Value-Adding Intermediaries in Software Crowdsourcing

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Abstract

The information systems (IS) discipline has been fertile ground for research that delineates the role of technology in transforming organizations. Crowdsourcing counts as one such phenomenon, but our empirical understanding of it is nascent at best. This paper presents a preliminary theoretical justification for the emergence of crowdsourcing intermediaries by describing how they add value to this new sourcing arrangement. We report findings of a case study as initial evidence confirming two sets of value-adding activities taking place in a crowdsourcing platform: those at the market (macro) level and those at the transaction (micro) level.

1. Introduction

With the advent of digitization and global networking, recent years have seen the emergence of new production patterns in which organizations are able to coordinate collaborative work on a mass scale without having to collocate their work forces. A phenomenon that supports such work and that has emerged in the last decade is crowdsourcing. Crowdsourcing represents “the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call” [1]. As such, crowdsourcing presents an important social phenomenon.

As crowdsourcing has proven itself an efficient mode of organizing, a growing number of firms have been adopting it. For example, in a 2009 sample of crowdsourcing service providers, an estimate of $750 million was paid to a crowd of over 2 million people; more recent estimates show that the number of crowd workers is growing in excess of 100 percent a year.

As important player in the crowdsourcing arena are intermediaries that provide crowdsourcing services to firms. In essence, the intermediary acts as a bridge between the crowd and clients, who are looking for talents outside their firms’ boundaries. There are increasing numbers of such intermediaries in practice, but they vary based on the services they provide and in which portion of production they are involved. For example, Rentacoder.com is an intermediary that operates much like eBay in that people place projects they need completed on the web site, and individuals from the crowd bid on the price. Alternatively, the intermediary TopCoder.com posts projects to its platform as well as hosts the competition, then transfers the individuals’ work to the client. TopCoder is more involved in production than Rentacoder, which merely provides the information on the crowd to the clients.

In spite of the growth of crowdsourcing intermediaries, the value that they provide remains an unexplored area of research. For example, on the one hand, it has been argued that introducing information technology to marketplaces would lower the cost of transactions, leading to disintermediation and reduced value of intermediaries [2]. On the other hand, accompanied by evidence from practice, it has been argued that electronic marketplaces will promote new types of intermediaries. Such intermediaries may take on roles such as matching buyers and sellers and managing physical deliveries and payments, aggregating products and content, providing trust relationships and ensuring the integrity of the market [3].

Given that crowdsourcing platforms count as such electronic marketplaces and that the intermediaries are increasing both in size and in number, it becomes important to understand the specific roles taken on by crowdsourcing intermediaries. More importantly we are interested in learning what value does the intermediary add to the crowdsourcing market.

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1 We wish to thank the TopCoder’s management team for their cooperation in conducting this research.


4 Ibid.
beyond providing a mechanism through which the matching of labor to tasks is furthered.

We present insights obtained from a qualitative study that answers this question through in-depth interviews with members of a successful software crowdsourcing intermediary. While there are numerous applications for crowdsourcing, software development is one with special importance to IS scholars since it creates the IT artifact that shapes the core of our research domain [4].

Our findings demonstrate two critical roles for the intermediary. At the macro level, it plays the role of the single orchestrator who defines the rules of the game and designs the market. At the micro level, it intervenes in transactions to contribute to their fulfillment. Moreover, we identify a pattern through which the intermediary reallocates its resources from micro to macro activities over time. We discuss the meaning of this shift in our discussion section.

In the burgeoning crowdsourcing literature our focus answers the call by Afuah and Tucci [5] for research on the role of the intermediary by providing a rich description of value-adding activities. In the broader outsourcing context, our work sheds light on the role of a third player in a sourcing arrangement, which has been referred to as the middleman [6-8].

We begin with a brief review of the crowdsourcing literature and what we have learned from past research. We also introduce the theoretical lens used to study the value-adding activities of intermediaries. We then explain our research methodology, followed by our findings and a discussion of the study’s contribution and implications for future research.

