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CROWDWORK PLATFORMS: JUXTAPOSING CENTRALIZED AND DECENTRALIZED GOVERNANCE

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Research paper

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Abstract

Crowdwork is a novel form of digitally mediated work arrangement that is managed and organized through online labor platforms. This paper focuses on the governance of platforms that facilitate creative work—that is, complex work tasks that require high-level skill and creative workers. Crowdwork platform governance faces numerous challenges as a result of technology mediation, scalable and distributed workers, and temporary work arrangements. Creative crowdwork platforms, such as Topcoder, typically require additional governance structures to manage complex tasks. However, we know relatively little about creative crowdwork platform governance, as most existing studies focus on routine work platforms, such as Amazon Mechanical Turk. Accordingly, this paper explores how incumbent and insurgent creative crowdwork platforms are governed under centralized and decentralized modes. We conducted a comparative case study based on the analysis of two different cases: Topcoder, a successful commercial platform with a largely centralized governance structure, and CanYa, an emerging innovative platform based on blockchain technology with more decentralized governance. We identified and classified different governance elements related to work control and work coordination. In addition, we explored the characteristics of creative crowdwork platform governance with different degrees of centralization.

Keywords: Crowdwork Governance, Creative Crowdwork, Centralized Platforms, Decentralized Platforms, Blockchain, Tokenomics.

1 Introduction

Paid, online crowdwork refers to different types of remunerated digital work organized by means of online labor platforms, which are responsible for choosing, organizing, assessing and paying crowdworkers (Kittur et al., 2013). These platforms act as intermediaries between workers and job providers (Kittur et al., 2013; Deng et al., 2016). In order to manage the challenges of a distributed and scalable workforce, a governance structure is essential (Deng et al., 2016; Donini et al., 2017). Governance can help organize the relationships among the workers, platform, and job providers and ensure the long-term success of the ecosystem. In general, crowdwork platform governance refers to different policies, rules, and standards maintained on the platform (Deng et al., 2016, p. 281). Specifically, crowdwork platform governance includes control and coordination of platform resources and activities to help achieve the desired results (Gol et al., 2019). Control includes mechanisms such as quality control, a reputation system of workers and accountability of job providers, whereas coordination includes, for example, task management, incentive management, and contract management (Gol et al., 2019).

Crowdwork platform governance is plagued by many well-known challenges due to technology mediation, scalable and dispersed workers, and impermanent work arrangements (Gillespie, 2017). Furthermore, until now, most research on crowdwork platforms governance has focused on micro-task platforms like AMT. Broadly speaking, there are two types of crowdwork platforms: those for routine or micro-task work and those for non-routine or creative work (Gol et al., 2019; Margaryan, 2016). Routine work platforms, such as Amazon Mechanical Turk (AMT), involve micro-tasks, which are performed in seconds or minutes and are usually repetitive with no high level of skill requirement and minimal payment (e.g., tagging pictures) (Deng et al., 2016; De Stefano, 2016). In contrast, creative work platforms, such as 99designs, Upwork, and Topcoder, involve more professional and creative tasks, such as graphic design and web development. These tasks take longer to accomplish, require a higher level of skill and provide higher compensation for the workers (Buettner, 2015; Margaryan, 2016). The evidence suggests that such creative work platforms follow a considerably more complex governance structure than do routine work platforms like AMT (Vakharia & Lease, 2015). Meanwhile, with technologies such as blockchain making significant inroads, it has also become evident that crowdwork platform governance may be run in a centralized or a decentralized manner (Atzori, 2015; Gol et al., 2019; Hein et al., 2016). This trend may be especially important in creative work platforms where highly-skilled workers offer their services. Creative work inherently requires more discretion, suggesting that platform control mechanisms may need to be adjusted to account for the particular nature of such work. Accordingly, the important question this paper explores is *how are creative crowdwork platforms governed under centralized and decentralized modes?*

This paper contributes to a better understanding of creative crowdwork platform governance under centralized and decentralized modes through a comparison of two case studies: Topcoder and CanYa. Topcoder is a long-standing (founded in 2001) and successful crowdwork platform that connects job providers with highly-skilled software developers, data scientists, and designers. The platform's governance structure is largely centralized. CanYa is an emerging blockchain-based crowdwork platform (founded in 2015) that seeks to create multiple decentralized exchanges, one of which is CanWork, a marketplace through which highly-skilled freelancers can offer their services. Our findings demonstrate that there are significant differences between centralized and decentralized governance mechanisms related to platform control, work control and work coordination. For example, while centralized Topcoder is owned by shareholders (held by parent companies), decentralized CanYa is owned by CAN token-holders (CanYa community members). The distribution of work in centralized Topcoder is based on competition (Gol et al., 2018), while in decentralized CanYa, work is distributed through a marketplace that matches job providers with workers (CanYa Services Pty. Ltd., 2018a). Moreover, Topcoder operates as a commercial company that maintains a community of workers and offers value-adding services to job providers to run complex jobs (Gol et al., 2018). Meanwhile, CanYa operates as an open source community and is only able to run relatively less complex jobs (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). In sum, this paper offers one of the first steps towards developing a systematic understanding of creative crowdwork platform governance under centralized and decentralized modes.

