BerkeleyHaas
Haas School of Business
University of California Berkeley

How to Manage Crowdsourcing Platforms Effectively?

California Management Review
2018, Vol. 60(2) 122–149

DOI: 10.1177/0008125617738255
journals.sagepub.com/home/cmr
SAGE

Ivo Blohm[1], Shkodran Zogaj[2], Ulrich Bretschneider[2,3], and Jan Marco Leimeister[1,2]

SUMMARY

To profit from crowdsourcing, organizations can engage in four different approaches: microtasking, information pooling, broadcast search, and open collaboration. This article presents 21 governance mechanisms that can help organizations manage their crowdsourcing platforms. It investigates the effectiveness of these governance mechanisms in 19 case studies and recommends specific configurations of these mechanisms for each of the four crowdsourcing approaches. Also, it offers guidance to organizations that host a crowdsourcing platform by providing recommendations for implementing governance mechanisms into their platforms and building up governance capabilities for crowdsourcing.

KEYWORDS: crowdsourcing, case method, creative collaboration, information systems, innovation, Internet, systems design, crowdsourcing platform, management, governance, effectiveness

New information technologies have empowered companies to tap into the creative potential, distributed work patterns, and expansive knowledge of huge online crowds. Crowdsourcing has become established in various business fields since crowds can solve certain problems faster, better, and cheaper than companies are able to in house.[1] Today, 84% of the world's most prestigious companies—including SAP, Dell, Google, General Electric, Fiat, LEGO, and Procter & Gamble—have started to build their own crowdsourcing platforms.[2] This article provides recommendations to organizations for implementing effective governance of their crowdsourcing platforms.

The premise of crowdsourcing is that a crowdsourcer invites a group of individuals or teams to solve a specific task via an IT-based crowdsourcing

[1]University of St. Gallen, St. Gallen, Switzerland
[2]University of Kassel, Kassel, Germany
[3]University of Siegen, Siegen, Germany

platform.[3] For instance, General Electric (GE) launched—in collaboration with various venture capitalists—a crowdsourcing platform called the "Ecomagination Challenge." The main objective of this "broadcast search" was to obtain novel technologies to improve GE's strength in innovation. In accordance with its long-term strategy, GE defined certain themes in the domain of sustainability and invited contributors (including Internet users, business partners, academic institutions, and startups) to submit innovative contributions. In total, over 60,000 contributors from more than 160 countries contributed 5,000 ideas. In 23 of those ideas, GE and its partners invested more than $140 million. Since then, GE has regularly used the Ecomagination platform to engage in new crowdsourcing projects.[4] Similarly, the toymaker LEGO launched "LEGO Ideas" in which more than 700,000 contributors collaborate with the toymaker in order to develop new toys. To date, each of the jointly developed toys has completely sold out.[5]

These examples illustrate the great potential of crowdsourcing and shed light on the pivotal role of crowdsourcing platforms in ensuring the success of large-scale collaboration and problem-solving approaches. Such platforms serve as technical and organizational infrastructure for managing and maintaining an emerging community of contributors and define how crowdsourcers and contributors can interact. Appropriately managing crowdsourcing platforms is of paramount importance for many organizations. It involves the creation of scalable structures and repeatable mechanisms for governing the simultaneous interactions between thousands of independent and distributed contributors. For instance, LEGO faced considerable scaling problems when its community of contributors grew rapidly. The company was no longer able to dedicate sufficient attention to its most active and most important contributors. As a result, LEGO developed a reputation system based on gamification elements including points, badges, and rankings. This reputation system meant that contributors could verify and signal their status on the platform and maintain motivation and participation.[6] However, not all organizations master their governance challenges. For instance, Villa Enterprises created an "information pooling" platform in cooperation with PepsiCo. On the "Dub the Dew" platform, customers could suggest and vote on names for a new apple-flavored Mountain Dew soft drink. However, the companies had no means for effectively controlling the appropriateness of the contributed soft drink names. When contributions such as "diabeetus" or "fapple" were voted to the top, the platform was shut down resulting in a public relations disaster.[7] General Motors, the Kraft Heinz Company, Henkel, McDonald's, and the conference organizer TED have had similar negative experiences.[8]

Establishing effective governance is not only about creating mechanisms for incentivization or assuring the quality and appropriateness of a large quantity of contributions. Organizations must also develop scalable approaches for defining self-explanatory tasks that contributors can process independently, allocate tasks to appropriate contributors, and, eventually, regulate misbehavior of contributors.[9] Once established, such mechanisms enable crowdsourcers to use their crowdsourcing platform more effectively and in a continuous fashion for conducting crowdsourcing projects.

In this article, we present a comprehensive set of 21 governance mechanisms for managing crowdsourcing platforms. Based on a qualitative research approach, we investigate the effectiveness of these governance mechanisms across four different types of crowdsourcing: *microtasking*, *information pooling*, *broadcast search*, and *open collaboration*. Based on the results of this study, we suggest a specific set of governance mechanisms for each crowdsourcing type that can help organizations establish effective governance. Finally, we provide four suggestions for building up governance capabilities for crowdsourcing.

Four Types of Crowdsourcing

In practice, there are a variety of crowdsourcing platforms that generate distinct contributions. For instance, the Fiat Mio platform—on which contributors collaborated in order to develop a new concept car[10]—is completely different from the GE Ecomagination Challenge—where contributors compete against each other. In the case of Fiat Mio, contributions are likely to be small and involve sharing, commenting, editing, or integrating ideas for further developing the car in a collaborative fashion.[11] Consequently, appropriate governance has to account for controlling the behavior of contributors during collaboration. In contrast, GE's Ecomagination Challenge does not require substantial collaboration among contributors. It facilitates an innovation contest in which each contribution reflects an independent and exhaustive solution to a specific crowdsourced task. Therefore, implementing mechanisms for governing collaboration is not necessary. However, such contests usually attract a high number of alternative contributions of which only a small number are truly innovative. Thus, mechanisms that permit the control and evaluation of contribution quality are more important.[12]

These examples illustrate that a differentiated analysis is needed when approaching governance mechanisms for crowdsourcing platforms. Drawing on the work of Geiger and Schader,[13] we distinguish crowdsourcing platforms by the *diversity* and *aggregation* of contributions that are created on them:

- *Diversity:* Contributions can be homogeneous (i.e., they are characteristically identical) or heterogeneous (i.e., they differ in their individual qualities). Homogeneous contributions are highly standardized and are usually the outcome of well-structured tasks. For instance, in many voting tasks, a contribution is defined by the number of stars that can be given to an object being voted on. Hence, contributions can only vary by the number of stars.[14] Heterogeneous contributions are distinctive and differ in their individual qualities. They result from open and unstructured tasks for which numerous alternative solutions are contributed, for example, single contributions in GE's Ecomagination Challenge are likely to be highly differentiated from each other.
- *Aggregation:* The value of crowdsourcing can be derived from selective or integrative contributions.[15] If value originates from selective contributions, as in the case of GE's Ecomagination Challenge, then each individual contribution

is an independent and self-contained solution to the task that can be accepted or rejected by the crowdsourcer. In contrast, for tasks that utilize voting, the value from crowdsourcing is derived from the aggregated entirety of contributions. Individual votes have minimal value.

Based on the diversity and aggregation of contributions, we distinguish four different archetypes of crowdsourcing platforms. Table 1 summarizes their traits, objectives, instances of "good practice," and examples.[16]

Microtasking

Microtasking encompasses crowdsourcing platforms that produce highly pre-determined, qualitatively identical, and homogeneous contributions resulting from simple tasks. The main goal is the scalable and time-efficient batch processing of highly repetitive tasks, for example, categorizing data or writing and translating small chunks of text. The most prominent microtasking platform for posting such tasks is Amazon's "Mechanical Turk." Other examples include Galaxy Zoo, where contributors classify galaxies on telescope images, or Translate Facebook, in which the task of translating the social networking software is broken down into a myriad of simplistic translation tasks that are then performed independently by different Facebook users as contributors.

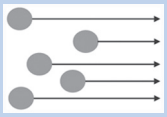
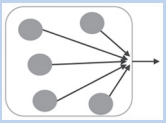
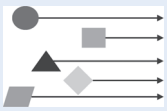
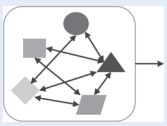
Information Pooling

Crowdsourcing platforms for information pooling aggregate contributions such as votes, opinions, assessments, forecasts, or other kinds of distributed information. This information is usually aggregated through approaches such as averaging, summation, or visualization. For instance, AT&T's "Mark the Spot" smartphone app invites contributors to report wireless coverage issues by choosing from a set of predefined options. It then aggregates these contributions into a map-based real-time visualization, highlighting connectivity problems. Information pooling is particularly useful for evaluating and selecting alternatives, eliciting and validating customer needs, forecasting, market research, or gathering location-based information. In addition to Mountain Dew's Dub the Dew, other examples include prediction markets such as the "Hollywood Stock Exchange," where contributors forecast the box office revenue of new movies, and Google Maps, which infers real-time traffic information based on the GPS data of smartphone users.

