



City Research Online

City, University of London Institutional Repository

Citation: Wang, Y., Papangelis, K., Lykourantzou, I., Khan, V-J., Saker, M., Yue, Y. & Grudin, J. (2022). The Dawn of Crowdfarms. Communications of the ACM, 65(8), pp. 64-70. doi: 10.1145/3490698

This is the accepted version of the paper.

This version of the publication may differ from the final published version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/28963/>

Link to published version: <https://doi.org/10.1145/3490698>

Copyright: City Research Online aims to make research outputs of City, University of London available to a wider audience. Copyright and Moral Rights remain with the author(s) and/or copyright holders. URLs from City Research Online may be freely distributed and linked to.

Reuse: Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

The Dawn of Crowdfarms

Key insights:

- A new paradigm is expanding opportunities and shifting work practices in crowdsourcing, which has become an international force.
- Crowdfarms are small professional companies that undertake relatively large, complex crowdsourced tasks that require specialized expertise and collaboration.
- Crowdfarms have developed strategies to procure and manage tasks and methodically manage reputation.
- Crowdfarm work settings and practices, rewards and challenges, and work-life balance differ from solo crowdwork, which introduces benefits and potential drawbacks.
- Crowdfarming could benefit from better communication and monitoring systems, and possibly from regulation as it continues to evolve.

Background

Crowdsourcing is the process by which organizations or individuals outsource tasks with an online ‘open-call.’⁹ Technology makes crowdsourcing possible. With tasks posted and instructions and finished goods exchanged digitally, crowdsourcing enables the geographically distributed online workforce and requestors to cooperate on various tasks, improving productivity, social mobility, and the global economy.

The common crowdsourcing practice, illustrated by Amazon Mechanical Turk, is the completion of tasks in which crowdworkers use human intelligence to rival the effectiveness of computational systems. This approach has succeeded in achieving impressive results in data clustering, content labeling, and other small tasks that individuals can do in a short time. However, simple tasks limit the opportunities for crowdworkers to collaborate and develop specialized skills and prevent the application of crowdsourcing to projects that require higher levels of expertise and tighter teamwork, such as software development and industrial design.

As crowdsourcing platforms and practices mature, will they reach a steady state, continuing to grow while maintaining the same structure focused on simple tasks, or could there be a shift or disruption?

In previous research into Chinese crowdsourcing, we identified a new crowdsourcing paradigm that could indicate a shift: small companies that regard crowdwork as part of their formal business, assembling teams to take on multi-faceted crowdsourced tasks that require specialized expertise. We refer to these companies as “crowdfarms.”¹ Crowdfarms are a small but growing crowdsourcing workforce in China today, positioned between traditional crowdsourcing and consultancies. A similar focus appeared recently in Upwork, which unveiled an “Agency Experience” policy aimed at supporting small firms that specialize in, complex, high-value crowdtasks.⁷ The emergence of these small businesses in both Eastern and Western crowdsourcing contexts indicates that organizational participation in crowdwork could become a widespread trend. This article describes a series of interview studies to obtain an in-depth understanding of this emerging organizational form. We describe how Chinese crowdfarms that were early adopters of this form operate, perspectives of people who work in them, and implications for the evolution of crowdsourced work.

Crowdsourcing platforms in China

By 2017, China’s rapidly growing digital economy was estimated to include 30 million crowdworkers serving around 200,000 clients worldwide.¹⁵ Two of the largest Chinese platforms, ZBJ.com and EPWK.com, post millions of tasks. Initially, tasks were simple and self-contained, such as image labeling and data clustering. These appeal to Chinese crowdworkers who usually work part-time at home on tasks that are of personal interest and relatively short, requiring a few hours to a few days labor.

As processes were established and trust in the platforms grew, some customers posted more complex tasks that required a few weeks of work and a range

¹ Our use of “crowdfarm” employs the English concept of “farming work out” (i.e., outsourcing) to identify this as a unique kind of firm, different from crowdsourcing platforms or firms that post crowdsourced jobs. Chinese IT workers sometimes self-mockingly call themselves as “ma nong” (“code farmers” in English) to describe the heavy pressures they encounter in digital work and support their identity and camaraderie with those doing similar jobs. Given the mixed connotations of the term “ma nong” or “code farmer,” we use the respectful “crowdfarm worker,” not “crowdfarmer,” to avoid any appearance of insensitivity toward people whose work we value.

of skills—software and game development, video and film production, industrial and interior design. This increase in task complexity stimulated demand for specialization and collaboration in the Chinese crowdsourcing market. Although a very skilled solo crowdworker could handle some of these complex tasks, they came to the attention of small companies that had teams that engaged in similar work offline.