2. Background

Firms use crowdsourcing for a diverse set of purposes, from problem solving [9] to accomplishing part of their operation [10], to harnessing the knowledge of individuals beyond their boundaries in order to come up with new ideas for business development [11]. As previously mentioned, software development applications are especially relevant for IS scholars, however, as an emerging phenomenon, successful development of software through crowdsourcing is a challenge for practitioners [12].

Crowdsourcing can happen directly, i.e. a firm reaches out to the crowd of individuals through an open call, or it can happen indirectly through an intermediary, which connects the crowd to the firm. The latter is often conducted through tournament-based crowdsourcing [13], in which compensation is based on relative rank in completion of tasks [14]. In these tournaments, participants compete with each other by submitting their solution to the problem posed by the crowdsourcing organization. Tournament-based crowdsourcing can be applied to various kinds of tasks that are inventive in nature [15] including, but not limited to, problem-solving [5] for R&D [16], idea-generation [17] for business development [11] and innovation [18], digital design [10], knowledge-sharing [19], and software development [20].

It should also be noted that there is variation in how collaboration in tournament-based crowdsourcing is practiced. For example, whereas in some cases participants do not collaborate and the situation is ‘winner takes all’, in most cases the outcome is achieved by a combination of active competitions with simultaneous collaboration (See, [14]) whereby competitors co-operate and compete with each other [21].

In this paper we focus on a mediated tournament model of crowdsourcing in which there are three key players: the crowdsourcing organization, i.e. project sponsor or client; the intermediary that acts as a service provider to the client; and the crowd, i.e. the community of developers.

We rely on a market design lens to study this model and in particular the value-added activities of the intermediary. Using this lens we consider crowdsourcing as representing a two-sided market comprised of the crowd and the client. Accordingly, transactions take place in this market as the crowd exchanges finished goods, i.e. written codes, with monetary rewards from the client.

In two-sided markets one or several intermediaries (or platforms) enable interactions between end-users and try to get them ‘on board’, mostly through a price mechanism [22] [23]. In the specific case of the crowdsourcing market the intermediary also provides the technological and administrative platform through which the two sides (client and crowd) come together, interact, and conduct the exchange.

Accordingly, we argue that the crowdsourcing intermediary should act to satisfy three features of a successful two-sided market design [24]: creating thickness in the market, ensuring that both sides are on board [25]:
avoiding *congestion* which refers to the friction that would result if market players do not have enough alternatives to choose from; and ensuring *safety* for all players in the market.

As an emerging phenomenon, most of the studies on crowdsourcing are descriptive and try to explain the phenomenon by showing successful cases (e.g. [11, 12, 16, 26, 27]) or classifying existing models (e.g. [20, 28-30]). Conceptual work to date has focused on the sociological impact of crowdsourcing on members of the crowd [31], [32], on the ability of organizations to leverage crowdsourcing to expand organizational boundaries [5], and on the reward structure of crowdsourcing. The latter includes work on the effect of an award structure on efficiency and performance-gain in innovation contests [33] as well as the optimal award scheme for crowdsourcing tournaments [34].

As the quick review above indicates, crowdsourcing is a phenomenon that seeds research in various disciplines and the literature around it is expanding. However, the number of studies in IS that include aspects of crowdsourcing as a focal research question is limited. This might partly be due to the difficulty of knitting crowdsourcing instances to the nomological network of the IS discipline [4]. Yet we believe crowdsourcing provides an excellent opportunity for conducting transformational research that delineates the role of technology in transforming organizations and their environments [35].

### 3. Research Methodology

We selected TopCoder as a service provider that represented an interesting and instructive case study of the role of the intermediary in successful crowdsourcing. According to the company ⁵, TopCoder has established a community of more than 400,000 developers, of which nearly 20 percent are active. Founded in 2001, it now offers crowdsourcing services for software development and digital design to various clients across numerous industries. Most clients are large North American-based Fortune 500 companies from financial, healthcare, media, and various other sectors. The clients are charged a subscription fee to access the platform and they also pay the monetary prize that is assigned to each contest.

