Getting Jobs Done for the Sharing Economy

Panagiota Micholia
Merkouris Karaliopoulos
Iordanis Koutsopoulos
Athens University of Economics and Business
{panamixo, mkaralio, jordan}@aueb.gr

Daniele Quercia
Luca Maria Aiello
Gianmarco De Francisci Morales
Yahoo Labs, Barcelona
{dquercia, alucca, gdfm}@yahoo-inc.com

EXTENDED ABSTRACT

One of the sharing economy's drivers is the idea of near-zero marginal costs. Marginal cost is the cost of producing additional units of a good or service, after fixed costs are covered. Startup businesses are producing and sharing 3D-printed products, often using locally available recycled materials, at near zero marginal cost. Members of home-sharing services such as Airbnb rent out rooms in their apartments to visitors at near zero marginal cost.

On the other hand, companies and people are using more and more crowdsourcing to satisfy their business needs. Think for example to the great success of platforms such as Amazon Mechanical Turk[1] and TaskRabbit.[2] Companies such as Airbnb try to tap into the freelance and amateur communities to get shootings of places listed on their flat rental website[3].

However, one might not necessarily need to create new sites for recruiting online workers. One could well recruit users of existing sites. That is because there are many users - especially power users - who passionately contribute to existing online communities and, as a result, become experts in specific areas. Those experts collectively form a totally untapped talent pool (e.g., passionate photographers on Flickr).

Currently, the matching between jobs needed by the sharing economy and talent pools on existing sites is not done, not least because there is no incentive for talents to get any job done. To make this vision a reality, we need a new mechanism that offers incentives to get jobs done by those users.

Our Proposal. We present an incentive mechanism to get non-trivial jobs done by members of existing online communities while minimizing costs and maximizing quality. The idea is to identify individuals on existing sites who are passionate about an area (e.g., photography) and incentivize them to do some jobs (e.g., take quality pictures).

The one-sentence description of the general scenario has three main elements: *contributors* get *suppliers' tasks* done (e.g., Flickr users take photos of restaurants). There are thus three main actors in this model: *contributors*, *suppliers*, and the *service provider*. Contributors execute tasks on behalf of suppliers. Suppliers post task requests on the platform provided by the service provider. Finally, the service provider matches task requests by suppliers to willing contributors.

Airbnb uses a similar idea to have freelance photographer shoot high-quality pictures of places on their listing. However, Airbnb directly pays the photographers a fixed amount per shooting (around 50-65).[4] This fixed-pay incentive mechanism might work for Airbnb, where all tasks are equivalently complex and there is no inherent willingness for the photographer to get the job done. However, in a more dynamic setting where jobs have varying complexities and places attract people even without any incentive, a different mechanism is needed.

Our proposal considers that the contributors are selected by the service provider (e.g., Flickr) based on two main considerations. The first is about the ability of the contributor to carry out the task. We define the *quality* of a user as the probability that they will successfully accomplish the task. In the case of Flickr, the ability might translates into the average number of favourites (likes) for each picture. That is, the ratio of contributor i's number of favourites (f_i) and his/her overall number of contributed pictures (c_i). To have the ratio in the range [0,1], we normalize it by the maximum number of favourites per picture in the entire set of contributors in the platform $\mathcal{N}$, and we use a square root transformation to further normalize the skewed distribution:

$$q_i = \sqrt{\frac{\frac{f_i}{c_i}}{\max\limits_{k\in\mathcal{N}} \frac{f_k}{c_k}}}. \tag{1}$$

The second consideration reflects the extent to which the contributor is willing to get the task done. This willingness further depends on two factors. First, on whether the contributor is a very active contributor, i.e., on its *engagement* with the platform. In Flickr, this can be modeled as the normalized number of contributions of user i:

$$e_i = \frac{c_i}{\max\limits_{k\in\mathcal{N}} c_k} \tag{2}$$

Second, on the interest of user i for the task j. We assume the set of tasks to be categorized into a set of topical areas $\mathcal{A}$. Further, that each contribution can be mapped to one or more topical area.

In Flickr, this might be the fraction of i's contributions (c_i) relevant to the task's topical area $a \in \mathcal{A}$:

$$g_i^a = \frac{c_i^a}{c_i} \tag{3}$$

[1] `https://www.mturk.com`
[2] `https://www.taskrabbit.com`
[3] `https://www.airbnb.com/info/photography`
[4] `http://www.glassdoor.com/Reviews/Employee-Review-Airbnb-RVW2979155.htm`

Table 1: Statistics of a sample of pictures on Flickr and venues on Foursquare in Barcelona.

Foursquare venues in Barcelona	14 781
Flickr pictures in Barcelon	3 239 089
Foursquare venues on Flickr	819
Foursquare pictures on Flickr	45 839
Flickr user taking Foursquare pictures	3172

A topical area might be defined, by the set of tags associated to the pictures of the users (e.g., "food" and "arts").

