

An Empirical Analysis of User Participation on Crowdsourcing Platform: A Two-sided Network Market Perspective

Research-in-Progress

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Abstract

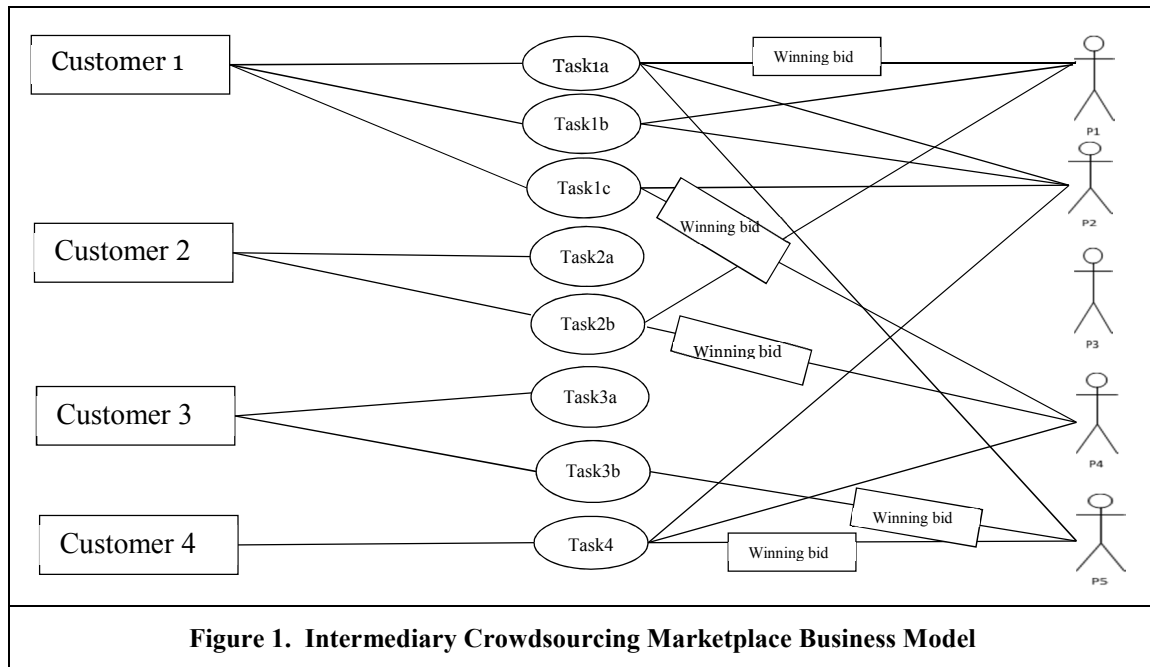
Crowdsourcing has recently emerged as a new platform for matching the demand and supply between professionals and businesses who seek external expertise for business task execution. Driven by the unique features of the two-sided crowdsourcing markets (such as auction-style competition on quality by professionals), this study seeks to examine how the dynamics of the two-sided crowdsourcing platform affect customers' and professionals' strategic behaviors and market outcomes. Using longitudinal transaction data from a crowdsourcing websites, we plan to empirically examine how the participation of professionals and customers, task reward and task completion rate are affected by the characteristics of the professionals such as distribution of the winning professionals and their reputation. The results of our study are expected to contribute to the growing literature on crowdsourcing and provide important insights on the design and assessment of the sustainability and profitability of the crowdsourcing business model.

Keywords: Crowdsourcing, network market, concentration, reputation

Introduction

Crowdsourcing is the use of the Internet to make an open call for talents (professionals) to contribute their skills under a competitive or collaborative environment to accomplish a task presented by the open caller (Estelles-Arolas and Gonzalez-Ladron-de-Guevara 2012). Originating from the intersection between crowd, outsourcing and online social media (Saxton et al. 2013), crowdsourcing has become a popular business model for organizations to go beyond their immediate environment to seek external expertise to accomplish tasks that they could not (or would not be cost effective to) accomplish locally (Vukovic et al. 2010). Some major models of crowdsourcing activities include intermediary, citizen media production, collaborative software development, digital goods sales, product design, consumer report, knowledge base building, collaborative science project, and peer-to-peer social financing (Saxton et al. 2013). This study focuses on the first model, intermediary, in which business tasks are fulfilled through individual contribution of skill and creativity on a competitive online intermediary.