The software in this model is produced via plan-driven methods in which production happens in successive stages. For each stage (e.g. architecture, design, and so on), there is a corresponding contest out of which the three best submissions are chosen and rewarded. Members of the crowd with specific credentials rank submissions based on predefined criteria. The winners are identified based on overall calculated score.

We chose a case study methodology that focuses on understanding the dynamics present within a single setting [36]. The single-case design is suited to in-depth analysis of the complex phenomenon on which we focused [37, 38]. We collected exploratory qualitative data through interviews with multiple individuals representing both the community (crowd) and the service provider (intermediary) to see the phenomenon from different perspectives and analyze it from the viewpoint of different stakeholders.

We conducted 13 interviews during a three-day period at an event held by TopCoder: seven interviews with community members and six interviews with TopCoder managers. The interviews were semi-structured (the protocol is available upon request) and there were minor modifications to some questions during the data collection phase. The interviewees from TopCoder were managers, senior vice presidents and the chairman of the board. On the community side, we interviewed individuals with different skillsets who took part in different projects. All interviews were audio recorded and their lengths ranged from 29 to 122 minutes with an average of 45 minutes. The first author participated in the event and conducted the interviews. In addition to transcriptions of the interviews, the notes that were taken during the event were used to analyze the data. Moreover, observations by the first author and interactions with individuals throughout the site visit provided another source of data [36].

In analyzing our data we followed the Miles and Huberman’s guidelines [39]. Coding was done based on transcripts and interview notes. Utilizing the market design lens as our framing, prior research was used to develop a starting master list [39] and then emic codes from data analysis were used to update the initial list. Based on the coding and analysis, themes were identified regarding each category of value-adding activities. Our insights are presented in the next section.

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⁵ The data about TopCoder is directly obtained from its management during interviews.
4. Findings

To explain the value-adding activities of a crowdsourcing intermediary in the tournament-based model we applied two lenses. From a macro (market) lens, the intermediary nurtures the platform and fosters collaboration between the clients and the crowd to ensure dependability of the platform. From a micro (transaction) lens, the intermediary aids in the success of specific projects. We identify three types of value-adding activities at the macro level that address thickness, congestion, and safety in this market. We also identify three types of activities at the micro level to address the fulfillment of projects. Table 1 and the discussion that follows explain these in more detail.

4.1 Community-related Activities

To ensure the thickness of the market the intermediary needs to get enough participants from both sides of the market on board [25]. In this regard, for the crowd side, the intermediary performs three important functions: attraction, development, and retention. Attraction of a critical mass of individuals to shape the crowd is among the preliminary tasks of the intermediary. In this sense the crowd is viewed and treated as a community that requires nurture and support:

“I don’t think you can make a community. You can’t force someone to be part of community... community is almost the most pure sense of individual choice to be part of or not. So, what we want is for TopCoder to be an attractive community.” [JH, Founder]

Beyond growth, the community is also nurtured through trust building and support:

“...there has to be that trust, ... on the TopCoder side, you know, we go through great pains to be extremely transparent in a process.” [JM, Manager]

“TopCoder doesn’t hide anything ... they are very transparent, that’s why we are very committed with them.” [AA, Community member]

Moreover, the intermediary also takes a training role, developing the community to ensure it is equipped with the knowledge required for upcoming projects. This is crucial especially with respect to technological uncertainty and the changing nature of the software industry. Therefore, the intermediary signals the crowd about future technological needs and expands the community’s knowledge:

“...if we know new technologies are coming up, we will come up with some new strategy to really engage the community, figure out what kind of taste, for lack of a better word, is there for a particular technology. We will kind of prep them saying, hey, we have a customer who wants to do this new leading edge technology, or they have a bunch of this type of work coming.” [MC, Manager]

Another aspect of development cultivated by the intermediary is expanding the type of tasks that are sourced to the crowd. For example, whereas in the early days the job of writing software requirements was a time consuming task assigned to platform managers, now such tasks are accomplished through contests. Over time, the intermediary has constantly come up with new roles for community members, thus engaging them in more stages of the production process as well as delegating management tasks to them. This development leads to having crowd members who can provide more services to clients, thus increasing the thickness of the market.