Broadcast Search

Broadcast search platforms collect contributions to solve a task in order to gain alternative insights and solutions from people outside the organization. These contributions are highly heterogeneous as each contribution may reflect an alternative solution to the crowdsourced task. Broadcast search is particularly suited for solving challenging technical, analytical, scientific, or creative problems. Other applications include the parallel execution of complex tasks with minimal margin for error (such as software testing or patent analysis) as well as

TABLE 1. Four Types of Crowdsourcing Platforms.

		Aggregation of Contributions	
		Selective contributions (the value is derived from individual contributions)	**Integrative contribution (the value is derived from the entirety of all contributions)**
Diversity of contributions	**Homogeneous** (contributions are characteristically identical)	**Microtasking**  • Highly pre-determined and qualitatively identical contributions as result of simplistic tasks • Goal: Scalable and time-efficient batch processing of tasks • Good use: Processing simple and repetitive tasks (e.g., categorizing data, translating text, correcting text); human computation; processing large amounts of information • Examples: Facebook Translations; Amazon Mechanical Turk; Galaxy Zoo	**Information Pooling**  • Additive aggregation of distributed information • Goal: Integration of diverse opinions, assessments, predictions, or other information of contributors • Good Use: Evaluating and selecting alternatives; market research; eliciting and validating customer needs; approval contests; forecasting; user engagement; gathering location-based information • Examples: Mountain Dew Dub the Dew; Hollywood Stock Exchange; AT&T Mark the Spot; Google Maps
	Heterogeneous (contributions differ in nature and quality)	**Broadcast Search**  • Contributions reflect alternative solutions to the same problem of which the most promising ones are going to be selected • Goal: Gaining alternative insights and solutions to problems from "outsiders" • Good use: Challenging technical, analytical, scientific, or creative problems; parallel execution of complex tasks with minimal margin for errors (e.g., software testing, patent analysis); on-demand acquisition of specialized talent • Examples: General Electric Ecomagination Challenge; Netflix Prize; Applause; InnoCentive	**Open Collaboration**  • Contributions of limited individual value are aggregated to an entire whole by means of collaboration among contributors • Goal: Creation of complex artifacts that require the integration of distributed knowledge and skills • Good use: Collaborative ideation; knowledge creation; wikis; user communities; customer support communities, open source software, and other open projects • Examples: OpenIDEO; LEGO Ideas; IBM Apache Community; Wikipedia; Fiat Mio

getting on-demand access to specialized talent. Frequently, broadcast search is applied to running different kinds of innovation, design, or data science contests. For instance, the "Netflix Prize" invited contributors to submit algorithms that forecast the preferences of Netflix customers more precisely than Netflix's own algorithms and offered $1 million for the solution. Similarly, Applause distributes software for the purpose of testing. Each contributor submits test reports including functionality, usability, and security issues.

Open Collaboration

Open collaboration platforms invite contributors to team up to jointly solve a complex problem where the solution requires the integration of distributed knowledge and the skills of many contributors. The individual contributions of contributors in open collaboration are largely heterogeneous and may have only limited individual value. However, through collaboration, the individual contributions are aggregated so that solutions to the problem emerge. Open collaboration is frequently used for ideation, knowledge creation, open source software, and other open projects. For instance, in OpenIDEO, a crowdsourcing platform of the innovation agency IDEO, contributors collaborate openly to develop joint contributions to global problems such as maternal health or urbanization. Other examples include Fiat Mio, the IBM Apache Community, or Wikipedia.

In practice, however, pure forms of these four archetypes are rare. Frequently, crowdsourcing platforms combine several traits. For instance, by participating in the Netflix Prize, contributors could team up to compete against other teams. Thus, this approach also combined traits of open collaboration.[17]

Governance Mechanisms for Managing Crowdsourcing Platforms

Governance within online communities refers to the system for organizing rules and processes that regulate and orchestrate the behavior of community members.[18] In such IT-facilitated environments, governance is conveyed by specific mechanisms that incorporate these rules and processes. In order to achieve the crowdsourcer's goals, governance involves structuring roles and responsibilities, formal and informal rules, standards and regulations, outcome control measures, communication processes, and matters of task allocation. In a previous research project, we identified 21 distinct governance mechanisms for crowdsourcing that can be organized into six groups.[19] We describe these governance mechanisms below and summarize them in Table 2.

- *Task Definition* encapsulates mechanisms that enable the precise, understandable, and repeatable definition for crowdsourced tasks. These mechanisms involve approaches for modularization so that the task can be split into (a multitude of) smaller subtasks of higher granularity in order to create simpler and self-explanatory tasks where results can be easily evaluated.[20] Defining

TABLE 2. Governance Mechanisms for Crowdsourcing Platforms.

Class	Governance Mechanism	Description
Task Definition	Task Modularization	Dividing tasks into (a multitude of) fine-grained subtasks
	Contribution Requirements	Define contribution requirements that the crowdsourced contributions must fulfill
	Pretesting	Pretesting tasks with a small group of contributors
Task Allocation	Skill-Based Allocation	Restricting the group of participating contributors by personal skills (e.g., languages or qualifications)
	Demographic-Based Allocation	Restrict the group of participating contributors by demographic characteristics (e.g., gender or age)
	Performance-Based Allocation	Tracking a contributor's performance of solving tasks and restricting the group of participating contributors by means of past performances
Quality Assurance	Manual Control	Manually validating the contributions of contributors
	Automated Control	(Partially) automating quality assurance by mechanisms that countercheck contributions
	Peer Assessment	Providing functionalities by which contributors can verify the validity of contributions
Incentives	Payments	Offering financial remuneration for successfully completing a task
	Prizes	Offering cash or non-cash prizes for the "best" or the "first" contribution(s)
	Reputation System	Providing functionalities that signalize a contributor's experience, activity, and merits
	Framing	Framing the task so that it increases in importance for contributors (e.g., contributing to greater good)
	Feedback	Providing contributors with qualitative and/or quantitative feedback regarding their contributions
	Socialization	Implementing opportunities for direct communication and interaction between contributors such as forums, chats, social networking, or messaging
Qualification	Peer Coaching	Providing mechanisms with which experienced contributors provide advice to new contributors
	Tutorials	Offering text- and/or video-based trainings as well as instructions on how to solve ideal-typical tasks
	Onboarding	Providing sample tasks with which contributors are trained for contributing on the crowdsourcing platform
Regulation	Non-Disclosure Agreement	Legal regulations in order to maintain confidentiality of crowdsourced tasks and related information
	Netiquette	Establishing formal and informal rules of participation as well as terms of use with respect to desired behaviors of contributors
	Authentication	Verifying the identity of newly registered contributors

contribution requirements helps contributors to understand both how anticipated contributions should look and also the evaluation criteria.[21] Pretesting involves testing tasks with a small group of contributors prior to their publication on the platform.

- *Task Allocation* means the invitation of a specific group of contributors to participate in solving a task. In this way, crowdsourcers can invite contributors with specific skills (e.g., design professionals or individuals with a specific technical background), demography (e.g., age or income), or past performance (e.g., contributors that have successfully completed similar tasks in the past).[22]
- *Quality Assurance* involves the evaluation of contribution quality. Quality assurance involves manual control, in which all or a subset of contributions are checked manually to determine whether they meet defined requirements. Quality assurance might also involve automated control, which consists of the IT-facilitated validation of contributions.[23] Finally, peer assessment uses contributors to approve valid contributions from their peer contributors.[24]
- *Incentives* are the means for motivating and activating the crowd to conduct tasks.[25] Incentives may include financial compensation in terms of payments or prizes, for example, $1,000 for the winner in an innovation contest. However, beyond money, there are various other extrinsic incentives. For instance, reputation systems such as rankings or experience levels allow contributors to signal their standing within a platform's community of contributors.[26] By contrast, mechanisms such as framing (e.g., presenting tasks so that they appear meaningful to contributors or offer contributors the opportunity to receive feedback regarding the quality of their contributions) address the intrinsic motivations of contributors.[27] Similarly, socialization enables contributors to communicate and interact with peers and is often appreciated by contributors.[28]
- *Qualification* mechanisms help achieve and retain a "qualified crowd" and include peer coaching (e.g., experienced contributors answer questions from their less-experienced peers and help them successfully solve tasks) and tutorials (e.g., text-based descriptions that explain how to solve different tasks). Finally, platforms can implement onboarding processes that frequently test specific tasks, which can then infer the expertise of individual contributors.[29]
- *Regulation* mechanisms aim at directly controlling the behaviors of contributors to avoid violations of law and other misconduct. Such measures include non-disclosure agreements (NDA) for establishing confidentiality and trust between the different parties, netiquettes as more general codes of conduct, and authentication to verify the identity of contributors.[30]

Determining Effectiveness of Governance Mechanisms

Our central argument is that different crowdsourcing platforms require a distinct set of governance mechanisms. In order to determine the effectiveness of governance mechanisms across the four crowdsourcing types, we investigated

the governance structure of well-established company-hosted and intermediary-based crowdsourcing platforms.[31] Companies can interact directly with the crowd by creating their own platform (e.g., LEGO Ideas) or utilize "crowdsourcing intermediaries" whose business model primarily aims to provide crowdsourcers access to qualified contributors for a platform fee (e.g., InnoCentive).[32] Company-hosted platforms may be better integrated in an organizational context and adapted to the crowdsourcer's overarching strategy. By contrast, crowdsourcing intermediaries—who govern contributors and continuously design, implement, and refine governance mechanisms—are likely to employ more sophisticated governance patterns. We considered both to be highly appropriate and complementary data sources.