Figure 1 illustrates some common situations that may arise in an intermediary crowdsourcing marketplace when a customer submits a task for professionals to compete to fulfill. The ideal scenario is when a customer posts a task and successfully selects a professional that meets the task requirements (such as Tasks 1a, 1c, 3b, and 4). A customer can place a task that might not generate any interest from the professionals' side as depicted in Tasks 2a and 3a, or multiple submissions are received but no one meets the requirements (as in Task 1b). Professionals also face a myriad of challenges when they compete in this market. Professional P3 could not find any task posting that matches her professional capability or interest. Some professionals such as P2 might compete on several tasks but did not win any, while P4 and P5 both submitted three bids and won two tasks.



As illustrated in Figure 1, the intermediary crowdsourcing is very similar to an online auction except that professionals need to exert significant efforts to produce a prototype (e.g., for website construction tasks) or even a full-fledge product (e.g., logo, product design, etc.) for customers to review, whereas in an auction participants generally do not have to devote effort throughout the bidding process. Moreover, a crowdsourcing marketplace exhibits two-sided market characteristics, which include product or service complementarity, cross-group externalities, and multi-homing by participating agents (Armstrong 2006). The value of the crowdsourcing platform lies in the ability to match demand with supply. The marketplace gains higher value when more customers (requestors) and professionals (bidders) participate in it, leading to cross-group externalities. Professionals and customers who take part in one marketplace may also participate in several others (i.e., multi-homing) to increase the chance of fulfilling a task. Since both customers and professionals can be multi-homing, it is imperative for the platform administrator to offer incentive compatible mechanisms to retain them. However, because the two sides of the market are interdependent, attracting customers requires the marketplace to have a sufficient number of qualified professionals, which happens only when there are a large enough number of customers offering tasks. This creates a “chicken & egg” problem like that of matchmaking sites (Caillaud and Jullien 2003).

Given these unique features, the level of participation by both professionals and customers has been suggested to be a key factor that drives the dynamics in the crowdsourcing market (Burtch et al. 2013). To address the participation issue, prior studies on incentive mechanisms in two-sided markets have recommended that the less competitive side of the market should be subsidized to increase the profitability on the more competitive side (Eisenmann et al. 2006; Rysman 2009). In crowdsourcing markets, the less competitive side of the market is the customer side. Rather than subsidizing these customers directly, crowdsourcing platform administrators adopt a different mechanism by offering customers a refund of the commission fee if a task does not attract a certain minimum number of

professionals to participate. On the professional side, unlike the traditional ascending-price online auctions (e.g., eBay), the crowdsourcing business model involves professionals competing to win a business task (contract) rather than purchasing a product. The task reward is a fixed monetary amount and the customer selects a winning bid based on the quality of the work submitted by the professionals, or other criteria independently determined by the customer. As such, professionals in a crowdsourcing marketplace need to establish their credibility by constructing a high quality prototype or building a good reputation through a successful task-winning history. To encourage their participation, most crowdsourcing marketplaces will provide non-monetary reward points for those who have successfully secured and completed a task.

