Microwork: Theory, Models and Mechanics for enabling impact through aggregate action

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ABSTRACT

This major research project will focus on the primary investigation area of microwork. Several sub-areas of inquiry will be visited in order to explore potential new directions, determine and suggest factors potentially maximizing impact via microwork projects, including historical examples of analog micro-tasks and their possible correlations to both existing and future digital microwork; the mechanized design elements for executing microwork projects, including drivers, challenges and opportunities, and ultimately the potential for future impacts via microwork, on individual and collective levels, with focus on increasing social impact, and volumes of action.

In turn, this combined understanding will suggest the formation of a new microwork model, as well as a business model canvas for evaluation, by helping to suggest the theoretical and physical components required for success, such as new socially-based drivers, tools, mechanics, success metrics, and processes.

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DEDICATION

Written for all those who seek to do good in the world: the visionaries, enablers, aggregators, and (positive change) makers. May you and your impacts flourish!

Together, we can do anything—*so let's do something good*—because every little bit counts.

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01 | INTRODUCTION

> "We are becoming aware that the major questions regarding technology are not technical, but human questions." – Peter Drucker

There are days that start off like any other day, yet end quite differently—driving volumes of change and impact in the course of one's life. One such seemingly innocuous day was a sunny Saturday in late November of 2009, when my brother Goran insisted we go see a documentary film entitled *Taking Root: The Vision of Wangari Maathai* (Dater & Merton, 2008). Admittedly, I had not wanted to go, and in truth, he had exercised personal influence to get me to the theatre; he felt this film had merit, and indeed had been correct; yet neither of us would realize for years to come just how much.

The documentary told the story of Ms. Maathai, a young, well-educated African woman, who upon studying in the west, returned to find her Kenyan homeland devastated by a looming ecological disaster. Ms. Maathai decided to create impact on the ecology of her nation by facilitating communities of women to plant trees, a project which began as a localized joke—and ended as a national success that influenced not only the ecology, but also the democratic process of her nation.

The documentary planted a seed of thought in my mind—small, strategic, deliberate actions can be aggregated to create projects of massive influence. Seemingly impossible things can be made possible over time. Together, we can do *any*thing, so why not do something *good*?

Indeed, this was the beginning of an internal dialogue that would eventually lead me to seek to become a positive change maker; and alter my professional course from an existing career in graphic design and brand management to a newly forged path via the *Strategic Foresight and Innovation* program at OCAD University; the very reason I am writing, and you are reading, the words on this page.

In due time, Goran would also join the same program, and each of us would come to undertake the challenges and opportunities faced by collaboration and collaborative systems. Influenced by that early documentary-driven narrative, I would

come to focus on the analog to digital possibilities of microwork, defined as the "digital, aggregated micro-actions resulting in a singular (project) whole", where tiny tasks are provided to (and completed by), a vast volume of geo-distributed workers, only to be pieced together to form a singular end-project (Janah, 2009).

The paper below attempts to offer a look at why—and how—this might be accomplished, by offering a new, digital model of Wangari Maathai's original approaches; albeit, with some timely additions (in fact, her Green Belt Movement example is featured as our first case study). Who could have predicted that a well-timed documentary on an innocuous Saturday could have such lasting influence?

CURRENT STATE: GLOBAL SNAPSHOT

Microwork, Complexity and the Behaviour Economy

The volumes and rates of change have been increasing globally: in technology, in economies, in experience. For instance, these rates of change have heralded unprecedented global challenges rooted in interconnected complexity. These complex problems are even at times considered 'wicked' due to their unruliness, and can be defined as "a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Rittel & Webber, 1973).

Interventions within this level of complexity are in themselves complex, and implementation of potential solutions may in fact yield further challenges, and even have the opportunity to make the situation worse via emergent unexpected outcomes (Taleb, 2014). One of the main tactics for dealing with complex problem solving is to iterate: attempt to test the proposed solution of a specific portion of the problem, learn from the process and outcome, pivot quickly and iterate again. In this approach, we may be able to uncover potential solutions that may otherwise remain invisible (Jones, 2014).

However, this process can be labour, resource, and coordination intensive; and most organizations—be they government, private or not-for-profit—may not have the bandwidth to take on that level of complexity individually, or the available infrastructure

to handle the coordination necessary to partner and execute in collaboration. Tapscott argues that the state of global affairs may require us to 'rethink and rebuild' many of our institutions and approaches, and adds that due to the interconnectedness of the internet, people now have the ability to globally contribute towards a just and sustainable world (Tapscott, 2012), potentially utilizing an approach towards self-organized, self-governing entities comprised of diverse contributors that can address global problems via the internet (Tapscott, 2013).

There are a number of examples that showcase this approach, such as the notable Innonatives platform, which allows users to post sustainability-based challenges, provide solution ideas, vote up projects, gain collaborators, raise funding, and ultimately, implement participatory global solutions. This open innovation approach enables solutions for social, economic, and environmental challenges. While individuals, non-government and community organizations can all part-take in the process, the structure of the platform itself appears quite complicated, and requires a significant command of the English language, which may be problematic for global users, and may present structural barriers to participation (Innonatives, 2016).

In short, we require new models that enable action, and an unprecedented number of people to engage these challenges collaboratively in order to tackle problems rooted in complexity—and perhaps in time, even to sufficiently grow to be able to significantly impact such 'wicked problems'.

Of course, further research is needed on *how, specifically* individualized approaches or aggregate initiatives might be combined together, to attempt to impact areas of problems rooted in complexity. This paper endeavors to present a model by which we can engage a large volume of enabled workers to perform an increased number of small yet collectively significant, volume-oriented tasks. Additional research is needed on how to engage these workers in the resolution of wicked problems specifically.

Additionally, the last decade has heralded a disruptive change in the ways people live and engage—with organizations, services, things, and each other—toward the paradigm of the behavior economy, in which we are moving away from commodified purchasing, towards seeking increased meaning and engagement with services that allow

us to behave in memorable ways, and to participate in community. The economic model promoted by the behavior economy is a model where behavior is the main goal of our actions, and where intrinsic motivation is the key to participation, engagement, and the satisfaction of multiple dimensions of value (Hastrich, 2015).

The emerging business paradigm behind the behavior economy allows for the creation of new models, through the use of interconnected, platform-driven ecosystems that shape information flow towards desirable user experiences. These new approaches are disrupting the existing economic model of production by generating revenue based on the consumption of ways of 'being', rather than the consumption of 'having' a product. Instead, the behavior economy is transforming the lives of people by creating value via the production of experiences that people want to engage in, as well as showcase to others (Manu, 2015).

Thus, the potentiality of community-driven, participatory, and meaning-based impact is of interest, especially within aggregate, user-engaging approaches.

However, a challenge that impedes aggregate impact is the notion that people themselves are at times experiencing personal challenges, and can be overwhelmed by the volume of negative reporting in the media that leads to feelings of anxiety, alienation, and lack of agency; and thus, the perception of inability to tackle large problems outside of their own immediate lives (Gregoire, 2015).

Furthermore, within behavioural economy, the potential impact of the experiential digital self can be lost in the noise of immediate yet impact-less actions, such as a Facebook 'like'—where perceived action is taken, yet no measurable, lasting impact is captured (Schweisberger V. & Billinson J., 2014).

One potential answer to these individual agency challenges is to lower the barrier to entry of individual action, while offering the perception of immediacy of a Facebook 'like', yet, in a framework that is able to capture and aggregate the impact of these actions over time.

A model that facilitates this action is is the microwork model, comprised of tiny, approachable actions that are distributed to, and undertaken by many workers, and pieced together to form a potentially impactful aggregate (Janah, 2009). Effects of

simultaneous vs. sequential process on distributed work are examined (Andre, Kraut & Kittur, 2014).

Although microwork lends itself quite easily to the digital platform, there are examples of aggregate impacts in the analog world also. This paper will examine the social impact presented in Wangari Mathaii's Green Belt Movement, and illustrate the individual and collective social impacts the movement garnered, in order to translate them to the potential approaches available to new digital microwork business models, and how they may be better leveraged for not only capturing micro-action impacts, but also driving social cohesion (Maathai, 2004a).

Thus, this major research project will focus on the main question of:

"How might we create a new model of microwork to enable and sustain gamified projects that drive social impact through individual action in complex aggregate solutions?"

Additional Areas of Inquiry will include:

- How might aggregate collaboration be of assistance in capturing lost capacity of individuals, time and economies?
- How might we enable large, complexity and volume-based projects via collaborating in great numbers?
- How do we enable action and outcomes with a positive social impact, to drive social impact and cohesion?

The purpose of this inquiry is to research microwork business models, and correlate them to experiential behavioural economy approaches, in order to explore a new model that:

- Enables and incentivizes individuals to contribute microtasks to a greater whole (project), to:
    - create positive aggregate social impacts via completed project outcomes;
    - achieve an increased sense of social cohesion and agency via micro-participation in positive, aggregate action;

- connect to a digital, gamified experience design with ease; and
- create an engaged, fun experience

This major research project is undertaking this task due to the inspiration created by the Wangari Mathaii documentary (and the analog microwork impacts it featured), in order to create and offer a new experience-based, digital microwork model, so that its availability, implementation, mechanics and approaches might incentivize micro-task action from a greater number of people, in order to drive an increase in positive social impact via microwork outputs.

The desirable outcomes of this project include advancing thinking and dialogue on the topic and experience of microwork to drive positive impact and social cohesion through collective micro-actions; suggesting approaches, mechanics, strategies, and tactics for implementation of the new model; as well as the discussion of its future possibilities, next steps, and the potential implications.

02 | METHODS

"You've heard of software-as-a-service.
Well this is human-as-a-service." – Jeff Bezos

This Paper gathered and synthesized information via three types of research methods, including a literature review, case studies, and expert interviews. These approaches were chosen in order to synthesize learning, and suggest a new microwork model, created by gathering information about existing models in order to combine the mechanisms within them with elements from new yet impacting theories, and to add additional inputs garnered via real-life experiences of subject matter experts. As the microwork model we are suggesting did not yet exist, extensive primary research on an individual user level was not performed—as it would have been illustrative of the current status quo rather than future possibilities. Instead, a large-scale theoretical review was implemented to compare current theories, assess existing models, and combine with new theories in order to derive a new model—and showcase possible implementation.

The methods and outcomes undertaken in this major research project can be visualized as:

Figure #1: Research Methods and Outcomes Visualized

1. Literature Review

To begin, a non-exhaustive literature review was performed on the topic of microwork, including journals, periodicals, books, conference slide decks, video talks, et al, in order to gain fundamental knowledge of the topic, and begin to form a relational view of existing microwork models, assess an opportunity space, and begin to frame a potential impact direction.

Preliminary research yielded an interesting possibility—where gamification and gifting mechanisms might become action drivers for microwork (as an opportunity gap), with a distinct potential for positive social impact and social cohesion enablers; in addition to the current practice of impact via worker remuneration. At this time, a greater breadth of literary research was performed to assess the potential to adjust and improve the microwork model, with emphasis on the following impact factors:

1. The increase in microwork action via the mechanism and motivational feedbacks of gamification
2. The potentiality of social impacts via a gifting remuneration mechanism within microwork projects, where theories of Maus and Durkheim were instrumental
3. Further questions were posed about the possibility of impacting and increasing social impact through the use of the combined use of the gifting mechanism and behavioral economy approach and what it may mean for the future model of microwork
4. An approach to innovative implementation was suggested.

Additional input was explored in the areas of complex (and potentially even wicked) problems, technology barriers and availability, digital platforms, behavioural change, business model innovation, and others.

2. Case Studies

The literature review research uncovered areas of additional interest, while case studies of existing microwork examples were chosen as deliberate, external points of focus—in order to discover descriptive or exploratory questions within these areas such

as 'what' happened, and 'how or why' it happened (Yin, 1984). Many other case studies were not included, given that there were numerous examples available; and the ones chosen were included because they best exemplified a progression—a model evolution—that would enable a new model to be created by innovating around the existing elements.

Thus, the table below showcases the chosen case studies, why they were chosen, and what the specific case study contributed to the overall creation of the new microwork model:

Case study name	Why the case study was chosen	Contribution to new microwork model
Wangari Maathai and the Green Belt Movement	This case study showcased an early (analog) example of community-based micro task participation that created lasting and significant social change	This example illustrated that mass-scale, lasting social impact is possible via analog microwork action, and noted the use of narrative and importance of community and culture
Amazon Mechanical Turk	This case study featured the microwork mechanisms of a well-documented, ubiquitous platform with global reach, many projects, clients and microworkers.	This example showed two items: 1. A salient use of culture within a platform, and 2. Opportunity gaps - since AMT is microtask-based, and garners a large worker community, yet does not strive to create positive social impact specifically, or utilize gamification or gifting mechanisms, opting for a transactional revenue-based model
Occupy Sandy	This case study illustrated a 'pop-up' microwork example focused on user-led, mission-based projects that were executed in response to crisis aid	This example illustrated what is possible with the combination of digital platform distribution, combined with the resources of an existing network combined with real-world community settings
FoldIT	This case study showcased a useful utilization of gamification mechanisms within a scientific setting	This example illustrated how a gamified mechanism can be used to solve problems via mass participation, and to resolve

		resource barriers such as time, effort and skills distribution
SnailMailMyEmail.org	This case study is a differentiated, positive example of the types of social cohesion increase possible when gifting is utilized within the mechanism of microwork	An example of a working gifting mechanism within a microwork platform, in which participants not only donated time, but also resources.

Table #1: Case Studies, their relevance and model impacts

Together, the above Case Studies contributed key information to the synthesis and ultimately to the new direction for the proposed microwork model, its potential effects, approaches and structural mechanisms. Knowledge gaps were noted, and expert interviews planned in order to fill the discovered knowledge and opportunity spaces.

3. Expert Interviews

Microwork is a relatively new process, and as such, there is a possibility for the model to be impacted in numerous ways. As literary research yielded pertinent topics, gaps of knowledge were apparent in specific areas that showed promise towards desirable impact. It was noted that expert interviews would be beneficial in order to further assess the depth of potential within these topics, and provide the potential of influence towards microwork model change (toward social impact and cohesion). The knowledge gaps and opportunity spaces left by the Case Studies and other microwork examples were instructive in yielding new questions—which were then posed to the subject matter experts in the expert interviews.