The purpose of our study was to identify *effective* governance mechanisms. Our assumption was that effective mechanisms evolve over time as organizations that administer crowdsourcing platforms learn which mechanisms are best for their operations. For instance, a company may initially implement a mechanism aimed at better regulating the collaboration behavior of contributors. If this mechanism is not effective for promoting the desired behaviors, the crowdsourcing platform's managers will abandon it and, instead, create and implement a new mechanism to attain the desired goal. This form of organizational learning is more likely to be realized by well-established crowdsourcing platforms. This is why we focused our data collection on platforms that have attained a "steady state."

We investigated a total of 19 platforms. For each platform type, we studied at least four typical platforms. We acquired data primarily by interviewing C-Level executives, founders and co-founders, and operation managers of the crowdsourcing platforms. Table 3 provides an overview of the crowdsourcing platforms and interviews we investigated.

Within a total of 26 interviews, we discussed how crowdsourcing projects are typically conducted on a platform, the implementation of governance mechanisms (e.g., what mechanisms were implemented for what purpose), and their effectiveness (e.g., how and why certain mechanisms became more effective over time). Our secondary data were acquired by observing the platforms and reviewing additional platform material. We also reviewed additional documentation including company presentations, governance guidelines, and data freely available on the Internet. Where possible, we accessed the platforms from the perspective of both crowdsourcers and contributors in order to follow several projects from cradle to grave and gain a nuanced understanding of the perception and effects of the governance mechanisms. Thus, we were able to observe how governance mechanisms shape a platform's entire crowdsourcing process, which ensured that we could validate and refine our interview results.

Effective Governance Mechanisms for Crowdsourcing Platforms

Following are the effective governance mechanisms for each type of crowdsourcing and provide a comparison.

TABLE 3. Description of Data Sources.

Crowdsourcing Platform	Type	Model	Interviewees
Clickworker offers various microtasks to clients (ca. 700,000 contributors).	Microtasking	Intermediary-based	Head of Operations Head of Marketing
Contentmaster[a] asks the crowd to create written content for shops, websites, etc. (ca. 6,000 contributors).		Intermediary-based	Chief Executive Officer
Project Weather is a platform by Yahoo to collect photos that are to be incorporated into its Weather App (ca. 95,000 contributors).	Microtasking	Company-hosted	Chief Executive Officer
CrowdFlower distributes microtasks with a focus on data transcription and categorization.	Microtasking	Intermediary-based	Project Manager
TelCo Fellows[a] is a platform that enables TelCo customers to sell services such as the installation of set top boxes to other TelCo customers (ca. 4,000 contributors).	Microtasking	Company-hosted	Chief Executive Officer
Streetspotr applies crowdsourcing for monitoring the implementation of sales and retail strategies at the point of sale (ca. 325,000 contributors).	Information Pooling	Intermediary-based	Chief Executive Officer
Crowd Prediction ALPHA[a] asks the crowd to evaluate products and services via voting and prediction market mechanisms (ca. 2,200,000 contributors).	Information Pooling	Intermediary-based	Chief Executive Officer
Mückenatlas tracks the development of mosquito populations by using reports and sending mosquitos from contributors.	Information Pooling	Company-hosted	Project Manager
BahnScout asks train passengers to report damages, litter, etc. at train stations via smartphones.	Information Pooling	Intermediary-based	Chief Sales Officer Project Manager
OpenGridMap is a platform hosted by the Technical University of Munich and aims to create a map of power grid using the pictures and other information of the crowd.	Information Pooling	Company-hosted	Project Manager
Nussjagd aims to track the development of hazel dormouse populations by reports of contributors.	Information Pooling	Company-hosted	Project Manager
Software Solutions[a] calls the crowd to test software applications.	Broadcast Search	Company-hosted	Chief Operating Officer

(continued)

TABLE 3. (continued)

Crowdsourcing Platform	Type	Model	Interviewees
Testbirds offers crowdsourced software testing services (ca. 150,000 contributors).	Broadcast Search	Intermediary-based	Chief Executive Officer and Co-Founder Chief Operating Officer Project Manager
Jovoto applies broadcast search to creative work using contests (ca. 80,000 contributors).	Broadcast Search	Intermediary-based	Chief Operating Officer
SAPiens is a platform by SAP that integrates customers into innovation contests (ca. 550 contributors)	Broadcast Search	Company-hosted	Chief Operating Officer
Co-Create Uni Kassel is an open collaboration platform by a German University where students jointly elaborate ideas that help to improve conditions of studies (ca. 600 contributors).	Open Collaboration	Company-hosted	General Manager and Co-Founder Head of Marketing
Crowdworx develops software for open collaboration platforms within the innovation domain.	Open Collaboration	Intermediary-based	Chief Executive Officer and Co-Founder
DGM ThinkTank invites patients suffering from ALS to jointly develop ideas and solutions that help simplify their life (ca. 400 contributors).	Open Collaboration	Company-hosted	General Manager and Co-Founder
BeeUp supports its organizations in further developing their businesses by creating teaching cases for which contributors in educational institutions develop solutions.	Open Collaboration	Intermediary-based	Chief Executive Officer Project Manager Platform Developer

[a]For reasons of confidentiality, we use acronyms. ALS = amyotrophic lateral sclerosis.

Microtasking

Organizations that host a microtasking platform should consider governance mechanisms that are primarily geared toward assuring an appropriate quality of contributions. They should develop mechanisms that enable them to modularize tasks, define contribution requirements clearly, and automatically check contribution quality. In supporting this goal, incentives such as payments and a reputation system are also important.

- *Task Modularization:* In order to ensure the repeated and parallelized execution of tasks, modularization is central to microtasking. Modularization results in self-explanatory and self-consisted tasks that can be processed by contributors without costly feedback loops. For instance, TelCo Fellows is a microtasking platform where TelCo customers can offer small services to

other TelCo customers such as installing set top boxes. TelCo uses modularization to create standardized service offerings that can be delivered by its crowd. It defines the scope of the service provided and also which service modules are performed in which fashion by the crowd. In so doing, modularization helps standardize the results of the crowdsourced tasks, and also, in part, how the task is processed. Thus, TelCo can ensure that its crowdsourced customer support meets its high-quality requirements.

- *Contribution Requirements:* Because microtasking platforms usually process a large quantity of simple and repetitive tasks, crowdsourcers receive numerous small-sized contributions in a short period of time. In order to receive high-quality contributions, crowdsourcers should clearly define contribution requirements. Such definitions provide contributors with a clear set of instructions to help them to better understand the tasks and to document the results of their work.[33] For example, Clickworker provides templates for defining the characteristics of desired results. Then, contribution requirements are usually tested by a few sample contributors to compare the results with desired outcomes and to potentially improve the contribution requirements. Such measures may take considerable time to implement at the launch of a crowdsourcing platform. However, overall, ensuring that tasks are self-explanatory speeds up project execution and increases contribution quality.
- *Automated Quality Control:* The large quantity of contributions is also a challenge for quality control. Whenever possible, crowdsourcers should opt for automatization. Our results demonstrate that relatively simple measures, which could easily be adapted by many crowdsourcers, prove to be effective. For instance, Contentmaster—where contributors primarily write small texts for online shops—automatically counts whether the number of words in a contribution surpasses the minimum number of words as defined in the contribution requirements. Also, Contentmaster's employees write sample texts for a series of tasks and note the time taken to complete the task. Contentmaster then tracks the time taken by contributors to complete the task and compares it with the time taken for the sample texts. By contrast, Clickworker employs a more sophisticated approach. For instance, the Honda Research Institute Europe, a client of Clickworker, asked contributors to mark road signs and obstacles on more than 10,000 photos and to answer driving-behavior related questions. Clickworker inserted specific "control tasks" for which the correct answer is known and where results are easy to quantify, for example, small quizzes. The control tasks were distributed with the regular tasks to contributors. Based on the results for the control tasks, the platform could automatically check the validity of contributions for each contributor. If contributors made maximum effort on all tasks, given that they were not aware of the control tasks, Clickworker can assess the response quality of the regular tasks. However, in addition to automating quality control, crowdsourcers should also check contribution quality manually via random sampling.
- *Payment:* Organizations engaging in a microtasking platform should consider financial payments as the primary incentive. In microtasking, each contributor

who contributes a complete and valid solution that satisfies the task requirements is paid. Our results show that the exact remuneration offered for solving a single task usually depends on the time needed for completion as well as its complexity. Most commonly, payments range between 20 cents and a couple of dollars. Clickworker and Contentmaster aim to pay their contributors about $10 to $15 per hour. This is above the current minimum wage in Germany, where both platforms are based. We suggest that organizations follow this example. Existing research also shows that offering performance-based bonus payments for high-quality contributions increases the quality of results.[34] However, only one of the investigated microtasking platforms—CrowdFlower—used such a remuneration scheme in a systematic fashion. The other ones do not use it on a large scale, as performance bonus payments significantly increase the complexity of crowdsourcing projects as it is onerous to determine the quality of contributions. However, in each case, crowdsourcers must ensure payment structure transparency so that contributors are able to determine remuneration before they begin a task.