These interesting dynamics in the crowdsourcing markets raise interesting and important questions on the sustainability and profitability of the crowdsourcing business model from both theoretical and practical standpoints. Rochet and Tirole (2006) suggested that volume of transactions may not necessarily be the product of members of both sides of the market, especially when repeated patronage is possible. In the crowdsourcing context, the volume of transaction increases alongside the valuation of the marketplace when existing members make repeated submission and when new professionals and customers are attracted to the market. However, as shown in Figure 1, such a possibility may be hampered by the fact that there is a non-trivial risk of transaction failure on both sides of the market (i.e., for Tasks 2a and 3a, and Professionals P2 and P3). In light of the complex dynamics in the crowdsourcing markets, we are particularly interested in examining the strategic behavior of professionals, the task reward decisions by customers, and the market entry or exit decisions by both participants in these markets. Specifically, this study seeks to answer the following research questions:

1. How do the dynamics of the two-sided crowdsourcing platform (i.e., transaction history) affect customers' and professionals' decisions to repeatedly participate in or exit the market?
2. What are the impacts of reward mechanisms on the behaviors of professionals and their chances of winning a task in a two-sided crowdsourcing marketplace?
3. How do the characteristics of successful professionals (i.e., distribution and reputation of the winning professionals) affect new customers' and professionals' decisions to enter the market?

Following Ariely and Simonson (2003), this study will empirically analyze a crowdsourcing marketplace, characterized by customers placing a task request and professionals submitting bids in response, using the framework of entry choice, mid-stage value assessment, and end of auction decision dynamics. The results of our study are expected to contribute to the growing interest in understanding and using crowdsourcing as a third workforce option after employees and outsourcing contractors. As one of the early empirical studies on two-sided crowdsourcing markets, our findings will shed light on whether such an innovative market mechanism could allow us to address the gap between the demand and supply of skills and talents, and whether the marketplace is sustainable and profitable. It will also offer important guidance for intermediaries to design a platform that is conducive to the crowdsourcing business model.

Related literature

This study builds on three distinct streams of research: market dynamics on online crowdsourcing platforms, online auctions and two-sided markets.

Crowdsourcing

Several themes in the crowdsourcing literature yield insights for this research, including crowdsourced product and service pricing, participant motivation and platform competition. Although increasing the number of participating agents is a fundamental goal of a crowdsourcing marketplace, it is the recurring and satisfied agents (professionals and customers) that make a crowdsourcing marketplace successful. In addition to motivated agents, Satzger et al. (2013) suggest that other external factors such as the nature of the tasks and characteristics of the agents contribute significantly to the success of a platform. Strengths of crowdsourcing marketplaces include transaction cost effectiveness, easier labor accessibility, efficient matching, high probability of task completion and low market prices; whereas challenges include lack of motivation, cognitive limitations of professionals and instruction ambiguity by customers (Chandler et al. 2013). Therefore, market operators should provide the stimulus for learning the required skills so that agents can be kept motivated. However, crowdsourcing platform administrators face a difficult task in

determining a fee that motivates customers to place their task request and a reward mechanism for professionals to take up a task (Satzger et al. 2013). In an empirical study of an online crowdfunding (which is a form of crowdsourcing) site, Kickstarter.com, Zvilichovsky et al. (2014) found evidence of network exchange patterns exhibited through direct and indirect reciprocity by initiators and backers. Using data from 85 online multi-player game platforms with unpaid agents, Boudreau and Jeppesen (2014) investigated if reliance on network effects and strategies to attract large numbers of agents is advisable in unpaid crowdsourcing marketplace. They concluded that network effects had no overall meaningful effect. This leaves open the question whether there are any indirect network externalities within and between the two sides of the marketplace, and whether findings in related markets that adopt a similar business model, such as online auctions and two-sided markets, can be extended to the crowdsourcing context.

Auction Behavior

Conceptually, product and service acquisitions through crowdsourcing is very similar to those fulfilled by auctions in that the auctioneer can maximize its payoffs by pushing bidders to compete against each other, and reveal their true willingness to pay (Wilson 1977). Due to competitive pressure and psychological factors, it is not uncommon for bidders to make late bids and pay a higher price than their maximum reservation price, which often leads to higher profits and transaction volume than what an auctioneer would generate in a traditional fixed price setting (Bajari et al. 2003; Hong and Shum 2002).