2 Theoretical Background

Governance has been poorly defined in crowdwork studies, and a review of the literature shows a lack of studies on different crowdwork platform governance mechanisms, especially in the domain of creative work platforms (Deng et al., 2016; Donini et al., 2017; Margaryan, 2016). Moreover, the crowdwork phenomenon is still in the early stages of development, the associated practices are still forming, and the governance processes are still flexible (Nickerson, 2014). Broadly speaking, crowdwork platform governance refers to the coordination of interactions and the management of dependencies among all parties on the platform (based on Crowston, 1997; Howcroft & Bergvall-Kåreborn, 2018; Schmidt, 2017), as well as the control of worker and job provider behaviour and the monitoring of their performance by means of rules, policies and standards (Deng et al., 2016; Manner et al., 2012).

Most research on crowdwork platforms and their governance assumes some degree of centralization is essential for successful governance (Vakharia & Lease, 2015). However, a few recent studies have emphasized that crowdwork platforms may be governed in a more decentralized manner—for example, by building on the ideas of worker-owned and -managed platforms (Gaikwad et al., 2015; Scholz, 2016). Centralized and decentralized modes of platform governance have different characteristics (Hein et al., 2016). Centralized governance can enable smoother coordination of workflows through central direction and a high level of control over workers' behaviors and their submission quality (Brown & Grant, 2005; King, 1983), whereas decentralized governance can enable smoother coordination of contracts among parties as well as more efficient and fairer dispute resolution (avoiding a centralized bottleneck) (Tate et al., 2017). However, quality control of workers' outputs has to be performed by costly consensus-based evaluation and will most likely depend on difficult-to-achieve, mutually agreed-upon standards (King, 1983). However, most of these specific governance mechanisms (e.g., quality control, dispute resolution, etc.) have not been studied across both centrally- and decentrally-governed crowdwork platforms. Thus, most of these advantages and disadvantages are assumed based on the general governance literature and lack empirical support. As such, this paper provides, to our knowledge, one of the first comparative investigations into crowdwork platform governance under centralized and decentralized modes.

2.1 Blockchain for crowdwork platforms

Current platform architectures support centralized governance by the platform owner. Decentralized crowdwork platform governance, thus, will rely not only on a different logic but also on a different technical architecture. Blockchain, a new distributed computing technology that is growing fast across industries, is currently considered the main contender for providing such an architecture. Through decentralized autonomous organizations (DAO), which function as business rules within smart contracts and possession rights listed on a blockchain, the envisioned possibility of decentralized governance (for crowdwork platforms and beyond) seems increasingly possible (Schweizer et al., 2017). In the crowdwork context, new forms of decentralized platform infrastructure provided by blockchain technology can enable members to reach consensus on critical issues (e.g., the identity of job providers and workers, job completion and payment conditions, etc.), without the need for a central platform owner or other third parties to function as intermediary and trustworthy arbitrators (Schweizer et al., 2017; Xu et al., 2016). Hence, blockchain-based crowdwork platform governance could improve governance efficiency by automating payments through smart contracts (i.e., payments are executed automatically when the conditions stipulated in the contract are met); by managing dispute resolutions decentrally, thus avoiding bottlenecks; and by making it easier to create and manage job-specific smart contracts (Tate et al., 2017).

3 Research Method

This paper follows the research design of a comparative case study based on the analysis of two different cases, allowing for a comparison of centralized and decentralized creative crowdwork platform governance. In contrast to a single case study, a comparative case study provides the possibility to perform a comparison across contexts and thus to achieve more robust conclusions (Yin, 2013). Specifically, we analyzed the Topcoder[1] and CanYa[2] platforms. We chose Topcoder because it is a successful creative crowdwork platform with a largely centralized governance structure. It works

[1] According to Mike Morris, Topcoder CEO, the platform included 1.2 million freelance developers in December 2017, and thus figure is increasing by a rate of 50,000 software developers every quarter (Talley, 2017).

[2] According to CanYa community manager, the platform included 1300 freelance workers in August 2018 and is growing rapidly.

with many large companies such as IBM, Google, and NASA as job providers and attracts a large number of highly skilled workers. Topcoder holds online algorithm competitions as well as software development and software design competitions (Archak, 2010). As a comparison, we chose CanYa because it is an innovative platform based on blockchain technology. CanYa is an open ecosystem hosting a peer-to-peer service marketplace and includes decentralized applications using blockchain technologies (CanYa Services Pty. Ltd., 2018a). It is a member-owned, loosely organized entity that aspires to run as a DAO (i.e., decentralized autonomous organization). Consequently, relying on a lean organizational structure, CanYa expects to operate a profitable crowdwork platform with fees that are 20 times lower than those of other crowdwork platforms (CanYa Services Pty. Ltd., 2018a). Therefore, these two cases illustrate two radically different governance modes and form an ideal setting to perform the desired comparison.