Therefore, expert interviews were performed for the following topics:

Topic	Expert name and title	Why the topic was chosen	Key topic considerations	Topic contribution to new microwork model
Social Organization for Social Impact	Clarissa Chandler, *Managing Consultant and Organizer,* LCC Consulting and Services	Discovery of social impact potentials, their organization, process and potentials	In your expert opinion, what do you believe are some of the biggest social issues today? In your expert opinion, what	Illustrating the benefits and possibilities of social impact models, and how they might be relevant to the new microwork model

			are your thoughts on individual social impact? In your expert opinion, what are your thoughts on collective social impact? In your experience, how might we best incentivize individuals or groups towards positive social action? In your expert experience, how might we contribute towards social cohesion via impact action? What else have we not yet asked you?	
Microwork	**Sharlene Brooks,** *YUTE Project Lead,* **icdgroup.net**	Real-world implementation of the digital microwork model of the YUTE project; how it functions and what can be learned and improved in the new model	What are some basic game mechanics? What are components that elevate and enrich play experience? How can players be incentivized to return? Are you aware of any games that capture the energy behind the game play, and do something with it? What haven't we asked you?	Assessment of challenges, barriers, opportunity gaps, scaling and feedback of the real-world implementation of the theoretical model.

Gamification	**Ryan Fitzgerald,** *Narrative Lead,* **Evodant**	Elements of gamification and how they might apply to the microwork model specifically	What are some basic game mechanics? What are components that elevate and enrich play experience? How can players be incentivized to return? Are you aware of any games that capture the energy behind the game play, and do something with it? What haven't we asked you?	Gamification as a means to enable microwork micro-actions; enable users and create a drive for participation
User Gaming Experience	**Jason Entine,** *Sponsorship Manager, (and Gamer),* **Strategy Institute**	Understanding gaming experience, how it impacts users on an invidivual level, and how it might be utilized to create community and social cohesion	What is the game you play, how often do you play it, and for how long? Why? What is your incentive to return? What is the impact of community of your gameplay? What is the experience like? Has gameplay impacted your regular life, and if so, how? Is there anything valuable we have not yet asked you that you think needs to be added?	Elements of the user experience and how they be synthesized into the new microwork model, to drive action, assist in creating community, and potentially impact social cohesion

Inclusive Experience Design	**Jess Mitchell,** *Senior Manager Research + Design,* **Inclusive Design Research Centre OCAD University**	Assessing whether elements and considerations of Inclusive Design can be utilized to impact the microwork model in order to increase user interaction	What is the essence and purpose of Inclusive Design, and how can it be utilized? How might we utilize elements of inclusive design to create microwork platforms and processes that enable all potential users? How might we increase the quality of rich, deliberate design experiences, to incentivize user interaction through experience design?	Inclusive Design considerations, and how they may be utilized to lower barriers within the microwork model, especially via visual and verbal language, as well as cultural and technological barriers
Mobile Development, UX/UI	**James Eberheardt,** *Mobile Developer, Technical Director, Internet of Things and Mobile Platforms,* **Echo Mobile**	Assessing how element of structural UX/UI design might impact microwork model adoption and usability	How does traditional programming utilize elements of Microwork? How does Microwork relate to Open Source Projects? ex. Wikipedia The Structure of Open Source software, and how actions are enabled? ex. Leaders leading meaningful change ex. GitHub Open Source The Culture of Open Source programmers, and how actions are incentivized?	Elements of mobile development, and how the new microwork model can be positively impacted by the current opportunities and constraints

			How might Microwork become a richer experience?	

Table #2: Expert interview topics, their relevance and model Impacts

Each interview was conducted over the phone, and lasted between 30—60 minutes, depending on the depth of expertise and length of answers provided. Each interviewee provided verbal permission for their name and indirect quotes to be used in this Major Research Project—with full knowledge of its intended use and publication, as well as a recording of their interview to be saved, yet not shared publicly as a recording. Each Interviewee was first provided with an explanatory framework for this research project, as well as, for the areas of expertise they would be asked about. Extensive notes were taken during each interview, and sense-making models created from the knowledge derived—in order to be able to drive towards innovating a new microwork model.

The expert interviews proved to be quite instructive in knowledge development, and were instrumental in the data synthesis the research area; resulting learning is examined and further discussed in the Findings, and Conclusion sections.

4. Data Analysis and Synthesis

The Literary Review research information, lessons gleaned via Case Studies and qualitative data gathered via expert interviews were combined to identify an opportunity gap within current microwork models. The goal was to reframe and suggest a new microwork model that drives participation and potential positive social impact on individual and collective levels. This endeavor has proven to be successful; this paper has synthesized gathered learning to suggest a new model of microwork, as well as a means of targeting social impact in microwork projects via a new microwork social impact canvas. Additionally, an example of implementation was suggested to showcase process possibilities, and embody the newly presented (yet theoretical model) as a purposive, implementable innovation.

LITERATURE REVIEW

Complex Problems and Aggregate Action: Nudge nudge

"Never waste a good crisis"—Winston Churchill

The number of people in the world is the highest today than it has ever been (The World Bank, 2016); environmental upsets due to climate change (NASA, 2016), disruptions within markets, and rates of change in technology are ever increasing; in short, complexity is on the rise.

As access to resources is becoming more competitive due to our increasing population combined with the decrease in natural resources, there is a possibility for the competition and unequal balance of resource distribution to lower social cohesion, eventually contributing to civic unrest (World Economic Forum, 2016).

Thus, there are four timely, relevant needs: first, to continue to enable work and potential impact on the problems we collectively face as a society; second, to increase perception of agency within the individual, in order to drive participation and volumes of action; third, to enable perception of social cohesion so that we might lower the potential of civic unrest; and fourth, to increase education as part of the microwork mechanism, so that we may drive learning towards increased task complexity, and therefore perhaps be able to collectively tackle wicked problems in time.

These combined elements are contributing to an overarching need to accelerate and drive approachable, positively effective solutions that are based in problem-solving implementation.

However, problem-solving within complexity has high inherent elements of risk, and requires flexibility of approaches and implementation, as potential 'solutions' may in fact yield further problems (Churchman, 1967). Some solutions may affect the whole in a different way than originally planned, largely due to their inherent confusion factors and multiplicity of actors, causes, and consequences (Rittel & Webber, 1973).

As such, Buchanan notes that the formulation of design thinking approaches within complexity offers a non-linear structure, as well as a refusal to adhere to a single problem solution. A salient approach is to iterate the solution within a phased process; pilot test the proposed idea; quickly gather information from the outcomes of the process; change and improve what is necessary; and 'pivot' (change direction) to iterate again in a new phase, continually learning while advancing the process forward (Buchanan, 1992).

Using this iterative, phased approach, we may be able to drive solution sets closer toward desirable outcomes by slowly adjusting course, as a sailor adjusts the sails to a changing wind. A challenge with this approach is that it is labour-, resource-, and coordination-intensive, within a complex situation that may be growing in intensity over time; in short, our complex problems require timely and coordinated action; to extend our sailing metaphor, we are called to an 'all hands on deck'.

However, most organizations, regardless of their existing business model, currently lack the infrastructure, organizational capacity, and resources to tackle this level of complexity single-handedly. Although partnerships of multiple organizations are salient and their outputs can certainly be fruitful, these may not actually garner the volumes of activity necessary to truly affect the size of the problem in a cogent way, due to their formal structures and internal rigidity.

These "inter-related dilemmas, issues, and other problems at multiple levels of society, economy, and governance" (Weber & Horn, 2007) are calling for an unprecedented number of actors—people as workers or players—to take on the planning and execution of the challenge in a collaborative way through the use of distributed cognition and human computation enacted toward problem solving (Michelucci, 2016).

This paper does not presume to answer the question of *how to specifically solve* seemingly individuated, yet effectively highly interconnected wicked problems. By their very nature, these 'problems' are—and by their very definition—postulated as effectively *unsolvable* (Weber & Horn, 2007). However, this paper does suggest that the mechanism of microwork, if adapted for further alignment with social impact, may

provide the necessary distribution and volume-based approaches that could aggregate efforts to help create desirable types of impact via structured, monitored projects with increasing levels of task complexity.

In this regard, Pekka Hipponen speaks to the need for collective agency combined with deliberate, implementable strategy, and asks how we might envision our legacy—individually and collectively—to enable the mass collaboration success that is needed (Hipponen, 2014).

We are seeing examples of this already; in his thesis titled *Participatory Aid Marketplace: Designing Online Channels for Digital Humanitarians*, Matt Stempeck writes "Recent years have seen an increase in natural and man-made crises. Information and communication technologies are enabling citizens to contribute creative solutions and participate in crisis response in myriad new ways, but coordination of participatory aid projects remains an unsolved challenge" (Stempeck, 2006). Participatory aid is only one of the areas that may benefit from mass impact; the urgent need arises in numerous situations calling for a need in quick process and organization that enables people to contribute and act collaboratively.

A Potential Answer: The Microwork Model Benefits, Elements, and Functionality

A model that intentionally engages participation on a mass level, the microwork approach "…breaks down large data projects and identifies smaller tasks that can be simplified and distributed to workers through an innovative technology platform (Janah, 2012).

Thus, the microwork model takes large, unapproachable solutions, breaks them down into small, manageable tasks, and via a digital platform engagement, distributes these tasks across a large, active population of workers, thereby providing the possibility for action via completion of microtasks.

Complex Problems and the Microwork Model: Potential Organizational Benefits

This approach can be quite remarkable for organizations experiencing change, as competitive, strategic action becomes necessary in disrupted markets, while the cost and risk for innovation (the proverbial route to stay market-relevant) keeps increasing due to the rising cost of most resources. Organizations are experiencing a challenge staying relevant in increasing rates of change; and microwork can be a salient way to acquire a quick, distributed labour force to perform low-cost iterative innovation cycles (Kotter, 2013). Furthermore, microwork approaches can be a salient way to increase project execution, lower risk, save time through a greater workforce, and increase overall ROI (return on investment).

Complex Problems and the Microwork Model: Potential Individual Benefit

In the same way that organizations are experiencing heightened risk due to increased competition and difficulty staying relevant in shifting markets, people are experiencing similar stressors on an individual level. This is due to increased rates of change (such as with changing technologies), competition for resources (jobs and wealth, for example), increased anxiety due to an overwhelming volume of negative reporting in the media, and a general overwhelm about the state of affairs globally (Gregoire, 2015). Social media gives individuals an unprecedented view into the curated versions of others' lives, while they experience the totality—and messiness—of their own; feelings of failure and disconnectedness, and of 'not-good-enough' are pervasive. People experience a perception of a lack of agency toward the number and largeness of problems rooted in complexity, and their own individual, personal, relative smallness (Zeitel, 2014).

Thus, if we are to create the necessary volume of change, we need to increase the perception of agency within the individual, as well as within society at large; lower the barriers to action in order to capture lost capacities; enable approachable technologies of use; incentivize repeated action to drive project completion; and build supportive culture and community. Also, within the behavioural economy environment, immediate yet

ineffective actions—such as a Facebook 'like', for instance—can initiate a perceived individual action with no lasting aggregate impact, which represents a lost opportunity for captured action (Samson, 2015).

Microwork: The Functional and Behavioural Elements

In order to facilitate mass action, microwork requires an enabling mechanism that connects workers and project providers; this mechanism can make it possible to distribute individual tasks and allow them to be aggregated upon completion.

Some functional elements of microwork:

- **Microwork Platform**: the digital infrastructure that forms a user interface (platform) which acts as a cohesive medium to allow people to post and complete tasks.

- **Clients** (also known as task providers, or requesters): individuals or organizations that generate the original project task requirements, and put them on the microwork platform (for completion by workers). Clients might include individuals such as new media content creators, startups, not-for-profit or for-profit organizations, research bodies, aid agencies, and governments (Gino & Staats, 2012).

- **Microworkers,** (also known as workers, users, players, contributors, agents, turkers, or gifters): members of the independent, distributed workforce who individually complete tasks to submit back to clients for approval. Microworkers can be comprised of any individuals with access to the technologies and resources required to access the microwork platform, and complete the requested task.

- **Micro-tasks**: the minimum viable size of task that an individual can contribute to a whole (project).

- **Macro-tasks**: tasks of increased complexity, which may require a greater skill set from the worker (Janah, 2009).

- **Task Complexity**: the level of complexity inherent in the micro-task; simply put, the level of understanding and problem solving a worker needs to have in order to complete the task (Wood, 1986).

- **Task Accuracy** is an important factor of microwork, and has two varieties:

    - **Statistical Objectivity** refers to the accepted baseline truth as dictated by the majority of workers having completed the same task.

    - **Subjective Accuracy** refers to the personal opinion items, such as aesthetic or survey tasks, and the level of honest reporting a worker engages in to complete them.

- **Task Clarity**: the level of understanding of the task goal that is offered to, and understood by, the worker (Anderson & Stritch, 2015).

- **Task Completion Speed**: the amount of time that passes between a worker accepting and completing a given task.

- **Task Approval**: the required client acceptance of a completed task

- **Task Approval Rate**: the average approval rating an individual worker receives from all previous clients they have worked with; this is indicative of a workers' standard (Sarasua & Thimm 2014).

Microwork Project: the beginning project challenge from which individual tasks are created (Janah, 2009).

The Process of Microwork

Existing microwork platforms act as intermediaries between clients and microworkers, where a single individual or larger organization client is able to post a project. The project is divided into microtasks via the platform mechanism, or may be initiated and dispersed into microtasks via client-provided online code. Once a project is initiated, the tasks are posted for workers to select, and can include any minimum viable action, such as the act of transcribing data, translating language, drawing on an image, or

clicking a link (Kittur & Nickerson et al., 2013).

Having selected a microtask, workers are incited to complete the tasks, and may be timed on their speed and efficiency of completion, as well as their task approval rate upon completion (if accepted as salient and worthwhile by clients). Clients often have the final choice of whether they will remunerate the worker or not, based on task acceptance, which is linked to task accuracy, and may be tracked in accordance to the worker. Workers may have low task accuracy due to low task clarity, meaning that they misunderstood the goal of the task, and therefore completed it incorrectly. This can occur due to physical, mental, technical, cultural, and language barriers, among others. Workers may also exhibit low subjective task accuracy if they are clicking without true discretion or purposeful meaning in order to garner the highest pay with the lowest amount of time and effort spent, or, if they are deliberately completing a task incorrectly (Lehdonvirta, 2016).

