A Fair Share of the Work?  
The Evolving Ecosystem of Crowd Workers

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ABSTRACT
Crowdsourcing’s ability to forge new digital, and thus not location-bound, job opportunities spurred many visions of crowdsourcing’s social impact as an answer to failing economies and recessions, especially in developing countries. Yet, did the digital solution take the business world by storm and redefine the classical business process? Did it indeed mature into a stable source of income for a vast agile workforce, and did it fulfill the visions of social impact? While exploring whether the market place’s visions were fulfilled or not, we uncover a whole ecosystem the workers have built to leverage their productivity and earnings in the market place. In this paper, we shed light upon this system and all of its components, thus providing insights into the inner workings of the crowdsourcing platforms from the crowd’s side and raises attention to the need for engaging in research and creating tools.

CCS CONCEPTS
• Information systems → Information systems Applications; Collaborative and social computing systems and tools

KEYWORDS
Crowdsourcing; ecosystem; market place symmetry; social factors

1. INTRODUCTION
Crowdsourcing was coined as a term a decade ago by Jeff Howe [1], yet the essence of this internet-based manifestation has actually been around since the early 1700s. Namely, when the British government offered a prize to whoever came up with the best way to measure a ship’s longitudinal position [2]. Adopting the same idea and mapping it to our current technologies led to the rise of what we know today as crowdsourcing. The core idea revolves around the creation of an open call on an online crowdsourcing platform for the hiring of workers, to finish a particular task that a requester posts. Re-questers could be companies, organizations, individuals, researchers, government, or anyone else who has work to complete. The crowd choose between tasks that require human intelligence steering, since they are still too difficult to solve even by state-of-the-art algorithms. Thus, such platforms are sometimes referred to as artificial artificial intelligence, although at the ire of the workers, who would rather be viewed as real human intelligence.

With these platforms continually growing in popularity and number, crowdsourcing has rightly also been more frequently under scrutiny. A rich body of research has been roughly dedicated to cover three broad topics of interest:

1. Aiding requesters by: finding the best practices for designing tasks [3], developing typical design patterns to be adopted by requesters [4], predicting optimal task parameters: number of labels per task, pay per HIT, size of HIT [5], investigating active learning strategies [6], creating hybrid solutions, which combines human intelligence with state-of-the-art yet still limited algorithms [7], developing crowd-capital [8], helping requesters to create workflows to manage complex work processes [9], etc.

2. Resolving quality issues by: designing effective quality counter measures to fight off spammers [10], [11] and strategic spammers [12], identifying and shielding honest yet low-skilled workers from exclusion [13], etc.

3. Analyzing the underlying workforce by: conducting surveys about the workers’ demographics [11], [13], identify the workers’ motivations [14], [15], survey data and user studies [16], [17], researching the community networks they build between each other [18], etc.

In this work, we aim to observe and understand crowdsourcing through a new lens. During our research, we uncovered a whole ecosystem that the workers have built in order to leverage the money-work balance, their productivity and earnings. All of the support mechanisms within this hidden ecosystem were mainly developed by the workers themselves due to the unsupportive infrastructure of the crowdsourcing market, which is apparent in how requesters and workers are differently handled and supported by the platforms.

While shedding light on this hidden crowd-web, we will also address questions like: How do the workers find and choose tasks? How do they support each other and newcomers? How many newcomers actually stay and for how long? What and who are the Super Turkers? How do they become Super Turkers?

It’s important to note that in this work we give only a fleeting glimpse of a mostly hidden system upon which the crowd rely to leverage and optimize their work. This system is very agile however, and is continuously changing and evolving to fit the new needs of the workers. Our work provides an analysis of the foundational infrastructure being built to support them.
We start off in chapter 2 by investigate the market place through online surveys and pin point our initial observations about the working conditions, which allows us to draw conclusions about why Super Turkers are quite scarce. In Chapter 3, we delve into the ecosystem and illustrate in details its different components. Although the ecosystem is mainly there to enable to workers to operate in a more efficient form, in Chapter 4 we showcase that it has its dark side, which enables the workers to take shortcuts and illegally cheat the system. Next in Chapter 5, we highlight the academic efforts and contributions to this ecosystem, and finally we conclude in Chapter 6.

