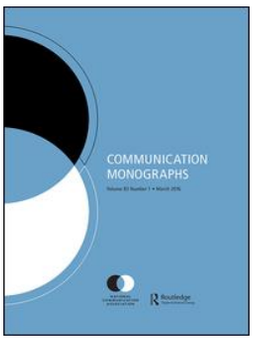

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Finding the diamond in the rough: Exploring communication and platform in crowdsourcing performance

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ABSTRACT

Ideas that rise to the top in crowdsourcing platforms are assumed to succeed because they are perceived to be the best ideas, but questions about the factors that influence the outperformance of one solution over another remain underexplored. The Peer Vetted Ideas model is proposed as an explanation of elements that affect performance in crowdsourcing for creative ideation solutions. Using content analysis and hierarchical multiple regression, the study examined the relationship between performance in a public sector crowdsourcing competition and (a) design concepts, (b) communication about the designs, and (c) platform context. Results indicate that crowdsourcing is not always a meritocratic process to produce the objective "best" ideas, but rather also depends on subjective communicative, temporal, and platform factors.

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Crowdsourcing; organizational communication; narrative; Peer Vetted Ideas model; peer-vetted creative production; design; performance

Crowds and communication are connected, but as the networked society evolves, the various relationships between them await further exploration by communication scholars (Stohl, 2014). Stohl (2014) conceives of the cloud as representing "the ubiquitous large-scale technological infrastructure of contemporary society," as both a real technological apparatus and a taken-for-granted set of relationships between individuals, technologies, and data that define possibilities and impossibilities (p. 6). Assembling crowds through online crowdsourcing platforms can be viewed as a form of networking to solve problems with a diversity of opinion or designs (Wexler, 2011). Grounded in the logic of informational capitalism, the information products of crowdsourcing are perceived as socially desirable and a source of economic value (Castells, 2009, 2010). Crowdsourcing systems are often praised as meritocratic (Brabham, 2013), or participative and distributed, where the best ideas emerge organically through an open call for solutions (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). Communication research suggests that apart from the ideals of equal exchange, however, there may be material, contextual factors that affect how and why certain ideas emerge in crowdsourcing arrangements (Condit, 1997). Communication by the crowd, especially the presentation and vetting

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of new ideas, has to this point remained relatively unexamined by communication scholars.

In design or policy problems, where the answer is one of subjective taste or opinion, determining the reasons for the outperformance of one option over another become difficult to decipher. Communication about a situation or artifact can persuade people to perceive it in a certain way (Cialdini, 2001), and a crowdsourcing platform invites a degree of dialogue between the design concept and the people in the crowd. Indeed, communication and design are intimately linked (Aakhus, 2007; Jackson & Aakhus, 2014). The technology context also affects user behavior (Mumford, 1934; Winner, 1980), and the role of a website's structure and community rules must be taken into account to understand an outcome (Preece, 2000). The current study investigates not only the communicated elements of design concepts in relation to a crowdsourcing competition outcome, but also the effects of online dialogue between people about the design ideas, and website and contest structure on a design's performance.

An understanding of communication in crowdsourcing is important theoretically as organizations and societies continue to view crowdsourcing as a networked and inclusive problem-solving option. A systematic examination that considers multiple communication theories to understand performance in crowdsourcing platforms has hitherto not been undertaken. The present investigation addresses calls made by Stohl (2014) to further study crowds and by Aakhus (2007) to theorize the relationship between design and communication. The Peer Vetted Ideas (PVI) model is proposed as an explanation of communication elements that affect performance in crowdsourcing intended for creative ideation solutions. Practically, the work isolates factors that allow creators to approach designing submissions and crowdsourcing platforms with the knowledge of features that can ultimately change the outcome of these competitions.

Crowdsourcing production: Finding the diamond in the rough

Research about the function and application of crowdsourcing has expanded rapidly in the decade since the term "crowdsourcing" was coined by Howe (2006). Crowdsourcing is "an online, distributed problem-solving and production model that leverages the collective intelligence of online communities[1] to meet specific organizational goals" by blending bottom-up creative process with top-down management (Brabham, 2013, p. xix). To date, thousands of scholarly articles have focused on the conditions under which crowdsourcing works for organizations and in fields as diverse as management, medicine, urban planning, and computing. The application of crowdsourcing has moved from the private sector into the public sector as well, where the method has become somewhat common as a way to bring public input into government decisions and operations under the umbrella of e-governance (Brabham, 2015; Koch, Füller, & Brunswicker, 2011).

For organizations, harnessing the crowd means the potential to find solutions that are either the sole contribution of a person or emanate from an aggregate of contributions by many people. Howe (2006) initially assessed that the crowd "produces mostly crap" but also innately "finds the best stuff." This allows the best work to rise to the top of the pile, outperforming professionals in organizations through combined competition and collaboration (Hutter, Hautz, Füller, Mueller, & Matzler, 2011). The logic presented in crowdsourcing for whole ideas is similar to that of locating a diamond in the rough, or

finding an idea with exceptional qualities but that lacks refinement or polish (Diamond in the rough, 2015). While claims about crowdsourcing as a democratizing process have been deflated by empirical evidence (Brabham, 2013), there is some truth to the notion that groups and open problem-solving environments can produce better results than people working alone, evidenced in open innovation research (Von Hippel, 2005), cognitive diversity research (Page, 2007), and research on marginality in problem-solving (Jeppesen & Lakhani, 2010). Despite the volume of cross-disciplinary scholarship and application across public and private sectors, there remains considerable interest among scholars and practitioners of crowdsourcing about how and why certain ideas fare better than others. General questions remain about the right conditions for a successful crowdsourcing venture and specific questions persist about the factors that contribute to an idea's performance in crowdsourcing contests (Huberman, Romero, & Wu, 2009; Kosinski, Bachrach, Kasneci, Van-Gael, & Graepel, 2012; Rogstadius et al., 2011). To date, the disciplines of business and computing have dominated the research conversation on crowdsourcing (see Afuah & Tucci, 2012; Kittur et al., 2013), viewing the phenomenon through a narrow lens of organizational and technical performance that fails to fully account for the contextual and platform influences so often the focus of communication studies (Brabham, 2013). Retrieving foundational concepts from Shannon and Weaver (1949), communication scholarship can shed light on both the process of an idea's performance in crowdsourcing and the relation of message and channel to outcome. The PVI model brings communication to the fore in crowdsourcing research.