Platform companies moved to support these high-revenue engagements with special bidding and management processes. ZBJ promotes itself as an “incubator” assisting more than 100,000 knowledge workers to grow and perhaps form or join companies. Since 2016, ZBJ has provided cheap rent and customized workspaces (which they call “ZBJ factories”) to host crowdfarms that take work posted on ZBJ, creating crowdsourcing communities in a hospitable business environment.

Government policies

Chinese government initiatives support the gig economy, including crowdfarms. The “mass entrepreneurship and mass innovation program”²¹ provides low taxation and subsidies for “Internet companies,” including space, easy access to government services, and monetary easing. This and other enabling policies, together with a large, well-educated Chinese digital workforce, enthusiasm for working online, and benefits of working for a registered company, such as health insurance and a pension, created a favorable landscape for this novel form of crowdsourcing.^{16, 18}

Crowdfarms

Many crowdfarms are companies with five to 20 workers who engaged in offline business before crowdwork, and now engage in both, with crowdsourcing becoming increasingly important. For some, it became their primary source of income. In this process, a company and its employees expand their business acumen and normalize management processes to include: (1) more complex work arrangements involving managers and internal teams organized by expertise; (2) recruitment that leads to labor contracts and social protections such as pensions and insurance; and (3) a reasonable wage system with monthly basic salary and commissions based on personal contributions to both offline and crowdsourced tasks.

Crowdfarms are external providers of labor that differ from consultancies, outsourcing, and contractors. Crowdfarms do not typically provide strategic

advice or reduce customer costs by taking over a business function. They do not procure work through email, telemarketing, online advertising, or offline marketing.^{5,17} By avoiding these expenses, they can be a lower-cost alternative for tasks that require a few days to a few weeks of work.

Our Crowdfarming Study

We encountered crowdfarming in 2019 while conducting survey and interview studies on crowdsourcing practices.^{18,20} After reporting on crowdfarms in a CSCW 2019 poster¹⁹ we conducted the interviews on several aspects of crowdfarming that are the focus of this article. We sought a deeper understanding of the paradigm: how these businesses operate on a daily basis, how their employees feel about crowdwork, and how crowdfarms affect the overall crowdsourcing context. We recruited participants by posting a request for half-hour interviews as a task on ZBJ, for which they were paid 100 CNY (approx. US\$14). We recruited crowdfarm workers and solo workers. Crowdfarm workers were told that (1) to qualify, they should be working for companies that take on crowdsourced tasks as part of their formal business; (2) to protect their privacy, use ZBJ's chat system to indicate their intention to participate and provide a phone number; (3) all data would be anonymized; and (4) they were welcome to contact researchers with any concerns. Twenty-three crowdfarm workers contacted us, each from a different company. After an initial online discussion to confirm that they worked in crowdfarms and to address concerns, such as assuring them that their company name would also be anonymized, we scheduled interviews with all 23. Most interviews lasted between 30 and 60 minutes and all were conducted in Chinese.

The following sections cover high-level findings from the interviews, supplemented with follow-up research. We discuss: (1) the procurement and carrying out of tasks by crowdfarms and reputation management following task completion; (2) the work experience of crowdfarm workers, including their perceptions of the work settings, problems encountered while completing tasks, and their rewards and work-life balance; and (3) the potential impact of crowdfarms on solo crowdworkers and task requestors, as well as broader implications this paradigm carries for crowdsourcing platforms.

1. Work practices of crowdfarms

Procurement of tasks. Solo crowdworkers look at a posted task and decide whether they have the skills to complete it on time. Sometimes they attempt to

asks beyond their current abilities as a means of developing their knowledge and skills. In crowdfarms, more often than not, managers make the selection. They may prefer large and complex tasks that offer more payment, but those we interviewed focus on task feasibility—is the request in a field they specialize in? Do they have the expertise to complete it on time? Our participants attributed this relatively cautious crowdfarm strategy to (1) the financial loss from a failed larger and more complex task is greater than that of a solo crowdworker who walks away from a short task, and (2) the loss of further business from a failed task in contrast to the potential for additional business and positive referrals from one that succeeds.