2. OBSERVING THE MARKET PLACE
To investigate the working conditions and understand why the existence of Super Turkers is scarce, we ran surveys on MTurk\(^1\) and Turk Nation\(^2\). In the following we report some first observations.

Observation 1 - Crowdsourcing appears to be an asymmetric market place. This can be observed in both the 1) information asymmetry [20], [21], [22] and 2) imbalance of power [23].

Information asymmetry. Materializes in the lack of reputation rating and general information provided by the platform about the requesters [14]. In contrast, workers are rated and filtered by their reputation, which is based on their previous work and made accessible to requesters. Whereas workers are scrutinized as early as at sign-up and are exposed to continuous monitoring that is apparent in computed reputation scores, requesters are allowed to choose any name they want, including: duplicate names, or anonymous names such as Survey Requester. Such information asymmetry hampers the market’s transparency and aids in the violation of the workers’ privacy [22]. We conducted a survey on Turk Nation, in which 86 workers participated. In this survey, we asked the workers about their satisfaction in regards to multiple factors on MTurk. Answers were given on a scale from 1 to 5 (1= not satisfied at all and 5=completely satisfied). We refer to this dataset as the workers’ satisfaction data. When workers were asked how satisfied they were with the amount of information provided by MTurk about the requestors and their reputation scores (see Figure 1A), more than half of them (~ 53%) expressed their dissatisfaction.

Imbalance of power. Materializes in the requester’s power to irrefutably decline the workers’ output and accordingly refuse to pay the promised money while retaining the submitted work. On the other hand, workers can only try to communicate over the platform’s channels to challenge a requester’s decision, resolve a conflict or unfair treatment. This communication may very well end up being one-sided, with the requesters not being obliged to answer. As MTurk plays only the role of a facilitator, it refuses to step in and mediate disputes (see MTurk participation agreement\(^3\)). In short, workers are vulnerably exposed to exploitation.

In our workers’ satisfaction data, workers were asked how satisfied they were with MTurk’s overall effort in hindering wage theft and unscrupulous requestors (see Figure 1B). Again, many complaints were raised, with ~ 58% of the participants expressing their disappointment in MTurk’s wage theft measures.

Observation 2 – The daily task of finding HITs and making an informed decision about HIT selection is widely unsupported. This task proves quite challenging; where on one hand good HITs do not last long before they are taken up (e.g. a good 10,000 HIT batch typically lasts for only 10 minutes\(^4\) or less\(^5\)). On the other hand, the search functionality on the platform is far from able to cope with the fast dynamics of HIT offerings. Yet, finding lucrative HITs is critical for workers, because the search itself is unpaid work. Theoretically, there are three built-in ways to search for a HIT on MTurk:

1. Requester’s search page, where each requester has a page upon which all their posted HITs are listed. This can be accessed by clicking on a requester’s name. Some Turkers bookmark particular requester’s pages with whom they have had a good past experience, and use a script that continuously mon-

\begin{figure}[h!]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{Workers’ satisfaction with: A – general information provided by MTurk about Requesters (i.e. information asymmetry), B – MTurk’s effort in hindering wage theft (i.e. power asymmetry), C – MTurk’s HIT search functionality. Scale runs from 1 (not satisfied at all) to 5 (totally satisfied)}
\end{figure}

\(^1\) The most prominent crowdsourcing platform.
\(^2\) The oldest community for MTurk founded in 2005.
\(^3\) http://requester.mturk.com/policies/conditionsofuse
\(^4\) http://turkernation.com/showthread.php?13806-disappearing-HITs
\(^5\) http://www.reddit.com/r/mturk/comments/2dkt8a/i_dont_know_how_you_guys_do_it/cjqi41n/
itors that page and alerts them when new work is posted. Another trick is to bookmark the page of the HITs themselves as a HIT group keeps its URL as long as the requester does not change its name. The beauty of this method is that when HITs are posted they first appear on the site in these HIT group URLs, but show up significantly later to the requesters’ search page, so a worker who has this URL gets access to the work first without having to search at all.