3.1 Data collection and analysis

In the Topcoder case, data were collected through 16 open-ended and semi-structured Skype interviews with staff, workers and job providers, conducted in February and March 2018. Each interview lasted approximately 40 to 50 minutes. In addition, online data were gathered from the platform website, from Topcoder forums, and from the Slack community channel which is used by workers and staff. In the CanYa case, data were collected through eight semi-structured Skype interviews with staff and workers. The approximate time for each interview was between 40 and 60 minutes. Moreover, white papers about the platform were used as another important source of data. Furthermore, online data were gathered from the platform website, the CanYa blog and the Telegram community channel which is used by staff and workers. Detailed information regarding the interviewees is presented in Table 1.

Case	Interviewee Category	Interview Number	Role	Area of Expertise
Topcoder	Worker	12 [P1…P12]	Competitor, Co-pilot, Reviewer	Development, Design and data science, Programming
	Staff	2 [P13, P14]	Project manager, Community manager	Development, Community
	Job provider	2 [P15, P16]	Job provider	Private Company
CanYa	Worker	3 [P17…P19]	Developer, Designer, Accountant	Development, Design, Accounting
	Staff	5 [P20…P24]	Co-founder, CTO, Community Manager, Developer, Business Advisor	Development, Community

Table 1. Overview of Interviewees across Cases

Building on the case study research strategy, we focused on the two cases to develop a richer insight into the dynamics of crowdwork platform governance in the underlying settings (Eisenhardt 1989). The purpose of the within-case analysis was to attain an understanding of the case stories and to perform analysis and organize data collection across the cases (e.g., making sure that data related to the same governance mechanism were available in each case). The data analysis within the two cases was accomplished using the same approach. We utilized the procedures presented by Huberman and Miles (1994) to perform qualitative data analysis. We performed iterative coding on the interview, documentary, and online data, initially via open coding and then by categorizing and altering the codes based on both data and theory. We coded for specific governance mechanisms related to control and coordination, as suggested both by the literature and the exploration of the data (e.g., reputation system, quality control, task management, incentive management, contract management, color rating,

skill, motivation, complaint handling, rewards, bonuses, and payments). New factors not mentioned in previous literature, such as dispute resolution and payment system, emerged from the data. We grouped the codes according to control and coordination as well as centralized and decentralized modes (see Table 2) to identify the most effective way of categorizing our findings.

4 Findings

Table 2 provides an overview of the identified governance mechanisms at play on creative crowdwork platforms with different degrees of centralization. We used the ideas of work control and work coordination to provide the basis for identifying and classifying different governance elements. In addition, the element of platform control emerged as an important distinguishing characteristic between Topcoder and CanYa. This separation of *work governance* and *platform governance* echoes Gillespie (2017), who argues that platform governance consists of two aspects: governance of and governance by platforms. Governance of platforms refers to the rules that guide platforms in their role as intermediaries (we refer to this as platform control), while governance by platforms refers to the platforms' ability to mediate between sides, moderate content, and generally to coordinate and control the workflow (we refer to this as work control and work coordination).

Table 2 reveals that, overall, remuneration in Topcoder is based on competition, which means that usually only a handful of people among those who work on a project are actually paid for their work (Gol et al., 2018). On the other hand, CanYa is a marketplace that matches job providers with workers, where job providers seek desired workers based on the skills advertised on their profiles and make contracts with them (CanYa Services Pty. Ltd., 2018a). Topcoder is a commercial enterprise; its business model relies on nurturing a community of workers and providing value-adding services to job providers by taking over the handling of complex jobs (Gol et al., 2018). Conversely, CanYa is an open source community and relies on community members (CAN token holders) to run the marketplace. Thus, it is not able to offer sophisticated or complex job handling services like those of Topcoder (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b).

Specific governance elements provided particularly rich insights for comparison. For example, dispute resolution management, payment management and contract management served as rich entry points towards understanding decentralized governance, while task management and quality control served as rich entry points towards understanding centralized governance. As expected, we found that the platform owner plays a vital role in centralized crowdwork platform governance, whilemembers play a critical role in decentralized platform governance. We unpack each of the mechanisms in more detail in the table below.

Governance mechanism		Topcoder	CanYa
Platform Control	*Platform Management*	Corporate management and senior community members	Community managers of the open source CanYa community (paid by CAN tokens)
	Platform Development	Developers employed by Topcoder	Developers of the open source CanYa community (paid by CAN tokens)
	Equity Ownership	Shareholders (held by parent companies)	CAN token-holders (held by the CanYa community members)
Work Control	*Remuneration*	Competition-based prizes and bonuses (only winners get paid)	Payment on delivery (or as negotiated in advance)