We combine these two factors in a single overall attractiveness score for the contributor-task pair (i, j):

$$\alpha_{ij} = e_i + g_i^a \tag{4}$$

where a is the topical area of task j. The effect of the two factors is compensatory. Namely, a low interest for the topic of a particular task can be balanced by an overall high engagement of user in the platform. This score represents the *intrinsic motivation* of a contributor to perform a task.

Given a task, many attempts by several contributors may be made to fulfill the request. We measure the quality of the task as the expected probability that at least one of the contributions is of good quality and thus satisfies the task supplier:

$$q_j = 1 - \prod_{i \in \text{Contributor}(j)} (1 - q_i) \tag{5}$$

Preliminary study. In a preliminary study, we consider the city of Barcelona. We take a sample of Flickr users who have taken at least one geo-located picture in the period of several months in the city. For each user, we gather geo-referenced pictures and their activity levels. From their pictures, we derive areas of interests of the user. From their activity level, we derive their willingness to potentially engage with our incentive mechanism (the less active the user, the higher the incentive needed). Since we consider the task suppliers (e.g., restaurants, coffees) to be places registered on Foursquare, we crawl all the venues on that platform in the city of Barcelona.

By looking at the number of passionate photographers on Flickr and of places in need of pictures (Table 1), our preliminary study highlights a great potential market for our approach. Indeed, only a small fraction of Foursquare venues are represented in Flickr. Clearly, the fraction of Flickr pictures regarding Foursquare venues is also small, albeit not zero. Therefore, there is already an interest of Flickr users in taking pictures of Foursquare venues that we can leverage and incentivize (bottom two lines of Table 1). Finally, the number of potential opportunities to propose tasks to users is also high, as testified by the high number of geo-located pictures.

To study the practical viability of our idea, we perform a simulation. We consider the task of a professional photo shooting. Airbnb pays freelance photographers 50$ for each photo shooting.[5] Each photo shooting delivers a minimum of 10

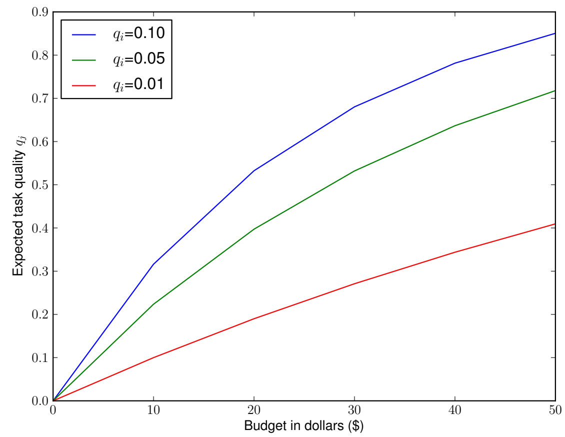

Figure 1: Expected quality of a picture taking task by varying the available budget. The maximum budget is the reward for a professional photo shooting in Aribnb (50$) while the incentive for the task is the Big Mac index in Europe (5$).

photos, for a reward of about 5$ per photo. Interestingly, 5$ is also the price of a Big Mac in Europe.[6], which is used in the Big Mac index to normalize currency values according to the theory of purchasing-power parity. Therefore, we take this value as the reward for a single task. Just by using a value of 10% favourites per picture for the Flickr users we obtain a very high expected quality, as shown in Figure 1.

Future work. We are currently designing a mechanism to efficiently determine how much each contributor should be paid (i.e., payment distribution). The task specification includes basic information such as the location of the PoI, the time constraint for fulfilling the task (if any), and the budget B_j made available by the supplier. The payments to the contributors may be monetary but, more often, are expected to be perks (e.g., virtual coupons that can be redeemed for free coffees, credit points, or entry discounts for exhibitions and shows). The goal of the S_P is to efficiently manage the budget provided for the task (for example, a set of 40 coupons for free coffees) to incentivize and recruit a specific set of contributors who are the most suited for the task at hand.

Our mechanism might result in costs that are lower than those of professionals, sustaining the sharing economy's premise of near-zero marginal costs. However, even after designing such a mechanism, a number of technical and societal questions need to be addressed. On the technical side, one needs to determine: 1) how frequently the payment allocation should be updated; and 2) how to automatically identify quality contributors other than what we have proposed (i.e., alternative notions of quality should be algorithmically established and validated). On the societal side, existing stakeholders (e.g., professional photographers) might oppose this solution, as it would disrupt the current way of doing things. More worryingly, our mechanism might reinforce existing urban problems - it is likely to work only in well-to-do areas and, as such, it will widen the engagement/participation gap between those areas and socio-economic deprived ones.

[5] **http://realwaystoearnmoneyonline.com/2014/01/freelance-photography-for-airbnb.html**

[6] **http://www.economist.com/content/big-mac-index**