2. **HIT-listing page** is a sorting facility provided by the platform, where available HITs are sorted by best-paid, etc. This page includes all HITs available on the platform at that time, but like the requester’s search page, the HITs appear here long after they are actually uploaded to the platform. Most workers search for the most recently posted HITs first, keeping track of what has just been added to the platform. Second, they search for batches with a high number of HITs so they can be occupied with work for long stretches at a time, which is a lucrative method of working [24].

3. **Keyword search page** allows for a keyword search, as the name suggests. However, it is only as good as the keywords or tags that requesters attach to their tasks. In reality, these tags tend to be misleading and not very descriptive. For example, the Turkers once rallied against a requester who continually included “survey” in their keywords despite the work being transcription.

Generally speaking, all three options are too slow to deal with the fast posting dynamics of the platform and thus fail to present the available HITs in a timely fashion. The fastest search option is the generic list of HITs provided by the HIT-listing page, followed by the requester’s search page, and lastly the keyword search page is the slowest. At this point, it becomes clear how Super Turkers do 80% of the work [25], since they can leverage the search function with automated scripts (see Section 3 for a comprehensive list of scripts and supporting software tools), bank of monitors and computer stations, and their social contacts. Indeed, in our workers’ satisfaction dataset, when workers were asked to rate their satisfaction with the MTurk’s search functionality (see Figure 1C), again an overall sense of dissatisfaction resonated.

But even if some matching HIT has been found, it spawns the next challenge of making an informed decision of whether to take on this work or not. This becomes extremely difficult given the information asymmetry [11]. Furthermore, MTurk fails to provide information about the hourly pay rate [25]. Only the monetary gain per assignment is given, without any mention of how long an assignment would take or the disclosure of the tasks’ effective hourly rate [14].

**Observation 3** – There is a 70% attrition rate in the first six months of a worker’s time on MTurk [26]. While observing the worker’s longevity on the market place, we roughly identified four categories:

1. **Rejected applicants**: Clearly, many applicants are rejected upon signup since July of 2012. A post discussing the reasons for the apparent ban on international workers includes comments from around the world by those who were rejected.

   Therefore, those who do not even make it to the point of being able to do a HIT and get paid for it may account for a large percentage of those who attempt to work on the system.

2. **One-day-workers**: applicants withstanding the approval process and receiving login credentials are instantly dealt a harsh dose of reality. Not having yet any qualifications or a high “HITs approved” statistic leave them only with access to HITs having a payment of one or two pennies. In fact, 80% of the available HITs pay less than a dime, see e.g., the task given out in [27]. This quickly leads to a rapid and massive drop-off rate.

3. **Newbies**: workers who do not get discouraged by the shockingly low pay rates and make it through day one are already exceptional. Yet, the 70% attrition rate reported in [26] stems from these set of workers. About 10-30% of these workers will start to look for a forum to support their daily Turking activities.

4. **Super Turkers**: are in essence successful workers, who tap into the crowd’s knowledge and leverage this knowledge to their advantage. As a Super Turker having social connections and being multifactorial is key. From a quantitative point of view, these workers do the bulk of work on all platforms. Some studies that have managed to actually interact with super Turkers [28] illustrate the 80/20 ratio, where only 20% of the crowd are doing 80% of the work. Some studies even claim a 90/10 ratio [13].

**Observation 4** – Crowdsourcing has not matured into a primary steady source of income for the majority of workers. We conducted a survey early in 2015 on MTurk by posting a HIT with no restrictions (i.e. open to all workers). A total of 334 workers participated.

As illustrated in figure 2, based on the income figures we collected, about 4.49% of the workers earn more than $501 per month, with only 0.3% earning $5,001 or more. This leaves the majority of workers

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8. [The reasons why Amazon Mechanical Turk](http://turkquesters.blogspot.de/2013/01/the-reasons-why-amazon-mechanical-turk.html)
workers earning $100 or less per month, an amount that cannot be considered a household’s main income.

The first two observations: the asymmetry in the market place and the lack of support in finding suitable HITs poses difficulties, which ultimately lead to high attrition rates and prevents crowdsourcing from maturing into a primary source of income. With these shortcomings hindering crowdsourcing from maturing into a steady widespread business solution, next we shed light as to how the workers and the academic community has intervened to overcome these difficulties.