After careful selection of tasks, crowdfarms bid for them via a mechanism designed by Chinese crowdsourcing platforms for large and complex tasks. A crowdfarm publicly posts an intention to participate on the task page. The crowdfarm may directly contact a requestor in private to clarify the requirements and negotiate payment terms. Because the payment for large tasks is relatively substantial, the bidding mechanism requires both parties to sign legal contracts after confirming their intention to collaborate. Only after the requestor deposits part of the payment on the platform as a guarantee does a crowdfarm begin the work. Although the bidding mechanism is designed to facilitate and nurture collaboration between crowdfarms and requestors, private direct contact decreases the transparency of the process. Participants confirmed reports^{3,4} that a lack of transparency in crowdsourcing can adversely affect trust, satisfaction, and motivation.

Carrying out tasks. Crowdfarms usually carry out a procured task by managing it internally. A manager could allocate a task that is difficult to decompose, such as logo design, directly to a specialized crowdfarm worker, but decomposable tasks are divided into smaller work units and assigned to internal team members based on their expertise or suitability. The manager then supervises the work progress to ensure that it is on schedule. After the crowdfarm teams or individual workers finish their tasks, they collaborate in their shared workplace to integrate the parts and submit the deliverable to the requestor for feedback. If solo crowdworkers collaborate, they generally do so remotely, but crowdfarm face-to-face collaboration is seen as improving worker productivity, especially for urgent tasks.¹ One participant described how his IT crowdfarm operates on a day-to-day basis:

“I usually start working at 9 am, the first thing I do is to check if there are tasks that we can undertake on ZBJ platform and then I will spend 2–3

hours communicating with requestors in terms of the requirements of the tasks we already procured. [...] In general, I will divide these tasks into small parts and assign them to workers based on their expertise. I, myself, usually program the functions and we also have workmates who are good at PHP language or specialized in software documentation [...] We usually have a meeting every one or two days to discuss the problems encountered in doing tasks and the future work plan. [...] Our company uses a software system to allocate tasks and supervise the work progress of workers so that we can easily integrate and test all work units before we submit to requestors.” (P1, 50 years old, male; all quotations are translated from Chinese.)

When a crowdfarm cannot handle a part of a task, it subcontracts the work unit to external business partners, solo crowdworkers, or other crowdfarms. The crowdfarm might select a company known to possess the necessary skill set, or, like a typical requestor, crowdsource the work unit with relatively low remuneration to maximize their profit. After paying the secondary workers, crowdfarms integrate the work and submit it to their requestor. Subcontracting by crowdfarms is not unusual: collaboration among companies is a common strategy for small Chinese enterprises with insufficient means to carry out an end-to-end business.¹³ Like crowdfarming itself, this subcontracting is a short-term arrangement and not outsourcing a business activity.¹¹ To control the quality of the subcontracted tasks, crowdfarms usually ask the external contractors to update the work progress regularly and send reports/prototypes to requestors for feedback. However, the crowdfarming companies exhibited mixed feelings about being transparent about subcontracting. About half believed that it is a requestor’s right to know how their tasks are handled and the other half worried that subcontracting may result in a requestor questioning their professional capabilities and negatively impact the possibility of future business.

Reputation management. Solo crowdworkers rarely interact with requestors before receiving a final direct acceptance or rejection of their submission. They manage their reputation by proactive, preventative tactics, such as sticking to familiar tasks, pre-task training, and returning a task as soon as it is found to be too difficult.⁶ In contrast, crowdfarms that take on larger, complex and lengthy tasks receive oversight and feedback from requestors over days or weeks, enabling them to preempt difficulties and fix issues that could lead to rejection. After a project has closed, a crowdfarm utilizes post-task and compensatory strategies to manage its reputation: (1) t

hey ask requestors for positive ratings and comments that can be displayed in the crowdfarm's profile; (2) they carry out extra and usually unpaid work to refine submitted tasks; and (3) they offer price discounts if necessary to obtain more favorable final feedback. A manager and worker in a design company explained how he obtained a favorable rating from a tough requestor:

"There was a requestor that insisted on giving us negative feedback as one of my staff quarreled with him over excessive requirements. So I apologized to him and offered him a few new designs for free, but it did not work out. [...] In the end, though we had already signed the contract, I had to give him a discount on the price in order to get him to give us positive feedback." (P2, 31 years old, male)

2. The work experience of crowdfarm workers

Perceived work setting advantages. The crowdfarm workers we spoke with reported being generally satisfied with their work conditions. They appreciate that managers can provide timely and effective help when they encounter difficulties, which enables them to handle tasks more efficiently than they would on their own. They also appreciate that crowdfarms "feed" them remunerative tasks that match their professional skills, and provide financial and social protection in the form of a monthly wage and health insurance, benefits not available to solo crowdworkers.