Practical applications of crowdsourcing in problem-solving environments have manifested in four formats. Based on problem types, crowdsourcing models include knowledge and discovery management, distributed human intelligence tasking, broadcast search, and peer-vetted creative production (Brabham, 2013). The current study examines *peer-vetted creative production* (PVCP). In the PVCP crowdsourcing approach, an organization posts an esthetic challenge to an online community. Then people submit ideas or design concepts to an online gallery or discussion space, where peers are able to vote on, comment on, and sort through ideas to determine the best ones. For instance, Threadless.com is a clothing company built around an ongoing crowdsourced design contest. Here, designers submit original t-shirt compositions and community members vote on the submissions. The highest rated designs are printed and offered to members of the online community for purchase. The Threadless system offers designers an outlet to communicate their ideas, and allows members the ability to communicate dynamically by vetting designs through posting comments and voting. An organization would use a PVCP crowdsourcing application when faced with an ideation problem where the best answer is one of public support or buy-in rather than a scientifically true solution. Top answers that emerge in PVCP applications are those that receive the greatest support from the community, which may or may not align with normative best practices or technical standards known by the organization. Public sector agencies regularly rely on public participation activities, such as town hall meetings and hearings, to gain public feedback and buy-in on policies and plans, and PVCP crowdsourcing is particularly well suited to these kinds of activities (Brabham, 2015).

Crowdsourcing is often understood to be an optimization process where discrete bits of knowledge or expertise are accumulated together in a way that outperforms individual experts or groups to solve a problem. This assumption is prominent in popular theories

often used to explain the logic of crowdsourcing, from Surowiecki's (2004) "wisdom of crowds" concept and Shirky's (2010) arguments in *Cognitive Surplus*, to Benkler's (2006) "commons-based peer production" and Brabham's (2008) early explanations. The wise crowd metaphor rests on a fungibility of the crowd's ideas, an interchangeability that renders the unique contributions of individuals' banal, with an expectation that some objective truth emerges from the process. Scholars have criticized this assumption for its devaluation of the creative contributions of individuals and subjugation of labor rights (Ettlinger, 2016; Felstiner, 2012). PVCP crowdsourcing is fundamentally different from other forms of crowdsourcing because it relies on complete narratives communicated by individuals in the crowd, contributions that are not fungible and are dependent on both the unique ideas of individuals in the crowd and those individuals' ability to vet the complete ideas of others. Instead of people contributing pieces to a larger solution, PVCP captures the process of people contributing whole solutions to be evaluated by the crowd. Prior research on crowdsourcing, especially the dominant discourse in business and computing, has largely ignored the peculiarities of PVCP cases, based on assumed fungibility of knowledge and objective performance outcomes. This study thus brings the socially dynamic nuance of PVCP crowdsourcing and the strengths of emerging communication theory about design to bear on the broader scholarly discourse on crowdsourcing, contributing an understanding of the contextual factors that explain why some ideas in PVCP crowdsourcing succeed over others.

The narrative of a design idea

Design and communication are linked in a co-constructed relationship. Aakhus (2007) asserts that "design is a way to understand communication and an approach for investigating the social world from the standpoint of communication" (p. 112). Designed objects carry meaning and have politics, and likewise people shape and ascribe meaning to these objects (Cross, 2006; Jacobs, 1958; Rapoport, 1990; Winner, 1980). Communication scholars have recently turned attention to the connections between communication and design, a relationship long pondered in the disciplines of sociotechnical systems, architecture, and urban planning. Cross (2006) writes that "designers have the ability both to 'read' and 'write' in this culture: they understand what messages objects communicate, and they can create new objects which embody new messages" (p. 9). Thus "the successes, failures, and surprises of designs and design work provide material for reflecting upon and theorizing communication" (Aakhus, 2007, p. 115). This study begins theorizing about the relationships among design ideas, communication, and platform in an empirical investigation of the PVCP crowdsourcing process.

Design concepts or ideas submitted to PVCP crowdsourcing platforms are composed of whole narratives that communicate a complete and specific vision. Since the "designer's aim … is the communication of a specific design proposal" (Cross, 2006, p. 16), the narrative of a design includes both persuasive and esthetic themes through visual and textual constructions that together communicate that idea on behalf of its creator. As Fisher (1985) explained, "any instance of discourse is always more than the individuated forms that compose it" (p. 347). Building from the narrative paradigm (Fisher, 1984), the way a design idea is presented, in terms of both the style and content of its visual and textual rhetoric, contributes to its persuasive appeal and success when competing

against other design concepts. In addition to the visual and textual elements of the design itself are the rules and expectations driving the creation of the design. Rapoport (1990) suggests it "is the *users*' meaning [in interpreting the built environment] that is important, not architects' or critics'" (p. 16). Thus, an understanding of what contributes to the persuasive appeal of a design is especially important for understanding the workings of communication in PVCP crowdsourcing applications. The way that individuals in the community perceive and evaluate ideas determines performance in this type of crowdsourcing, not necessarily any objective criteria related to technical standards or normative best practices known to the organization or industry.

PVI model

We set forth the PVI model as a way to conceptualize the relationships among design, communication, and platform to performance in the PVCP model of crowdsourcing. The PVI model provides a useful heuristic model that is comprised of three elements: (1) design concept which includes visual style, visual content, and textual narratives; (2) context, the surrounding environment in which the concept is presented, which includes communication and platform; and (3) performance, which centers on the rating or voting score of the proposed creative ideation solution. The PVI model (see Figure 1) begins with the assertion that both concept and context of a design idea impact performance. Visual