	Payment System	Brokered and intermediated by the platform	Direct payment via smart contracts (paid by CAN tokens)
	Quality Control	Reviewer-based (prior to delivery; done by platform's appointed reviewers)	Not offered yet[3]
	Reputation System for Workers	Seniority-based ranking	Stake-based ranking
Work Coordination	*Task Management*	The platform provides end-to-end built-in work process management that is complemented by appointed project managers and co-pilots	The platform provides only basic matching between job offers and workers
	Task Interdependence Management	Managed by co-pilots	Not offered yet
	Contract Management	Standard contract between platform and job providers, but no contract between platform and workers	Platform-generated smart contracts between job provider and workers
	Dispute Resolution Management	Arbitration by platform-appointed agent	Arbitration by platform-appointed third-party community member

Table 2. Creative Crowdwork Platforms Governance: Comparison of Topcoder and CanYa

4.1 Governance of and by creative crowdwork platforms

Governance *by* creative crowdwork platforms refers to the rules and policies that the platform uses to control and coordinate the workflow, user behaviors and content (Gillespie, 2017). Work control and coordination are vital for running a crowdwork platform (based on Crowston, 1997; Malone & Crowston, 1994; Kittur et al., 2013). Control performs the monitoring and guiding of processes within the platform (Schreieck et al., 2016) as well as verifying the compliance of workers' and job providers' behavior against standards, policies and platform objectives (based on Wiener et al., 2016). Coordination manages the dependencies among crowdwork activities, such as dependencies between tasks or between the parties (based on Crowston, 1997; Malone & Crowston, 1994; Kittur et al., 2013; Fernandes et al., 2018). Based on the literature and our data analysis, we suggest that work control includes financial remuneration, payment system, quality control, and the reputation system for workers. Meanwhile, work coordination involves task management, task interdependence management, contract management, and dispute resolution management.

[3] 'Not offered yet' describes governance elements that CanYa does not currently provide but plans to offer in the future.

4.1.1 Platform control

As highlighted above, we suggest that platform control consists of platform management, platform development, and equity ownership (Brown & Grant, 2005; Gawer, 2014; Denis et al., 2018).

Platform management refers to the overall control over the platform environment and resources access, as well as the setting of standards and policies that guide all parties' behaviors on the platform (Brown & Grant, 2005; Franke et al., 2011; Chard et al., 2016). Our data show that in Topcoder, platform management is performed by platform staff and senior worker community members (e.g., community managers and workers promoted to a co-pilot role). As a community manager described: "*I'm the one who interacts with people and finds the issues they are facing on the platform*" [P13]. On the other hand, in CanYa, which is an open ecosystem for peer-to-peer services and consists of decentralized applications powered via a DAO (decentralized autonomous organization), all members can be part of the system infrastructure and governance by getting a stake on the platform. Different levels of stakes involve different capabilities and responsibilities, and the members are also paid for doing platform management tasks (CanYa Services Pty. Ltd., 2018a). As explained by one of the platform staff: *"What we are trying to do is to create an open ecosystem on the blockchain that allows people to be part of the system. So, if you stake with the CanYa system, then you can be part of the governance and structure. You can also be incentivized to do tasks within the system and get paid"* [P20].

Platform development refers to who is allowed to develop and improve the platform regularly and to what extent (Gawer, 2014). On Topcoder, platform improvement capabilities are restricted to platform-employed developers. As mentioned by a co-pilot: "*Topcoder's developer team is working on improving the platform; for example, they are building a new program which is called MVB, for the new members to help them get started on the platform*" [P5]. CanYa also has its own temporary development team, but it is moving towards becoming open-source-developed in the near future [P20, P22, P24] (CanYa Services Pty. Ltd., 2018a). Hence, any developers will be able to easily integrate new components, follow the platform style guide, join their application to the DAO and launch them (CanYa Services Pty. Ltd., 2018a).

Equity ownership refers to the amount of the business assets owned by the business owner (Denis et al., 2018). Topcoder has shareholders, and the equity is held by parent companies.[4] In contrast, CanYa equity is held by the CanYa token holders (i.e., community members who get a stake on the platform through buying CanYa tokens) (CanYa Services Pty. Ltd., 2018b). Accordingly, any decision rights granted to equity owners are distributed differently in each of these platforms, as well as any financial benefits accrued.

In sum, in centralized platform control, the platform owner plays a vital role in the governance *of* the platform, answering to shareholders. Conversely, in decentralized platform control, all members with a stake in the platform play a critical role in the governance *of* the platform and share the responsibility and accountability for its performance.

4.1.2 Work control

As highlighted above, work control involves monitoring and guiding processes within the platform (Schreieck et al., 2016) as well as verifying the compliance of workers' and job providers' behavior against standards and policies. We suggest that the distinguishing mechanisms of work control include financial remuneration, payment system, quality control, and the reputation system for workers.

[4] Information retrieved from https://www.topcoder.com.