3. UNCOVERING THE CROWD ECOSYSTEM

Indeed, for Super Turkers crowdsourcing has (to some extent) reached its full potential. That is, it has become a steady primary source of income and has transformed their work life from the typical classical business process. Yet, Super Turkers are the exception. So how and why are Super Turkers successful?

Observing the Super Turkers on Turker Nation, it seems that being part of the Ecosystem is key for being successful on the market place. This means actively participating in forums, Facebook groups, using scripts and extensions to optimize work, etc.

Next, we give a comprehensive insight into the inner workings of this ecosystem and explain how it overcomes the market’s shortcomings listed in the previous section.

3.1 Online Forums and Facebook Groups

An online forum is a web-based site facilitating discussions among a group of subscribed users through posted messages. On such platforms, workers voluntarily share vital information like: 1) the best hardware technical setups, whether it is the computer, monitor, or keyboard, or even bank of computers, 2) how to organize and manage the work, 3) how to find good HITs in an efficient manner, 4) who are the good and bad requesters, 5) acceptable pay rates etc. The major downside of forums as a supporting tool for crowd workers is that they take unpaid time to monitor.

MTurk has many external forums e.g. Turker Nation, mTurk Crowd, subreddit, etc. On Turker Nation, MTurk users can discuss requesters and work habits. Central to the forum are the Daily HIT Threads, where workers share news about good HITs and the Hall of Fame/Shame, which hosts ratings for requesters. Such information helps the worker get over the information asymmetry in the market place.

Upon analyzing the login data we got from Turker Nation for 2016, the attrition rates reported in the market place by [26] were also within the Super Turkers on Turker Nation, it seems that being part of the Ecosystem is key for being successful on the market place. This means actively participating in forums, Facebook groups, using scripts and extensions to optimize work, etc.

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Upon analyzing the login data we got from Turker Nation for 2016, the attrition rates reported in the market place by [26] were also exhibited on the Forum. In total Turker Nation comprises 17,084 forum members.

Within a single month there will be between 200 to 400 unique individuals signing up. Every two to three months, the forum rejuvenates and the bulk of workers on the forum will be different. Focusing only on the first week of membership (see Figure 3), gives us a better overview on the longevity of active forum members, with active signifying logging onto the forum. Around 40.6% of the members who sign up are never active. Apart from those, the number of active members per day exponentially drops and many seem to give up. Those who stick around eventually become super posters (having more than 1,000 posts), which comprises only 0.2% of all members (see Figure 4).

Figure 3. Forum member’s first week longevity on the platform

Figure 4. Number of workers’ posts on Turker Nation

A survey we ran in June 2017, targeting the top 50 super posters on Turker Nation (47 posters participated) attested to a clear correlation with the higher number of Hits completed: the Super poster with the highest forum posts at 34,371 entries completed 185,553 Hits within a period of 810 days, while the super poster with the least number of posts at 1,049 entries completed only 46,489 Hits within a period of 777 days. This correlation between high forum posts and high number of completed Hits leads us to the conclusion that the 0.2 % super posters corresponds more or less to the 0.3% of workers earning more than $5,001 per month in Figure 2, that is, the Super Turkers.

Similar to the forums in their role, Facebook acts as a neutral playing field, where members of different forums get together. Super

Turkers have private Facebook groups on which they share experiences, HITs, information, etc. (e.g. Turkers United, MTurk Alerts, Mturk Members). Such information helps them overcome the poor HIT search functionality’s shortcoming on MTurk.

3.2 Scripts and Extensions

Scripts and extensions are basically computer software developed to automate cumbersome tasks. In order to support the workers in completing crowdsourcing work in a more optimized fashion, many scripts were developed and made open source. These scripts can be found in central repositories, which comprise aggregated lists of useful scripts, such as greasyfork. Other repositories comprising manually curated lists of links to scripts can be found on forum threads.

It is interesting to note that these scripts were mainly created by Super Turkers with programming skills. Next, we introduce and roughly categorize some of these scripts based on their functionality.