An aggregate project is created when the microtasks are aggregated back into a whole, and may result in the originally intended outcome, or, may be different than the original plan, in which case the client might consider a new iteration of the microwork project with amended microtasks, based on lessons learned, and new direction provided.

The process of microwork, as a form of human computation, can be represented graphically as:

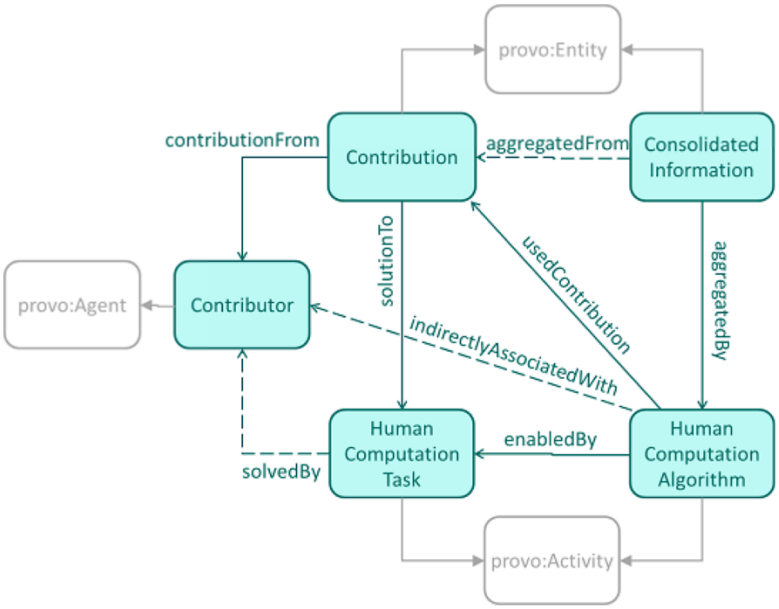


Figure #2 Microwork as Human Computation Cycle

Adapted from original created by *Human Computation Ontology*

In this diagram, the human computation task is representative of a microtask, while the human computation algorithm allows the microtasks to be aggregated into a whole (consolidated information) via workers (in this case referred to as contributors).

It is notable that microwork is not only a form of human computation, but also of crowdsourcing, which is defined as a type of participative online activity in which a requester proposes the voluntary undertaking of (a paid or unpaid) task to a varying group of individuals, via a flexible open call (Estellés-Arolas, 2012). However, microwork is distinguishable from other forms of crowdsourcing in that it focuses on microtasks (as minimum viable tasks), instead of tasks of variable size and complexity. Microwork is also a form of outsourcing, which is defined as the utilization of sources outside of the organization to develop the internal business (Troaca & Bodislav, 2012).

As such, the elements of work within the microwork model can be undertaken simultaneously or sequentially, and in their work on the subject, Andre, Kraut & Kittur illustrate that it is in fact the sequential process that creates appropriate allowances for online teams to undertake distributed tasks, in order to generate aggregate complex products; however, within this approach, coordination of activities and people becomes a challenge in order to minimize process loss, the challenge of which increases with task complexity, and growth of group size (Andre, Kraut & Kittur, 2014).

Furthermore, microwork and other types of crowdsourcing often incite the creation of digital and aggregate (real-world) communities of microworkers who support each other in their process by answering questions, learning form each other, taking leadership roles, and fielding process recommendations. Due to the fact that formal structures of microwork are simplified to ease efficiency and maximize client time investment, these types of supports are often excluded from formalized structures, and even if they exist, may be worker-led on the microwork platform (Lehdonvirta, 2016).

The Individual and Social Impacts of Microwork

The process noted above is indicative of the functional mechanism, or model, behind digital microwork platforms, and analog microwork projects. However, arguably the greater interest behind microwork lies in its potential and positive impacts toward the people—its users, or workers—and their expanding areas of influence.

Samasource is a US-based not-for-profit venture that specifically creates microwork projects for impoverished female and youth workers in African regions in order to offer remuneration (Gino & Staats, 2011). To describe the impact potential of microwork, we have adapted the Samasource model to depict areas of individual and societal impact:

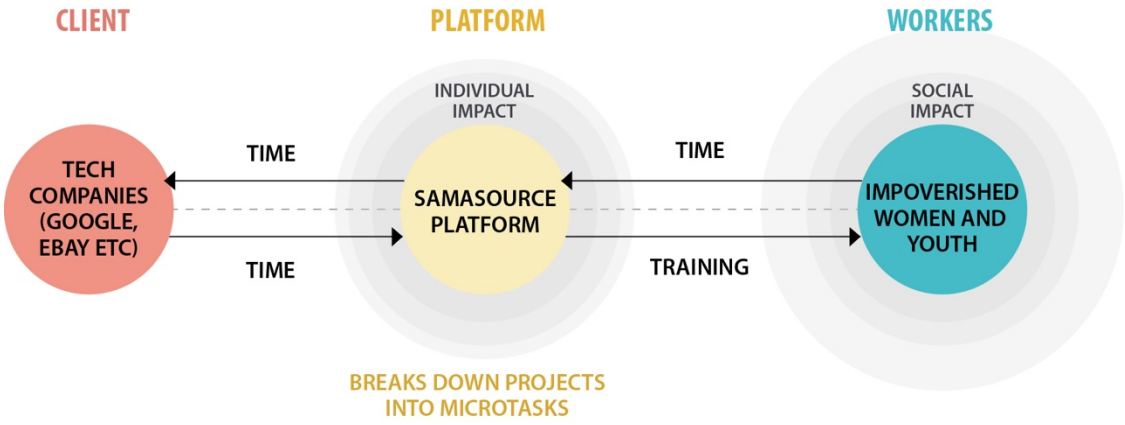


Figure #3 Microwork Impact Sourcing Process

Adapted from the Samasource Model accessed via http://www.samasource.org/model

Notably, the model of microwork for Samasource is to take on the data-driven projects of their technology company clients, such as Google, eBay, Microsoft and others, and to process these data tasks into microtasks for completion via a distributed microworkforce, which, in this example, is comprised of impoverished women and youth. The clients save time by taking advantage of a large, available workforce, while workers are offered remuneration and additional training (Lehdonvirta, 2016).

However, the social impacts that occur as one of the outcomes of this mechanism are important; given that, individual workers gain remuneration—personal wealth—that they might otherwise have little or no access to, which can significantly affect their lives. The remuneration and training offer workers the basics for life and, eventually, an increase in personal freedom due to the wealth earned. Additionally, as each person is able to improve their own livelihood and gain further training, their potential impact also increases as the volume of workers increases; such that they are able to collectively affect their social environment in a positive way by raising skills, knowledge and standards of living (Janah, 2011). However, this model leaves opportunity gaps; in addition to the monetary wealth and the inherent training offered to its workers, there are other possible areas of potential impact—such as, providing additional personal growth and satisfaction through increasing task complexity, creating a more engaging

worker experience, and offering a greater means to drive community. These options will be explored further below.

Microwork Audience Focus: Organizations, Collaboratives and Individuals

As the visual example of the Samasource model shows above, and the case studies which follow in the Case Studies section illustrate, current microwork platforms mainly focus on the following audiences:

Primary—Current focus: B2B (Organizations)

B2B Small- to medium-sized teams, connected globally via platform provider to a large, distributed microworker base

Secondary—Project Focus: P2P (Collaboratives)

Individuals running their own 'solution engines' (Example: people in developing countries running their own projects)

Crisis response and pre-crisis preparation

Tertiary—Suggested Focus: Aggregate Action for Social and Academic Good

Proposed focus on required development:

Academically (providing research opportunities)

Financially (in developing world)

Socio-cohesively (in developed and developing world)

However, there is an opportunity to reframe the way the microwork model addresses users, with a suggestion to further explore the audience types and facilitative mechanisms, in order to further user interaction and potential social impacts. These elements will be discussed further in the Findings section.

Microwork, Drivers, Human Factors, and Behaviour

The complexity of problems and the need for timely solutions necessitates that the microwork mechanism (be it digital platform, community engagement, or network) be highly effective, and engage users quickly and simply. Since the digital platform acts as the cohesive medium that connects workers to tasks via technology, human behavioural elements can be used to drive the rate and accuracy of action.

Drivers

A driver is defined as a deliberate incentive to generate a behavioural outcome; therefore it can be said that within microwork projects, clients and microworkers have distinct drivers, and act in different ways. For instance, clients are incited to enact microwork projects via several drivers, such as the ability to outsource tasks to a larger pool of available workers in order to save time on project completion (where increasing volumes of tasks can be mitigated by an increasing volume of workers in the same amount of time); to decrease costs of task completion via a lower average wage; to lower the risk of testing a business direction or innovation via task distribution; to increase security of a project by allocating distributed tasks to a large, non-connected pool of distinct workers (in order to disambiguate information); to perform research that may otherwise be unapproachable due to volumes; and to be able to measure and iterate quickly.

Microworkers may also be incited to perform tasks through several drivers, such as (economic) monetary remuneration for a completed task; (social) status recognition by a group or network; and (personal) gain such as additional learning via participation, a rise in self-esteem, belonging, or contribution by completing a task (Lehdonvirta, 2016).

Although current microwork platforms and mechanisms certainly use these drivers to create mass action, as in the cases presented in our Case Studies below, when reviewing the current literature on the topic, one may note that current platforms focus

extensively on microtasks that are simple, and *not yet* part of a gamified participation mechanism.

A gamification mechanism that could be used to incite action can be depicted as:

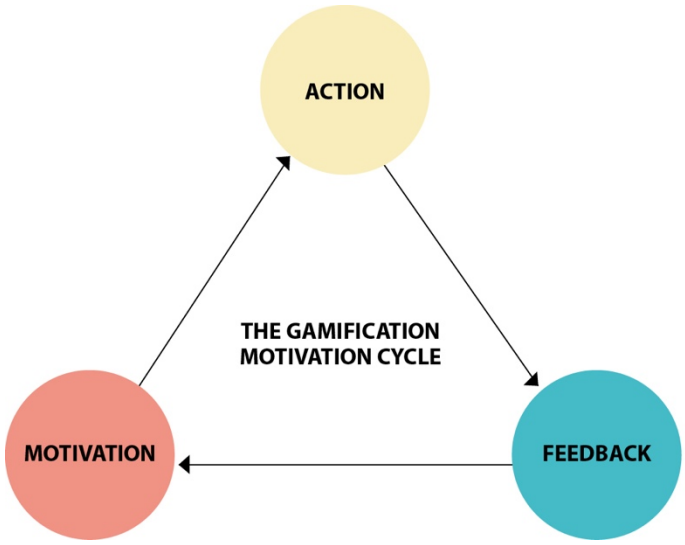


Figure #4 The Gamification Motivation Cycle

Adapted from the original created by *The Power of Gamification*

Furthermore, if each task is presented as a single, stand-alone item, it does not inherently drive continued action, especially if the task itself may be repetitive, or potentially boring. However, individual tasks can be reframed via the microwork platform mechanics to instill culture to drive further action and education. In this way, each task is seen as part of a larger whole through the gamification elements used, so that each task is rewarded, a motivation presented (in addition to the remuneration), and education instilled (if needed and appropriate), in order to drive future actions over time.

This mechanism can be depicted as:

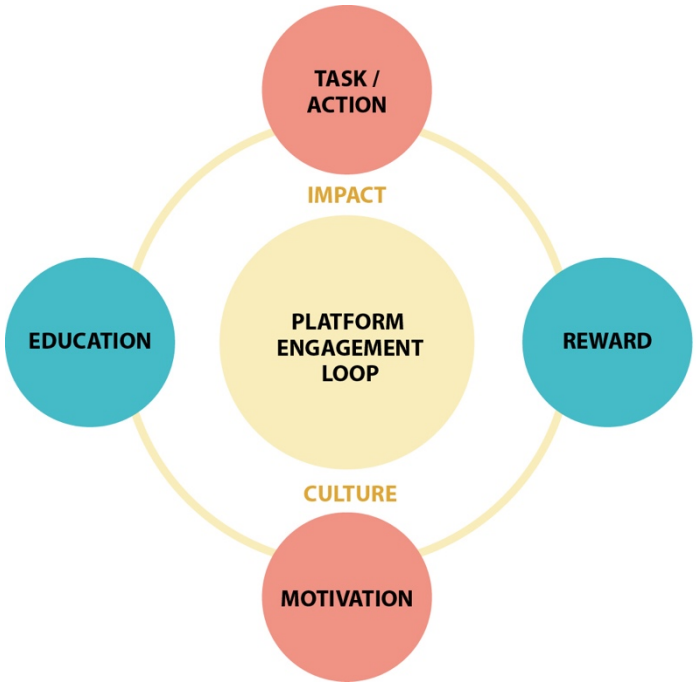


Figure #5 Platform Engagement Loop

Adapted from the original created by *The Power of Gamification*

Additionally, platforms do not yet allow microworkers to rate the types of tasks they perform by category, thus missing an opportunity for a worker to identify a more desirable and appropriate type of task (Lehdonvirta, 2016). Further notions on gamification are explored below in the Opportunities section, as well as within the Findings section.

CHALLENGES

Any approach, method or model—no matter its positive impact potential—may experience challenges and opportunities for improvement, and microwork is no different. In their paper on the Amazon Mechanical Turk as a seminal example of digital microwork, Lily Irani writes on the notions of "fair treatment of workers, lack of creativity in microlabor, and the ethics of microwork" (Irani, 2013). This paper will explore some salient challenge spaces, and utilize them to drive the creation of a new microwork model.

Impact Challenges: Unplanned Externalities and the Process of Labour

Unplanned externalities are defined within economic theory as 'an event (such as cost or benefit) that positively or negatively affects a party who did not choose to incur that impact. A real-world example can be noted when smoke from a factory is harmfully affecting the people living in the neighbouring area; this would can be seen as a social impact externality, created in addition to the planned product creation (and private economic benefit) generated by the factory (such as running shoes, for example).