Despite their similarities, crowdsourcing differs from traditional online auctions in several important ways. First, in online auctions, the listing agent (auctioneer) builds up a reputation through accumulating a high review rating for fulfillment of transactions, whereas in the crowdsourcing market listing agents (customers) are not evaluated or rated but bidders (professionals) rather establish a reputation by receiving points for successfully winning and completing a task. Second, bidders (professionals) in crowdsourcing markets are competing for a task (or contract) by demonstrating their talent. Hence the chance of winning a task is bounded by how their talent stands out in a competition and not their willingness to pay (which is independent across bidders in an online auction). As a result, a professional will often base her bidding decision on not only her own capabilities but also the level of competition observed for a given task, which is often indicated by the concentration of competitive professionals who have had a constant history of winning in the market. All else being equal, if a crowdsourcing market exhibits a “winner-take-all” kind of market concentration in which a small number of professionals win the majority of the tasks, other professionals will have less incentive to participate in the competition. Third, unlike in price-ascending or descending auctions where bidders can submit a bid at no cost, crowdsourcing bidders need to submit an almost ready product for customers to review, hence significant efforts are needed regardless of whether a professional wins a task or not. Prior studies on auctions with entry cost suggest that policies to limit the number of bidders (even to a single bidder) may be welfare improving (Samuelson, 1985). However, this finding contradicts the philosophy of crowdsourcing where the more the bidder the more likely a buyer gets the required expertise. Due to such a contradiction, the auction literature offers very little guidance on how efforts could be made to minimize the professional’s concern on the cost of participation. The above important distinctions from the online auction literatures, along with the inter-dependence of the dynamics on both sides of the crowdsourcing market, have led us to consider supplementing the online auction theories with the findings from the two-sided markets.

Two-sided Electronic Markets

The crowdsourcing market also relates closely to two-sided markets, widely studied in IS and Economics literature (Bhargava and Choudhary 2004; Caillaud and Jullien 2003; Rochet and Tirole 2003). Two-sided markets usually exhibit direct and indirect network effects. These effects impact participation in marketplace by influencing user willingness to pay, user adoption, and consequently the platform’s value (Shapiro and Varian 1999). Some factors that contribute to network platform success include openness, extensibility, and modularity and quality control (Eisenmann et al. 2006). Seeking to understand the achievement of some many-to-one labor markets despite the numerous challenges they face, Kojima and Pathak (2009) find that a stable matching will be realized under a student-optimal stable mechanism in a large market since a stable matching is efficient in general. Caillaud and Jullien (2003) proposed an analysis of the intermediation market that accounts for such specific aspects of informational intermediation as network externalities, non-exclusivity of services, and price discrimination. They suggest that intermediaries should create incentives to promote non-exclusive services as this moderates

competition on both sides of the market and allows them to exert market power. Furthermore, competition always improves consumer and merchant welfare because network profits decrease with competition (Chakravorti and Roson 2006). Therefore market operators should invest in creating and promoting cross-network externalities for higher welfare. However, departing from between-marketplace competition to within-marketplace competition, Li et al. (2010) concluded that increasing the cross-network benefits of agents might actually lower the profits of the marketplace. Therefore, market operators seeking to increase participation on either side of the market will have a hard time creating a profitable marketplace. Given some of the controversial findings, and the fact that the majority of these conclusions are derived from analytical studies and have not been validated empirically, it is important that we examine some of these conclusions using longitudinal data collected from a two-sided crowdsourcing marketplace.

Research Model and Hypotheses

As discussed earlier, the process of posting a task and submitting a bid in crowdsourcing marketplace is very similar to that of an online auction. Therefore, this research will follow the general framework presented by Ariely and Simonson (2003) for studying bidding behavior in online auctions which focuses on the differentiating characteristics of the auction purchase environment. The framework consists of auction choice/entry, middle phase of the auction and end of auction. The distinction of each phase is an important factor because a market involving an auction is typically a multi-phase process. In the first phase, a customer or a bidder decides whether to choose or enter a particular auction (task), which is often followed by a sequence of offers and bids, with a distinctive final phase, in which the customer selects a winning bid(s) from a pool of submissions.