Filtering Requesters Scripts:

This type of scripts were developed by the workers to filter the available HITs based on favorite or unwanted requesters. Using color codes is common to display a requestor’s reputation score. A few example scripts include:

- **Block Requesters** script, which filters out HITs from unwanted requesters. Other similar script extensions are available for Firefox and Google Chrome.
- **HIT Scraper**, which colors each HIT based on the Requester’s TurkOpticon score (see section 3.3) or can filter out HITs based on various parameters e.g. Masters qualification, minimum pay threshold, worker’s corresponding qualifications, etc.
- **Mmmturkeybacon Color Coded Search with Checkpoints**, which not only colors HITs based on the Requester’s TurkOpticon score (see section 3.3), but also allows workers to mark a HIT as completed or viewed so they will not attempt the same HIT twice.

Search Optimizing Scripts:

These scripts are intended to speed up the search process by automatically loading the next search page upon scrolling down, or through push alerts when a worker’s favorite requester posts a HIT. For example:

- **Auto Pager**, which automatically loads the next search page as the worker scrolls down.
- **Turk Master**, which pushes alerts through a worker’s Dashboard when their favorite requesters post HITs. Again, plugins for both Firefox and Chrome are available.
- **Mmmturkeybacon Enhanced HIT Information Capsule**, which converts a worker’s favorite requester’s name into a link, with which the worker can search with to find other HITs posted by the same requester.

Earnings Monitoring Scripts:

Many scripts are available to manage the earnings a worker is making. Some of the more useful scripts calculate the accumulated amount of pending earnings for the worker on a given day. For example:

- **Pending Earnings** script, which calculates the accumulated amount of pending earning for a particular worker.
- **Today’s Project Earnings** script, which calculates the accumulated amount of earnings for the current day.
- **Amazon Payments mTurk Details**, which keeps track of the worker’s transactions on MTurk and adds them to the worker’s account activity page for easy monitoring.

HIT Organizer Scripts:

These scripts enable the user to organize HITs within their different stages: active, pending, rejected, accepted. A few representative examples of such scripts include:

- **Mturk Dashboard HIT status links**, which provides the workers with direct links to both rejected and pending HITs.
- **Requester ID & Auto Approval Time**, which keeps track of the requesters ID, since requesters can freely change their account names. Moreover, it also displays the requester’s corresponding HIT autoapproval time (how long it will be before the HIT automatically approves) to help the workers in making a more informed decision about working with that particular requester.
- **mmmturkeybacon Queue Order Fix**, which automatically detects when a worker finishes a HIT and then opens the next HIT with the shortest time left before it expires from their queue for the worker to instantly start working on it.

Reputation scripts:

These scripts help the workers to keep track of their approval percentage rate as well as the requesters’ reputation. Examples for these scripts include:

- **Mturk Worst Case Scenario Calculator**, which computes for the worker how many rejections they can receive before their approval rating drops below a significant level.
- **TurkOpticon**, which allows the user to see the community ratings of requesters on the MTurk search page or quickly rate a requester. See section 3.3 for a more detailed description.

Warning scripts:

Workers need alerts when something has gone wrong. These scripts provide such warnings.

- **Mturk Hit Not Accepted**, which warns the worker that the HIT they are viewing has not been accepted by turning the

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14 https://greasyfork.org/en/scripts/by-site/mturk
15 http://userscripts-mirror.org/scripts/show/69128
16 http://userscripts-mirror.org/scripts/show/130929
background pink. Workers may find them-selves completing an exceptionally long HIT, but when they attempt to submit it they realize there is no submit button, only an accept button, as they never accepted it in the first place.

- **mmmturkeybacon Logged Out Alert**[^24], which alerts the worker that they have been logged out. Recently, MTurk began logging out workers every 12 hours, so this notice alerts a worker in case they are running a Search Optimizing script in an effort to find new work.

- **MTurk Captcha Alert**[^25], which displays an alert when a CAPTCHA is human or appears on a HIT. If a worker is engaging in “HIT hoarding”, a term that describes the behavior of grabbing 25 HITs to maximally fill their work queue before they begin working on the HITs one by one, they may reach a CAPTCHA as MTurk displays one after every 35th HIT the worker accepts. If they do not complete it and the page refreshes, or they have multiple tabs open each with the CAPTCHA displaying, their account will be temporarily suspended from the site for five minutes. This script allows the worker to be alerted that a CAPTCHA has appeared so they can stop their other activities and complete it, saving them from a five minute halt.