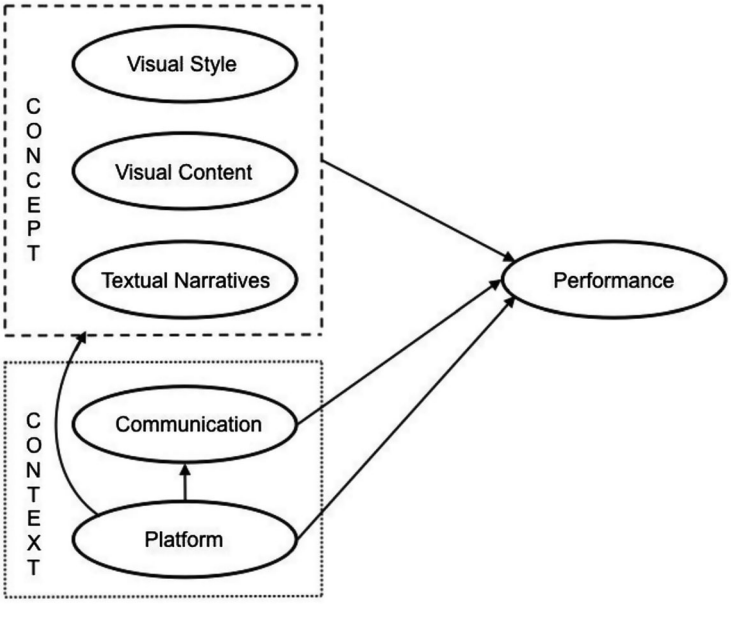

Figure 1. The PVI model. The PVI model begins with the assertion that both concept and context of a design idea impact performance. The visual style, visual content, and textual narrative combine together to form the concept, which is the whole narrative of the design idea. The context is the surrounding environment in which the concept is presented. Communication and platform factors, both contextual elements, contribute to the understanding of the design concept and its performance. Parameters of the platform impact the process of communication and the presentation of the design concept. Performance in this study refers to how well designs fared within the peer-voted competition.

style, visual content, and textual narratives contribute to the communication of the concept and its performance. *Visual style* refers to the perceived means by which the images were produced. Visual content refers to the subject matter depicted in the image. *Textual narratives* are the thematic descriptions provided by the designer about the design. The visual style, visual content, and textual narrative combine together to form the *concept*, which is the whole narrative of the design idea. The *context* is the surrounding environment in which the concept is presented. Communication and platform factors, both contextual elements, contribute to the understanding of the design concept and its performance. *Communication* is defined as interaction provided by designers and users about each entry. *Platform* includes temporal elements and attention paid to a design by visitors on each entry. *Performance* in this study refers to how well designs fared within the peer-voted competition itself rather than to imply how well the design might perform in the real world. High performance here means that a design received high scores in the competition.

The PVI model suggests three sets of relationships. The first is that design concept and context influence performance. The second is that platform influences communication. The third is that platform and communication influence design concept. These relationships are captured in three propositions derived from the model. Based on recent literature on design and/as communication (e.g., Aakhus, 2007; Jackson & Aakhus, 2014), the first proposition is:

> P1. The visual style, visual content, and narrative of design ideas all comprise the design impression and are judged by peers to decide on its performance.

The first question that emerges in the study is:

> RQ1: What (a) visual styles, (b) visual content, and (c) textual themes are depicted in designs?

While Fisher makes the hermeneutic argument that a whole narrative cannot be broken into its individual elements, judging criteria often asks leaders and the public to do just that in evaluation of a design's usefulness and appeal. The relationship of these individual design elements to a design's performance has not been examined in the context of crowdsourcing where the crowd decides on a winning idea.

Beyond the design idea itself, there are other communication and platform elements that may influence the performance of a design idea in a PVCP crowdsourcing format. Foundational communication research emphasizes the role of dialogue, feedback, and other contextual factors in the way a message, such as a design, is received and interpreted by viewers, as well as how they respond (Hall, 1980; Shannon & Weaver, 1949). Online, interactive communication has been explored by many scholars (Wise, Hamman, & Thorson, 2006), some of whom have viewed interactivity as a structural element afforded by the website context (Coyle & Thorson, 2001). Communication between designer and viewer about the design idea may shift the interpretation or understanding of that design, and must be accounted for in teasing out factors that play a role in performance.

Temporal dynamics must also be considered when theorizing about communication interaction and performance (McGrath & Kelly, 1992). The way exposure and attention unfold over time is especially important to consider in the implementation of an idea as a communicated artifact (Bayus, 2013; Leonardi, 2009). The current study examines whether the amount of time exposed on the site and the amount of attention a design

receives from users are related to a design's performance in a crowdsourcing platform. Crowdsourcing platform designers make important decisions about the timing and structure of a contest that may impact the behaviors of people who contribute to the site. Given the previous discussion, the remaining two propositions for the PVI model are proposed:

P2. The online discussion or communication between designers and commenters contributes to the interpretation of the design idea by voters and the design's subsequent performance.

P3. The platform context, including temporal factors, further influences the interpretation of the online discussion, design impression, and performance.

The platform is the primary context for the interpretation of design concepts presented by designers and has two distinct elements: the design concept and the communication of users. We explore the relation of the communication and platform context elements to whether the crowd favors a design:

RQ2: Which design elements (text and image), communication factors, and website context items significantly relate to its score?

Method

A combination of content analysis and hierarchical multiple regression was used to analyze the two research questions. The dual methodologies allow a description of statistically significant communication patterns for a performance outcome on a PVCP crowdsourcing platform.

Bus stop design vocabulary

A case study about bus stop architectural design was used to explore the PVI model's propositions. Architectural renderings are persuasive narrative devices, often idealized or exaggerated to meet particular goals when architects interface with clients or the public. As Freeman (2013) explained, "The idealized representation of un-built buildings is stock trade in the architectural profession … to sell the designs to clients or to persuade the public … to get the project built" (para. 4). The visual rhetoric of architectural pictorial renderings can vary in the elements of style to persuade viewers. For instance, architects view sketches as more interesting and imaginative and enable discussion and interpretation early on in a client relationship, whereas refined computerized renderings are more suitable for later stages with a client (Schumann, Strotthotte, Laser, & Raab, 1996). For the lay public, photorealistic renderings are more reliable and valid than sketches (Bates-Brkljac, 2009).

The visual content of an architectural design also holds persuasive weight. Schlegel (2012) found that viewers with less professional architectural experience emphasized " … the non-architectural features in the image (such as people, plants, etc.) … since they are important to create a convincing close-to-real impression" (p. 57). People and plant life in architectural renderings serve an important purpose in conveying the scale and intended use of a future space (Knoll & Hechinger, 2006). Trees depicted at bus stops and lining the sidewalk to a bus stop have been found to be the most preferred features among riders, alongside more obvious features, such as the simple presence of a shelter

and a bench on which to sit (Ewing, 2000). On depictions of people, the "persons that populate these drawings are meant … to look slightly unreal," often existing as semi-transparent figures atop the building (Gallanti, 2012, p. 55). These people figures are "a tool for promoting the project to juries and developers, and to market it to potential final users" (Gallanti, 2012, p. 55).