Perceived problems in crowdwork. The most frequent complaint in interviews was that remuneration for tasks was decreasing. Although payment varies across task type and domain, price competition among crowdfarms is driving down payment for tasks, affecting the bonuses that crowdfarm workers earn.¹⁹ Relentless bidding competition could create a race to the bottom in the Chinese crowdsourcing market. Another major problem reported by crowdfarm workers was ill-defined requestor requirements. Solo crowdworkers who undertake short tasks are given relatively straightforward requirements, but crowdfarm workers must resolve complex requirements in the ongoing process we described. An unclear or ambiguous requirement can increase the cost of communication with requestors and affect the timing and final quality of the completed work, impacting the crowdfarm worker's remuneration. One crowdfarm worker identified concerns and frustrations also expressed by others:

“I took a task that looked like they needed a simple online platform with a 100k CNY budget (approx. \$14490 USD). However, it turned out that the requestor had no idea what they wanted. [...] In the end, we received only 1/10 of the money as they thought we did not meet their ever-changing and unrealistic requirements though we had already provided the general framework of the website. [...] I know a [crowdfarm] on ZBJ in our city. Their strategy is to bid with extremely low prices to win the tasks. To be honest, if it was not because the platform gives them more opportunities to attract customers with low prices, I seriously doubt these workers could support themselves with such low profits in tasks.” (P3, 30 years old, male)

Rewards from crowdwork. Although many crowdfarm workers also earn money from offline businesses that their companies procure locally, they use crowdwork income for basic living expenses or to improve their quality of life, such as by supporting hobbies. In addition to the monetary reward, ‘guanxi’ with requestors, a Chinese concept of an interpersonal relationship involving obligation, commitment and exchange of favors, is generally regarded as a very important non-monetary reward. Given that Chinese business transactions often result from a successful guanxi,² working for a well-connected requestor can reduce the potential problems at work (e.g., post-task refinement), enabling tasks to be completed in a timely and smooth manner. In fact, for some of our participants, guanxi with requestors is of greater significance than the remuneration. Therefore, in contrast to the smaller tasks involving little or no communication, frequent interactions with requestors in complex crowdwork drive a logical shift of workers’ focus from direct task payment to work relations. Business collaborations with requestors in good guanxi bring workers more stable task payments and richer work experiences that assist personal career development. A crowdfarm worker who specializes in visual identity reported:

“The most important reward we gained from crowdsourcing is that we have reached more customers and established business relationships with them. [...] Although we usually cannot make much money from the first task we do for one, after gaining their trust, they will contact us with more tasks. Then the profit for a task will be much higher.” (P4, 49 years old, male)

Work-life balance of crowdfarm workers. In contrast to Chinese solo crowdworkers who rarely undertake tasks when sick and rarely repeatedly work overtime,²⁰ crowdfarm workers reported high levels of stress and exhaustion, with less time spent on leisure and family activities. Crowdfarm workers cannot

flexibly control task volume or scheduling, being full-time employees with tasks mandated by managers. This is affected by the 9-9-6 work culture of many Chinese IT companies: 9 am to 9 pm, 6 days a week.¹² The crowdfarms in our study are small Internet companies that often rely on employees working overtime to stay in business. To prevent further disruption to their lives, crowdfarm workers report talking less about their work with families and friends, creating a clear boundary between work time and family time.

Discussion

Crowdsourcing is generally regarded as an emergent work paradigm with a disruptive business model that deviates from traditional business operations. Could crowdsourcing itself be disrupted? We found that traditional management approaches came to play a significant role as crowdsourcing scaled and was applied to tasks that required closer internal collaboration and coordination.

Crowdfarms share the “online task” crowdwork platform category with Upwork and TaskRabbit (in contrast to “asset-based services” crowdwork platforms such as Airbnb or Uber, “Playbour” or playful labour platforms, and “profession-based freelance platforms” such as iStockphoto).⁸ They too mix typical solo crowdworkers and small businesses and projects ranging from simple to complex, so the emergence of crowdfarms on ZBJ could provide these platforms with an intriguing alternative model to organize and incubate their crowd workforce.