- *Reputation Systems:* We suggest hosts of microtasking platforms to install a reputation system with which contributors can signal their skills, expertise, or participation level. Such systems are used by almost all investigated microtasking platforms. These systems effectively complement financial incentives and increase the effort exerted by contributors. Such systems address the desire of contributors to stand out in the community of contributors. In microtasking, reputation systems can be effectively combined with financial rewards. For instance, CrowdFlower and Contentmaster award experience levels for their contributors that allow access to specialized and better-paid tasks. Thus, contributors are very keen on achieving higher reputation levels.
- *Authentication:* All investigated microtasking platforms implemented some sort of authentication for verifying the identity of contributors. Organizations should consider authentication because taking contributors out of anonymity ensures that they perform their task more accurately and helps prevent misconduct.

Information Pooling

Organizations intending to establish an information pooling platform should implement a governance structure that focuses on helping contributors submit high-quality information using definitions of contribution requirements and tutorials. Non-financial incentives and allocating tasks based on demographic attributes are also advisable.

- *Contribution Requirements:* To aggregate results efficiently, clear contribution requirements must be defined. BahnScout is a crowdsourcing app where passengers of Munich's urban rail system can report damages and litter at train stations. The train station operator aggregates these contributions with information gathered from other sources. Based on this aggregated information,

the train station operator creates work plans for its service personnel. However, for this aggregation, the crowdsourced information needs to correspond to the internal IT system's structure that is used to manage service personnel. To achieve this, BahnScout has defined clear contribution requirements, for example, include a picture of the issue, a textual description, the precise location, a predefined category, and potential hazards.

- *Demographic-Based Allocation of Tasks:* Organizations seeking to apply information pooling should recognize that contributors *voluntarily* participate in crowdsourcing. This has a significant drawback, particularly if organizations use information pooling for aggregating opinions, assessments, or experiences from a distributed group of contributors for internal decision-making processes. Due to the voluntary nature of participation, most contributors are personally interested in a certain task or project. Consequently, results may be positively biased and not representative.[35] Therefore, organizations should focus on integrating diverse and independent contributions. In this way, demographic-based task allocation may help to attain a realistic representation of how different target groups (characterized by the contributors) perceive a product or service. For instance, Streetspotr applies crowdsourcing techniques for point-of-sale retail execution. Contributors report how they perceive product presentations at the point of sale, for example, shops or supermarkets. Streetspotr deliberately allocates tasks to both customers and non-customers of the product.
- *Reputation Systems and Framing:* For information pooling platforms, non-financial incentive mechanisms such as framing and reputation systems are most effective, in particular when they build upon each other. This is particularly the case at BahnScout, where contributors predominantly consist of train enthusiasts. As the social recognition among their peers is highly important for such specialized interest groups, the managers of BahnScout have created a reputation system that consists of multiple integrated mechanisms. After registration, contributors have only limited access to the functionalities of the crowdsourcing app, which expands with rising reputation. For each contribution, contributors receive "experience points," which lead to nine different "experience levels" from "Beginner" to "Train Conductor." With each experience level, new functionalities are unlocked, for example, being able to comment and validate other contributors' reports. Also, BahnScout awards various badges in order to surprise contributors, for example, it introduced a "winter service" badge for reporting icy conditions at train stations when a blizzard hit Munich. Based on the experience points, levels, and badges, several rankings and leaderboards are created. This reputation system proved to be highly effective for BahnScout. However, organizations developing such reputation systems should consider that they consist of more than just awarding points, levels, and badges. Managers of BahnScout put significant effort in aligning these mechanisms into an overarching narrative that conveys the sense that contributors become part of Munich's urban rail system team. Thus, BahnScout's reputation system conveys a sense of achievement, while

it also addresses the contributors' desire for "glory." In order to achieve these objectives, substantial effort was made in finding the right pace of reputation progress. For instance, when the platform initially launched, progress was much too slow; it was not rewarding enough for contributors to participate. This was resolved by adjusting the thresholds for attaining the different experience levels. However, when adjusting these levels, BahnScout recognized the need for transparency when making such adjustments. The most experienced contributors perceived the revision as devaluing their hard-earned reputation. Reputation systems may also be combined with payments to speed up information collection. For instance, *CP Alpha* conducted a project for an oil company where contributors were invited to describe their experiences at the company's gas stations. For this specific project, contributors could transfer their "experience points," which they obtained for participation, into vouchers that could be redeemed at the company's gas stations.

- *Tutorials:* Small text-based instructions on how to report accurate information are effectively used by most of the investigated information pooling platforms. Such step-by-step guides help standardize the collection process of information.

Broadcast Search

Organizations that engage in broadcast search should consider governance mechanisms that are geared toward carefully defining contribution requirements and providing appropriate financial incentives. In fact, prizes should be considered as a central prerequisite for broadcast search. Payments for participating should also be considered, particularly if a group of contributors with specific skills are included within the broadcast search, for example, design professionals.

- *Contribution Requirements:* Solving complex or creative tasks on platforms optimized for broadcast search usually allows for a great degree of freedom. Thus, organizations should develop precise definitions of contribution requirements to ensure that results can be implemented in practice. For instance, jovoto, a broadcast search platform for innovation, requires its clients to provide precise descriptions of the problem, background, aim(s), and specific requirements necessary for implementation. Based on this information, innovation contests with clearly defined requirements for valid contributions are offered on the platform.
- *Skill- and Demographic-Based Allocation of Tasks:* Completely open approaches to broadcast search tend to create a lot of "noise," resulting in many low-quality contributions. In order to receive a manageable number of contributions without substantially reducing the chances of their quality, organizations should consider focusing their broadcast search on groups of contributors with proven abilities.[36] In this regard, jovoto frequently offers "invite-only" projects that contributors must complete an application process to work on. Only "jovoto Pros" are eligible to apply. To achieve jovoto Pro status, contributors must apply with a portfolio of their creative work, which is then

verified by jovoto. An alternative approach is to focus the broadcast search on a specific target group. For instance, the software producer SAP created a broadcast search contest among students hoping to receive suggestions for improving SAP-related education at universities. Similarly, Testbirds, which applies the principles of broadcast search to test software, frequently restricts its software tests to contributors with specific hardware and operating systems.

- *Prizes and Payment:* For broadcast search, our results indicate that financial incentives are particularly important. Organizations should recognize that competition and prizes are integral to broadcast search. For instance, at jovoto, the contributor who contributes the best solution receives a financial prize that usually ranges between $5,000 and $10,000, while the other ones frequently receive nothing. However, jovoto recognized that competing for such prizes is perceived as risky by many contributors. To ensure broad participation, jovoto usually offers multiple prizes that may also reward runner-up contributions or progress prizes that award the best contribution at the halfway point of the contest. Sometimes, jovoto also offers a payment. This is often the case for invite-only projects where usually between five and ten contributors are invited. Payments usually range between $500 and $1,500. Testbirds applies a similar incentive scheme. It offers a payment for ensuring participation and a performance-based premium for each software bug detected. However, the performance-based premium is only paid for the first contributor who contributes a particular bug. For a contributor, a software test usually takes between one and two hours and the total financial compensation may range between $10 and $20 an hour. Also, for broadcast search, it is vital to communicate the terms of compensation upfront.
- *Manual Control and Peer Assessment:* To ensure quality assurance, manual control is inevitable as the entire value of the crowdsourcing project is likely to be concentrated in a single contribution, for example, the most innovative product design or a highly critical security issue. Manual control reduces the chance that these contributions are overlooked. It also prevents poor evaluation through community voting, where excellent contributions are frequently overlooked by contributors. However, our results indicate that some of the examined broadcast search platforms employ "experienced" contributors who check the validity of contributions, which are subsequently evaluated in manual control activities.