The second phase involves value assessment, which is conceptually similar to a customer's or a bidder's use of various value cues in ordinary transactions. However, the crowdsourcing environment offers a different range of value indicators. The impacts of particular cues, such as the task reward, the bidder's reputation, and the number of participants (customers and bidders) are likely to play different roles at different phases of the auction.

The third phase in crowdsourcing market participation includes repeated participation decision dynamics which relate to the impact of the history of wins and number of completed prior tasks in the same marketplace. An interested professional can evaluate the profiles of other professionals who have submitted a bid since the information on the bidding professionals is displayed along with their submissions. This interesting aspect of intermediary crowdsourcing compounds the decision processes of participants on these platforms. We will examine various ways in which the characteristics of winning professionals and prior transaction records of the customers could dynamically impact subsequent decisions on the part of customers or professionals. These might trigger emotional reactions, competitive behavior, a desire to participate by professionals, as well as a customer's subsequent task award decision.

Among these issues, of particular interest to us is the impact of the characteristics of professionals when cross-group externalities exist in the marketplace. The variable describing the characteristics of professionals is manifested in two dimensions: the concentration of the winning professionals and the reputation of all the professionals. The concentration of winners examines the distribution of the number of bids each professional wins. Pareto curve, commonly used to successfully describe the distribution of income, wealth, and city size (Brynjolfsson et al. 2011), is introduced into the context of this crowdsourcing research to measure how quickly the disparity in the number of projects a professional wins changes as the number of new customers, professionals, task reward or completion rate increases. Reputation refers to the average reputation rating of all participating professionals who have received points for winning and successfully completing a task. A high reputation rating sends an important signal to customer and other competitors and directly influences their perception of the quality of a professional's work and the degree of competition, respectively. Based on this framework, we derive the hypotheses of the study and construct our research model.

New Customers

Our first set of hypotheses investigates how the characteristics of the winning professionals, as represented by the concentration and reputation of the winning professionals, influence the entry decision of new customers. In a regular market, the distribution of winning professionals should follow a normal

distribution, with the majority of the professionals winning an average number of tasks and fewer professionals winning either very few or a large number of tasks. However, due to the unique characteristics of the crowdsourcing platform, i.e., first mover advantage, reputation mechanism, and the decision criteria of customers, a winner-take-most outcome may arise in which few professionals consistently win the majority of the tasks. Therefore the distribution of winning bids is likely to follow a long tail distribution as those observed in many other Internet markets (Brynjolfsson et al. 2011). This form of concentration of winning bids will have an impact on the level of competition among existing professionals and the entry decision of new customers. A platform with a long-tail distribution of winning professionals indicates a relatively less competitive market and that the scope of expertise that can contribute to a task is relatively narrow. A customer seeking external talent to execute a task is probably looking for a crowdsourcing platform that gives them access to a divergent pool of highly competitive professionals so that its task request will be met with the highest quality. Therefore, we expect the decision of incoming customers will be affected in a way that:

Hypothesis 1a: The concentration (clustering) of winning professionals in a crowdsourcing marketplace is negatively associated with the number of new customers joining the marketplace.

In a traditional service acquisition, customers will most likely outsource task to vendors with a successful track record of similar tasks. Similarly, customers in a crowdsourcing marketplace are more likely to source their tasks in a marketplace with a proven track record. The second dimension of the characteristics of the professionals, reputation of the professionals, is the rating a professional received for successful execution of customer task request. This measure has been operationalized in previous crowdsourcing literature as the ability level that measures the skills of professional and is influenced by competitive intensity, task reward and complexity (Shao et al. 2012). When a professional wins a task, they earn reputation points as a non-monetary reward; whereas if they fail to win a task, certain points will be deducted (only up to a certain level). As the number of completed tasks increases, so does the reputation level of the existing professionals. A good reputation signals a customer that the professional has the needed skills and experience to meet her business needs. Hence we predict that:

Hypothesis 1b: The average reputation rating of the professionals in a crowdsourcing marketplace is positively associated with the number of new customers joining the marketplace.