Written descriptions that accompany images also relay part of the total narrative of an architectural or artistic design. The empirical research on the effects of writing accompanying visual artworks – including labels, descriptions, and artists' statements – is at present somewhat conflicted, but there is some evidence that written descriptions do matter in terms of how viewers enjoy or understand an image (Specht, 2010). Written communication is an important part of an architect's creative processes and in how he or she communicates designs to stakeholders. Studying the written notes and spoken conversations of architects during the design process, Medway (1996) found that writing and talking about drawings during the evolution of designs helped the virtual building seem real. Indeed, architects may desire written accounts more than drawings, as they immerse the reader in the emotional feel and intended use of a possible space without fixing the image of that space in the viewer's mind through a rendering (Rasner, 2012).

Normative best practices in bus stop design suggest that a number of features may make bus stops optimally safe, usable, and desirable (BC Transit, n.d.; Bodmer & Rainer, 1977; Easter Seals/Nelson Nygaard, n.d.; Texas Transportation Institute, 1996). The Transportation Research Board of the National Academies maintains a set of guidelines for bus stop design, which includes discussion of seating, shelter, lighting, options for materials in the construction of bus stops, security cameras, vending machines, pay phones, and other elements of site planning, such as the placement of trees and set-backs from the road (Texas Transportation Institute, 1996). In addition, the Americans with Disabilities Act informs the inclusion of accessibility features, such as ramps and curb heights, braille, and other technologies (BC Transit, n.d.; Easter Seals/Nelson Nygaard, n.d.). A successful bus stop design would be reasonably expected to incorporate many of these normative elements.

Case: Next Stop Design

The Next Stop Design competition was a federally funded research project to test the viability of the crowdsourcing model in transportation planning at the neighborhood scale. Similar to Threadless, Next Stop Design allowed users to submit designs for a bus stop shelter for a busy transit stop in Salt Lake City, Utah. The competition website was established and attracted users for the purpose of submitting and voting on bus stop designs. The bus stop designs represented a whole narrative expression of each designer – visual and written – to convey visions esthetically desirable enough to persuade voters in the crowdsourcing contest. Many features come together to create an appealing architectural design and an effective bus stop, and public transportation planners who outlined expectations for bus stops assumed that designs with many best practice features would fare better in a competition than those that do not. After a period of promotion on various media channels with the support of the Utah Transit Authority (Brabham, 2012a), the crowdsourcing competition lasted nearly four months (113 days) beginning on 5 June

2009. Information about Next Stop Design participants, including demographics and prior experience in planning and design, was reported in Brabham (2012a).

Design submissions included up to three digital images and description text of no maximum character length. Designs were static and submitted as whole entries to the contest platform that remained unchanged (i.e., they could not be updated with additional or replacement posts of visual or textual content). Designers could browse 12 pictures of bus stops from around the world on the "inspiration" page of the website, as well as a design brief of specifications and a list of free design tools. National standards on bus stop design were described in the guidelines (Texas Transportation Institute, 1996). Designers could submit more than one design as separate entries, and 225 designers submitted 258 designs in total.

People that visited the site, however, had some avenues for interacting with a design by scoring designs and posting comments. People that registered – a total of 3187 registrants – could vote once for each design, designating a score on a scale of one (lowest) to five (highest). On the voting page, the display logic was variable: designs were default displayed newest first, though users could sort by ascending or descending based on rating or date submitted. The three designs with the highest average scores and at least 25 votes won the competition. People who registered could post comments that would appear on the sidebar next to the design entry under discussion (see Figure 2). Designers were able to respond to visitors by also posting comments on their design. There were 1953 comments were posted (1816 from registrants on 201 designs and 137 from designers on 57 designs). At its close on 25 September 2009, a total of 11,058 legitimate votes had been cast (excluding 4218 fraudulent votes; see Brabham, 2012b, for more information). These elements – scores, visitor comments, and designer comments – provided a communication context that contributed to the perceived narrative of each design. The communication context may have influenced the score visitors gave designs and thus overall performance of a design in the contest.

One platform feature of Next Stop Design was a simultaneous submission and voting period, rather than a multi-phase endeavor. Functionally, one designer could have chosen to submit a design early in the contest period to give other people a longer window of time to view, comment, and score the design before the contest closing date; another designer may have opted to submit a design closer to the contest closing date so that it appeared fresh and new in light of an already robust collection of previously submitted designs. Time of exposure was a contextual factor that reasonably may have shaped the performance of a design's narrative. Whether the amount of time a design was exposed on the site was related to its performance is unknown. The number of visitors who saw a design (unique page views), the amount of time a visitor spent on the design page, and the number of days a design spent on the site could each have a relationship to the design's performance.

Sample

This research used a census sample of 258 designs submitted to the first iteration of the Next Stop Design website between 5 June and 25 September 2009. Archived since the competition ended, the website provided a frozen time capsule of unaltered data. Ten design submissions were excluded for various reasons, including that images were too small to be

Figure 2. A typical design submission web page from the Next Stop Design contest, which contained: (1) the score represented visually on a five-star scale; (2) the exact score on a one (lowest) to five (highest) scale with number of votes (i.e., ratings); (3) a comment box for people to write and submit comments; (4) a display of comments in chronological order, with each comment attributed to a user name and labeled with a time stamp; (5) a required primary design image; (6) up to two optional supporting design images (all images enlarged as a pop-up layer when clicked); (7) the design title; (8) the user name of the designer and date the design was submitted; and (9) an optional textual description to accompany the images.

readable, incorrect structures depicted in the design images (e.g., an office building), and designs that stated explicitly they were not a design submission. A sample of 248 cases were included for content analysis, and a final sample of 247 cases were used in the hierarchical multiple regression analysis after the exclusion of an outlier.

Procedures

To generate the dataset, basic information for each design submission was downloaded from the site to create variables including score, word count, number of images,

number of votes, number of user comments, and number of designer comments (see Table 1[2]). Next, Google Analytics was employed to acquire individual webpage metric variables, including unique page views, average time on page, and number of days on website. The two authors, hereafter coders, then established a coding scheme and coding instructions iteratively after reviewing and discussing design submissions. Some measures were obtained from the contest website, including items for communication between people (e.g., number of comments) and website statistics (e.g., unique page views). Coded measures on the design narrative for visual style, visual content, and textual content were formed a priori based on the contest instructions, which emphasized normative bus stop shelter design elements (Texas Transportation Institute, 1996), and a posteriori based on content found during the iterative coding process. Five amenities were coded in the visual content based on design contest instructions and urban planning standards given to designers, including lights, seating, bike rack, digital sign (e.g., interactive screen or television), and print sign (e.g., printed bus map or schedule information). Four themes were coded in the textual content based on the same criteria, including sustainable, safety, accessibility, and modular.