The crowdfarm work model enhances the role of crowdsourcing by tackling more advanced projects for requestors. It accelerates the accomplishment of open-ended and complex tasks that cannot be easily decomposed into the small tasks posted on microtasking platforms such as Amazon Mechanical Turk. The cost of creating the workflow to address a complex task can be high, even for large corporations. Crowdfarms, matching their skill sets to specific complex task requirements, can produce workflows more cost-effectively than in-house workflow development. By scaling up the number of complex tasks that can be carried out efficiently, these companies accelerate complex work production, which is highly valued in knowledge and innovation-seeking economies.

Crowdfarms are impacting the vast solo crowdworker community, the individuals and enterprises that request crowdwork, and the platform companies. For

solo crowdworkers, crowdfarms are a double-edged sword. By decomposing procured tasks into smaller work units and subcontracting some of them, they add low-complexity tasks to the crowdsourcing market. On the other hand, profit-oriented crowdfarms use their advantages in teamwork and professionalism to procure as many tasks as possible, leaving solo crowdworkers with specialized skills increasingly competing at a disadvantage with specialized companies. Crowdworkers who subcontract or join a crowdfarm must share income from their work with crowdfarm management. They obtain employment benefits, but are also prone to work-life balance stress.

Crowdfarm and the larger crowdsourcing field can mix in different ways. Solo crowdworkers could join a crowdfarm. Crowdfarm employees who have developed specialized skills could become independent freelance contractors or form their own companies.¹⁰

Requestors take on some risks but obtain clear benefits: an efficient, professional, one-stop crowdsourcing approach to enlist required expertise. Requestors do not have to decompose complex tasks and integrate the resulting work. They too do not have to find and communicate with multiple competent solo crowdworkers. The risk for requestors, especially given that crowdfarms sometimes subcontract tasks without informing them, is uncertainty about who is performing a task and the quality of the final submission. This risk is offset by the contracts managed by the platforms, quality control within a crowdfarm, and the strong desire of crowdfarms to establish *guanxi* and get positive recommendations. And one experimental study found that in some situations, subcontracting by a crowdworker led to superior outcomes.¹⁴

Platform companies responded to the opportunity to take on more lucrative tasks by offering crowdfarms space and by mediating high-stakes crowdsourcing tasks for requestors and crowdfarms. Our interviews identified points of friction that platform companies are likely to address: a need for better tools for requestor-crowdfarm communication and better strategies for regulating and normalizing subcontracting to protect subcontractors. Platform companies monitor for fake requests²² and could also detect problematic bids that are significantly lower than payments for similar tasks. Imbalances in remuneration could affect crowdfarms and their employees, as well as solo crowdworkers, and undermine the crowdsourcing industry.

Our study of crowdfarms provides an initial insight into an emerging and evolving crowdsourcing phenomenon in China. With its significant differences

from the solo-worker-based crowdwork, as well as its impacts on the general crowdsourcing context, crowdfarming can help shape our conception of the future of work.

We do not have a complete picture of crowdfarming. We hope our work motivates others to join in research into and discussion of this phenomenon. It is not clear how crowdfarms, rooted in a 30-million Chinese crowdsourcing community and supported by platforms and the government, will evolve, or how the experience of crowdfarm workers will change. Moreover, considering that the US-based platform Upwork is now encouraging small firms to participate in crowdwork, how ZBJ's crowdfarms and Upwork's boutiques differ in terms of technology, policy, legal framework, and labor characteristics is not known. These differences could have a profound effect on the evolution of the gig economy and the well-being of millions of people now engaged in crowdsourced tasks.