Financial remuneration is a key apparatus of creative crowdwork platform governance that controls workers' behaviors by motivating them to take part in the crowdwork platform and by incentivizing them to deliver quality work (Harris & Wu, 2014; Gol et al., 2018). In Topcoder, financial remuneration is competition-based. The platform hosts weekly cash prize competitions in algorithm, design, and software development fields. The prize usually goes to the winner of the competition as well as a few runners-up who also submitted high-quality work (Archak, 2010). Thus, creative workers are motivated to participate in these risky competitions by the chance to win a significant prize (Archak, 2010; Gol et al., 2018). Further, some of the workers mentioned that the prizes for jobs on Topcoder are higher than on other platforms, which is one of the leading factors that motivate them to participate in this platform over others [P2...P4, P5, P7, P9...P12]. Per one co-pilot: "*If you are an active member, you can earn a lot of money here in comparison with other platforms. I know some members who can earn $20,000 per month, and other members can earn $2000 or $3000 on average*" [P4]. In contrast, CanYa incentivizes workers and job providers to join to the platform by reducing fees to 1% (about 20 times lower than the rate of other crowdwork platforms, such as Upwork and 99designs) [P20-P23]. According to one employee of CanYa, "*This means a more efficient market with more money in the pockets of our freelance workers*" [P21].

Moreover, CanYa includes some lightweight decentralized applications that can be used by anyone for free [P20, P22]. These apps are loosely dependent on the CanYa platform and designed to accomplish a particular task; for example, CanInvoice permits users to generate, save and share invoices (CanYa Services Pty. Ltd., 2018a). These apps are intended to share the advantages of decentralized technologies with the broader community [P20, P22], but they also reinforce the attractiveness of the platform by increasing the usefulness of CanYa tokens and attracting new members ("*come for the tool, stay for the ecosystem*" being the operating slogan; CanYa Services Pty. Ltd., 2018a). Furthermore, CanYa will be run entirely by DAO in the future, which means that users who are token holders will run the platform (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). Therefore, they will be financially incentivized to improve their performance within the platform [P20, P24] and get paid with CanYa coin for doing tasks related to the running of the CanYa platform (McLoughlin, 2018).

Just as the rules of financial remuneration differ significantly between the focal platforms, so do the **payment systems**. Delays in payments due to inefficiencies in the payment system constitute one of the major problems reported in existing crowdwork platforms (Zhang & Van Der Schaar, 2012). In Topcoder, the payment system is centralized, and payment for a job is made ahead of delivery by job providers [P4, P13]: "*Customers pay us ahead of time*" [P13]. The payment to workers is made via the current banking system and via online transfers from Topcoder's account to the workers' accounts. Delays may occur in payment processing due to account verification issues: "*It happened one or two times that Topcoder paid us with a delay due to some account verification issues*" [P2]. This system also excludes workers without international bank accounts. Conversely, CanYa has a decentralized payment system based on the blockchain technology. CanYa created its own currency called CanYaCoin (CAN) [P20…, P24]. The CanYaCoin improves the platform's payment system, providing a trust-less, decentralized, and hedged escrow service[5] to solve the problem of currency inflation by maintaining the escrow value, regardless of the token price (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). Payments from job providers to workers can thus be made without an intermediary and without delays.

[5] "The hedge is a Bancor Array Token that connects with a basket of Ethereum stable coins, such as the Digix gold token and the DAI USD token. This will create an internal pool in order to provide collateral to hedge the amount of cryptocurrency sent to the smart contract. Bancor technology will provide the price oracle for the CAN token. The outcome is that the value of the invoice is stable, despite fluctuations in price. Intended recipients will be paid a fixed value, but not a fixed amount of CAN tokens" (CanYa Services Pty. Ltd., 2018a, p. 25).

Quality control is necessary to verify the quality of work and in performing corrective actions such as preventing false rejections of work and allowing for the correction of mistakes in a worker's submission (Vakharia & Lease, 2015). In Topcoder, there are reviewers for each project that check the quality of work. These reviewers are selected and promoted from the pool of highly skilled workers who have at least one winning submission in their profile [P2…, P6]. Furthermore, Topcoder has developed scorecards to assess the quality of worker's submissions; these are prepared for each project (to cater to different standards and requirements), and the workers' submissions must be checked and assessed against the performance metric in the scorecards. The final score then indicates the winner of the competition [P5, P6]: "*The reviewers choose from 1 to 5 for each question. For example, does this design have the Apple design standard? The final score then gives you a score of 98%. This score indicates the winner*" [P4]. Therefore, quality control is done in a centralized process via highly professional workers within the platform. By contrast, CanYa does not currently have a quality control system, but they do have a plan to develop a review and feedback system in the future [P20, P22, P24]. Thus, quality control is currently performed by the job providers themselves, creating an environment for potential complaints by workers about unfair rejections.