The unit of analysis was the standard template webpage of each design submission (see Figure 2). Visual style and visual content of designs were coded first, specifically images of the design at the top of each page. Textual content was coded second, specifically the identification of themes discussed in the design title, description, and image labels. The two coders coded all cases in the dataset separately in rounds of cases, and discrepancies were discussed and reconciled between rounds. For each round, a random selection of cases was drawn from the dataset (10 for the first three rounds to stabilize the codebook, followed by rounds of 50 cases) for coders to individually code until all cases were coded. Overall intercoder reliability was $\alpha \geq 0.82$ and calculated using Krippendorff's alpha-reliability coefficient (Hayes & Krippendorff, 2007; Krippendorff, 2011). After each round of coding, the coders compared and resolved discrepancies in meetings to finalize agreement. Coding was applied to all 248 cases.

Operationalization of variables

Communication, platform, and performance variables were acquired from the individual design webpage and metrics (see Table 1). The design variables for visual style, visual content, and textual themes, described in the following, were coded in the dataset.

Visual style variables

There were three visual style variables. The type of dominant, secondary, and tertiary images were coded in terms of whether they were present, and then categorized as computer, photo of model, hand-drawn and scanned, or media mashup/other.

Visual content variables

There were 14 visual content variables. Five amenities were binary coded in the visual content based on design contest instructions and urban planning standards given to designers, including lights, seating, bike rack, digital sign (e.g., interactive screen or television), and print sign (e.g., printed bus map or schedule information). Other content was binary coded as it emerged, including car, bus, grass, trees, shrubs, birds, and

buildings. The final emergent category, people, was coded on based on the depictions of people, including whether they were present, and then stick figures, photo figures, silhouettes, and other.

Textual theme variables

There were nine textual theme variables that captured the topics designers wrote about in the text. Four themes were coded in the textual content based on design contest instructions and urban planning standards, including sustainable, safety, accessibility, and modular. Sustainable was a mention of environmental sustainability using terms such as renewable, green, environmentally friendly, or eco. Experiencing nature was a mention of interaction with surroundings such as viewing, touching, or enjoying scenery, or sitting among the leaves or birds. Cost was any comment about expenses anticipated for construction materials or maintenance. Materials was an acknowledgment of construction elements, such as glass, plexiglass, fiberglass, wood, steel, or plastic. Modular refers to a type of architectural design and was recognition of prefabrication, or mass produced and replicable components. Safety and security was the reference to protection elements, such as a police call box or well-lit areas. Accessibility was remarks on accommodations for disabled users, such as a wheelchair ramp, textured ramp, or braille. Technology was the inclusion of technological features, such as digital screens, wireless Internet, and outlets. Movement was specifying structural motion of the physical space, such as hydraulics and movement with the sun.

Selection of variables

Variables were selected using Pearson's correlation coefficient and linear regressions. First, tolerance and variance inflation factor (VIF) were used to diagnose multicollinearity of predictor variables. Second, linear regressions were performed on groups of variables because the limited size of the dataset (the entire population of designs) did not have the statistical power to handle the full set of variables all at once. Bayesian information criterion (BIC) was assessed for all models to determine goodness of fit (Raftery, 1995). Several of the variables were non-significant sources of variance. Variables were retained for hierarchical multiple regression models if they had a significance $p < .10$, a tolerance of .60 or more, and a VIF lower than 1.40 in the linear regressions performed. Third, the subset of variables that were significant was used in the hierarchical linear regression models to answer RQ2. Variables were entered based on the concepts they represented: model 1 is design variables (cost, materials, modular, word count, buildings), model 2 adds communication variables (comments), and model 3 adds website context variables (days). All statistical analyses were performed using SPSS Statistics v. 20.

Results

RQ1 asked to identify the (a) visual styles, (b) visual content, and (c) textual themes of designs. Content analysis methods were used to examine each of these research sub-questions (see Table 1). In answer to the component (a) of RQ1, visual styles varied greatly between designs, as well as between the three images that designers could submit (see Table 2[3]). The most predominant style of design for all three images was computer

generated. Designers relied on "media mashups" – combinations of computer, drawings, photography, or other types of media – as the second most predominant way to express ideas in the contest. Scanned drawings and photographs of models were the third and fourth most popular expressions, respectively. About 20% of designers (50 designs) did not submit a second image, and another 20% of designers (98 designs) did not submit a third image.

In answer to component (b) of RQ1, the visual content in the images was coded on 17 items that were dichotomous, measuring whether or not the design images contained these items (1 for yes, 0 for no). Almost 40% (99 designs, 39.9%) included *labels*, or the labeling of elements shown in design images. An overwhelming majority of designs depicted people as *silhouettes* (128 designs, 51.6%), but some designs illustrated people as *photorealistic* (42 designs, 16.9%) or as *other figures*, such as avatars or stick figures (26 designs, 10.5%). About 20% of designs (50 designs, 20.2%) depicted *none*, or excluded any people from the images. Of the five coded amenities mentioned by the contest instructions and planning standards given to designers, *seating* was by far the most popular to include (230 designs, 92.7%). *Lights* (83 designs, 33.5%) and *print signs* (72 designs, 29%) were the next most popular amenities, followed by *digital signs* (63 designs, 25.4%) and *bike racks* (54 designs, 21.8%). Human-constructed environmental elements appeared in less than a third of designs, including *buses* (76 designs, 30.6%), *buildings* (68 designs, 27.4%), and *cars* (57 designs, 23.0%). Natural environmental elements such as *trees* (150 designs, 60.5%) and *grass* (119 designs, 48.0%) were often depicted; less popular were *shrubs* (60 designs, 24.2%) and *birds* (5 designs, 2.0%).