In traditional labour markets, these may be mitigated by formal process items such as levied taxes and laws, as suggested by Pigou in the *Economics of Welfare*, which enable a balance between the social and private impact factors (Pigou, 1928); in our example these situations cause the owner of the factory to be liable for both outcomes, therefore minimizing the unplanned impacts through incentivizing correct action. However, since microwork—and micro workers—are geographically distributed, the traditional processes of taxes, laws and liability are unable to meet the demands of balancing potential externalities, due to the breadth of the affected area geographically, politically and socio-economically. In short, since microwork spans geographic lines across nations (and therefore across governing laws), it is challenging to assess and impose liability, and therefore difficult to balance externalities.

This lack of balance, of course, could prove to be quite dangerous; as such, we must take extreme caution at the onset of microwork projects to ensure that externalities

are considered and met with due diligence in order to minimize unplanned negative outcomes, and if any are found in process, that they are fixed as a matter of organizational self-governing, so that longevity is ensured.

This caution is exponentially affected by microwork or aggregate collaboration projects that are self-deriving; that is, which can alter course and self-propel in new directions, since these types of projects are by their nature constantly creating, and derivative of, new externalities (Dumitru-Alexandru & Troaca, 2012).

Impact Challenges: Planned Negative Impacts

Any mechanism or process can be utilized for negative impacts, and microwork is no different; the aggregate product of this process can in fact be purposely negative, with the impact mechanized towards manipulative, negatively impactful, or even nefarious purposes. However, the *Democratization of Power* section below speaks to the opportunity to counter these effects via purposeful counter-activity projects, and suggests a democratized approach in order to maintain order.

The Ethical Wages Challenge

Collectively, there is a question of whether microwork is currently an ethical model of labour. For example, the availability of a large, geo-variable workforce creates an environment in which the average pay (remuneration) for microworkers is below that of a single national average, due to the availability of people who are willing to work for very low wages, thus lowering the collective average wage. Due to the average microwork wage being below the average wage of most nations, it could be considered to be unethical. Due to the low average microwork wage, workers may not be able to garner an adequate living wage while performing microtasks, especially if they live in developed nations, where the cost of living is higher (Scholz, 2013).

The Ethical Worker/Client Search Challenge

Some existing microwork platforms allow clients to specify statistics of their worker pool, such as geo-location, number, acceptance rate, and completion speed of tasks completed; while others hide elements of a worker's specificity (such as geo-location) in order to lower biased algorithms (Scholz, 2013). However, clients have found ways to work around the data barriers, in order to create worker data biases. For instance, in a platform example, clients asked workers to fill out a skill-testing question regarding the sport of cricket, and were said to bias against any correct answer to that question, as the worker may have been located in India, where cricket is a national sport.

Similarly, there is a power dynamic built into some of the platform mechanisms that favors data toward the clients, as they are able to search and collect data about the worker pool, while the workers are not able to rate and categorize the clients. Mutual rating may be beneficial for statistics such as remuneration, acceptance rate of other workers et al, and may allow workers a better return on investment (ROI) for their time and efforts.

Microtask as Lacking Creativity

Workers may feel disengaged from the small—and potentially banal and repetitive actions of their work (Wilson, 2013), potentially causing creativity to be stifled, and the true capacity of worker skills and impact potential may be lost via tasks that are too small and paired down to capture their innovative contribution (Scholz, 2013).

Limiting Factor: Low Technological User Skill Levels

The OECD (the Organization for Economic Co-operation and Development) performed a large-scale technology Skills Research Study, collecting data from 2011–2015, with over 215,942 people aged 16–65, in 33 countries. The results were released in 2016, and OECD findings were able to quantify and illustrate the difference between the general population and tech elite.

The OECD Findings showed that within the population surveyed:

- **5%** of the population showed competency toward enacting **high computer-related tasks** (the tech elite)
- **26%** of the population showed ability to complete **medium-complexity tasks**
- **29%** of the population showed ability to complete **low-complexity tasks**
- **26%** of the population was **not able** to use computers to solve tasks (OECD, 2016)

Mapped by country, some of the results can be illustrated as:

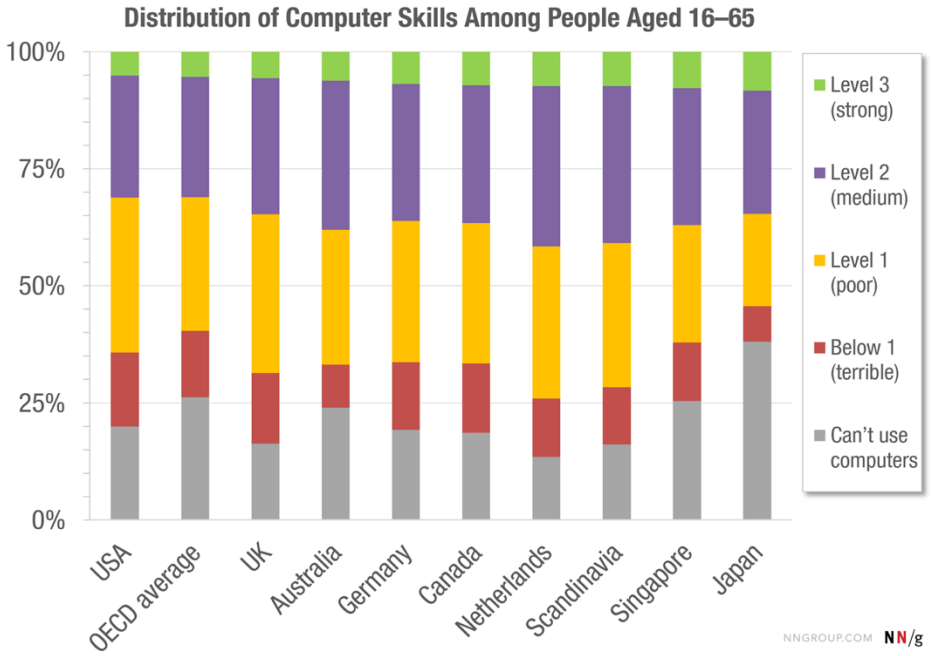


Figure #6 Distribution of Computer Skills Among People Aged 16-65 (OECD, 2016)

The tasks varied in complexity, with specific examples. However, it is notable in the study findings that the majority of the general population surveyed could only perform simple tasks, that required low skill levels to execute. The tasks included a clear, explicit problem with a single step, and a single constraint (ex. using the reply-all feature to respond to three people via email). Thus, an increase in task complexity might potentially alienate a portion of the worker population.

However, given that the study excluded adults 66 years old and older, we can note that it does not in fact depict the totality of the client base for microworkers; further research noted a significant increase in usability issues of this target audience, who may have lower technology skill levels than the rest of the population, and therefore would likely impact the study data (OECD, 2016). In terms of microwork, low computer skills levels translate to a need for simple and clear user interface design that drives easy, intuitive participation while maximizing task clarity, in order to facilitate worker interaction and task completion.

OPPORTUNITIES

Microwork platforms and mechanisms have proven to be increasingly efficient at processing volumes of microtasks via human computing. However, this paper argues that there are still a number of opportunity areas that may increase and maximize current opportunities, and perhaps, illustrate new opportunity gaps. Although this list is non-exhaustive, two major opportunities are listed first:

Gifting Mechanism to Drive Microwork Action

Gifting mechanisms have been part of cultures throughout history; gifts have been implemented to denote gratitude, faith via sacrificial actions, and to mark social importance (Mauss, 1966). However, there is a part of the gifting mechanism within culture that may have salience towards enabling action within microwork model mechanics, especially when combined with gamification elements.

Sociologist Marcel Mauss noted that although gifts are supposed to be perceived as 'free', gifting is associated with embedded social obligations of reciprocity, in which reciprocal gifting becomes a way to make one's social and personal statements of being (such as demonstrating connection, or illustrating personal wealth). Thus, he states, the

'future moment of exchange' elicits an evolving social bond and mutual interdependence that continues to grow over time; and therefore has the potential to build what Durkheim refers to 'solidarity', which can ultimately lead to social cohesion through the expectation of a continued interaction. Mauss noted that gifting has within it elements of both 'magic' and 'spirituality', due to its power to create transformation via bond between giver and gift, and how this bond may (positively) impact the recipient (Mauss, 1966).

Correlating Mauss' theories with Microwork, gifting has the opportunity to create a sphere of transformative exchange, in which both giver and recipient benefit from the exchange, and the gifting mechanism is enabled to elicit a form of positive cultural driver for both the individual, and potentially, greater society.

The illustration below shows the levels of gifting available via microwork:

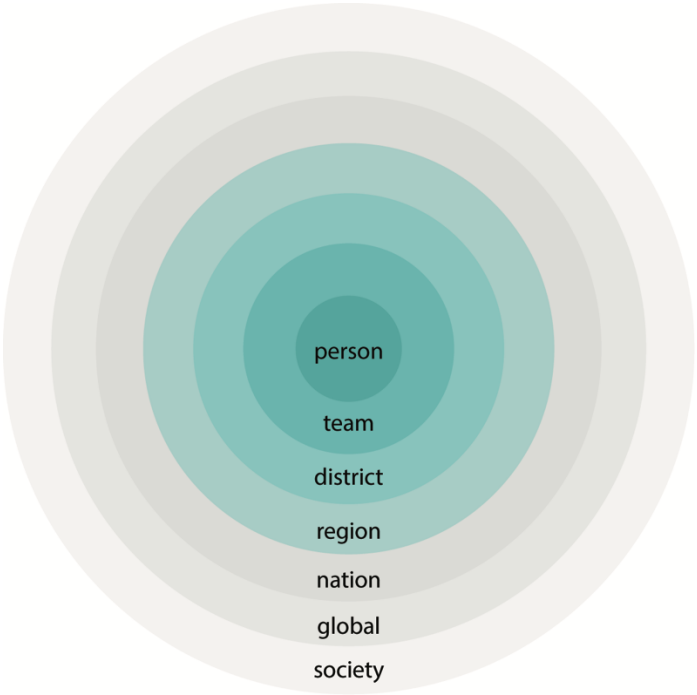


Fig #7: Levels of Gifting and Social Impact Potential
Adapted from original (Sahlins, 1972)

The process and success of the gifting mechanism has been noted in the SnailMailMyEmail case study showcased in this paper, and features a microwork process in which requesters post an email that they would like to have illustrated by a random platform worker, who gift their time, artistic skill, and necessary physical resources (such as paper, art supplies, and postage fee) to the project in order to mail the snail mail version of the requester's original email to a designated recipient. The worker (gift giver), does not in any way benefit from this transaction, other than to have the pleasure of participation, and knowing that their gift will be received. They do not know the requesters (clients), or recipients (end users), and will likely never know the response their gift garnered. And yet, thousands of workers (gifters) have participated in this project, and continue to do so.

If the success of this example is an indicator, we may note the potentiality of gifting mechanisms within microwork models, and their ability to drive future micro-actions. This potentiality is explored further in the 'Findings' section.

Gamification as Driver to Action and Return Action

Within their paper titled *Experiments on Motivational Feedback for Crowdsourced Workers*, Lee et al discuss the relationship between motivational effects on crowdsourcing systems and their overall success rates of both quantity and quality of the work outputs. Gamification and individual/social achievements were examined during a six-month period, with 437 respondents. Findings noted that gamification can increase workers' motivation overall; the combination of motivational features creates the most salient results. They note: "Specifically, gamified social achievement is the best performing design over a longer period of time." (Lee & Dugan et al, 2013).

The paper titled *The Power of Gamification to Drive User Behavior and Engagement* explores the mechanics, gaming dynamics, and human needs and emotions that may be explored via gamification in general, as well as gamification within microwork platforms. They are listed below:

Figure #8 Driving Behaviour through Gamification

Adapted from the original (Enterprise Hive, 2013)

Microwork projects can also utilize the elements within Gaming Mechanics (such as collecting or quantifiable items such as levels, points, badges or ratings), Gaming Dynamics (such as reward and feedback loops, status features, quantified achievements or awards et al), and Human Emotion/Needs (of driver-related accomplishments, linear progress, exercised control over actions, and featured recognition) to create and install drivers that incite microworker and client action, enable task completion, and mechanize return activity (Lee & Dugan et al, 2013). These mechanics have to potential to correlate very well with the meaning derived via experience-based elements within behavioral economy, mentioned earlier.

A salient example of these mechanisms in real-world, applied aggregate projects can be noted in FoldIt (beta), a gamified microwork puzzle game platform, that offers hundreds of protein matching puzzles for players to solve on a free, volunteer basis. This example is further explored as one of the Case Studies featured in this document, showcasing the example of AIDS-related enzyme research project, a portion of which was solved via the FoldIt platform, having previously eluded researchers for over a decade.

Schulz' Platform Cooperativism Model

In his work on the sharing economy, Trebor Shulz mentions numerous challenges with the sharing economy concept, and how it may in fact *not* be fair, or even just, to the individual worker (Schulz, 2016). In fact, Shulz goes as far as to suggest a new model, which he calls the *Plaftorm Cooperativism Model,* which he outlines as having three significant parts:

1. Utilizing existing sharing economy (or microwork) platform technologies, yet with a new ownership model which adheres to "democratic values, so as to crack the broken system of the sharing economy that only benefits the few"; in short, it proposes a change of ownership from the few, to the many, who within the cooperative model are also the workers (Schulz, 2016).

2. Shultz states that platform cooperativism is about ensuring worker solidarity, which he states is often missing within a distributed - and therefore underrepresented - workforce. He proposes a call to action for platforms to be owner/operated, as self-governing, collective-benefitting entities, and for teams, cities, unions and all other types of potential cooperatives (whether multi-stakeholder, worker-owned co-ops, or platform cooperatives) to undertake their own projects, governance, and ultimately ownership (Schulz, 2016).

3. Shultz calls for a reframing of key concepts such as innovation and efficiency towards an understanding that benefits all involved, instead of driving profits towards the few owners, as within previous, non-cooperative models (Schulz, 2016).