Open Collaboration

For open collaboration platforms, modularization of tasks that structure the collective effort of contributors alongside incentives that appeal to intrinsic motivations are often highly effective. In particular, this includes framing the objective of the open collaboration platforms in a manner that personally appeals to contributors, offering a framework for socialization and providing feedback to the collective effort of the emerging community of contributors.

- *Task Modularization:* Open collaboration platforms are frequently centered on a broad and complex goal, for example, OpenIDEO wants to make the world a better place by solving acute problems. Open collaboration platforms try to solve such unstructured problems by harnessing the collective creativity of many contributors, who participate by making numerous, small, individual contributions such as sharing, editing, or commenting on ideas. We recommend that organizations engaging in open collaboration impose some structure onto these collaborative processes by applying task modularization. In this specific context, modularization corresponds to breaking down the overarching goal of the platform into sub-goals, which can then be processed in a project-like fashion. For instance, *DGM ThinkTank* is a crowdsourcing platform for patients that suffer from amyotrophic lateral sclerosis (ALS) and encourages them to jointly develop solutions to simplify the life of those affected by ALS. To structure the task, managers of DGM ThinkTank created a series of themed weeks that addressed topics such as housekeeping, mobility, and nutrition. These themed weeks resembled time-bound campaigns to address these specific topics. In so doing, the managers of DGM ThinkTank were able to activate its community of contributors and ensure a wide range of responses. Also, the structure prevented the crowd from working on unrealistic contributions. To further investigate topics that were raised in these themed weeks, the managers of DGM ThinkTank created permanent "channels" within the platform, which encouraged more frequent collaboration.
- *Peer Assessment:* Due to the collective nature of open collaboration, peer assessment is an effective mechanism for quality assurance. In this way, quality control can be achieved by letting contributors verify the contributions of other contributors. For instance, at DGM ThinkTank, contributors with greater experience (e.g., contributors with the role "responsible worker") can exclude inappropriate contributions after discussion with other contributors.
- *Framing:* Contributors participating in open collaboration have an intrinsic motivation to participate. Frequently, contributors perceive the topic of an open collaboration platform as personally important and are willing to expend substantial effort in contributing to achieve its objectives. Thus, organizations should define a precise and inclusive objective that appeals to many contributors. They should ensure that these objectives are clearly communicated on the platform. For instance, at DGM ThinkTank, the objective for the crowdsourcing platform—"together, we improve daily life for those affected by ALS"—was positioned very prominently on the platform's home page. In doing so, the platform's purpose was clear to each potential contributor. Similarly, a short introductory text explained why the individual contributions of each contributor were important and also explained how the exchange can directly improve peoples' lives. However, finding an attractive objective that appealed to contributors was an iterative process during which the final wording was tested several times with contributors.
- *Socialization:* Contributors participating in open collaboration hope to be part of an emerging community and, by engaging in such a community,

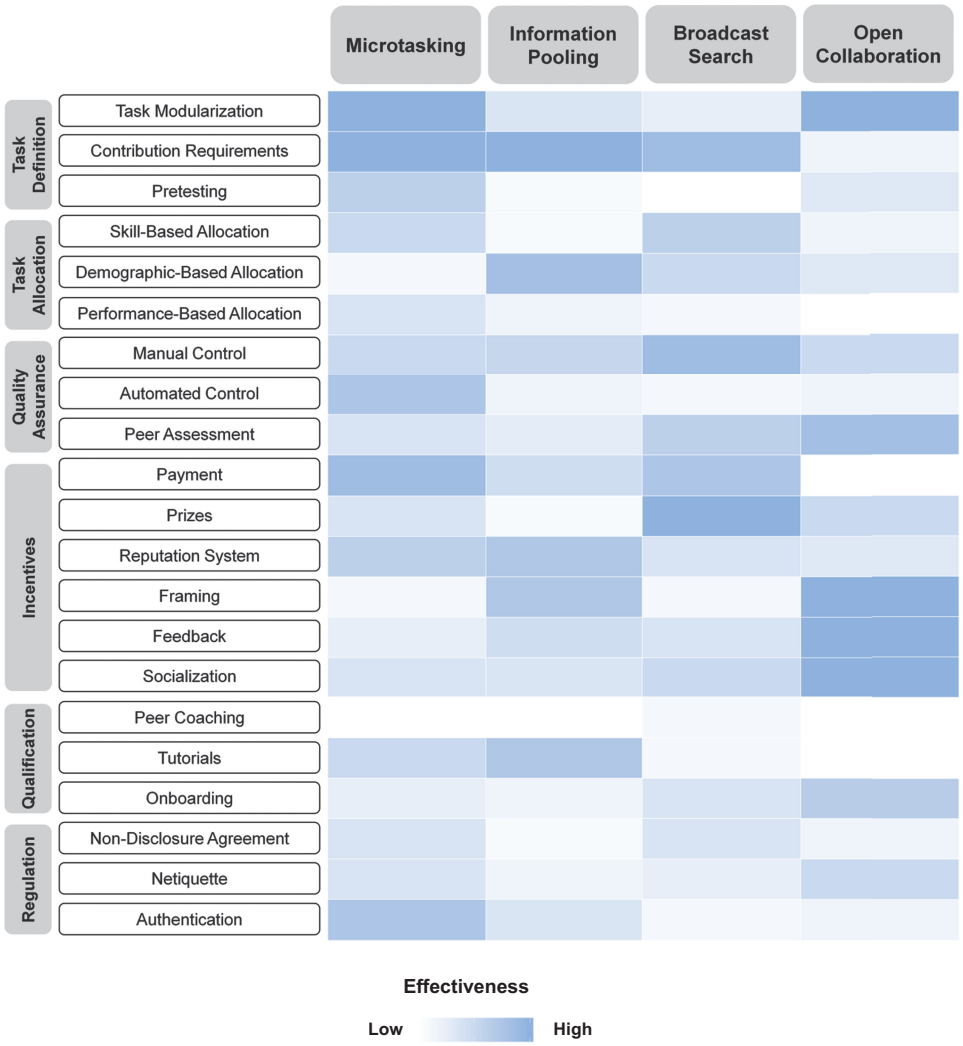
they address their intrinsic motives of social exchange and social learning. Thus, organizations implementing open collaboration platforms should provide a wide variety of socialization mechanisms that enable contributors to immerse themselves in the community. Such mechanisms enable contributors to communicate, exchange, and discuss their ideas with their peers, and also resolve disputes during collaboration. For this purpose, all the open collaboration platforms we investigated maintain communication forums that are used extensively. While these forums resemble a general communication infrastructure, open collaboration platforms should also contain sophisticated structures with which contributors can directly collaborate on their emerging contributions. For instance, *Co-Create Uni Kassel*—an open collaboration platform in which students can collaborate on improving the processes of the University of Kassel, Germany—employs a wiki with which contributors can directly collaborate and comment on the ideas of their fellow contributors. If a note is added to an idea, the original author is automatically notified via email, so that she can directly participate on the collaboration platform. Also, Co-Create Uni Kassel employs a sophisticated team-building process by which new contributors can find team members to collaborate in an easy and intuitive way. In addition, the managers organize regular face-to-face meetings where contributors can meet in person. Contributors have greatly appreciated these interactions.

- *Feedback:* Contributors must perceive that their contributions are important to the host organization. They might not expect feedback on all their contributions, nor that all their contributions should be implemented in the ultimate solution. However, contributors do consider feedback on the collective effort of the community of contributors as a genuine sign of appreciation. Thus, providing contributors with feedback is key to long-term success and to the development of open collaboration platforms. However, the sheer quantity of contributions received in open collaboration platforms makes this a hugely challenging task. Thus, DGM ThinkTank focused its activities on commenting on "hot" contributions that attracted a large number of contributors. Similarly, *CrowdWorx* recognized that if providing feedback is particularly important, then new projects or channels should emerge on the platform that are responsive to previous input from contributors. Also, regular web conferences, in which managers discuss how selected contributions have been implemented, are used by the platforms we investigated to great effect.

Comparative Analysis and Discussion

Figure 1 summarizes the effectiveness of different governance mechanisms across platform types.[37] In this article, we have focused on presenting the most effective governance mechanisms that are used by the investigated platforms within a given crowdsourcing type. However, Figure 1 also shows moderately effective mechanisms that are effective for at least some platforms within a given crowdsourcing type.

FIGURE 1. Comparing effective governance mechanisms across types of crowdsourcing.



