number of mundane or redundant ideas

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¹Harvard School of Engineering and Applied Sciences
Cambridge MA USA ²Carnegie Mellon University
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Crowds and Creativity

Session: Crowds and Creativity

CHI 2014, One of a CHInd, Toronto, ON, Canada

Searching for Analogical Ideas with Crowds

Lixiu Yu, Aniket Kittur, Robert E. Kraut

Carnegie Mellon University

5000 Forbes Avenue, Pittsburgh, PA 15213

{lixiuyu, nkittur, robert.kraut}@cs.cmu.edu

ABSTRACT

Seeking solutions from one domain to solve problems in another is an effective process of innovation. This process of *analogy searching* is difficult for both humans and machines. In this paper, we present a novel approach for representing a problem in terms of its abstract structure, and then allowing people to use this structural representation to find analogies. We propose a crowdsourcing process that helps people navigate a large dataset to find analogies. Through two experiments, we show the benefits of using abstract structural representations to search for ideas that are analogous to a source problem, and that these analogies result in better solutions than alternative approaches. This work provides a useful method for finding analogies, and can streamline innovation for both novices and professional designers.

Author Keywords

Analogy searching; schema; crowdsourcing; creativity

ACM Classification Keywords

H.5.3. Group and Organization Interfaces

INTRODUCTION

The emergence of large online idea repositories has the potential to radically improve design practice by increasing designers' access to ideas relevant to the problems they are

Online idea repositories could provide a treasure trove of useful solutions to problems that are analogous to the original idea but in different domains. For example, a method for extracting a lost cork from a wine bottle might be adapted to save a baby stuck in the birth canal [33]. Analogy can be a highly effective tool for increasing innovation in domains ranging from scientific discovery to creative problem-solving to product development. Scientific and technological breakthroughs are often the result of taking a solution from a source domain and transferring it to a target domain [14]. Numerous psychological studies have shown that analogy transfer improves creative problem-solving [17,18]. Similarly, both empirical observation and experimental studies in product development find a positive relationship between the extent of analogical transfer and the originality of the product concept [8]. However, being able to harness the power of these idea repositories depends on designers' ability to find, recognize, and use analogies.

Searching for analogous ideas across domains is challenging for a number of reasons. Ideas that are analogous may share the same deep relational structure but be very different in terms of surface attributes [16]. For example, Chrysippus in the second century B.C. made an important analogy that sound waves behaved like water waves, despite the many different surface features between the two [22].

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Searching for Analogical Ideas with Crowds

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Carnegie Mellon University

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Crowds and Creativity

Fast, Cheap, and Creative: Evaluating Translation Quality Using Amazon's Mechanical Turk

Chris Callison-Burch

Evaluating translation quality through reading comprehension, which is rarely done, can be easily accomplished through creative use of Mechanical Turk.

Manual evaluation of translation quality is generally thought to be excessively time consuming and expensive. We explore a fast and inexpensive way of doing it using Amazon's Mechanical Turk to pay small sums to a large number of non-expert annotators. For \$10 we redundantly recreate judgments from a WMT08 translation task. We find that when combined non-expert judgments have a high-level of

people. We show that:

- Non-expert annotators produce judgments that are very similar to experts and that have a stronger correlation than Bleu.
- Mechanical Turk can be used for complex tasks like human-mediated translation edit rate (HTER) and creating multiple reference translations.

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"The Effect of Peripheral Micro-tasks on Crowd Ideation", Girotto V, Walker E, Burleson W. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*

The Effect of Peripheral Micro-tasks on Crowd Ideation

Victor Girotto¹

¹ School of Computing, Informatics,
and Decision Systems Engineering
Arizona State University
Tempe, AZ, USA
{victor.girotto, erin.a.walker}@asu.edu

Erin Walker¹

Winslow Burleson²
² Rory Meyers College of Nursing
New York University
New York, NY, USA
wb50@nyu.edu

ABSTRACT

Research has explored different ways of improving crowd ideation, such as presenting examples or employing facilitators. While such support is usually generated through peripheral tasks delegated to crowd workers who are not part of the ideation, it is possible that the ideators themselves could benefit from the extra thought involved in doing them. Therefore, we iterate over an ideation system in which ideators can perform one of three peripheral tasks (rating originality and usefulness, similarity, or idea combination) on demand. In controlled experiments with workers on Mechanical Turk, we compare the effects of these secondary tasks to simple idea exposure or no support at all, examining usage of the inspirations, fluency, breadth, and depth of ideas generated. We find tasks to be as good or better than exposure, although this depends on the period of ideation and the fluency level. We also discuss implications of inspiration size, homogeneity, and frequency.

Author Keywords

Crowdsourcing; ideation; creativity; microtasks.

ACM Classification Keywords

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

INTRODUCTION

With the advent of crowdsourcing, people can now collectively accomplish a wide range of tasks that could not

In our work, we leverage a similar micro-tasks paradigm to achieve creative solutions in response to complex problems. Creativity thrives on diversity and exploration. It is about creating something that is both novel, breaking away from common knowledge or practices, but at the same time being appropriate or useful [11]. From designing T-shirts (www.threadless.com) to solving tough technical challenges (www.innocentive.com), there are many examples of the crowd performing tasks that rely on their creativity.

Why explore the creativity of the crowds? The first reason is that a great number of people will generate a great number of ideas. Furthermore, the heterogeneity of the crowd can increase the potential of ideas being sparked that otherwise wouldn't [8]. However, there are also issues that need to be carefully considered in a system that tries to tap into the crowd's creativity. Issues such as cognitive interference or social loafing can increase together with the number of ideators [8]. Therefore, crowd ideation needs to be carefully designed in order to improve, not hinder the creative output.

A popular method used for generating ideas is typically brainstorming, which seeks to increase the number of ideas generated by encouraging intensive exploration of ideas while restricting criticism [25]. In the crowd context, just like in smaller groups, people have tried to enhance idea generation during brainstorming sessions in different ways, many times employing other individuals or workers, outside

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- Ideation: The process of coming up with ideas, typically in some design setting
- Example from paper:

“Mechanical Turk currently lacks a dedicated mobile app for performing HITs on smartphones (iPhone, Androids, etc.) or tablets (e.g., the iPad). Brainstorm N features for a mobile app to Mechanical Turk that would improve the worker's experience when performing HITs on mobile devices. Be as specific as possible in your responses.”