The above considerations, Schulz hopes to reposition profit from the few to the many, and ultimately democratize power to the platform's worker base, calling for an additional ten principles to drive resolution of the problems inherent within the existing digital economy, including:

1. **Ownership:** via a people-centered internet, with workers as owners
2. **Decent Pay and Income Security:** ensuring fair wages for all workers
3. **Transparency & Data Portability:** showcasing all types of data collected, and how they are utilized, sold or otherwise benefitted from
4. **Acknowledgement:** ensuring worker rights, an ability to communicate with clients
5. **Co-determined Work:** early-involvement of the audience the platform is meant to impact
6. **Protective Co-Op Legal Frameworks:** legal co-op frameworks that enable and protect while driving correct action
7. **Portable Worker Protections and Benefits:** worker benefits and protections for all types of workers
8. **Protection Against Arbitrary Behavior:** ensuring workers are fairly treated and reasons for action are clear
9. **Rejection of Excessive Workplace Surveillance:** ensuring appropriate worker privacy, and consent
10. **The Right to Log:** planning for adequate and appropriate time off for all workers

In short, the above platform cooperativism model attempts to resolve some of the challenges apparent in current microwork models, in order to reposition power, benefit and ownership back to the worker collective. The above approaches and concepts are a significant opportunity gap, and can be utilized in the new microwork model to ensure fairness and justice for all types of workers.

Open Source Technology

Open Source is defined as a series of changes in the technologies, economic organization, and social practices of nonmarket and nonproprietary production, both by individuals and via loosely or tightly woven collaborations (Benkler, 2006). Largely practiced within areas as diverse as software development and creation of multiplayer online games, open source illustrates an emergence of a new type of information environment, where individuals are enabled to contribute to the industrial information

economy by participating and creating. They may do so as a means of enacting individual freedom, bettering democracy through action, contributing to culture; and in order to achieve improvements in human development.

This notion best be noted in the Wikipedia example, in which fifty thousand volunteers successfully participated in coauthoring an extensive information database alternative to the Encyclopedia Britannica, all for free; and similarly, in the SETI@Home example, in which 4.5 million volunteers contributed their extra computer cycles to aggregately create the most powerful supercomputer on Earth.

In an explanation to the 'why' of these actions, Elon Musk writes that : "We act for material gain, but also for psychological well-being and gratification, and for social connectedness." He adds that within the industrial and information economies, most opportunities to make valuable things were constrained by physical capital requirements, and yet, the open source approach lowers, or even potentially negates, these requirement barriers (Musk, 2016).

This 'net-worked information economy' is characterized by the possibility of decentralized individual action— "specifically, new and important cooperative and coordinate action carried out through radically distributed, nonmarket mechanisms that do not depend on proprietary strategies"—to a degree that would not have been possible in the industrial information economy (Benkler, 2006). This approach has the potential to pair with the other elements apparent within microwork, to enable mass action that is relatively free of bureaucratic elements (such as IP) apparent in more formal project structures.

Plug-and-play Infrastructure as Enabler

The term plug-and-play-infrastructure has been used in the architecture community to connote easily scaleable urban solutions, such as using shipping containers to create quick structures in developing nations (Global Containerized Data Center Market, 2015), refugee camps, and rural areas (Wanshel, 2016). Shipping containers can be refitted to contain cafes, food production spaces, and now also

internet cafes with working technologies powered by solar cells (Saletta, 2016), An example of this opportunity is ZubaBox, an organization that converts shipping containers into classrooms or internet cafes—and powers them with solar cells (Wanshel, 2016). This opportunity would allow microwork centres to pop up in areas that require technology infrastructure, and would also allow for the creation of in-situ community centres.

Human Factors and Inclusive Design to Facilitate Rate and Accuracy of Action

Human Factors (also known as Ergonomics) are defined as 'the design and engineering of human-machine systems for the purpose of enhancing human performance' (Dempsey, 2000). Generally implemented as an iterative process, Human Factors consider the way a person may interact with an interface or environment—such as a microwork platform—within the constraints of their physicality and mental abilities, as well as perceptual items such as understandings and biases of culture and language (verbal and visual). Therefore, designing microwork mechanisms, interfaces and microtask components with Human Factors in mind can increase ease-of-use of microworkers and clients, thus increasing task clarity and completion rates within microwork (Sarasua & Thimm 2014).

Since the nature of microwork is distributed to a variable worker base, Inclusive Design considerations may be used to expand the breadth and width of the potential worker pool. The inclusive design research center at OCAD University defines Inclusive Design along three tiers: recognizing the diversity and uniqueness of each individual in mind; ensuring that the process of and tools used are inclusive; and finally, striving for broader beneficial impact beyond the single intended beneficiary of the design. Inclusive Design points to the possibility of a microwork platform as an adaptive, or flexible system, which can digitally conform to the needs of its current user in order to increase the worker base, as well as facilitate accuracy of task outcomes via design (Inclusive Design Research Centre, 2016).

Democratization of Power versus the risk of purposeful negative action

The ideas presented above also align with the philosophical notions of positive and negative liberty, which allude to an individual's access to potential actions. Negative liberty is defined as "the absence of obstacles, barriers or constraints", while positive liberty is defined as the "possibility or fact of acting — in such a way as to take control of one's life and realize one's fundamental purposes." While negative liberty is viewed on an individual level, positive liberty is often attributed to collectives, and individual members within collectives (Zalta, 2016).

In a recent 2016 interview, Elon Musk speaks about the necessity to create a democratization of power as a means of trying to increase the probability of a positive future outcomes, and although the original question speaks to articifical intelligence technologies specifically, the notion may be expounded to microwork approaches also:

> **Interviewer Question*:***
> *"Do you worry that by making this open, some bad actors may use some of some of what has been developed to do bad stuff (with the power of AI)?"*
>
> **Elon Musk Answer:**
> *"That is certainly a good rebuttal to that. However, I think that if AI power is widely distributed, and there is not, say, one entity that has some super AI that's a million times smarter than anything else; if instead AI power is broadly distributed, to the degree that we can link AI power to each individual's world; like, you would have your AI agent, and everyone would have their own AI agent, then if somebody did try to do something terrible, then the collective will of others could overcome that bad actor. Which it can't do if there's one AI that's a million times better than everything else. And in the beginning is controlled by some small set of people* (Musk, 2016)."

The correlation to microwork can be seen; creating an open source social impact microwork engine may allow users with bad intentions to create purposefully negative impact; however, given the open source structure, that negative impact may be mitigated via the majority of other active microworkers and microprojects. Thus, power must be

evenly distributed to all potential microwork users—clients, microworkers, platform owners and beneficiaries.

Agent Learning and Increasing Task Complexity

In their paper on Amazon Mechanical Turk as a seminal example of digital, crowdsourced microwork, Irani postulates that 'divisions of labor and mediations of software interfaces made possible by sociotechnical systems of microwork' do in fact create further opportunities for aggregate work, such as within new media production. Furthermore, Irani postulates that crowdsourcing systems create infrastructure that supports not only the completion of microtasks, but can also advance agent skills, and therefore the complexity of future tasks.

By this theory, we can deduce that a further opportunity exists within microwork—that of stepping up workers from micro to macro tasks, to collective problem solving, and finally to innovative work, as a means of on-boarding active learning toward innovation (Irani, 2013). This is a significant notion, in that current platforms may not yet maximize this opportunity, in order to grow and advice their worker base; especially when combined with the potentiality of implemented gamification.

Microwork: Potential Social Impacts

In one of its potential states, microwork platforms would not only allow for the completion of distributed, aggregate tasks projects, but also be able to meet the demands of its taskforce—the individual workers who are performing the tasks, who have an opportunity to enact and receive potential positive impacts beyond that of simple task remuneration. In this approach, the overall benefit would be increased by model mechanics that facilitate task completion, as well as strive for further worker benefits; potentially creating individual incentive to act again, and thereby driving an increase in aggregate actions.

The above notion of microwork as potential change driver has significant value when working with complex problems; with repeated engagement in micro-successes, individuals can begin to see themselves as active agents of change (with increased agency perception), who are able to tackle large project undertakings in tiny pieces. This notion can be noted in the example of analog aggregate action we mentioned earlier—that of Wangari Maathai's Green Belt Movement, in which individual actors expected 'something or someone else' to solve the problem of depleted ecological resources within their environment. However, after individually planting trees within a community setting, and positively impacting the ecology over time, individual actors reported having an increased perception of agency, and also noted the self-perceived ability to enact change in their own environment (Maathai, 2004a).

One might wonder if this analog example could indeed be indicative of project outcome potentials within digital formats; by focusing on "simple, attainable" micro actions that "guarantee quick successful results within a reasonable amount of time", might we be able to capture lost capacity of people, time and perhaps even economies via mcrowork, to engage large groups of people in individually-enacted, community-based change?

Individuals, Groups and Feelings of Social Cohesiveness

Granovetter defined the the strength of a social tie as "…a combination of time, emotional intensity, intimacy, and reciprocal services", while postulating that the focus most network models place on strong social ties (which foster local cohesion yet might lead to overall fragmentation) is actually missing the importance of linking social interaction patterns from micro to macro levels. Granovetter stated that weak ties might in fact be viewed as indispensable and may act as a bridge between an individual's personal experiences with community integration (as larger scale aspects of social structure), which could otherwise be disconnected.

Furthermore, Bollen and Holye introduced the concept of perceived cohesion, which they felt describes the 'extent to which individual group members feel 'stuck to', or a part of, particular social groups, and believed that perceived cohesion at the

individual level combines to reflect the perceived cohesion of the group as a whole. Instead of focusing on individuals, Moody and White expanded the theory of cohesion toward sets of relationships, focusing on what they termed structural cohesion, in which they presented five features:

Structural Cohesion:
(1) describes how a collection of individuals are united
(2) is expressed as a group property
(3) is continuous
(4) rests on observable social relationships among individuals
(5) makes no reference to group size.

Lastly, according to Moody and White, structural cohesion allows individual members to connect to each other through at least one relational path, which acts as 'social glue' that holds the group cohesively together, and varies in strength relative to the number of connections, while still allowing for a group status that is greater than that of any individual.

Furthermore, Moody and White expand upon their structural cohesion theory by introducing the notion of social networks, which are made of nested cohesive groups (groups that fit within one another), and are thus governed by sets of relationships. To illustrate this point, Springer presents the example of new migrants, who are known to typically turn to their immigrant community during the initial period of resettling, and may reach out to their kin and ethnic groups for support. This groups would have high ethnic ties, and can therefore act as a buffer for the individual to develop new social ties within nested communities over time.

Microwork: Ideal States and Potential Social Impacts

Examining the items noted above, we can begin to examine the potentiality of the expanded, or ideal, microwork approaches. We note that in accordance to the combined theories of Granovetter (social ties as social interaction patterns from micro to

macro), Bollen and Holye (perceived cohesion of individual actors leading to collective group cohesion), and Moody and White (social network theory as illustrated by elements of structural cohesion); social cohesion can be achieved within a microwork setting by framing the interaction for individual micro-action (task) successes, which allow for each actor to perceive themselves as contributing to a greater whole.

In accordance to the items noted above, we may be able to incentivize greater action from each individual, in order to cause an increase in perceived cohesion, and also use the micro-action contribution to drive perception of agency of each worker, by increasing perceptions of self-determination via approachable tasks, notable as micro-successes.

This mechanism of the 'positive feedback loop' of micro-actions has the potentiality to drive further actions, and therefore increase causality by motivating individuals to act again (and again) through the use of positive reinforcement via their own—and others'— successes, which may have the potential to impact complex problems over time, or even offer collective solutions to existing challenges (as can be seen in our case study examples below).

Therefore, we may be able to increase the behavior potential of individual workers, to not only increase their expectancy of a desirable microtask outcome, but also to drive the overall reinforcement via positive feedback, and increase individual micro-task engagement to become a change driver.

Furthermore, this change driver mechanism can be used to alleviate feelings of social anxiety in regards to complex problems; by presenting individuals with an option for approachable micro-action, we may in fact be able to reframe the idea of the self as that of a global actor.

CASE STUDIES

"Tree planting became a natural choice to address some of the initial basic needs identified by women. Also, tree planting is simple, attainable, and guarantees quick successful results within a reasonable amount of time. These are all important to sustain interest and commitment. So, together we planted over 30 million trees."
(Maathai, 2004a)

The Historical Contexts of Microwork: Evolving Business Models

Current microwork platforms might be seen as the digital extensions of more traditional aggregate projects, which occurred in analog real-world settings. Historically, there are a number of examples of such endeavors, where the small actions of numerous people were added across time to create a larger project whole.

There are many examples of microwork platforms and marketplaces available to clients and workers today. This paper will not strive to categorize them all, but instead will try to present five Case Studies that examine the historical evolution of microwork business models. These specific models were chosen in order to capture and illustrate the best evolutionary practices of microwork.

These Case Studies, and their reasons for being chosen, include:

Wangari Maathai's Green Belt Movement: illustrating the potential for social impact via microwork
Amazon Mechanical Turk: featuring traditional microwork platform mechanics and opportunity gaps
FoldIt: noting the salience of gamification mechanisms within microwork platforms
Occupy Sandy: showcasing the intersection of responsive microwork aid in collaboration with existing resource networks

SnailMailMyEmail.org illustrating the viability and potential value of the gifting mechanism, as combined with volunteer-based social impact through gifting and value creation.

The Case Studies listed above will be used to present and discuss common elements in microwork process such as platform, types of workers, business model, drivers, challenges, opportunities, and social impact in order to combine learning with information gathered in expert interviews, and present a new social impact microwork model.

Case Study 1: Wangari Maathai and the Green Belt Movement
Communities that Enable – An Analog Volume-based Microtask Example

Wangari Maathai was born in 1940 in a village in central Kenya, to an lush ecological environment rich with animal life, farming soil, and abundant rivers. By the time she returned from gaining a Ph.D. abroad—the country of her girlhood had developed deep environmental challenges resulting in arid desert climates—arguably a complex problem requiring a speedy solution. Ms. Maathai believed that these ecological changes were triggered by soil erosion caused by eliminating trees, leading to the destruction of usable farmland, and potentially, an increase in disputes over usable land, and thus a decrease in social cohesion (Maathai, 2004b).

Therefore, she decided to organize a women-led movement to reverse soil erosion, using the simple task of planting trees. Initially, this simple work lacked momentum due to the societal self-perception of inability toward impact, largely ascribed to a deep cultural understanding of deficiency—a self-perceived lack of resources such as skill, knowledge, strategies or capital *(Maathai, 2004a)*. Thus, Wangari Maathai spoke of the *need* for ecological systemic change, and the *lack* of helpful assistance coming from the outside, from governing bodies or simply, 'those more qualified' *(Maathai, 2004a)*, causing a gain of momentum over time, largely by the act of doing small, approachable tasks while building and educating community, and therefore causing a change in perception of both individual and group potential.