New Professionals

Our second set of hypotheses considers the effect of the characteristics of professionals on the decision of new professionals to join a crowdsourcing marketplace. As discussed earlier, concentration of winning professionals will send some signals to potential entrants about the capabilities of the existing professionals and the level of competition in the marketplace, which will allow them to infer the chance of winning in such a marketplace. A skewed distribution (concentration) of winning professionals implies that only few professionals repeatedly win the contest for most tasks while a less skewed distribution suggests that more professionals have won a task before, indicating greater competition but also a better chance of being selected by a customer if the new entrant has the right talent. Therefore, we anticipate that:

Hypothesis 2a: The concentration (clustering) of winning professionals in a crowdsourcing marketplace is negatively associated with the number of new professionals joining the marketplace.

The reputation of existing professionals on a marketplace also has an impact on how a new professional views the prospect of the marketplace. Reputation increases with successful execution of task request and this could result from repeated winning submissions or unique submissions. An upward trend in reputation suggests that most tasks have been fulfilled or the marketplace has the right talents to meet customer demands. To a potential professional, an increase in reputation also implies that more customers will be motivated to place their task requests in the marketplace. Therefore, participating in such a marketplace increases the chances of professional success. On the other hand, a decrease in reputation could mean that there is a mismatch between professionals and customers, indicating that the chance of a new professional meeting the expectation of a customer is small. Hence we hypothesize the following:

Hypothesis 2b: The reputation of professional in a crowdsourcing marketplace is positively associated with the number of new professionals joining the marketplace.

Task Completion Rate

Our third set of hypotheses considers the effect of the characteristics of professional on the task completion rate. A task set up for bidding by a customer may or may not close with a successful bid due to various reasons. The task completion rate measures the number of successfully closed tasks to the total number of tasks posted by all customers. In other markets, customer feedback has been used as an instrument for evaluating the chances of a task request being successfully executed (Seow et al. 2005), or the probability of fulfillment in business transactions such as auctions (Lucking-Reiley et al. 2007). In the crowdsourcing market, successful task completion results in positive reviews and reward points; this will influence potential customers and professionals' decisions to join the marketplace. As discussed earlier, a less skewed distribution of winning professionals indicates that there are more talents within the professional group on the network marketplace. Thus the chances that a task will be successfully executed increases with a less skewed distribution of the winning professionals. Hence, we expect that:

Hypothesis 3a: The concentration (clustering) of winning professionals in a crowdsourcing marketplace is negatively associated with the task completion rate.

In a similar vein, reputation of the professionals also has an impact on task completion rate. An increased average reputation of the professional group indicates a better match between the talents of professionals and the tasks posted by customers, and consequently a higher probability of winning. This encourages professionals to exert their best efforts and submit a bid to a task request. As the number of submissions to a task increases, so do the chances of getting a task to be successfully completed. Therefore, we predict that:

Hypothesis 3b: The reputation of professional in a crowdsourcing marketplace is positively associated with the task completion rate.