- *Task definition* is highly important for all crowdsourcing types. Organizations should consider their crowdsourcing platforms as infrastructure for regularly conducting crowdsourcing projects where specific tasks are broadcast to the crowd. This requires approaches for systematically converting business problems into tasks that can be crowdsourced in a repeatable fashion. However, the decision for a certain crowdsourcing approach may create path dependencies in terms of what types of tasks can be broadcasted to the crowd. Organizations need to develop effective task definition mechanisms that can be applied to a variety of business problems, and they need to transform these problems into a structure that can be crowdsourced on a given platform. In this regard, task modularization and contribution requirements are particularly important. These mechanisms enable crowdsourcers to accurately

describe their tasks to contributors. This facilitates processing of tasks by a large number of distributed contributors. By contrast, the pretesting of tasks and the contribution requirements can be considered as optional for when crowdsourcers are not certain that these descriptions are self-explanatory.

- *Task allocation* permits the invitation of a specific group of contributors. Our results suggest that allocating tasks based on demographic characteristics is most important for information pooling platforms because it may help increase the diversity of contributions. Thus, demographic-based task allocation may mitigate the self-selection effects of contributors and can help to ensure appropriate coverage of the most important groups of contributors. Skill-based task allocation is more effective in broadcast search, while performance-based task allocation can be considered as being moderately effective for microtasking platforms. On these two crowdsourcing platforms, task allocation mechanisms help distribute tasks to contributors with proven abilities in order to obtain a manageable set of high-quality contributions. However, organizations engaging in crowdsourcing should also be aware that implementing task allocation mechanisms is costly. It requires building up a large crowd, involving various data collection and profiling efforts, and may complicate the processing of crowdsourcing projects. For instance, crowdsourcing platforms must be designed in a way that only contributors who meet the previously defined requirements are able to access tasks. Also, assembling project-specific crowds of contributors may increase a project's runtime.
- *Quality assurance* is a challenge across all crowdsourcing approaches. Although we have outlined several governance mechanisms that increase the possibility of obtaining high-quality contributions (e.g., task definition and allocation mechanisms), managers should bear in mind that these mechanisms do not substitute for continuous quality control. Even well-defined tasks can be misunderstood and even the best contributors may submit low-quality contributions.[38] Thus, quality assurance should not be exercised as ex-post evaluation but rather during the entire runtime of crowdsourcing projects so that organizations can intervene and improve contribution quality by giving direct feedback or taking other measures. In this regard, the implementation of manual control is inevitable to a certain degree, for example, checking contributions in random samples. To date, this is both the most basic and the most effective approach across all platforms. Automated quality control can be used effectively for microtasking platforms. Peer assessment has been shown to be particularly effective in open collaboration and broadcast search. However, when competition among contributors is introduced, peer assessment mechanisms must be designed very carefully because competition may spur misconduct.
- *Incentives* are crucial for all types of crowdsourcing. It is important to understand that financial compensation is not the only reason for contributors to participate in crowdsourcing. Fun, social status, competition, or social exchanges are frequently of equal or even higher importance. When designing incentives, managers should bear in mind that their effectiveness varies across the four crowdsourcing approaches. Financial incentives such as

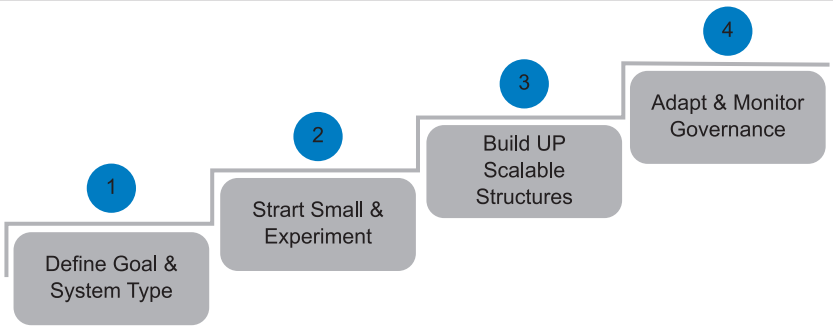
payments and prizes are primarily important in microtasking and broadcast search where contributors develop individual and selective contributions. In contrast, on information pooling and open collaboration platforms, non-financial incentives such as reputation systems, socialization, framing, and feedback are more successful. However, we recommend that managers, when implementing incentives, develop a deep understanding of their contributors first. It is very likely that they will recognize that their crowdsourcing platform attracts distinct types of contributors whose participation is driven by different intrinsic and extrinsic motives. Thus, managers should instead think of integrating several incentive mechanisms into an incentivization system that addresses the most important motives of these heterogeneous groups of contributors.

- *Qualification* is effective for training contributors to develop and submit high-quality contributions. In this regard, managers should think of qualification mechanisms as an indirect measure to increase the quality of contributions. Although qualification is only used within information pooling systematically—by means of tutorials—such mechanisms may support all types of crowdsourcing. However, since implementation is costly, crowdsourcers must carefully examine how qualifications could support contributors on their platform. It might be best if they are optional. We suggest that platforms start with tutorials and peer coaching and then develop onboarding processes as the next step. However, qualification mechanisms can effectively complement other governance mechanisms, for example, successfully solving sample tasks in onboarding processes could be used as proof of certain abilities for skill-based task allocation.
- *Regulation* mechanisms—including NDAs, netiquettes, and authentication—can help to ensure the smooth processing of projects. Also, they can prevent misconduct of contributors and mitigate the risk of losing control. NDAs impose some legal restrictions on contributors, whereas netiquettes apply social pressure. Authentication is perhaps even more strict. It is mostly applied when clients of crowdsourcing platforms require proof of identity as a prerequisite for participation. Because regulations define the "rules of participation" for contributors, managers should establish high transparency about them. Contributors are very sensitive toward changing and evolving rules of participation since even small changes might have a large impact on how they contribute. Thus, it is crucial to establish transparency on why certain regulations are implemented, how they are used, and if necessary, why they are changed. This is particularly true when using financial incentives.

Recommendations for Building Governance Capability for Crowdsourcing

We offer four overarching recommendations that can help leaders and managers of crowdsourcing platforms in building up governance capabilities for crowdsourcing (see Figure 2).

FIGURE 2. Building up governance capability for crowdsourcing.



Define Goal and Platform Type

First, managers should define the objectives of a crowdsourcing platform and how reaching these goals might support their organization's strategy.[39] Next, organizations should determine what type of crowdsourcing platform is conducive to reaching these objectives. They should consider three questions:

- What crowdsourcing platform outcomes will support our strategy?
- What is the nature of tasks that could be solved on the platform that will reach these outcomes?
- How must the results of these tasks be aggregated so they can be adopted within the organization?

To answer these questions, managers can use our typology of crowdsourcing (see Table 1) to help them choose which types of tasks should be crowdsourced and how the results should be aggregated.

BeeUp defined the objective of its crowdsourcing platform as supporting small- and medium-sized businesses by transforming their business development problems into teaching cases. These would then be used as learning materials in educational institutions (e.g., universities and vocational colleges). It became clear that the tasks to be crowdsourced on the platform would reflect open and unstructured problems so that contributions would be highly heterogeneous. Also, the managers of BeeUp concluded that a "collaborative ideation" approach that aggregates the various perspectives, experiences, and skills of contributors when solving the teaching cases was highly appropriate for developing innovative solutions to complex problems. Consequently, BeeUp opted for developing an open collaboration platform.

TelcoFriends opted for crowdsourcing in order to engage contributors in performing small location-based service tasks for its customers (e.g., installing set top boxes). Because the results of these tasks are highly homogeneous (e.g., a correctly installed set top box) and are not aggregated, TelcoFriends opted for a microtasking approach.

Start Small and Experiment

After having made the decision for a certain crowdsourcing approach and having established a platform, organizations should start implementing governance mechanisms. However, organizations should bear in mind that effective governance is an experiential learning process and that effective governance mechanisms develop over time. Thus, organizations should consider pilot-testing their governance mechanisms with a series of smaller crowdsourcing projects in a noncritical environment. Also, they should think of restricting the crowd to a certain degree. In so doing, organizations are able to create room for experimentation and learn how to improve their governance mechanisms without having to fear negative consequences.

After having established an open collaboration platform, BeeUp recognized that task definition mechanisms are pivotal for obtaining high-quality contributions. Thus, it started to experiment with developing different presentation styles of the case studies, different degrees of modularizing the clients' problems into independent sub-problems, and different contribution requirements in terms of minimum conditions that a potential solution must meet. In this piloting phase, the number of contributors was restricted and measures for building a larger community of contributors were only taken after task definition mechanisms had reached a certain maturity. A similar approach to experimentation was taken by BahnScout when it developed its governance mechanisms. Adapting its governance, in particular, incentives, to the specific needs of train enthusiasts, it restricted its operations to passengers of subways first and then expanded to other types of public transportation. In order to ensure agility for implementing changes and responding to the feedback of contributors quickly, it offered its crowdsourcing app only for the Android platform in order to reduce complexity and effort required for adaptions.