Finally, attracting globally dispersed talents and developing a community with dependable knowledge and skills is a risky investment if not accompanied by activities that ensure retention of such a community, as demonstrated by the intermediary’s community-centric view:

Table 1. Value-Adding Activities of Intermediary at Two Levels

<table>
<thead>
<tr>
<th>Level and Focus</th>
<th>Toward the community</th>
<th>Toward the clients</th>
<th>Toward the platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>Ensure thickness</td>
<td>Attraction</td>
<td>Capability development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retention</td>
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<td></td>
<td></td>
<td>Development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overcome congestion</td>
<td>Different</td>
<td>Extending utilization</td>
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<tr>
<td></td>
<td></td>
<td>Incentivizations</td>
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</tr>
<tr>
<td></td>
<td>Ensure Safety</td>
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<tr>
<td>Transaction</td>
<td>Fulfillment</td>
<td>Participation</td>
<td>Involvement</td>
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</tbody>
</table>
“We exist to serve the members and that is not a nice branding phrase or anything. It is the truth. It is an absolute fundamental truth about TopCoder.” [JM, Manager]

Retaining the community also happens through establishing personal ties and building relationships with community members, who recognize these efforts:

“I have a very good relationship with them [TopCoder staff], in spite [of the fact] that I see them once a year... So personally I feel like we are friends, I feel very close with them in that way... I think it’s really easy to get along with them.” [LM, Community member]

Beyond thickness, another aspect of the two-sided market design is to avoid congestion. Congestion refers to the friction that would result if market players are unevenly attracted to particular transactions and it can be overcome by providing the players with alternative possible transactions to arrive at satisfactory ones [24]. In our case, this is achieved through an incentive structure, both monetary and non-monetary, that motivates crowd members to move away from some projects onto others. Congestion is especially a problem when transactions are heterogeneous and offers are addressed to particular market participants rather than to the market as a whole [24]. Providing various incentives can more evenly distribute efforts among projects.

Incentives in tournament-based models range from making money to building reputation and demonstrating skills, to altruism and love of community [5, 10]. Beyond direct monetary rewards, the intermediary can also provide opportunities for people to interact with peers, learn, and get recognition:

“For members there are so many different awards.... There is the money, there is the recognition and then there is the learning.” [JM, Manager]

In sum, our insights from the interviews show that the intermediary plays a prominent role with the community of individuals who take part in projects. Through processes and practices that are targeted at developing the skillsets of attracted individuals, delegating more production responsibilities, and retaining the members through establishing constructive relationships with them, the intermediary transforms the crowd of talents who are globally dispersed into a form of social organization that is justifiably characterized as a community[40, 41]. This, in turn, translates into efforts to ensure thickness at market level and prevent congestion so that there are enough players in the crowd for all the projects and tasks.

4.2 Client-related Activities

Ensuring the thickness of the market also requires sufficient participation from clients [25]. In this regard, the intermediary performs an important client-facing activity, i.e. capability development.

The intermediary needs to bring clients onboard so that it can feed the platform with projects. However, realizing the potential of crowdsourcing and using the platform to the fullest requires capabilities that clients may not possess ex ante [42] and providing capability development services that help clients overcome such impediments is an important task of the intermediary. In this vein, an important first step for clients is to get familiar with the concept of crowdsourcing and to be open to the idea. As some of our interviewees mentioned, crowdsourcing requires a paradigm shift in regards to how one gets things done in a sourcing arrangement and it is the intermediary’s role to provide the training that facilitates such a shift:

“Our training focuses on ... how to work with a crowdsourced, open innovation-type platform...the change being that the customers go from a more common development process, where you got a handful of developers and people are part of the project that are there for the lifecycle of the project, it’s kind of a traditional way to do it ... so just that mind shift of you’re not going to see the same person over and over again. You’re going to have different people and there’s some discomfort initially and that’s where the training comes in” [CP, Manager]

These empowering services facilitate the utilization of the platform for clients; the more clients onboard, the more participants on the supply side of the market and more expected transactions, thus more thickness. The intermediary not only enlarges the client pool, but it also escalates their usage so that more of their business needs are transferred to the platform. A by-product of this extended utilization is projects with more breadth for the crowd to work on. In other words, the
participants from the crowd have more options to match their talents to tasks, and so perceive higher chances of winning a contest. With more projects and a broadened scope of tasks, the distribution of the crowd to projects becomes more uniform, and consequently an increased number of potential transactions for participants reduces congestion in the marketplace.

Another important way in which the intermediary adds value in this market is through information sharing. The intermediary shares important market information such as the average costs of projects based on their nature, complexity and scope, the overall performance of projects on the platform, and reliability of the platform. Collecting such information not only serves the clients by giving them a big picture of the platform’s reliability, but also it enables them to make a comparison between their own project’s performance and those of others and see how they are trending versus the other crowdsourcing customers:

“...we constantly collect statistics. We actually communicate those back to our customers, so a customer can see the overall fulfillment rate. Fulfillment is a big indicator in the community ... All those metrics are there for the customer, just to help educate them and to make it available to them.” [MC, Manager]

The objective information on the expected rate of success provides clients with a proxy for how safe the transactions are and to what extent they are guarded against misbehavior, which can reduce the cognitive impediments and concerns of the clients.

4.3 Platform-related Activities

The cornerstone of a crowdsourcing arrangement is the infrastructure upon which people are brought together and interact [29]. As described by interviewees, the infrastructure plays a critical role in facilitating the interaction of clients with the crowd:

“We are a platform that sits between the community and the customers. We do look at it like they interact in one community but we have a piece of sophisticated software that manages those interactions. We do it in a way that’s designed to facilitate those interactions, so that the customers are getting what they want out of it but so are the community members.” [JH, Founder]

The significance of infrastructure stems from the fact that it provides the virtual space through which the clients and community meet, supporting thickness in the market. The strong body of research in IS on adoption has highlighted the effects of individuals’ perceptions toward technological artifact and their intention to use (e.g. [43]). Given that enhancing the perceptions of ease of use and usefulness of the platform would ultimately increase usage, the allocation of resources by the intermediary towards developing the infrastructure can be seen as an effort to augment its utilization by both the crowd and the clients. This, in turn, increases the number of potential transactions, and consequently the thickness of the marketplace.

The platform can also be designed to support competition mechanisms that address congestion. Rather than a predefined pricing schema, for example, it is the market mechanism that stabilizes the prices. Relying on the market is important since prices that are far from the average may not attract enough submissions. If the members think it is overpriced, that may signal that the complexity of the project is more than typical, or if it is underpriced it may not be worth the required effort. However, when the technology is new or there are not enough members with the required skill set, the projects are priced above average to attract more submissions. In addition, competition is the critical mechanism through which individuals self-select from a multitude of tasks and gravitate toward what they do best. Since clients only pay for those who truly prove they are best at what they are doing, the competition mechanism leads to efficient allocation of crowd members to projects and prevents congestion. A senior manager explained how the competition works:

“If you want really high quality output from an individual, you need them to bring their A-game, as we say. Bringing their very best every day to every test they do. So you don’t force them to do tasks. You let them naturally gravitate to the tasks they enjoy doing and as a result the quality of the output is almost always far superior.” [JM, Manager]