Finally, in answer to component (c) of RQ1, the narratives of design ideas in the text of titles, descriptions and image labels produced nine themes that were dichotomous measuring whether or not the design text contains these themes (1 for yes, 0 for no). The majority of designs (152, 61.3%) described the *materials* used to build the design, such as glass, plexiglass, fiberglass, wood, steel, and plastic, in the text. Many designs mentioned *sustainable* architecture (100 designs, 40.3%) – renewable, green, environmentally friendly, or eco – and *technology* (91 designs, 36.7%) – features such as digital screens or wi-fi Internet access. Some designs (55, 22.2%) featured an *experiencing nature* theme, where passengers would view or touch their natural surroundings, enjoy the scenery, or reside among leaves or birds. Fewer (44 designs, 17.7%) mentioned *safety* directly or through features such as a police boxes or intentionally creating well-lit space. *Cost*, such as whether designs would be affordable or expensive to build or maintain, was mentioned in 34 designs (13.7%). *Accessibility*, or whether designs mentioned wheelchair ramps, textured ramps, braille, or convenience of access, only appeared in 31 designs (12.5%). Not many designs (30 designs, 12.1%) mentioned *modular*, prefabricated, mass produced, or replicable, and the fewest number of designs (14, 5.6%) indicated *movement* of the physical bus shelter structure by the passenger (e.g., see-saw).

The visual style of computer generated images adopted by most designs in the contest aligned with the norms of the later stages of client negotiations in the architectural profession. Designs more often illustrated people as silhouettes and included environmental components such as trees and grass, conveying scale and intended use in a realistic imagined scene consistent with research on content in the architectural discipline. Based on the content analysis results, however, many designs varied from these consistencies in illustration style and content. Additionally, although some designs depicted amenities

or mentioned textual themes that drew from the design contest instructions and urban planning standards that were available on the website, only seats for passengers was almost uniformly adopted in designs. Lighting, bike racks, digital signs, and print signs were shown in a third or fewer of designs. The textual theme of sustainability was mentioned in 40% of designs, whereas safety and accessibility were described in fewer than 20% of all designs for bus stop shelters. In this case, the flexibility of expression in answer to a crowdsourced problem enabled creativity, but ultimately allowed designs to escape the inclusion of necessary practical elements for the construction of a bus stop. The visual style, visual content, and textual themes shown in these crowdsourced designs may have reflected the esthetic preferences of a designer rather than the persuasive elements needed to perform in the competition.

RQ2 investigated which design narrative items (image and text), communication factors, and website context items significantly related to performance. To answer RQ2, a multivariate linear regression was conducted separately for groups of designer image and text variables together, due to the limitations of the sample size. For instance, all text variables (sustainable, experiencing nature, cost, materials, modular, safety and security, accessibility, technology, and movement) were regressed together to identify sources of variation. Similarly, all other image and text variables were grouped and regressed together for selection in the first, baseline model. The models are reviewed individually and results of all three models, which build upon each other, are shown in Table 3. Building was the only image variable retained for model 1 analysis. Textual theme variables that were retained included cost, materials, modular, and word count. Model 1 addresses the significant image and text variables that relate to performance, or a high score. The textual theme of cost ($\beta = -.167$, $p < .01$) was the only variable to negatively and significantly influence the score. The other textual themes of materials ($\beta = .181$, $p < .01$) and modular ($\beta = .129$, $p < .05$) were positively and significantly related to score. Word count ($\beta = .157$, $p < .05$)

Table 3. Hierarchical multiple regression analysis of the effects of designer submissions (Model 1), with communication added (Model 2), and website attention added (Model 3) on design performance.

	Model 1 (Designer submissions)		Model 2 (Designer submissions and communication)		Model 3 (Designer submissions, communication, and website attention)	
	β	(SE)	β	(SE)	β	SE
Cost	−.167**	(.073)	−.170**	(.072)	−.147*	(.068)
Materials	.181**	(.051)	.195**	(.050)	.162**	(.048)
Modular	.129*	(.075)	.094	(.075)	.065	(.071)
Word count	.157*	(.018)	.120†	(.018)	.125*	(.017)
Buildings	.180**	(.054)	.188**	(.053)	.137*	(.050)
Comments	–		.188**	(.002)	.248***	(.002)
Days	–		–		−.324***	(.001)
R^2	.135		.167		.266	
Adj. R^2	.117		.146		.244	
F value	7.51***		8.02***		12.37***	
df	5		6		7	
BIC	−8		−12		−38	

Note: $n = 247$; BIC = $n \ln(1 - R^2) + p \ln(n)$.
†$p < .10$.
*$p < .05$.
**$p < .01$.
***$p < .001$.

was also positively and significantly related to score. The depiction of buildings ($\beta = .180$, $p < .01$) in images was the only image variable that significantly and positively predicted score. Model 1 included only design narrative variables – those of visual style, visual content, and textual themes – and explained 13.5% of the score variance among designs. The textual themes of materials and modular, word count, and the depiction of buildings in images all positively predicted score. Only the mention of cost negatively predicted score.

Communication variables on a design submission were also examined for their relation to score performance. A second linear regression was conducted with comments. For model 2, the designer variables of buildings, cost, materials, modular, and word count were included in step 1, and comments was added in step 2 of the hierarchical regression. Model 2 incorporated comments into the first model and sought to address which communication context items were significantly related to score. The textual theme of cost ($\beta = -.170$, $p < .01$) negatively predicted score. Another textual theme, materials ($\beta = .195$, $p < .01$), was positively and significantly related to score. No significant difference was found for the effect of the modular theme on score. Word count ($\beta = .120$, $p < .10$) was marginally significant and positively related to score. Buildings ($\beta = .188$, $p < .01$) was the singular image variable to significantly and positively predict score. Comments ($\beta = .188$, $p < .01$) among users on the website about a design significantly and positively predicted score. Model 2, which included both design narrative and communication context variables, explained 16.7% of the variance in score.

Finally, website context items allowed an exploration of whether the platform related to both the design narrative and communication context and score performance. To answer this, days was added as a variable in step 3 of the hierarchical regression for model 3. The textual theme of cost ($\beta = -.147$, $p < .05$) significantly and negatively predicted score. The textual theme of materials ($\beta = .162$, $p < .01$) significantly and positively predicted score. Modular produced no significant difference. Word count ($\beta = .125$, $p < .05$), buildings ($\beta = .137$, $p < .05$), and comments ($\beta = .248$, $p < .001$) positively and significantly predicted score. The number of days ($\beta = -.324$, $p < .001$) a design spent in the contest significantly and negatively predicted score. Model 3, which included design narrative, communication context, and platform variables, accounted for 26.6% of explained variance on score.

In sum, certain elements in designs, and not all ideal by planning standards, were found to be persuasive in affecting performance in the competition. Across models and independent of other factors, in a design narrative the mention of cost had a significant negative effect, but the mention of materials had a significant positive effect on score. The reduced effect of buildings, the only image variable that was significant in analysis, suggests that perhaps task-relevant image content may not be as important to design performance as the written description of themes, several of which remained significant. The amount of time an idea was exposed on the platform, however, dramatically negated the value of comments; the longer a design was available for conversation on the site, the less significant comments were for its performance.