The Green Belt Movement Microwork Model can be visualized as (gray areas depicting social impact):

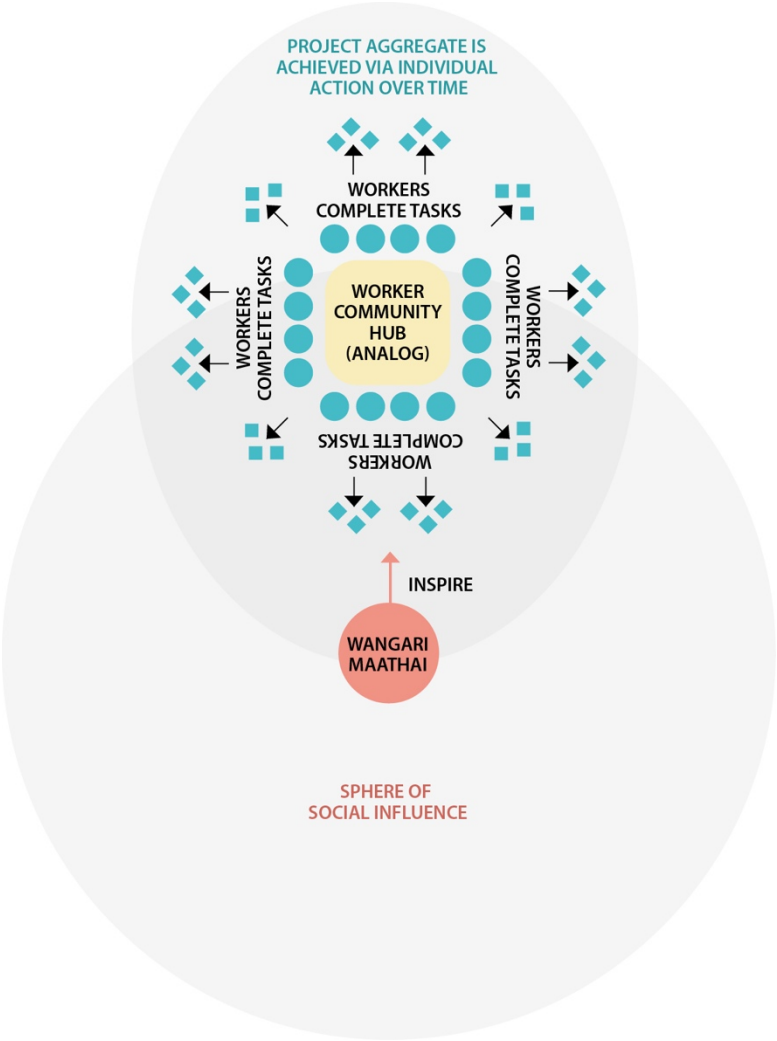


Figure #9 The Green Belt Movement Microwork Model – Simple Model Visualization

Expanding in volume of participants and number of trees planted, aggregated via autonomous planting groups that facilitated community participation and education, the movement not only increased a sense of social cohesion with women, but also gained a measure of male participation and support *(Maathai, 2004a)*. Thus, the type of social impact created by the simple tasks of tree planting (and their associated collaboration) also grew.

The Green Belt Movement Model included numerous community hubs, which can be visualized as:

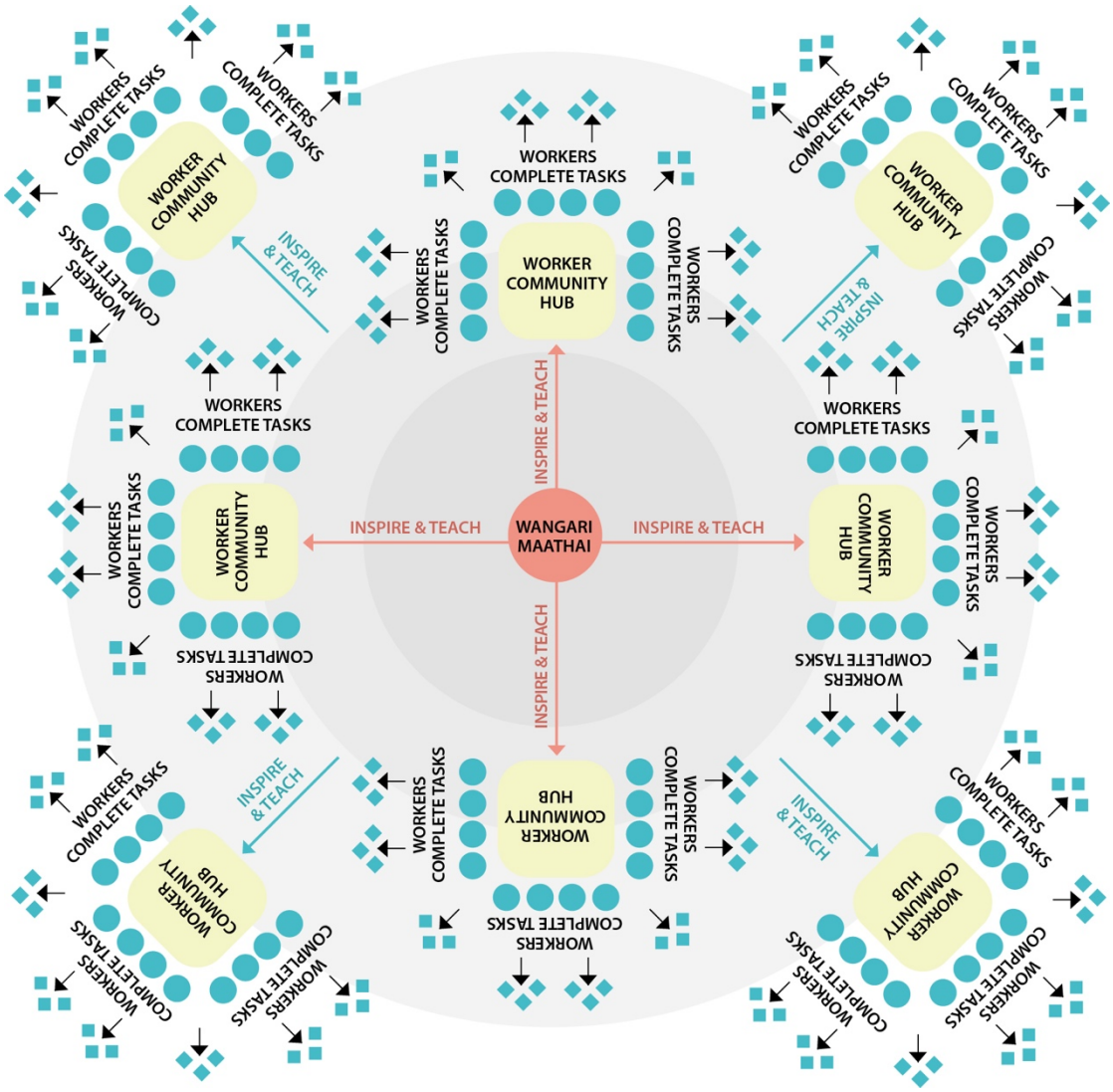


Figure #10 The Green Belt Movement Microwork Model – Hubs Model Visualization

The micro-tasked planting of trees not only restored the ecological systems over time, but also created social impact, some of which was exceptionally positive. On an individual level, through the employment in collaborative, community-based tree planting projects, Kenyan women gained education, an additional degree of agency, and increase in their autonomy and socio-economic standing, while the growing community

called for a democratic space for decision making, negotiation and conflict resolution *(Maathai, 2004a)*.

This change was also ushered by the use of historical symbols that became associated with the movement; including 'the simple tree' which symbolized the democratic struggle—moving previously disengaged citizens to action, and creating significant change in the political system, eventually allowing Ms. Maathai to hold significant political office in order to act on behalf of the citizens, and represent their interests in ecological systems.

Aggregate Action: The Need for Citizen Participation in Analog and Digital Systems Change

As noted in the above example, the Green Belt Movement was indeed successful. After all, they employed more than 30,000 women, who planted over 30 million trees, and positively altered the ecology of the region. However, this level of systemic change was not without significant lessons and exertion, most noted by the fact that Ms. Maathai was herself jailed several times during the process *(Maathai, 2004a)*. Yet, it does exemplify the ability of a series of aggregate micro-actions to have significant impact on a grand scale, a fact that may be expounded to include other types of volume-based actions, such as those that can be achieved digitally via the collaborative aggregate process of microwork.

Furthermore, the micro-tasks of tree planting correlated to the larger democratic and environmental impacts created by the Green Belt Movement, and Wangari Maathai specifically, might be indicative of an arguably greater possibility of our times; the idea that the volume of positive change required within our current social and ecological systems—the large challenges we are collectively faced with, and their oft temperamental, temporal nature—might necessitate a significant increase in the level of citizen participation, as potential, active, and engaged agents of change. Individuals may be required (and may need assistance) to fully ascertain, and employ their own agency in order to drive action, individually, yet collectively.

It is with this charged notion of participation that projects—whether led by government initiatives, not-for-profit agencies, private for-profit companies or individual community-based leaders—might be able to build and sustain the volume of action necessary to tackle the complexity of the current challenges, and perhaps even wicked problems, that our world currently faces; and just like the Kenyan village women, there is a call to realize that 'help from above, sideways or below' may or may not come, or may not be arriving in time (Maathai, 2004a).

It is with this idea in mind that we further explore the potential of the digital aggregate actions facilitated by the process of microwork, and the impact and intervention potential it garners via distributed volume-based actions.

Model Significance: can be noted in the fact that community-based small teams have the potential for significant, lasting aggregate impact

Model Opportunity Gap: model reach being limited by real-world, non-technological mechanisms

User Feedback: Women involved in the movement reported having a significant increase in self-perception of agency, as well as having increased opportunities via renumeration, and shared resources (such as community child-minding to enable participation, for example).

Case Study 2: Amazon Mechanical Turk
Systems that Enable: A Digital Volume-based Microtask Platform Example

The analog example of the Green Belt Movement is an illustration of projects heralding the potentiality of volume-based, participatory engagement for impact, with the ability to affect change via completion of aggregate microtasks, by utilizing enabling systems embedded in real-world community networks. However, while the communities built by the Green Belt Movement were active, the did not yet connect cohesively in the digital sphere. One of the earliest and most prolific examples of a digital

microwork platform is the Amazon Mechanical Turk (known as AMT), created in 2006. AMT quickly became a working example of crowdsourced 'Humans-as-a-service'—where people provided completion of micro and macrotasks, distributed via a series of technology infrastructures that combined to generate a robust online marketplace. Amazon's Data Centres had increased their existing digital offering from that of original data storage and processing to include what Founder Jeff Bezos referred to as 'human computation'—an enabled digital service that distributed large numbers of tiny data processing tasks to a global workforce; and included items such as "transcriptions, image labeling, pornography categorization, and informational research tasks"; tasks that a non-human, or Artificial Intelligence (AI), would have trouble processing (Irani, 2013).

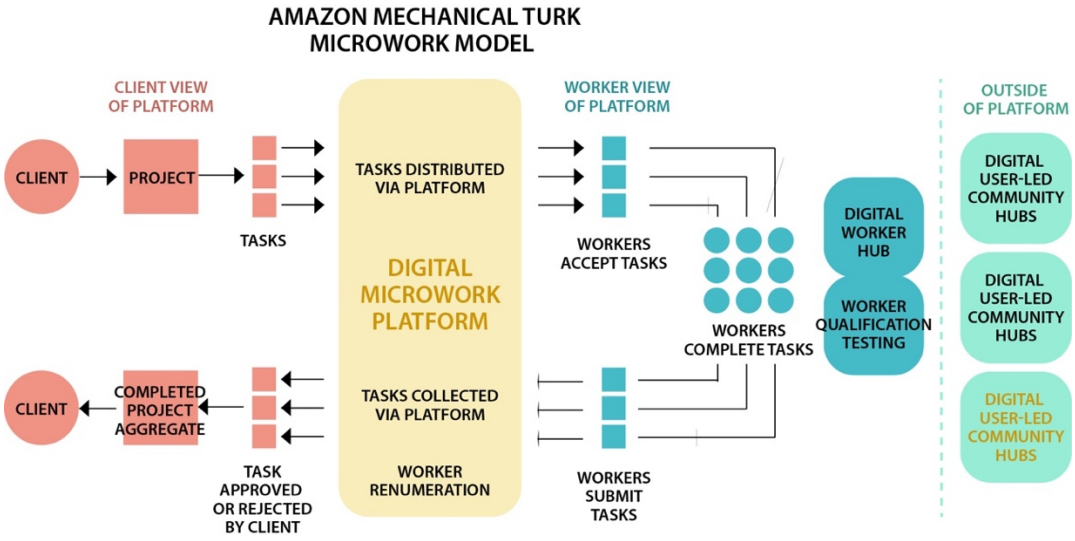


Figure #11 The Amazon Mechanical Turk – Model Visualization
Illustration adapted from original (Amazon Mechanical Turk, 2016)

Originally Amazon was inspired to create AMT in order to resolve its own internal task volume challenges—due to the nature of the company's online sales platform, and the types of tasks required to maintain high standards of image quality, price allocation and other simple tasks (such as spelling corrections on sales items, for instance). Amazon required quick responses to small, potentially time-consuming actions at a cost lower than that of hiring internal personnel. Although task pricing varies by task and client, and different workers use variable amounts of time to compete

similar tasks (based on skill and technology variability), in the article titled *My Grueling day as an Amazon Mechanical Turk,* journalist Jeremy Wilson notes that four (4) hours of task completion on AMT yielded him roughly $2.00 USD, which is a whopping $0.50USD per hour (Wilson, 2013); certainly a savings from minimum hourly wage in the US, which the Fair Minimum Wage Act lists at $7.25 USD per hour (The Minimum Wage Act in detail, 2016).

Amazon Mechanical Turk acted as an intermediary online marketplace (digital platform), connecting clients to thousands of distributed global workers (active, independent agents), who could complete the tasks in their own time via personal, individual computers, and now, mobile phones (Irani, 2013).