Build Up Scalable Structures

After having accomplished an effective proof of concept for the implemented governance mechanisms, organizations should consider gradually scaling up their crowdsourcing approach in terms of the number of broadcasted projects and contributors involved. Current research shows that organizations that apply crowdsourcing systematically usually develop internal services that offer the organization's business units and product teams access to the crowdsourcing platform to run projects.[40] Consequently, managers responsible for crowdsourcing platforms should recognize that they function as "middlemen" between their organization and the crowd. In order to prevent a lot of time-consuming interactions, managers should invest in making their governance mechanisms scalable. Our results indicate that there are two approaches for doing so: standardization and self-organization. Standardization involves the formalization of lessons learned and the definition of processes that evolve around the established governance mechanisms. This makes organizations less dependent on the implicit knowledge of the responsible crowdsourcing managers. Self-organization

involves building up structures with which stakeholders can be directly involved in operative governance. As a result of standardization and self-organization, efficiency of governance operations can be increased and managers can reallocate their time and resources to further develop governance and the overarching crowdsourcing platform.

After having identified effective task definition mechanisms, BeeUp formalized its learning and created a variety of templates and "cookbooks" for writing case studies. Beyond this standardization, it implemented various mechanisms that permitted contributors to self-organize. By implementing peer coaching, BeeUp allows contributors to train their peers. Such peer coaches are "experienced" contributors that supervise a specific case study and also provide feedback to contributors on their case solutions. Similarly, BeeUp created intensive onboarding materials for teachers and lecturers that educated them in the sense of how they can control and manage their own class on the BeeUp platform, implementing a series of specialized functionalities for "class management." Similarly, Testbirds invested in standardization of its operations—in particular, processes for task allocation and quality control—so that it could guarantee its clients that all software bugs found by the crowd are valid and can be reproduced. Also, it has created means for self-organization by offering a "self-service interface" to its clients. Based on highly standardized governance mechanisms, its clients are now able to set up their own testing projects without the active involvement of Testbirds. As a consequence, the company's assets are dramatically leveraged.

Monitor and Adjust Governance

Finally, companies establishing crowdsourcing platforms should continuously monitor and adjust their governance mechanisms. Because developing effective governance mechanisms is an organizational learning process, organizations should consider their continuous improvement as a pivotal part of governance operations. Whenever possible, organizations should consider evaluating the effectiveness of their governance mechanisms on the project level. Following this approach, they are able to compare different projects and infer the effectiveness of governance mechanisms from the projects' success, for example, by comparing the quality of contributions from slightly adapted task definition mechanisms. In this regard, defining and measuring some quantitative key performance indicators can be helpful. Quality and quantity of contributions, project runtime, and effort for conducting the crowdsourcing project can be good starting points. Organizations should also consider using a more qualitative approach and request direct feedback from contributors regarding their satisfaction. By contrast, evaluations on the platform level are recommended for assessing how far crowdsourcing contributes to the organization's overall strategy.

BeeUp measures the quality of contributions, its clients' satisfaction with them, and the participation of contributors for each project. Also, it directly asks

contributors for qualitative feedback at the end of each completed crowdsourcing project. Once a month, all the obtained information is discussed, and measures for further developing the governance mechanisms are worked out. A much more rigorous approach has been implemented by SAP with its SAPiens platform. It regularly runs controlled experiments in order to compare different implementations of its governance mechanisms.

Concluding Remarks

Crowdsourcing can achieve astonishing results. However, managing crowdsourcing platforms is challenging. By following the recommendations provided in this article on how to govern different types of crowdsourcing platforms, companies can leverage the wisdom of crowds in a better, faster, and cheaper manner.

Author Biographies

Ivo Blohm is Assistant Professor for Data Science and Management at the University of St. Gallen where he also heads up the Competence Center Crowdsourcing (email: ivo.blohm@unisg.ch).

Shkodran Zogaj obtained a PhD from University of Kassel and currently works as strategy consultant (email: zogaj@uni-kassel.de).

Ulrich Bretschneider is an interim Professor for Information Systems at the University of Siegen and also a research associate at Kassel University (email: ulrich.bretschneider@uni-siegen.de).

Jan Marco Leimeister is a full Professor for Information Systems at the Universities of St. Gallen and Kassel (email: janmarco.leimeister@unisg.ch).

Notes

1. Allan Afuah and Christopher Tucci, "Crowdsourcing as a Solution to Distant Search," *Academy of Management Review*, 37/3 (July 2012): 355-375; Daren C. Brabham, "Crowdsourcing as a Model for Problem Solving: An Introduction and Cases," *Convergence*, 14/1 (February 2008): 75-90.
2. Jeremiah Owyang, "The State of Crowdsourcing in 2015: How the World's Biggest Brands and Companies Are Using Consumer Creativity," accessed November 10, 2016, http://eyeka.pr.co/99215-eyeka-releases-the-state-of-crowdsourcing-in-2015-trend-report.
3. Existing research characterizes crowdsourcing by two traits: an "open call" for participation and a "self-selection" of contributors. Publishing an open call on the Internet, crowdsourcers invite contributors to submit solutions for a specific problem. Contributors then decide to contribute a potential solution in a voluntary fashion. For more details, see Ivo Blohm, Jan M. Leimeister, and H. Krcmar, "Crowdsourcing: How to Benefit from (Too) Many Great Ideas," *MIS Quarterly Executive*, 12/4 (December 2013): 199-211; Afuah and Tucci, op. cit.
4. Henry Chesbrough, "GE's Ecomagination Challenge: An Experiment in Open Innovation," *California Management Review*, 54/3 (Spring 2012): 140-154; Andrew Winston, "GE Is Avoiding Hard Choices about Ecomagination," accessed November 5, 2016, https://hbr.org/2014/08/ges-failure-of-ecomagination.
5. Thomas Kohler, "Crowdsourcing-Based Business Models: How to Create and Capture Value," *California Management Review*, 57/4 (Summer 2015): 63-84.

6. Ibid.
7. Charles H. Noble and Serdar S. Durmusoglu, "Introduction: The Journey to Open Innovation," in *Open Innovation: New Product Development Essentials from the PDMA*, ed. Abbie Griffen, Charles H. Noble, and Serdar S. Durmusoglu (Hoboken, NJ: John Wiley & Sons, 2014), pp. i-xxii.
8. Peter C. Verhoef, Sander F. M. Beckers, and Jenny van Doorn, "Understand the Perils of Co-creation," *Harvard Business Review*, 91/9 (September 2013): 28; Nilofer Merchant, Eric Garland, Jason Kemp, John I. Stone, Pascale Scheurer, and Lex Sidney, "TED's Hard-Learned Lessons in Crowdsourcing: Interaction," *Harvard Business Review*, 91/6 (June 2013): 20.
9. Dominik Mahr, Aric Rindfleisch, and Rebecca J. Slotegraaf, "Enhancing Crowdsourcing Success: The Role of Creative and Deliberate Problem-Solving Styles," *Customer Needs and Solutions*, 2/3 (September 2015): 209-221; Lars B. Jeppesen and Karim R. Lakhani, "Marginality and Problem-Solving Effectiveness in Broadcast Search," *Organization Science*, 21/5 (September/October 2010): 1016-1033; Kevin J. Boudreau, Nicola Lacetera, and Karim R. Lakhani, "Incentives and Problem Uncertainty in Innovation Contests: An Empirical Analysis," *Management Science*, 57/5 (May 2011): 843-863; Johann Füller, "Refining Virtual Co-creation from a Consumer Perspective," *California Management Review*, 52/2 (Winter 2010): 98-122.
10. Fabio P. Saldanha, Patrick Cohendet, and Marlei Pozzebon, "Challenging the Stage-Gate Model in Crowdsourcing: The Case of Fiat Mio in Brazil," *Technology Innovation Management Review*, 4/9 (September 2014): 28-35.
11. Arvid Malhotra and Ann Majchrzak, "Managing Crowds in Innovation Challenges," *California Management Review*, 56/4 (Summer 2015): 103-123.
12. Karim R. Lakhani, Kevin J. Boudreau, Po-Ru Loh, Lars Backstrom, Carliss Baldwin, Eric Lonstein, Mike Lydon, Alan MacCormack, Ramy A. Arnaout, and Eva C. Guinan, "Prize-Based Contests Can Provide Solutions to Computational Biology Problems," *Nature Biotechnology*, 31/2 (February 2013): 108-111; Karan Girotra, Christian Terwiesch, and Karl T. Ulrich, "Idea Generation and the Quality of the Best Idea," *Management Science*, 56/4 (April 2010): 591-605; Ivo Blohm, Christoph Riedl, Johann Füller, and Jan M. Leimeister, "Rate or Trade? How to Identify Winning Ideas in Open Idea Sourcing," *Information Systems Research*, 27/1 (March 2016): 27-48.
13. David Geiger and Martin Schader, "Personalized Task Recommendation in Crowdsourcing Information Systems—Current State of the Art," *Decision Support Systems*, 65 (September 2014): 3-16.
14. Blohm et al., "Rate or Trade?"
15. Eric Schenk and Claude Guittard, "Towards a Characterization of Crowdsourcing Practices," *Journal of Innovation Economics*, 7/1 (2011): 93-107.
16. Table 1 integrates various typologies of crowdsourcing. For more details, see Geiger and Schader, op. cit.; Daren C. Brabham, "Crowdsourcing: A Model for Leveraging Online Communities," in *The Participatory Cultures Handbook*, ed. Aaron Delwiche and Jennifer J. Henderson (London: Routledge, 2013), pp. 120-129; Kevin J. Boudreau and Karim R. Lakhani, "Using the Crowd as an Innovation Partner," *Harvard Business Review*, 91/4 (April 2013): 60-69; Eric Bonabeau, "Decision 2.0: The Power of Collective Intelligence," *MIT Sloan Management Review*, 50/2 (Winter 2009): 44-52.
17. Katja Hutter, Julia Hautz, Johann Füller, Julia Mueller, and Kurt Matzler, "Communitition: The Tension between Competition and Collaboration in Community-Based Design Contests," *Creativity and Innovation Management*, 20/1 (March 2011): 3-21; Andrew King and Karim R. Lakhani, "Using Open Innovation to Identify the Best Ideas," *MIT Sloan Management Review*, 55/1 (Fall 2013): 41-48.
18. Gabriele Piccoli and Blake Ives, "Trust and the Unintended Effects of Behavior Control in Virtual Teams," *MIS Quarterly*, 27/3 (September 2003): 365-395; Andrea Forte, Vanessa Larco, and Amy Bruckman, "Decentralization in Wikipedia Governance," *Journal of Management of Information Systems*, 26/1 (Summer 2009): 49-72; Siobhán O'Mahony and Fabrizio Ferraro, "The Emergence of Governance in an Open Source Community," *Academy of Management Journal*, 50/5 (October 2017): 1079-1106; Vivek Choudhury and Rajiv Sabherwal, "Portfolios of Control in Outsourced Software Development Projects," *Information Systems Research*, 14/3 (September 2003): 291-314.
19. Shkodran Zogaj, Niklas Leicht, Ivo Blohm, and Jan Marco Leimeister, "Towards Successful Crowdsourcing Projects: Evaluating the Implementation of Governance Mechanisms"