Monetary Task Reward

Last but not least, our fourth set of hypotheses deals with the effect of the characteristics of professionals on amount of monetary task reward offered by a customer. The task reward reflects a customer's evaluation of the value of a task and varies among customers (even after controlling for task type or complexity). Even holding the nature of the task and level of complexity constant (i.e., for similar task in the same product category), such a variation in task reward amount could be driven by a number of factors and in particular, by the level of competition in the bidding process. In the auction literature, Kauffman and Wood (2006) found that bidders' willingness to take part in an auction exhibit herding effect because they will be more willing to engage in an auction as the competition intensifies. Hence the closing price is usually higher when the bidding process is more competitive. In a crowdsourcing marketplace, as customers have their request fulfilled, they develop an understanding of the dynamics of the market and the characteristics of professionals bidding on a task. If the market has evolved into a state in which the majority of the bids are won by a small group of professionals, it will inevitably lead to a higher concentration of winning professionals, which in turn leads to a less competitive bidding process as fewer professional will be willing to participate in a bidding in which the chance of winning is relatively small (due to the existence of those frequent winners). If such a scenario arises, customers will have to increase the award amount to encourage more participation. On the contrary, if the bidding process is more competitive (e.g. the concentration of the winning professionals is small), then customers will be able to benefit from competition by lowering the award amount. In the long run, such a learning effect will also be extended to new customers as they observe what others offer for a similar task before they set their task award amount. Thus, we expect that:

Hypothesis 4a: The concentration (clustering) of winning professional in a crowdsourcing marketplace is positively associated with the average monetary reward for task offered by customers.

From the customer's perspective, it is always desirable to lower the monetary reward for their tasks. But an experienced customer is also aware of the fact that the reward for a task influences the level of participation in crowdsourcing (DiPalantino and Vojnovic 2009) and will therefore exercise their power carefully. A repeated customer in a crowdsourcing marketplace who has had some tasks completed before will rationally adapt their price setting strategy based on the ability of the professionals observed in the market, which is often indicated by the professional reputation ratings. When the overall reputation of the professional group increases, it indicates less uncertainty, a better match between prior customer requests

and the talents of professionals, and a higher quality of work submitted by these experienced professionals. Experienced customers will therefore take advantage of this market benefit and lower the award amount for their tasks. As repeated customers play a major role in shaping the evolution of the market, we expect that:

H4b: The reputation of professionals in a crowdsourcing marketplace is negatively associated with the average monetary task reward offered by repeated customers, and such an effect is more significant when a customer has more tasks successfully fulfilled.

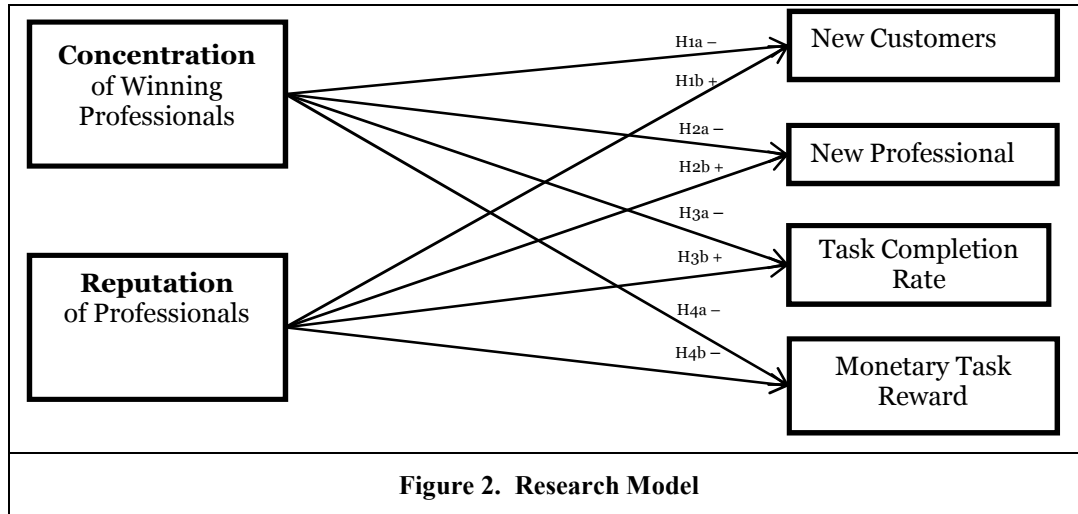


Figure 2 above illustrates the conceptual framework for our future empirical analysis and summarizes the eight hypotheses, along with the predicted directions of the associations between the characteristics of professionals and task characteristics, and market participants' (customers' and professionals') decisions to enter the market.