Discussion

Three key findings and several implications emerged from this study. The analytical models indicated that the role of communication about design ideas and the platform context could

not be overlooked in the narratives conveyed in crowdsourcing platforms. The content of, and communication about, a design was related to its performance, and platform context was related to both content and performance. Taken together, the results of these research questions demonstrated that the solutions that rise to the top as answers to esthetic problems in PVCP crowdsourcing sometimes defy best practices or normative expectations.

The first finding was that among the three predictors of performance in the PVI model, the design concept alone and the design situated within its platform context were the most critical predictors of performance. In this study, the final model indicated that the third factor of communication about the design was relatively unimportant for performance. Comments mediated the salience of certain design content in this PVCP crowdsourcing platform. This finding resonates with an iterative sensemaking process (Weick, 1979), where feedback on a communicated narrative can shape perceptions of it for later audiences. The strong negative impact that number of days posted on the website had on performance suggests that the more time people have to scrutinize plans, the more they will do so. Analysis revealed that a higher verbal communication variable of comments in the textual narrative of designs predicted a higher score, which may be related to information processing theory (Miller, 1956; Newell & Simon, 1972). Higher values on comments may indicate cognitive processes of thinking, reasoning, and judging among users about the design concept. Higher values on the other verbal communication variable, word count, made by the designer, may point to cognitive processes of imagining, conceptualizing, and planning the design concept. Through this lens, verbal communication made by designers and users may be perceived as a mechanism to both convey and process various decisions in crowdsourcing.

Second, designs that fare better in the competition do so not necessarily based on whether they feature the "objectively good" elements (technical standards and normative best practices derived from bus stop design architecture), but rather through a mix of design, communication, and platform factors that persuade voters in how they score designs. Indeed, the juxtaposition of the objective and subjective criteria for design performance reveals perhaps the most important, counterintuitive finding in the study. The forms of visual style, visual content, and textual themes of the design narratives enabled a variety of esthetic expression from the crowd to meet the proposed challenge. Not all these design elements, however, were persuasive to influence performance, and the influence of some was eliminated as the communication about the design and the structure of the platform were added to the complexity of the narrative.

Third, while it is assumed – especially by architects and designers and supported by visual communication and media research (Kress & van Leeuwen, 1996; Lester, 2014; Medway, 1996) – that the image is of prime importance and emblematic of the success of a narrative project, images may not carry uniform weight in all online spaces. Other important factors add context to the images and help to convey complex concepts, such as a vision for the built environment. Visual style, visual content, and textual themes paint more holistic pictures for the public when understanding future urban space.

Implications

The findings from this study present several research implications. First, the public does not necessarily use the same normative criteria for assessing designs as professional

communities of practice. Criteria used to determine winners by the lay public may not select designs that adhere to legal or technical engineering requirements. A design had a good chance of succeeding in the competition by including some narrative items but ignoring others, including those identified as normative best practices by transportation planners. Professional ideals used to determine winning designs by experts may adhere to normative best practices, but may not represent the preferred esthetic elements in a design by the crowdsourcing audience. In other words, planners and architects may see value in a bus stop that includes certain elements, and this value may even be bolstered by empirical research, legal requirements, or engineering standards, but the lay public – including bus riders – wants other elements in bus stop design. The tension that crowd preference poses to crowdsourcing contest designers and groups or organizations who sponsor these contests is that the crowd may decide on design concepts that defy technical or legal requirements. In PVCP cases concerning the built environment, the crowd functions in an advisory capacity rather than as a conveyor of perfect solutions. Experts must be incorporated in the construction phase to scrutinize and transform design concepts into engineered realities. Thus, PVCP should not be viewed as a replacement for expertise and professionalism but rather proposes an innovative recombination of public solicitation and professional revision.

Second, the current study develops deeper understanding of online persuasion by delivering a receiver-oriented view of communication to explore the elements and activities that persuade a user to vote and influence the performance of a design. The PVI model extends narrative and visual understandings of persuasion by linking design concept and context to performance. The PVI model expands upon narrative models by synthesizing several separate elements: it incorporates a design's individuated components, its whole as determined by users, and its presentation context. Textual and visual persuasion are also considered together as a whole, rather than separated, in the model. The PVI model presented here provides a map for how communication literature, from Fisher's (1984, 1985) narrative theory to the emerging communication as design framework (Aakhus, 2007; Jackson & Aakhus, 2014), helps to explain the performance of creative ideas in one particular type of crowdsourcing. The PVI model emphasizes the central role of narrative at work in communicated design ideas. Fisher (1984, 1985) finds that style and content of a message, as well as the visual and textual attributes of a message, work together as a coherent whole. The designs submitted in a PVCP crowdsourcing competition are complex, complete, persuasive narratives, and assessing the performance of these ideas must account for the all elements of the narrative holistically. Borrowing from the communication as design framework (Aakhus, 2007), the model considers communication among designers and viewers as having an influence in the performance, and possibly understanding, of design ideas in the crowdsourcing platform. The linkages between a design, a person's interpretation of that design, and the affordances of the platform all shape the meaning of a design and thus its persuasive appeal to a voter.

The present study adds nuance and granularity to the communication as design approach (Aakhus, 2007). Prior work in communication research has largely taken a piecemeal approach to examining the communication process, homing in on the nature and effects of a communicated message or on the contextual factors that shape a message and influence audience perceptions of the message. By taking a holistic view of a crowdsourcing competition informed by communication as design, the research design reveals a

complex interplay between message (the design concept) and context (communication and platform). Message and context are inextricably linked, and a thorough examination of the communicative dimensions of a crowdsourcing design competition is necessary to isolate aspects that determine the privileging of some ideas over others. Previous studies in crowdsourcing have focused at the micro-level on optimizing tools and testing incentive structures (Huberman et al., 2009; Rogstadius et al., 2011) or at the macro-level on whole isolated case studies of crowdsourcing to show its general usefulness in new problem-solving domains or to generate best practices (Aitamurto, Landemore, Lee, & Goel, 2014; Brabham, 2013; Molina, 2014), but adopting a communication as design approach to crowdsourcing connects micro-level communicative factors with context to produce more fine-grained claims about performance. This is the first study on crowdsourcing to consider such a dynamic with a receiver-oriented analysis, and it emphasizes the importance of communication theory in understanding performance outcomes in crowdsourcing.