(International Conference on Information Systems, Fort Worth, TX, December 2015); Shkodran Zogaj and Ulrich Bretschneider, "Analyzing Governance Mechanisms for Crowdsourcing Information Systems: A Multiple Case Analysis" (European Conference on Information Systems, Tel Aviv, Israel, June 2014).

20. Afuah and Tucci, op. cit.; Schenk and Guittard, op. cit.
21. Geiger and Schader, op. cit.
22. Dimitra Anastasiou and Rajat Gupta, "Comparison of Crowdsourcing Translation with Machine Translation," *Journal of Information Science*, 37/6 (December 2011): 637-659; Geiger and Schader, op. cit.
23. Aniket Kittur, Jeffrey V. Nickerson, Michael S. Bernstein, Elizabeth M. Gerber, Aaron Shaw, John Zimmermann, Matt Lease, and John J. Horton, "The Future of Crowd Work" (conference proceedings, ACM 2013 Conference on Computer Supported Cooperative Work, San Antonio, TX, February 2013), pp. 1301-1318; Panos G. Ipeirotis and John J. Horton, "The Need for Standardization in Crowdsourcing" (conference proceedings, ACM CHI Conference on Human Factors in Computing Systems, Vancouver, BC, Canada, May 2011), pp. 1-4.
24. Bonabeau, op. cit.; Blohm et al., "Rate or Trade?"
25. Jan M. Leimeister, Michael Huber, Ulrich Bretschneider, and Helmut Krcmar, "Leveraging Crowdsourcing: Activation-Supporting Components for IT-Based Idea Competitions," *Journal of Management Information Systems*, 26/1 (Summer 2009): 197-224.
26. Thomas W. Malone, Robert Laubacher, and Chrysanthos Dellarocas, "The Collective Intelligence Genome," *MIT Sloan Management Review*, 51/3 (Spring 2010): 21-31; Blohm et al., "Crowdsourcing: How to Benefit from (Too) Many Great Ideas."
27. Jakob Rogstadius, Vassilis Kostakos, Aniket Kittur, Boris Smus, Jim Laredo, and Maja Vukovic, "An Assessment of Intrinsic and Extrinsic Motivation on Task Performance in Crowdsourcing Markets" (conference proceedings, AIII Conference on Weblogs and Social Media, Barcelona, Spain, July 2011), pp. 321-328; Malone et al., op. cit.; Osamuyimen Stewart, Juan M. Huerta, and Melisa Sader, "Designing Crowdsourcing Community for the Enterprise" (conference proceedings, ACM SIGKDD Workshop on Human Computation, Paris, France, June 2009), pp. 50-53; Yang Yang, Pei Yu Chen, and Paul Pavlou, "Open Innovation: An Empirical Study of Online Contests" (ICIS 2009 Proceedings: Thirtieth International Conference on Information Systems, Phoenix, AZ, December 2009); Leimeister et al., op. cit.
28. Vladimir Zwass, "Co-creation: Toward a Taxonomy and an Integrated Research Perspective," *International Journal of Electronic Commerce*, 15/1 (Fall 2010): 11-48; Maja Vukovic and Claudio Bartolini, "Towards a Research Agenda for Enterprise Crowdsourcing" (conference proceedings, International Symposium on Leveraging Applications of Formal Methods, Verification and Validation, Heraklion, Greece, October 18-21, 2011), pp. 425-434; Aaron D. Shaw, Joseph J. Horton, and Daniel L. Chen, "Designing Incentives for Inexpert Human Raters" (conference proceedings, ACM 2011 Conference on Computer Supported Cooperative Work, Hangzhou, China, March 2011), pp. 275-284.
29. Shkodran Zogaj, Ulrich Bretschneider, and Jan M. Leimeister, "Managing Crowdsourced Software Testing: A Case Study Based Insight on the Challenges of a Crowdsourcing Intermediary," *Journal of Business Economics*, 84/3 (April 2014): 375-405.
30. Maja Vukovic, "Crowdsourcing for Enterprises" (conference proceedings, World Conference on Services, Los Angeles, CA, July 2009), pp. 686-692; Rick Kazman and Hong-Mei Chen, "The Metropolis Model: A New Logic for Development of Crowdsourced Systems," *Communications of the ACM*, 52/7 (July 2009): 76-84.
31. Kohler, op. cit.
32. For a detailed description of crowdsourcing intermediaries, see Zogaj et al., "Managing Crowdsourced Software Testing."
33. Robbie T. Nakatsu, Elissa B. Grossman, and Charalambos L. Iacovou, "A Taxonomy of Crowdsourcing Based on Task Complexity," *Journal of Information Science*, 40/6 (December 2014): 823-834.
34. Shaw et al., op. cit.; Chien-Ju Ho, Aleksandrs Slivkins, Siddharth Suri, and Jennifer W. Vaughan, "Incentivizing High Quality Crowdwork" (conference proceedings, 24th International Conference on World Wide Web, Florence, Italy, May 2015), pp. 419-429; Ming Yin and Yiling Chen, "Bonus or Not? Learn to Reward in Crowdsourcing" (conference proceedings, International Conference on Artificial Intelligence, Buenos Aires, Argentina, July 2015), pp. 201-207.

35. Bonabeau, op. cit.; Blohm et al., "Rate or Trade?"
36. Existing research shows that the most innovative contributions in broadcast search are frequently contributed by contributors that have a high "distance" to the problem. However, the results of our study show that obtaining such solution has a cost: a high number of low-quality contributions that highly increase the complexity of a crowdsourcing project. For more details about "distance of contributors" and "quality of contributions," see Jeppesen and Lakhani, op. cit.; Afuah and Tucci, op. cit.
37. The data for this heat map were created by identifying the governance mechanisms on each investigated crowdsourcing platform and their managers' indications of what they consider as being most effective. For each case study, we created two dummy variables, that is, "implemented mechanisms" and "most effective mechanism." For plotting the heat map, these data were aggregated by arithmetic mean.
38. Mohammad Allahbakhsh, Boualem Benatallah, Aleksandar Ignjatovic, Hamid Reza Motahari-Nezhad, Elisa Bertino, and Schahram Dustdar, "Quality Control in Crowdsourcing Systems: Issues and Directions," *IEEE Internet Computing*, 17/2 (April/March 2013): 76-81.
39. Gary P. Pisano, "You Need an Innovation Strategy," *Harvard Business Review*, 93/6 (June 2015): 44-54.
40. Niklas Leicht, Ivo Blohm, and Jan M. Leimeister, "Leveraging the Power of the Crowd in Software Testing," *IEEE Software*, 34/2 (March/April 2017): 62-69; Blohm et al., "Crowdsourcing: How to Benefit from (Too) Many Great Ideas."