Data and Plan for Empirical Analysis

In this study we seek to understand the market dynamics at both the market participant (customers and professionals) level and the project level. A longitudinal quantitative methodology is chosen for this study as data will be gathered on a weekly basis for all of the variables involved in our hypotheses. Using a software agent, we are in the process of collecting data from a crowdsourcing website. At the project level, we are collecting project-related data on all projects posted on the website in different project categories (i.e. logo design, website development, marketing slogan, etc.) from 2008 to 2015, which will allow us to construct a dataset with more than 33,000 projects over a seven-year period. At the market participant level, we will collect the demographics and other individual characteristics of both customers and professionals (6392) who have participated in the afore-mentioned projects. On the customer side, we will collect the description of a task including the name of the customer, date posted, reward amount, the number of bids, information on each bidder, the outcome of the task request (completed or not), the id of the winning bid; on the professional side, we will collect data on the professional's id, activity history, user profile, number of bids submitted, number of winning bids, and reputation rating. These data will allow us to assemble a panel dataset in which the projects differ in their product category (i), the customer who posts the project (j) and time (t) dimension. This rich dataset will be able to capture the dynamics on a crowdsourcing platform and help us explore the research questions outlined in the introduction. Figure 3 shows a sample page of the data to be collected. A generalized least square regression will be employed to analyze the panel dataset. Our data collection effort is ongoing and is expected to last for six months, which will be right in time for us to present the results at ICIS in December 2015.

The screenshot displays a crowdsourcing marketplace interface. At the top, there are navigation filters for Categories, Type, Status, Gallery, Industry, and Time, along with a search bar. A yellow banner prompts users to log in or join. Below this, a summary indicates 22,332 logo projects are shown. The main content area features a list of projects, with two featured: 'Logo for New Co' (prize \$499, 652 entries) and 'Logo Design for Web Care Health' (prize \$450, 177 entries). A detailed view of the 'Creative brief' project is shown, including its deadline (10-Sep-15 GMT), prize (\$499), and entry count (652). The brief asks for the exact name of the logo and the user's industry. Below the brief is the profile of the buyer, 'vjeko', with a reputation of 87, 300 projects, and 22 awards. The profile also lists location (Croatia), time zone (GMT +02), languages (Croatian, English), and specializations (Logo, Web, Packaging, Brand Strategy).

Figure 3. Sample Webpage for Data Collection

Concluding Remarks and Future Work

Integrating theories from auction behavior, two-sided network market, and the crowdsourcing business model, this study attempts to understand the dynamics within a crowdsourcing marketplace that consists of a platform administrator, customers who outsource their business tasks, and professionals who contribute their talent to compete for winning the task. We expect our work to contribute to the literature on crowdsourcing business model and cross-network dynamics in two-sided markets in several important aspects. First, we examine the crowdsourcing model from both the customers and professionals perspectives, whereas most prior literature focuses on only one side of the market (bidder side). Second, we define and measure intrinsic market characteristics such as professional's profile and distribution and composition of both customers (buyers) and professionals (bidders) and examine how these factors change the competitive behaviors of the participants in the crowdsourcing market. Third, our work extends the online auctions literature by empirically examining how the reputation mechanism adopted in online auctions for sellers can be applied to crowdsourcing context for professionals (bidders) and how such an evaluation system can influence the market outcome. To the best of our knowledge, our study is among the first empirical work on the dynamics of the crowdsourcing market. Our results will provide important guidance for policy makers and crowdsourcing market administrators on how to design a sustainable market structure that is compatible with the interests of all participating agents. It will also shed light on how market participants can maximize their payoffs through observation and analysis of market signals and participant characteristics.

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