Finally, the intermediary also institutionalizes rules and structures to ensure safety of transactions on the platform and to guarantee sustainability of the model’s success by reducing opportunistic behavior. In this vein, the rules are defined, reviewed and constantly monitored by the intermediary. A few examples
of the rules defined to safeguard against opportunism include payments being held off for thirty days to make sure submissions are defect-free and no issues arise afterwards. Also, as the project progresses through its lifecycle, winners of past contests are in touch with the participants of upcoming stages to answer their questions and fix any issues that might exist in their work. There are also strict rules that necessitate the authenticity and originality of the submitted works. While these rules have remained somewhat intact, other rules about the platform in general are subject to change by feedback from the community. As a community member explained:

“... we say everything that we don’t like or we liked and they announce that the new process is in review ... So when someone suggests something they’ll take it seriously.” [MA, Community member]

In sum, our findings show that the intermediary plays a crucial role by providing the platform through which the collaboration of clients and community members takes place. According to our data, these activities can be categorized based on the features of market design they satisfy: thickness, decongestion, and safety.

So far the value-adding activities that we described have been at the market, or macro, level. The intermediary also engages in projects once they are started and plays a facilitative and consulting role in the success of the projects at the micro level. We explain this in more detail below.

4.4 Activities at the Transaction Level (Micro)

We have thus far discussed activities through which the intermediary helps gain thickness, reduce congestion, and enhance safety in the market. These features of the designed market influence the overall performance of the platform and they do not necessarily translate into transaction level success. Therefore, the second set of value-adding activities of the intermediary contribute to the success of individual projects by steering the collective action of both parties involved in the right direction.

It has been argued that not all projects fit the crowdsourcing mode of development [5, 33]. Therefore, the intermediary makes modifications to projects and their ongoing progression to ensure fulfillment and to realize the potential of what is feasible through crowdsourcing. Accordingly, since the project’s outcome is the result of the crowd’s participation in collaboration with clients, the intermediary adds value by altering their behavior should either side fail to carry out their roles.

In this vein, if the projects fail to attract enough submissions, the intermediary managers undertake corrective actions such as increasing the amount of the prize or changing its structure, changing the scope of the project, breaking the project down or extending the timeframe of the contest so that more community members take part:

“We can turn that [failure to attract submissions] around ... and then we refine what we’re doing. ... the scope is too large [for] this prize money, so we’ll increase the prize money, you know all kinds of different things trying to fix it ...what they’re trying to do needs to be done in a different way.” [NP, Manager]

On the other hand, since the communication between the clients and the crowd is vital for the success of a project, the intermediary makes sure that clients are involved as the contests are running and the community members get the answers to their questions in a timely manner:

“Once the contest is running it’s a case of making sure that the communication keeps going ... So we have a forum where the members communicate and ask questions and we need to make sure that the clients answer those questions in a timely fashion.”[NP, Manager]

We discussed previously the importance of institutionalizing norms and rules at the market level to ensure safety. Monitoring efforts are also used in governing individual transactions to minimize opportunism and malfeasance:

“So we will go in and if we catch someone misbehaving in some way or not performing, we pull them out, we take them out” [JM, Manager]

Another interesting insight obtained through our interviews is that over time the intermediary has tried to reduce its intervening role in the interaction of clients and the community members. Extending the tasks accomplished by the crowd and transferring managerial roles to community members is one example of how this is achieved:

“So we have three pieces here: client, community and TopCoder. In many traditional
business models you put yourself between the workers and the clients, the end-users if you will. ... By removing yourself, staying as much out of the process as possible, you are enabling it ... you might remain but you are not inserting yourself into the mix more than absolutely necessary. That makes the community and clients interface directly and that is what it is all about. The less links in the chain the better.” [JM, Manager]

5. Discussion

Beyond providing a rich description of the role of the intermediary in crowdsourcing, this study presents several important insights. First, the analysis of the data from our case demonstrates the critical role of crowdsourcing intermediaries in software competitions. We find that the intermediary provides two types of value-adding activities. At the macro (market) level, the intermediary acts to satisfy the three features of a successful market design [24], namely thickness, decongestion, and safety, by nurturing the platform and fostering the collaboration of crowd and the clients. At the micro (transaction) level, the intermediary ensures fulfillment by supporting participation and communication, and by acting as a monitor.