The **reputation system for workers** is used as an informal social control in the creative platforms for verifying the qualifications of workers and motivating them to abide by the rules of conduct (Horton & Golden, 2015). In Topcoder, the reputation system includes two parts. The first part is a color rating to indicate the worker's level of experience (from novice to experienced worker), based on the number of competition wins: "*In Topcoder we have different colors from red to grey. If you are very experienced and win a lot, you get red*. *Colors are used only in hackathons that are held by Topcoder. The Hackathon usually has a big prize and is sponsored by a big company such as Google or General Electric*" [P2, P3, P5]. The second part of the reputation system involves different roles within the platform, such as co-pilot and reviewer (Gol et al., 2018). Workers with sufficient experience (i.e., a few wins) can receive a promotion within Topcoder to a co-pilot role (allowing them to run projects) or to a review role (allowing them to review other workers' submissions) [P3, P4, P6]. In addition, the behavior and profiles of workers are monitored so that they can be assigned to private projects requiring specialized skills. As one co-pilot said: "*Sometimes, we have a project where we need machine learning and AI skills, but we have only a few members who have these skills. We reach out to those members and [tell] them, 'hey, we have this project and we need your skills.' So, we don't create a challenge for everyone around the world. We reach out to one or two people who are very good at [the relevant] technology.*" [P4].

Unlike TopCoder, CanYa does not have a ranking system for workers based on stars or colors, but the CanYa DAO includes different member levels: agent, admin, and core. Agents accomplish basic tasks in the DAO after staking a small number of CAN tokens needed for DAO entry. Admins govern agents and accomplish more complicated and higher-level tasks in the DAO, which have results with broad impact such as approvals, curation, and arbitration. Admins need a higher stake and more experience in the DAO, which is demonstrated by passing a reputation threshold to ensure that they have socially proven their commitment to the platform. Finally, core members of the CanYa Team handle complex matters such as funding approvals and changes to the CanYa DAO and CanYa Core. As the CanYa DAO develops, admins may want to join the core level by staking a much higher amount. Progressively, this should lead to the CanYa DAO being governed by the DAO members and becoming fully decentralized (CanYa Services Pty. Ltd., 2018a). Members can leave the DAO and retrieve their stake at any time. The stake is held to avoid dishonest actors within the DAO and to motivate long-term commitment (CanYa Services Pty. Ltd., 2018a). Furthermore, in the future, CanYa is planning to run a skill proof decentralized app, which verifies the workers' claims regarding their skills using other workers' votes. Agents are rewarded for voting on the claims, and admins are paid to prove the claims (CanYa Services Pty. Ltd., 2018a). Therefore, members, instead of the platform owner, will play a vital role in the functioning of the reputation system.

In sum, in centralized work control, the platform owner plays a vital role in setting up the structure and mechanisms through which governance *by* the platform is done (e.g., in Topcoder, a layered structure

of project managers, co-pilots and reviewers performs work control on behalf of the platform owner). Conversely, in decentralized work control, all members with a stake in the platform play a critical role in participating in governance *by* the platform. Such decentralized control procedures take time to develop; as we can see from our data, many of the essential work control mechanisms in place in Topcoder are still under development in CanYa.

4.1.3 Work coordination

As highlighted above, coordination involves the managing of dependencies among crowdwork activities, such as dependencies between tasks or between parties (based on Crowston, 1997; Malone & Crowston, 1994; Kittur et al., 2013). Work coordination involves task management, task interdependence management, contract management, and dispute resolution management.

Task management refers to the management of a 'job' from the 'offer' stage to 'submission' to 'completion' through a process that facilitates the capturing of workers' knowledge (Vukovi, 2010). Topcoder usually runs complex projects in which project managers, sometimes together with co-pilots, create a proposal and a game plan including the number of challenges for running the project and the budget for each challenge. Then, if the job provider approves the proposal and game plan, the platform starts the project, runs the challenges, and integrates deliveries from different challenges. Finally, the completed project is delivered to the job provider [P3, P4, P5..., P7, P10, P11]. Therefore, the task management in Topcoder is centralized and is the key value-adding service Topcoder offers to job providers. In contrast, CanYa lacks a full task facilitation service. Thus, the platform only performs basic matching between job providers' requirements and workers' skills based on their profile information (CanYa Services Pty. Ltd., 2018a). As such, CanYa is only able to run comparatively less complex jobs (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b) on the platform.

Task interdependence management is part of task management but is worthy of separate consideration. It manages the interdependencies between tasks, such as splitting the complex task into smaller tasks, managing those subtasks and spreading them among crowdworkers with different skills and capabilities (Kittur et al., 2013). In Topcoder, a project manager and a co-pilot are assigned for each project. Together, they cover the task interdependence management based on their knowledge and experience, as described by a co-pilot: "*My responsibility as a co-pilot is to take a project and divide it into small pieces and run the challenges. In each challenge, we have to create a very small part of the whole project*" [P5]. A project manager explained the rules of breaking projects into smaller tasks: "*It's based on experience. As a typical rule, I try to run challenges that I think the developers in their free time might be able to work on and get done in 3 days*" [P14]. In contrast, in CanYa there is currently no task interdependence management.