### Refreshing and Page Monitoring extensions:

In order to get work, one must find their favorite requesters and HIT groups and refresh the pages that list that work continually. In fact, MTurk has a built in “preview and accept” mode that allows the worker to constantly refresh a HIT group URL and grab a new HIT each time they do. Without automated refreshing tools, a worker would have to manually refresh multiple pages to find new work. If the specific URL of new work is not known, a worker can instead use a page monitoring extension to alert them when the requester’s HIT listing page is updated.

- Some refreshing extensions require you to keep the page open in a tab, such as Easy Auto Refresh, ChromeReload, AutoRefresh, and ReloadEvery. These are good to use when you are reloading “preview and accept” URLs as they will continue refreshing even if you accept a HIT, meaning you can quickly fill your queue.

- Other extensions monitor the page in the background, sending you a visual or audio alert when some content on the page changes. For the requester’s HIT list page this is more appropriate as refreshing the page will not accept HITs for you. Instead, an extension such as Page Monitor Plus, Distill Web Monitor, Update Scanner, or Check4Change alert to changes on the page in general, which the worker can then visit to see if the new work is of interest to them.

### Layout scripts:

Workers have created manuscripts that alter the layout in ways that help them to work more efficiently. Some examples include

- **mmmturkeybacon Butt-In Buttons**[^26], which adds many features to the site, including a “preview and accept” button that allows the worker to accept a HIT from the search page, a “return and accept” button so the worker can return this HIT and automatically accept the next one available, and moves all buttons closer to the workspace so the page is more efficiently laid out.

- **MTurk Max Job Window Height**[^27], which makes the work iframe a more acceptable size in the browser window, giving workers the ability to see all of the HITs at one time.

- **MTurk Queue Count**[^28], which displays how many HITs the worker has in their personal work queue at the top of the HIT, allowing them to keep tabs on their progress.

### 3.3 Activist Platforms

Multiple platforms were developed with the aim of supporting the workers and bridge the information asymmetry within the crowdsourcing platforms. Next, we present two prime examples of such platforms.

**TurkOpticon:**

TurkOpticon[^29] is a website that was created and maintained by Lilly Irani (University of California San Diego) and Six Silberman (University of California, Irvine). TurkOpticon is a platform that enables the dissemination of requesters’ subjective star ratings[^29]. Basically, workers can evaluate requesters and make this information available directly on the MTurk website through plugins. The qualitative attributes upon which TurkOpticon ranks the requesters are: 1) Generosity, in terms of the amount of money paid relative the amount of time needed to finish the task, 2) Promptness of a requester in terms of accepting the work and paying, 3) Fairness of a requester in his/her decision to accept or reject the work provided, and 4) Communicativity in terms of the availability of a requester to respond to concerns.

**Dynamo:**

The community platform Dynamo[^30], is the product of the combined efforts of Turkers and academic researchers from Stanford University and the University of California, San Diego. The forum paves the way for collective action, thus empowering the crowd to push for needed change[^30]. On the platform, ideas and issues can be proposed and supported pseudonymously by Turkers. When an idea receives more than 25 up votes, where at least 50% of the votes in total are in favor, an action is mobilized.

### 3.4 Communal Sharing

Very similar to the spirit in the forums, communal sharing can be strongly exhibited in particular with Indian Turkers, where a true sense of sharing is displayed through the dissipations of recommendations and information about HITs through cellphone calls and texts, emails, and even yelling across houses[^30].

### 4. THE DARK SIDE OF THE ECOSYSTEM

Although our focus is geared towards the ecosystem the honest workers rely on in order to have the best time-money return, we still found it interesting to briefly report about other used tools, as

[^29]: https://turkopticon.ucsd.edu/
[^30]: http://www.wearedynamo.org/
listed in [31], unfortunately in ways which both provide low quality data to the requester and violate MTurk’s Conditions of Use[31], thus endangering the workers’ accounts.