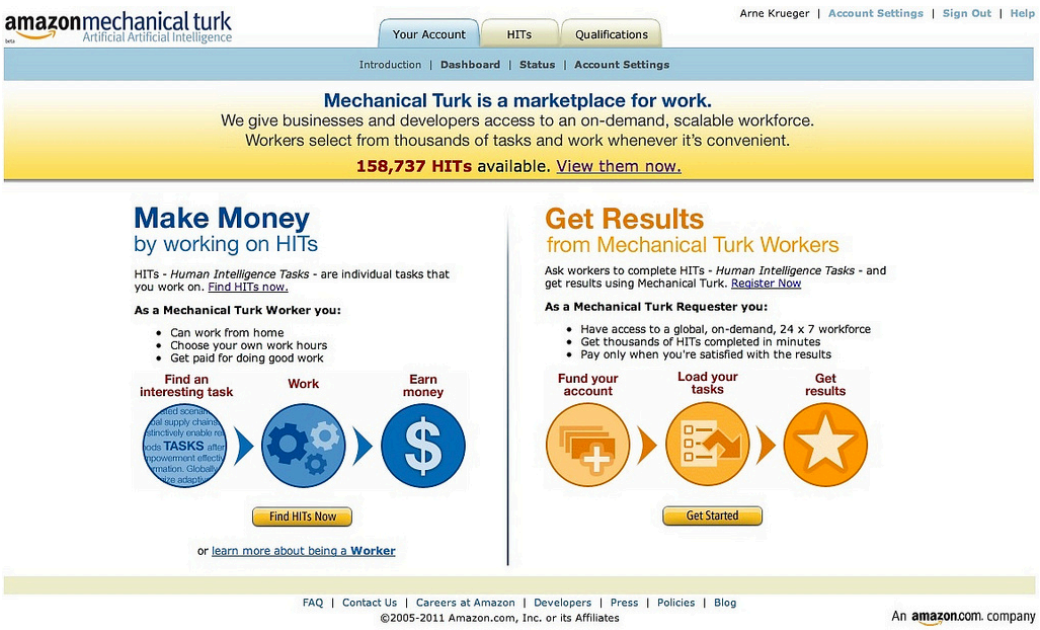


Figure #12: The Amazon Mechanical Turk: Illustrating the benefits of participation for workers and clients, Image by Arne Krueger / CC (Krueger, 2011)

This new format of distributed human computation offered immediacy via on-demand activity by an expandable workforce, allowing clients to set their own individual task prices, and upload any number of required tasks in batches via code, or web user interface. Clients include all types of individuals and organizations, such as internet content creators or managers, as well as scaling startups, non-profit organizations, and

corporations. Workers get paid per transaction completed and approved (Pontin, 2007); clients have full discretion on whether they would like to pay workers for their submissions—presumably based on quality of work—while Amazon makes a profit by taking a percentage of each transaction.

However, workers and clients don't interact directly; the platform mitigates their interaction through microtasks. Workers are referred to by an alphanumeric ID, and classified by parameters such as geo-location, time needed for task completion, and percentage of tasks approved (meaning previous clients were happy with the results of their task completion). Workers can take AMT qualification exams, which are similar to actual tasks in type and complexity, which would then be added to their skill specifications (Irani, 2012).

AMT also uses its own language to create specific culture—clients are known as 'requesters', workers are caller 'Turkers', and tasks are called HITs, or Human Intelligence Tasks, thereby instilling a sense of culture within the platform by use of that specific language. Interestingly, in terms of workers, Wilson notes that "the most commonly cited reasons for Americans spending time on Mechanical Turk is it's a more fruitful way to spend free time than watching TV: that it's fun and it kills time". This quote points to a potential opportunity to expand on capturing the lost capacity of wasted, available time that potential workers may have, and the option to make this microwork more desirable. He further describes having attempted a four-hour, 40-task AMT working session, in which he responds to tasks including transcribing receipts, noting items on photographs, writing short content, clicking links, answering psychological research questions, and drawing shapes. He notes that although some of the tasks were fun, most were actually boring, repetitive and tedious, and that he didn't plan to do it again due to the low wages, noting an obvious opportunity gap (Wilson, 2013).

However, Wilson isn't a clear example of all types of AMT users; for some Turkers, especially in developing nations with lower costs of living, the wages can make a significant difference. Additionally, Irani writes that AMT and other types of microwork (and crowdsourcing systems) are not only mechanisms that enable task production, but

may also increase worker skill to enable them to complete tasks of increased complexity over time. Irani cites media production (such as writing, image capture, data input et al) as a perfect example of increased task complexity, and points to the opportunity for further worker skills development. He further points out "Rather than managers of global data factories, microwork employers can imagine themselves as technologists and innovators engaged in non-hierarchical peer production", thereby driving self-perception, and potentially social cohesion (through the distribution of tasks across a widely distributed workforce, or 'team' (Irani, 2013).

Model Significance: A simple yet approachable mechanized microwork model can have global reach, and large volume of completed tasks; worker boredom can be utilized as a driver for user participation by reframing tasks as fun

Model Opportunity Gap: AMT is in itself a robust platform, with a workable microwork mechanism, active communities, large worker base, and thousands of tasks completed daily, yet it is missing one salient component; a deliberate mechanism towards positive social impact beyond that of mere remuneration for tasks completed. Of course, remuneration itself is a very worthwhile social impact, especially in geographic areas with low domestic job availability, and for individuals who lack labour choices and therefore, access to wealth. However, there is an opportunity cost here; a lost capacity of this well-oiled platform not attempting to create social change beyond the mechanistic, task-oriented approach. Our Findings will explore this opportunity further.

User Feedback: Users report both positive and negative feedback; requested are higher rates of pay, and boredom appears to be an issue.

Case Study 3: Occupy Sandy
Networks that Enable: An Analog-Digital Volume-based Microtask Example

Crisis response can often have formal aid elements attached to it; formally structured organizations—such as non-government organizations (NGOs), formal

government bodies, and for-profit organizations might be dispatched to the affected problem and/or geographic area to offer aid solutions. Although formal, top-down aid organizations can be extremely useful, the speed of response and potential effectiveness might be limited by their organizational size and length of necessary internal process when dealing with extremely complex situations. Patrick Meier adds to this discourse on his blog, reflecting on the "dramatic mismatch in demand for responder services versus supply" as paid responders do not have the ability to cover the entirety of the area affected by a disaster, which is why he believes aid response would benefit from being community-based, decentralized, and crowdsourced (Meier, 2013).

One such example of participatory informal aid relief can be noted via *Occupy Sandy*, who self-define their organization as "…a grassroots disaster relief network that emerged to provide mutual aid to communities affected by Superstorm Sandy", a natural disaster that affected a large geographic area and severe damage to New York City in October 2012, and included flooding, as well as people, power and infrastructure losses (Occupy Sandy Recovery, 2016). The American Red Cross and the City of New York responded and encountered extreme challenges due to the size and complexity of the need for relief, which included millions of people. Conversely, *Occupy Sandy*—which is a is part of the larger *Occupy* network—emerged as a volunteer-based participatory organization, in a model that is structurally distributed and relatively non-hierarchical (Stempeck, 2013).

Thus, the basic Occupy Sandy model can be visualized as:

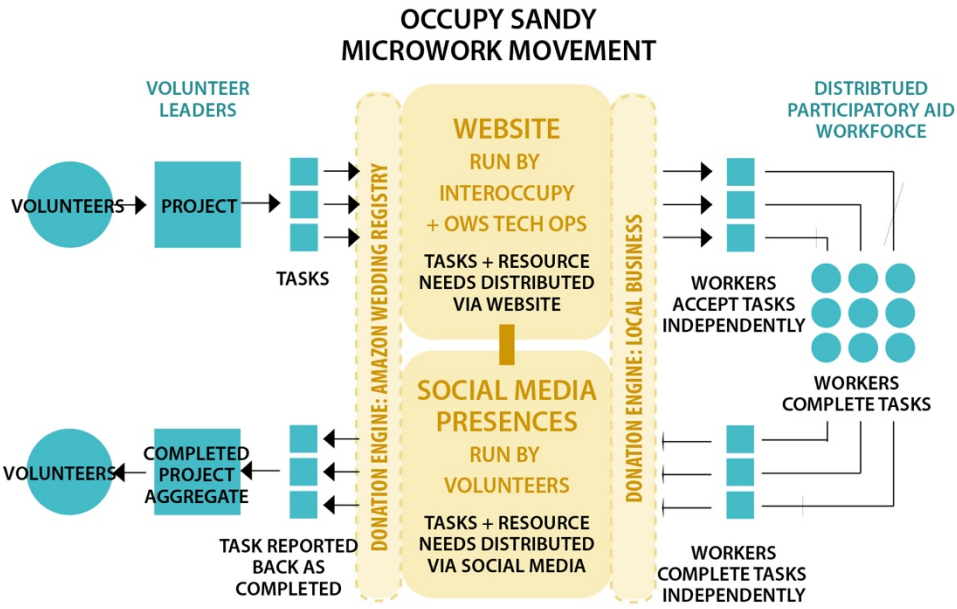


Figure #13: The Occupy Sandy Microwork Model

As a result, *Occupy Sandy* had the capacity to break the crisis aid response into numerous smaller, distributed efforts to maximize resources and human abilities, largely fielded by independent volunteer teams. In this case, the flat distributed model proved superior in effectiveness to that of a formal organizational hierarchy. This approach proved to be essential in garnering the right volume of aid response, as individual workers were engaged to participate in the efforts required. Also, the number of available roles and projects meant that 'unaffiliated New Yorkers' could assume agency in the situation, and become involved volunteers. Furthermore, volunteers did not require any specialized skills, and could become engaged easily in productive, meaningful actions. The organization also had the capacity to handle the volumes of complexity via project enablement, as well as task and resource distribution of people, monetary donations, and in-kind contributions to the the network, and to distribute these items in the most useful way (based on real-time, locally relevant information and needs).

Analog to Digital: The Role of Technology

Of course, real-world models and approaches can translate to digital formats. Occupy Sandy was a cogent example of this translation, as well as the collaborative use of combined digital and analog formats within the framework of the global Occupy Network, which consisted of numerous, distributed yet networked organizations. As such, they were able to leverage distributed resources, such as the Occupy Faith church locations, which housed the Sandy Aid Distribution Hubs, the Occupy Motor Pool, which provided ride shares, and the Occupy Tool Library, which distributed tools and resources. Occupy Sandy also actively supported and facilitated community-based locations, which were outside of their main network, to enable an even greater number of volunteer participants that were outside of their own immediate network.

The digital component of the Occupy Sandy movement was comprised of a website run by InterOccupy and OWS Tech Ops, as well as active social media presences, run by volunteers. The social media, mainly Facebook and Twitter, were used to frequently inform the volunteer base of the assistance, location and supplies required. Initial supply donations were cleverly collected via an Amazon.com wedding registry, whereby needed items were listed and purchased by individuals globally, facilitating donations of more than $700K USD (Stempeck, 2006). A second donation-by-purchase registry was setup to allow donations from local businesses, so that supplies could be purchased directly from the businesses affected by the storm, in order to ensure local success (Andrea, 2012).

Thus, it can be said that Occupy Sandy is an example of an early adopter of the translation from analog to digital approaches of a combined participatory aid model, since early adopters are defined as "users who try out products and technologies very early on in the product release cycle; who at times provide valuable initial feedback to the manufacturers / providers; who generate early sales that can be supportive to R&D" (Rogers, 1962). By creating work-arounds for supply donations, volunteer aid and distribution centres, Occupy Sandy expanded on the existing Occupy network to produce networked online and real-world solutions, thus showcasing themselves to be

an example of organization as a lead user, which Von Hippel defines as "…users whose present strong needs will become general in a marketplace months or years in the future (Von Hippel, 1986), thus being an example of a further need for participatory aid models within complex problem contexts (such as disaster aid relief).

The more robust visualization, showcasing existing Occupy Hubs and resources, the distributed nature of the workers and tasks, and the social impact areas in gray, can be visualized as:

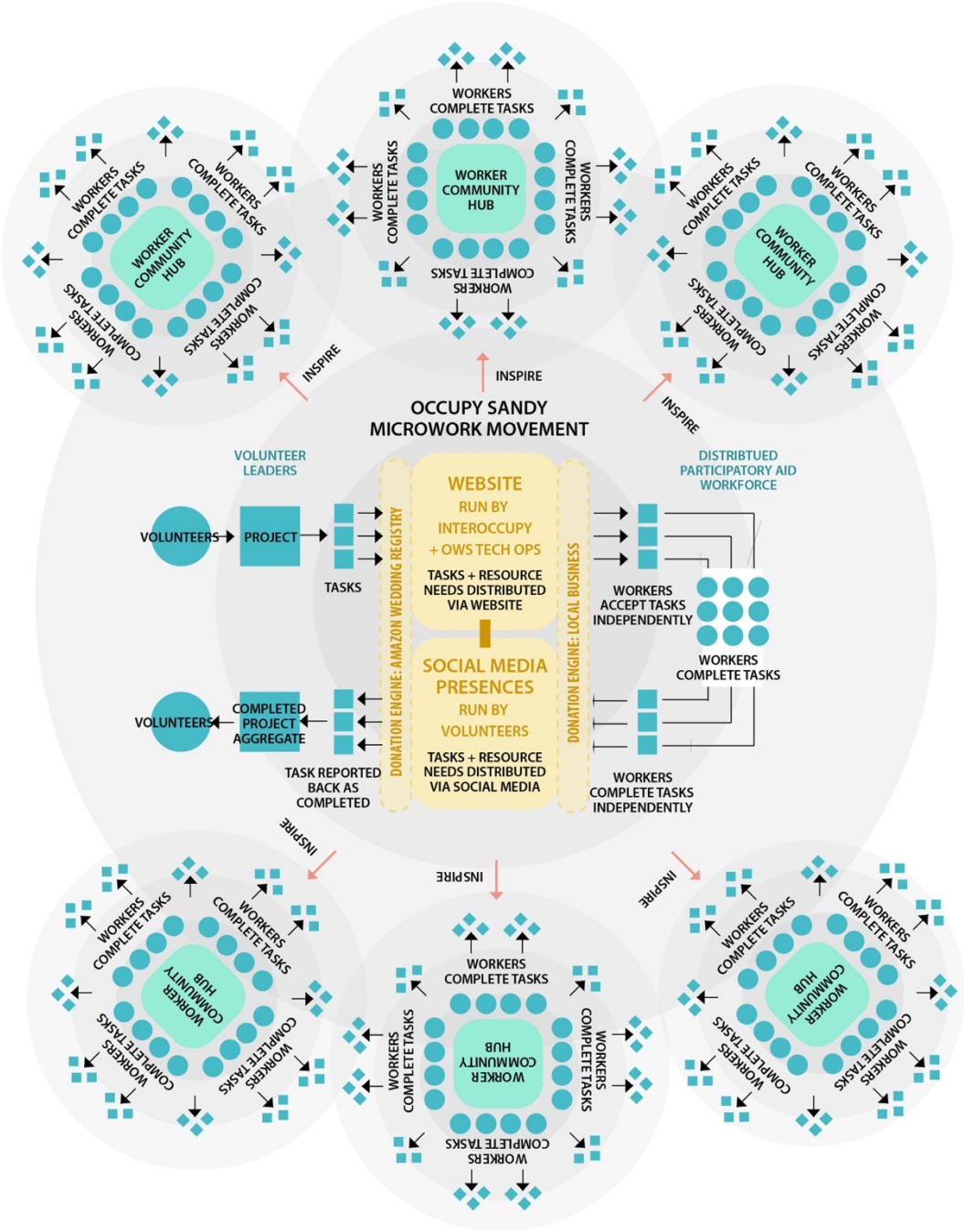


Figure #14: The Occupy Sandy Microwork Model – with Hub Examples

Furthermore, Occupy Sandy was a salient example of the combination of micro-tasks (defined as the smallest possible task to enact), and macro-tasks, which are more complex tasks that require greater worker skill. Occupy Sandy allowed participants to

choose and self-select the level and type of task to complete, thereby driving the greatest possible interaction through use of low barriers.