Contract management is considered another essential governance mechanism and a core platform functionality for managing the interdependencies among workers and job providers and coordinating the work plan, including deadlines, job conditions, and delivery format (Agrawal et al., 2015; Vakharia & Lease, 2015; Howcroft & Bergvall-Kåreborn, 2018). In Topcoder, there is no contract between a job provider and a worker; instead, the contract is made between the Topcoder as a platform owner and the job provider for each project. The contract covers worker payments and Topcoder consulting fees [P4, P6, P7]. There can also be a contract between Topcoder and the highly skilled workers in the co-pilot and reviewer roles [P3, P4, P6, P7, P14] but no contract between regular workers (participants in the competitions) and Topcoder. Such a contract between Topcoder and co-pilots/reviewers is made to protect the rights of the platform owner only when the project is private: "*If the project is open, we don't sign any contract, but when the project is private, we should assign a document, scan it and send it to Topcoder. [The document states] that I cannot take this project as a private job off the platform and I cannot go to another company and say, for example, 'hey, I did this project before for company X'...*" [P4]. CanYa uses Can Escrow as a contract between job providers and workers. Can Escrow is a smart contract that is used to hold the payment (secure cryptocurrency)

for the intended person. Entry currency is transformed to CAN before being held in escrow. The escrow is joined with a hedge that tries to maintain the value of the escrow in case of token price fluctuation (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). A CanYa member explains the process as follows: "*We've just released the escrow contract, which can release the exchange module to pay. So, now what we believe is that the client will come and reach out to the worker and then have a discussion with them [to] agree on the job, and the contract will begin*" [P20]. Therefore, contract management is decentralized in this platform. Moreover, in the future CanYa intends to run some new decentralized apps including CanHire and CanJob. The CanHire app is being developed as a platform that allows employers to display their open vacancies. Smart contracts will be used in this app as the escrow of payment (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). The CanJob app, also in development, will be used for small local jobs (e.g., painting, plumbing, etc.). Job providers will be able to insert job posts, and payments will be held in escrow. Any workers who complete the task will receive a review, feedback, and payment (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b).

Dispute resolution management manages the work behaviors on the platform among workers and job providers regarding solving complaints among them, which usually arise as a result of false rejections of work, low wages, and low work quality (Tate et al., 2017; Howcroft & Bergvall-Kåreborn, 2018). Topcoder provides feedback to all workers (even non-winners) to let them know why their submissions were rejected or accepted [P3, P4, P7…, P10]. The platform is responsible for solving any problems between workers and job providers by negotiating with both of them. Moreover, Topcoder dedicates a forum for each project that is managed by one of Topcoder's employees, and workers can talk about their issues regarding the project within that forum [P1, P2]. For example, one worker mentioned that: "*Sometimes the project is too big in comparison with the prize. So, the workers complain about that. So, the project manager talks to the client and asks them to run the project in two challenges or increase the prize*" [P5]. In higher-level disputes, for example between co-pilots and job providers, the project manager from Topcoder takes the responsibility to try to solve the problem, as one co-pilot mentioned: "*Sometimes clients don't know what they really want. I check with them [regarding] the requirements at first, but when they receive the final submission, they say it is not what we expected. So, I talk to the project manager and he talks to them. The project manager is [the one] who solves the problem. These problems happen a lot, especially with small clients. They don't know what they really want*" [P4]. CanYa has created an automatic dispute resolution system using a chatbot. If the chatbot cannot solve the issue, the user is connected to a DAO agent who is able to provide support. At the end of the conversation, the user is able to rate the DAO agent and enhance or diminish his/her reputation score (CanYa Services Pty. Ltd., 2018b). In addition, CanYa is in the process of developing a decentralized dispute resolution system that will operate through a smart contract that holds the payment but allows both workers and job providers to take recourse and negotiate in case they are not satisfied with each other's performance. When the negotiations among parties are unsuccessful, each party can demand arbitration from CanYa DAO, as explained by a CanYa core member: "*If two parties [to a dispute] can't come to an agreement themselves, that's when they are able to call app to the DAO and then rent a member of the organization. So, the DAO member can see all the information about the parties, and the job log will be open for him/her, but s/he'll need to be quite an experienced member with our stakes*" [P20].

In sum, in centralized work coordination, the platform owner again plays a vital role in setting up the structure and mechanisms through which governance *by* the platform is done (e.g., in the layered structure of Topcoder, the project managers, co-pilots and reviewers also perform work coordination on behalf of the platform owner). Conversely, in decentralized work coordination, much of the coordination effort is coded into the platform architecture (e.g., smart contracts), thus reducing the demand for human intervention and increasing efficiency.

5 Discussion

This study explored centralized and decentralized crowdwork platform governance by investigating Topcoder and CanYa as two examples of creative crowdwork platforms with different degrees of governance centralization. We contribute to a better theoretical and practical understanding of crowdwork platform governance by delineating the mechanisms of platform control, work control and work coordination, combining the ideas of governance *of* and *by* platforms (Gillespie, 2017; Gol et al., 2019). These mechanisms allow us to distinguish between centralized and decentralized crowdwork platforms. We summarize the insights generated from our study regarding differences in centralized and decentralized governance modes in Table 3.