The temporal implications for ideas that emerge in crowdsourcing borrow from decision and information processing literature and relate to marketing and organizational design. First, the newness and freshness of an idea – its relative novelty in the eyes of others – can draw attention to designs. In decision-making, for both individuals and groups, tasks that are novel have been shown to increase decision scrutiny and attention (Berlyne, 1950; Betsch, Fiedler, & Brinkmann, 1998; Poole & Baldwin, 1996). In light of viewing the competition voting as a task, new designs garner increased attention because they present novelty in terms of the task content. Designs are intended to be persuasive in contests of the PVCP sort, and it stands to reason that timing and exposure of a narrative to an audience – key concepts in marketing and advertising – affect how persuasive a message can be. Firms and government entities that deploy PVCP crowdsourcing to generate new ideas that will be well received by a market or citizenry must pay close attention to how a contest structure and website design constrains or enables communication about an idea because the amount and quality of that communication will have significant effects on its performance in the market. In other words, it is the temporality and dynamic communicative context of a PVCP contest, not just the perceived merits of the design narrative in isolation, which contribute to outcomes and performance within the system.

A practical implication for designers who submit crowdsourcing solutions might be to consider a shorter window of time for display and engagement rather than posting submissions for the entirety of a contest. For crowdsourcing website creators, incorporating a time-centered structure, where people who submit designs have the ability to update their entries to communicate new or additional content, similar to Kickstarter project pages, might enhance engagement and keep attention riveted. Crowdsourcing platforms now incorporate multiple social media websites into their communication, and subsequent cases built on Next Stop Design's model have tested multi-phase contest structures, separating design submissions temporally from voting periods (Messina, 2012). Changes to communication capacity in websites offer new venues in which to explore the relationship of communication to the performance of ideas. Returning to Fisher's (1984, 1985) "instance of discourse," the narrative must be considered with its platform context to be fully understood, despite practitioner checklists of best practices.

Limitations and future directions

There are limitations to the extent to which these findings, and even the application of the PVI model, can be generalized for understanding communication phenomena in crowdsourcing. In comparison to the varieties of crowdsourcing, PVCP rests at an extreme of social complexity, involving crowds in both the generation and the ongoing vetting of whole, creative ideas. Communication may not function in the same way in the three other types of crowdsourcing processes, but the PVI model may provide an avenue to bridge elements of communication theory to these other crowdsourcing types. The current investigation explored only one PVCP crowdsourcing case in depth. Future studies could analyze multiple PVCP cases to bolster claims about how context and communication influence the peer-vetting process with additional rigor.

The narrative paradigm and the communication as design perspective were used to inform a model for PVCP, sacrificing other lines of inquiry that could be fruitful in understanding managerial uses for crowdsourcing or technical factors of performance. The study does not explore questions that focus on the efficiency, speed, costs, or technical design of crowdsourcing arrangements, nor does it assess whether or how organizations should deploy crowdsourcing for innovation or outsourcing. Future research, however, might stitch together these lines of inquiry, examining the concept of performance as both a messy outcome of communication and social interaction and as an indicator of business or technical efficiency for organizations, all in a single research study. Future research could also test the influence of specific elements of PVCP platforms themselves, which would extend previous work on peer assessment, decision quality, and rating tools (Klein & Garcia, 2015; Kulkarni et al., 2013; Riedl, Blohm, Leimeister, & Krcmar, 2013).

The present study did not dive into the specific interactions and back-and-forth dialogue that occurred between designers and commenters on the site, a line of inquiry that could prove useful to a deeper understanding of the role of communication in crowdsourcing performance. The computer-mediated question becomes how to design a system that supports sufficient connectivity (Fulk, Flanagin, Kalman, Monge, & Ryan, 1996) for peer-vetting. PVCP crowdsourcing inherently contains a double-bind: it is not only communal information-centric, but it also must support robust communication among peers for vetting to function properly. The Next Stop Design platform was less supported in preference to generating content (i.e., submissions). Testing the PVI model with a peer-vetting system where robust communication is a central factor to the system design might result in different associational outcomes. Communication scholars should test the propositions of the PVI model, determining the degree of influence these connections have in overall crowdsourcing performance to create more robust theoretical constructs.

Communication within and temporality of the platform context matters for how an idea is perceived in PVCP crowdsourcing applications, and the narrative of an idea alone does not determine success in a crowdsourcing competition. The study questioned the accepted wisdom among crowdsourcing researchers and practitioners that crowdsourcing systems identify ideas that are inherently, objectively good. The research injected a communication perspective into the discourse on crowdsourcing by embracing the messiness of human communication processes on performance in crowdsourcing systems. The PVI model is a way to understand the relationships of design concepts, communication, and platform context on crowdsourcing outcomes. Crowdsourcing is not a pure

meritocratic process, and indeed the success of an idea in a crowdsourcing competition may be as much shaped by dialogue and the platform as by how well a design persuades or conforms to normative professional standards of excellence. Crowdsourcing may be a bit of a treasure hunt for organizations searching for the best single answer, and rather than finding a diamond in the rough, ideas may emerge that are gems of a different color.

Few communication scholars write about crowdsourcing, but crowdsourcing is fundamentally based on communication, especially in PVCP. With the introduction of the PVI model and propositions, this paper challenges communication scholars to test and improve the understanding of communication dynamics among the crowd in computer-mediated environments. Furthermore, this research calls for crowdsourcing scholars to embrace communication theories in their work, with the hope of creating a more nuanced, interdisciplinary understanding of crowdsourcing – an online problem-solving method increasingly embraced for its ability to unearth gems from all over the globe.

Notes

1. This study builds from Brabham's definition and typology of crowdsourcing. For the sake of clarity and consistency, this study uses Brabham's preferred term of "online community" to describe those who participate in crowdsourcing. This does not imply that these groups of participants always function as a community per se. Some crowdsourcing cases indeed have robust online communities with individuals who communicate regularly with one another and have various social norms and a group identity, but many crowdsourcing cases do not foster community among participants and individuals engage only with the platform and not with other users on the site.
2. Table 1 can be accessed online here: http://digitallibrary.usc.edu/cdm/compoundobject/collection/p15799coll84/id/3863
3. Table 2 can be accessed online here: http://digitallibrary.usc.edu/cdm/compoundobject/collection/p15799coll84/id/3863

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