References

1. Battiston D, Blanes i Vidal J, Kirchmaier T. Face-to-Face Communication in Organisations. *SSRN Electron J*. Published online 2017. doi:10.2139/ssrn.2934290
2. Buckley PJ, Clegg J, Tan H. Cultural awareness in knowledge transfer to China –The role of guanxi and mianzi. *J World Bus*. 2006;41(3):275–288. doi:10.1016/j.jwb.2006.01.008
3. d'Eon G, Goh J, Larson K, Law E. Paying Crowd Workers for Collaborative Work. *Proc ACM Hum-Comput Interact*. 2019;3(CSCW):1–24. doi:10.1145/3359227
4. Fieseler C, Bucher E, Hoffmann CP. Unfairness by Design? The Perceived Fairness of Digital Labor on Crowdsourcing Platforms. *J Bus Ethics*. 2019;156(4):987–1005. doi:10.1007/s10551-017-3607-2
5. Gummeson E. The Marketing of Professional Services – An Organizational Dilemma. *Eur J Mark*. 1979;13(5):308–318. doi:10.1108/EUM00000000004951
6. Gupta N, Martin D, Hanrahan BV, O'Neill J. Turk-Life in India. In: *Proceedings of the 18th International Conference on Supporting Group Work – GROUP '14*. ACM Press; 2014:1–11. doi:10.1145/2660398.2660403
7. Hippler K. From Freelancer to Agency: Is it the Right Move for You? | Upwork. Published May 3, 2020. Accessed May 6, 2021. <https://www.upwork.com/resources/from-freelancer-to-agency>
8. Howcroft D, Bergvall-Kåreborn B. A Typology of Crowdwork Platforms. *Work Employ Soc*. 2019;33(1):21–38. doi:10.1177/0950017018760136
9. Howe J. The Rise of Crowdsourcing. *Wired*. Published online 2006. Accessed March 31, 2019. <https://www.wired.com/2006/06/crowds/>
10. Kauser H. Can crowdsourcing steal the thunder from traditional consulting? Can crowdsourcing steal the thunder from traditional consulting? Published 2017. Accessed April 28, 2020. <https://www.beroeinc.com/article/crowdsourcing-con>

sulting/

11. Kavčič K, Markič M, Meško M, Ježovnik A. *Strategic Management of Outsourcing*. Faculty of Management; 2014. Accessed April 28, 2020. <http://www.fm-kp.si/zalozba/ISBN/978-961-266-159-5.pdf>
12. Li Q, Zhong R. '996' Is China's Version of Hustle Culture. Tech Workers Are Sick of It. – The New York Times. '996' Is China's Version of Hustle Culture. Tech Workers Are Sick of It. Accessed April 28, 2020. <https://www.nytimes.com/2019/04/29/technology/china-996-jack-ma.html>
13. Liu X. SME Development in China: A Policy Perspective on SME Industrial Clustering. *SME Asia Glob*. 2008;5:37-68.
14. Morris MR, Bigham JP, Brewer R, et al. Subcontracting Microwork. In: *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems - CHI '17*. ACM Press; 2017:1867-1876. doi:10.1145/3025453.3025687
15. Shengping Huo, Chijian Z, Tu H. On the Research of Intelligent Coupling and Coordination between Employers and Witkey on the Crowd Innovation Network Platform. *J Xiangtan Univ*. 2017;41(1):94-101. doi:0.13715/j.cnki.jxupss.2017.01.017
16. To W, Lai LSL. Crowdsourcing in China: Opportunities and Concerns. *IT Prof*. 2015;17(3):53-59. doi:10.1109/MITP.2015.47
17. Vigato V. Transition to Consulting: Marketing & Sales Activities & Tools.
18. Wang Y, Papangelis K, Lykourantzou I, et al. In Their Shoes: A Structured Analysis of Job Demands, Resources, Work Experiences, and Platform Commitment of Crowdworkers in China. *Proc ACM Hum-Comput Interact*. 2020;4(GROUP):07:1-07:40. doi:10.1145/3375187
19. Wang Y, Papangelis K, Lykourantzou I, Khan V-J. The Changing Landscape of Crowdsourcing in China: From Individual Crowdworkers to Crowdfarms. In: *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing - CSCW '19*. ACM Press; 2019:413-417. doi:10.1145/3311957.3359469
20. Wang Y, Papangelis K, Saker M, Lykourantzou I, Chamberlain A, Khan V-J. Crowdsourcing in China: Exploring the Work Experiences of Solo Crowdworkers and Crowdfarm Workers. In: *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. CHI '20. Association for Computing Machinery; 2020:1-13. doi:10.1145/3313831.3376473
21. Zhang J, Zhang. Mass Entrepreneurship and Innovation: New Impetus to Development. Mass Entrepreneurship and Innovation: New Impetus to Development. Accessed April 28, 2020. http://en.drc.gov.cn/2016-04/07/content_24350321.htm
22. Zhu F, Chen W, Sun S. ZBJ: Building a Global Outsourcing Platform for Knowledge Workers (A). Published online January 26, 2018. Accessed October 11, 2020. <https://www.hbs.edu/faculty/Pages/item.aspx?num=53948>