We hope this study can serve as a guide for both researchers and practitioners, especially platform owners, to attract more workers and job providers and, most significantly, to maintain attractiveness in the eyes of job providers and workers to guarantee continued platform success in the market. As this is an emerging field and functioning decentralized crowdwork platforms are rare, a mature case of a decentralized platform does not exist. Thus, our comparison is between a start-up and a mature platform following different business models (matchmaking vs. competition). However, we contend that the key dimensions of governance in each platform (Table 3) are comparable. While some governance characteristics (e.g., competition-based work culture) may be directly related to the respective business model, other characteristics (e.g., brokered vs. direct work agreements) theoretically make sense for both matchmaking and competition platforms. However, we show that in practice the characteristics differ based on the degree of centralization of governance.

Governance Dimensions	**Centralized Platform**	**Decentralized Platform**
Ownership	Shareholder	Community members
Management	Corporate management	Community leadership
Control	Top-down	Bilateral peer-to-peer
Work culture	Competition	Collaboration
Work agreements	Brokered	Direct (via smart contracts)
Transaction management	Intermediated	Direct (via smart contracts)
Transaction cost	High	Low
Platform service orientation	Full service	Self-service
Platforms service range	Mature full portfolio	Emergent lean portfolio
Economic model	Transaction cost economics	Tokenomics

Table 3. Creative Crowdwork Platforms: Juxtaposing Centralized and Decentralized Governance

In Table 3, we highlight ten dimensions that allow for a systematic differentiation between creative crowdwork platforms based on the degree of governance centralization. Based on our study, we suggest that in decentralized governance, democracy, fairness, accountability, and self-determination can be improved by diffusing responsibilities, ownership and decision-making rights among community members (based on Azfar et al., 2001; Brown & Grant, 2005). As shown in Table 3, ownership and management are based on community and group consent in a decentralized crowdwork platform and on top-down corporate decisions guided by shareholder interests in a centralized crowdwork platform. Governance *of* the platforms is, in both cases, conducted according to the interests of the platform owner; however, the ownership is either centralized into the hands of one corporation (e.g., Topcoder) or decentralized among a community (e.g., CanYa token holders).

Given the prominent role of the platform owner in the governance *of* the platform, it is perhaps not surprising that the owner also guides the governance done *by* the platform (i.e., how the platform controls and coordinates worker and job provider behavior). In centralized governance, a high level of control is concentrated in the hands of a few project managers and co-pilots, who oversee and monitor the progress of hundreds of workers (Brown & Grant, 2005). This tight control over process usually also leads to greater control over the quality of submissions (based on King, 1983). On the other hand, in decentralized governance, control is diffused among community members, complicating the ability to monitor all processes, as much of the monitoring is done in a peer-to-peer manner. While this may reduce misuse of power, it also increases inefficiencies in the monitoring process.

The prominent role of the platform owner – whether a corporation or a community – also translates into distinct working cultures and transaction management in the platforms. In Topcoder, the culture is based on competition, with only one winner per job (Gol et al., 2018), while the work culture in CanYa is based on collaboration among members. In centralized platforms, the platform owner plays a vital role as an intermediary to facilitate functions such as task management, dispute resolution, and contract management (based on King, 1983). In decentralized platforms, such mediation services are left to the workers and job providers themselves. Furthermore, in decentralized platforms, work agreements are created by smart contracts, enabling job providers and workers to negotiate their own prices, work conditions, and job details and to have discussions with each other regarding the job without third party intervention (Atzori, 2015). Once a smart contract is in place, transaction management is accomplished by means of following the contract coded into software (Atzori, 2015). Subsequently, because of the intermediary services in centralized governance, the transaction cost is much higher than in decentralized governance.

Despite these potential drawbacks of centralized crowdwork platforms, such platforms are more mature than decentralized crowdwork platforms, as their economic model is based on transaction cost economics, in which the nature of transactions influences the contracts and the allocation of economic functions among platform and markets (Williamson, 2008). This provides centralized platforms with a well-established economic model as a basis and allows them to invest in developing value-adding services for the workers and job providers. Meanwhile, in decentralized crowdwork platforms, the economic model is tokenomics. In this model, all users in the ecosystem are motivated to take part and receive financial benefits according to their stakes (CanYa Services Pty. Ltd., 2018a; CanYa Services Pty. Ltd., 2018b). The long-term sustainability of this economic model is unknown, but limited monetization opportunities for specific actors may hinder value-adding service development on such platforms.

6 Conclusion

In this paper, we explored how creative crowdwork platforms are governed under centralized and decentralized modes through a comparative case study. We gained a deeper insight into centralized and decentralized crowdwork platform governance by utilizing the ideas of work control and work coordination as well as exploring the platform control element as a significant distinguishing characteristic between Topcoder and CanYa. We highlight ten dimensions that allow for a systematic differentiation between centralized and decentralized governance modes. Overall, ownership and management are based on community and group consent in a decentralized crowdwork platform, whereas they are based on top-down corporate decisions guided by shareholder interests in a centralized crowdwork platform. These different ownership models translate into significant differences in both the governance *of* the platforms and the governance done *by* the platforms.

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