As has been argued in prior research, one challenge of crowdsourcing models concerns the motivation for individuals to participate and the potential underinvestment of effort [33, 41]. The intermediary adds value to crowdsourcing by incorporating mechanisms that ensure participation by broadening the scope of work available to the community and by diversifying incentives beyond just monetary rewards, which helps sustain the market in the long run.

In addition, the intermediary has allocated resources to developing a competitive platform, which has unique infrastructural and structural dimensions. The infrastructure itself is sophisticated software that has been developed and improved throughout the years of practice and so counts as an IT-enabled resource [44] that can provide the intermediary with sustainable competitive advantage [45].

Another important finding from our data is that, comparatively, the intermediary has dedicated increasing efforts to activities that create value at the market level rather than at the transaction level. Over time, it has learned that more efforts at designing the market translate into less effort at transaction level activities. In other words, if the market mechanisms work perfectly, there is no need for the intermediary to intervene in the transactions; the transactions would make both sides satisfied as best solutions are exchanged for monetary rewards. Such orientation obviously does not convey disintermediation [2] and it is a strategic reallocation of resources to create value at the market level. The manifestation of such reallocation would be institutionalized structures intertwined with sophisticated infrastructure that can compensate for the absence of transaction level value-adding intervention.

In essence, when a firm is considering crowdsourcing for developing a piece of code, it is making a “make or buy” decision. If a buy decision would translate into outsourcing three decades ago and offshoring became another alternative two decades ago [46], nowadays there is another option, crowdsourcing. The intermediated platform represents an institutional arrangement whereby the transaction costs of the development of a piece of code are reduced. In this institutional arrangement, transactions take place that would remain impossible were it not for crowdsourcing. Our study stands among the first empirical works to shed light on the extended role of the intermediary in shaping the institutional arrangements through which transactions take place.

The paper also contributes to market design literature by explaining the mechanisms with which an intermediary has developed and sustained a successful two-sided market. Whereas economists concentrate on how the price structure for different sides of the market are important design features [47] or how different design features yield structural differences [48], our work shows how the features of design and market mechanisms are intertwined through the value-adding activities of the intermediary.

Our study has limitations as well. First, our evidence is based on a single case and on the particular use of software development. Having chosen a case study for our theory’s development, we decided to err in the direction of rigor rather than robustness. Hence, generalization from our work should be cautiously done. Further quantitative research that can test our model on various platforms of crowdsourcing may strengthen our theoretical framework. Our study also focuses on the value adding activities of the intermediary and, as such, is biased towards positive aspects of the case. Of course no case is without its challenges.
There are several important implications from our work to researchers and organizations. Based on the findings of our work, intermediaries and client organizations need to be cognizant that effective implementation of crowdsourcing requires paying attention to the activities that add value both at micro and macro level. As time goes on, macro level activities can offset for lack of intervention at the transactions level, resulting in value creation that may eventuate in the competitive advantage of the intermediary in the long run. Beyond this general insight, the value-adding activities we have identified in this study are important for organizations to properly understand. In fact, each of these activities entails a rich domain of knowledge and best practices, some of which have been studied in different contexts and all of which can be further explored and studied in different crowdsourcing contexts and from different lenses. For example, we have discussed the important of transparency between the intermediary and the crowd. Transparency can be tied to the wide literature on trust and its roles in online communities (e.g. [40]), which can be further explored in the unique context of software crowdsourcing. Similarly, we have discussed the various rewards and their use to encourage participation. Reward structure and equity in rewards is another interesting avenue for future research.

Finally, crowdsourcing requires a paradigm shift from clients. With this paradigm shift, clients adopt a new practice of being served by people whom they do not know instead of those from whom they can ascertain their credentials. We did not cover the capabilities that clients should possess or develop in assimilating this new perspective and it remains a potential area of research. We have evidence that failure to develop certain capabilities may inhibit harnessing the power of crowdsourcing (see [9, 42]). Future research can shed light on our understanding of what capabilities are required from the client side.

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