**Generic and task-tailored bots:**
Due to low pay, scammers use “bots” (automated answering systems) and generic malicious algorithms that can sign up for tasks and submit answers, either through random output generation or by utilizing minimal artificial reasoning [31]. AutoHotKey, as mentioned above, enables scripters to create automated bots that complete HITs with no human intervention.

**Shared Question Answering Dictionary (SQAD):**
SQAD is an online repository, where answers to questions can be stored. When the same question is encountered, the same answer is given. Thus, quality safe guards such as majority voting will always be in favor of the workers. This is more like an organized group attack where workers can submit entries through an automated request to a SQAD. Similarly, they can automatically retrieve an answer that was given to a particular question before.

**Artificial Clones:**
Unlike the coordinated effort with SQAD, with artificial clones a worker needs only to rely on himself. The strategy here is to have a clone program that duplicates the behavior of the worker. Thus for a given task, the spammer answers truthfully a set of questions and stores them. The clone program would then give the same answers to already seen questions. For unseen questions, either a skip strategy is followed, a random answer generation is deployed, or another worker is asked.

5. **ATTENTION IN THE ACADEMIC COMMUNITY**
Of course some of these problem have already raised awareness in the academic community. In the following we present some of the academic contributions that were developed to aid the workers in leveraging their productivity.

**Turkmotion:**
Turkmotion[32] is a website and a new browser extension developed at Technical University of Berlin. In addition to being able to rate requesters, workers can also rate HIT groups. The system comprises two parts: 1) a browser extension that enables workers to rate the tasks based on fair payment and enjoyable factor, which then automatically appear beside the respective HITs on MTurk, 2) a website that lists the top rated tasks and provides a filtering service, which the workers can use to choose the HITs based on their preferences.

**TurkBench:**
TurkBench is a tool that was developed at Xerox Research center [29]. TurkBench aims at eliminating unpaid search work by providing workers with a list of HITs to complete. It consists of three main components: 1) a personalized market visualization that presents the workers a current personalized state of the market, 2) a session manager that manages automatically created work sessions, and 3) a scheduler that crawls MTurk and creates individual schedules for the workers.

6. **CONCLUSION AND OUTLOOK**
It is clear to see that crowdsourcing has not yet reached the envisioned potential. We have observed two major factors: the market place’s asymmetry and the HIT search functionality’s inadequacy, which have hindered crowdsourcing from becoming a primary steady source of income as well as discouraged many new workers explaining the very high attrition rates (70%).

Still, a very small number of workers have indeed secured a comfortable living out of crowdsourcing: Super Turkers. By observing both MTurk and Turker Nation, we investigated how and why Super Turkers actually are successful. In essence, Super Turkers have created an ecosystem within which they can leverage the crowd’s knowledge to their advantage. In this ecosystem, a set of diverse tools were created to tackle the two major shortcomings mentioned above at least to some degree.

In terms of the market’s asymmetry, activist platforms have been created, e.g. Dynamo or TurkOpticon, with promptness and fairness scores recorded per requester to relieve the power asymmetry problem. On the other hand filtering request scripts and reputation scripts as well as Forums e.g. Turker Nation and its ‘Hall of Fame and Shame’ fight off the information asymmetry. Moreover, communal sharing and search optimizing scripts aid the workers in their daily HIT search, which is unfortunately inadequately supported. Similarly, the academic community also developed some tools to tackle both shortcomings e.g. Turk-Bench, Turkmotion and Crowd Workers.

Yet despite of this ecosystem, the percentage of Super Turkers unfortunately remains small. This may be because many workers are simply unaware of this ecosystem. But even if workers are aware of this ecosystem, being an effective part of it solely remains on the individual effort and requires much perseverance due to its distributed nature.

In summary, there is a definite need for the providers of crowdsourcing platforms to invest in designing technologies that would support workers in leveraging their productivity and in easily finding suitable HITs. Moreover, transparency is needed, since workers are given way less information about the requesters than the other way around.

If crowdsourcing is truly a serious aspect for the future of work, we must take action in engaging in research and creating tools that are seamlessly integrated within the platforms, and which will allow workers to exert their rights in a fair fashion and thus, pave the way to a sustainable career by work models based on crowdsourcing.

7. **REFERENCES**

[31] https://www.mturk.com/mturk/conditionsofuse