Model Significance: in-situ, wide-spread, community hubs that enact impact quickly and with few bureaucratic requirements; the combination of real-world and technological elements; the combination of new and existing infrastructures and resources; focus on local resourcing; volunteer ability to choose task types

Model Opportunity Gap: continued action after response resolution; gamification

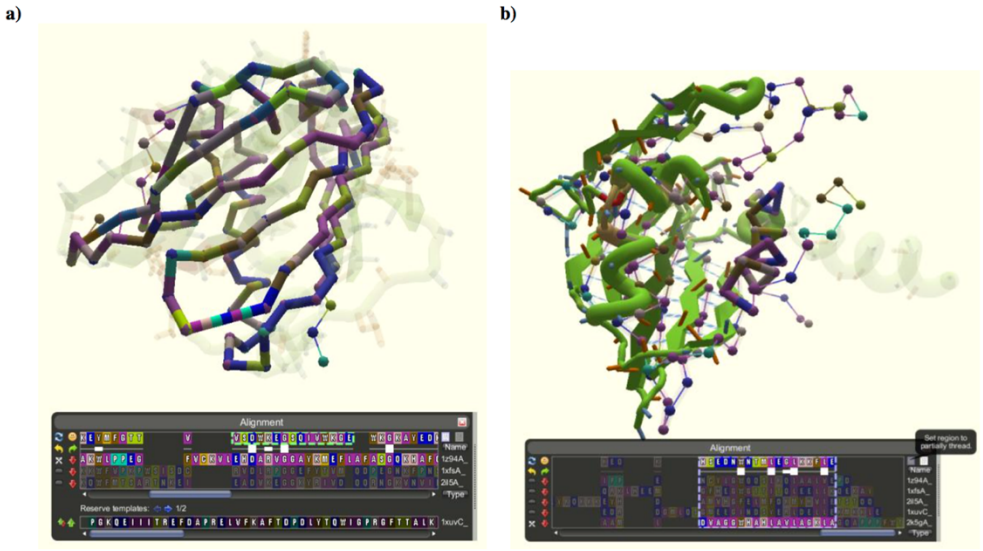
User Feedback: workers reported positive engagement feedback, and also presented numerous ideas (both negative and positive) to improve process flow.

Case Study 4: FoldIt
Mechanisms that Enable: A Digital Volume-based Microtask Research Impact Example

One of the most prolific and successful examples of gamified microwork is the FoldIt (beta), which is a crowdsourcing research platform whose games and research are often situated around scientific protein discovery, and more specifically, the folding and matching of protein structures to facilitate research innovation. Originally created by the University of Washington's Centre for Game Science's collaboration with the Department of Biochemistry, FoldIt has successfully engaged thousands of users to contribute to solving over 1300 protein puzzles, and continues to expand its research of available games.

For instance, in their paper *Crystal structure of a monomeric retroviral protease solved by protein folding game players,* Khatibi et al speak to the way FoldIt players solved the complex problem of 'crystal structure of M-PMV retroviral protease by molecular replacement'—an AIDS-related enzyme research game—after previous non-microwork attempts had proven fruitless for over ten years (Khatib & FDiMaio et al,

2011). This simple microwork example gamified a research project into a fun puzzle experience, which people around the world played for enjoyment using the sets of tools provided in the game experience, as an act of competition and contribution. This mechanization allowed for the proliferation and completion of a research project that was previously unapproachable, in that it previously could not be solved by other means, including via the usage of AI technologies.



Supplementary Figure 1 Foldit screenshot of the Alignment Tool. The Alignment Tool allows Foldit players to load in different templates and manually move alignments. Players are then able to thread their sequence onto the structures of these known homologs. **(a)** When a template is selected, the aligned regions are represented as cylinders in the game while any unaligned regions are shown as spheres connected by lines; these graphical representations change in real time as players select residues and move the alignments around in the Alignment Tool. **(b)** During CASP9, Foldit players requested the ability to thread only a specific region from one template so partial threading was added to the Alignment Tool; this allows players to combine different regions from multiple templates into one hybrid model.

Figure #15: FoldIt Screenshot of the Protein Alignment Tool
(Khatib & FDiMaio et al, 2011)

The potential of this approach is formidable, as game mechanics may enable the user to have increased enjoyment within microtask completion, separating the individual task from the original project goal, and transferring that larger goal to the deliberately placed game mechanics that combine the efforts of technology, as well as human computation, intuition and fun. Science Daily reports "the discovery was achieved through Foldit, which allows players to collaborate and compete in predicting

protein molecule structures. Foldit is an example of engaging the public in scientific discovery by using games to solve hard problems that can't be solved by either people or computers alone" (Gray, 2011).

Project Researchers evaluate the highest scoring submissions, to determine whether the structural configuration of the protein is indicative of usable information relevant in the real world. In this way, submission are vetted by the research team, and appropriately accepted or discarded for the larger, aggregate research project.

In terms of structure, players are strictly volunteer-based, and do not get paid for their input. Publicly displayed team scores ensure the competition element is embedded into the mechanized gaming process to elicit and drive further engagement. Global player high scores feature the individual achievement of players, while blog posts, YouYube videos and forum chats create a sense of engaged community.

Thus, the microwork model of FoldIt (beta) can be visualized as:

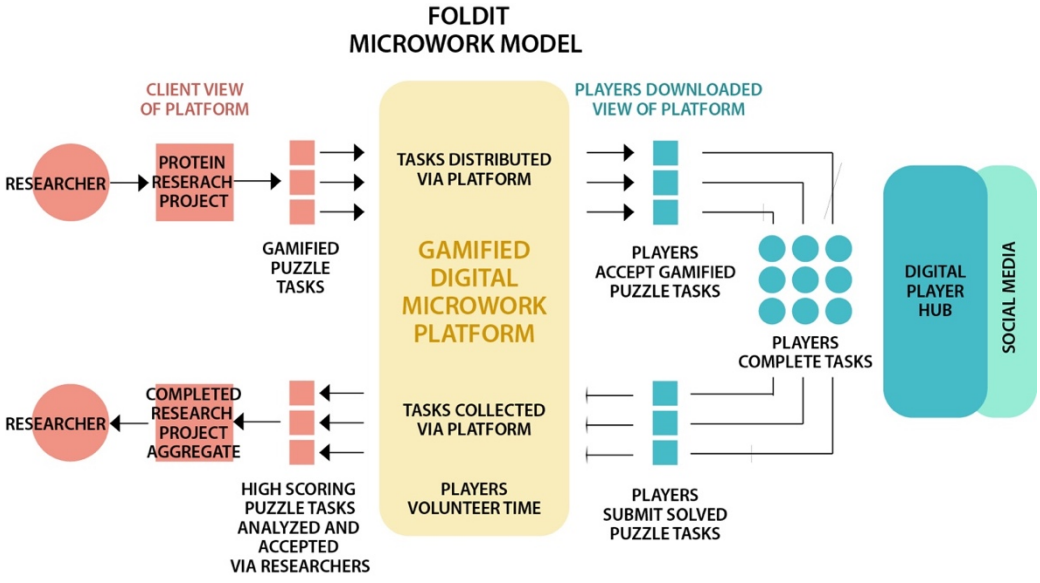


Figure #16: The FoldIt (beta) Gamified Research Microwork Model

In short, The FoldIt (beta) model is a salient example of a gamified microwork mechanism that drives valuable research results through user micro-action participation, engaging the player audience through fun and competitive approaches. Not only does this model drive user engagement, but it also features elements salient to the behaviour economy, such as the ability to feature one's activities of being—the activity garnered and value created via playing—by featured a player's, or team's, high score, thereby driving further action.

Model Significance: Mechanized gamification to drive mass appeal and increased user interaction, which allowed for solution of a large, previously unattainable challenge

Model Opportunity Gap: Extending gamification beyond academic research

User Feedback: Users report enjoying the game play and puzzle aspect

Case Study 5: SnailMailMyEmail.org
Gifts that Enable: An Digital-Analog Volume-based Microtask Social Cohesion Example

SnailMailMyEmail.org is an organization created from the imagination of award-winning experience designer and digital strategist, Ivan Cash. Having previously worked on social campaigns that created both national (USA) and global digital impacts, Cash wanted to undertake a passion-project that spoke to people on a very human level, and utilized everyday objects. In his talk on the subject, he speaks to the need for greater connectivity between modern urban dwellers, and how he learned through action and social connection that a single person can enact significant change, as well as contribute to a larger whole. His initial offering was a form of a gift—he began by asking for submissions of emails to personally convert to hand-drawn letters, but when the project got too popular for him to handle the volume single-handedly, he began to recruit friends and colleagues to translate the emails.

In the next iteration, the project became a website-based email submission, which allowed participating requesters (clients) to submit emails to be distributed to random illustrators (workers, or gifters) globally, each of whom provide (donate) their own resources—paper, drawing tools, envelope, postage fee, et al—and are not remunerated for the task. The process is an act of global, creative gifting between two people, with a randomly geo-located stranger in between, who acts as email-to-snail mail translator, and gifts the fullness of the creative experience to the other two participants (sender and receiver), whom they will likely never meet. No money or remuneration exchanges hands.

And the statistics are staggering. Since the project began in 2011, it has garnered more than 1,500 global volunteers, from all walks of life, who have created an excess of 26,000 hand-drawn and illustrated letters, each intricate and individual, and mailed them to recipients in over 80 countries worldwide.

The volunteer drivers for action include enacting human connection, by reaching out to a person far away whom you might otherwise never meet; being known, validated, and heard through their work; facilitating happiness and communication by being the transcriber in an otherwise private correspondence, and therefore seeing a bit of someone else's private life; volunteerism and giving back to community; and finally, being creative by making art. Importantly, Cash advocates for 'starting small' and seeing where the action could take you, aswell as helping to facilitate human connection (Cash, 2015).

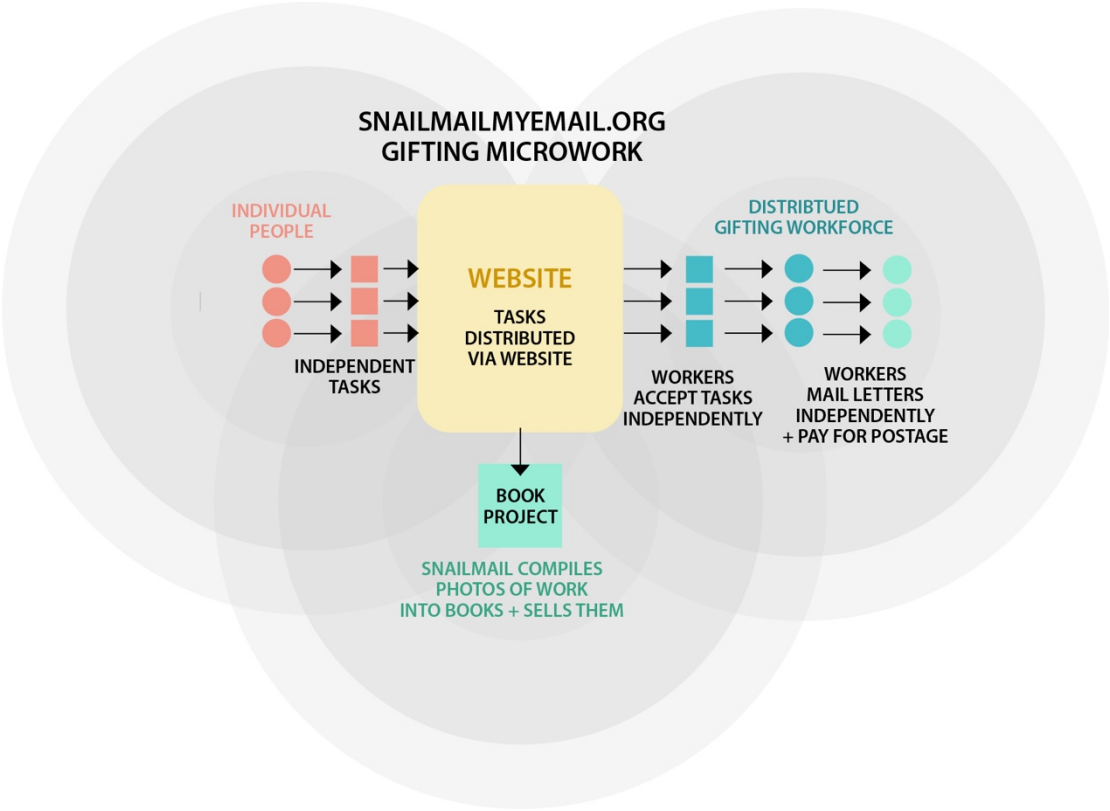


Figure #17 The SnailMailMyEmail.org Microwork Model

Model Significance: can be seen in the value of the shared human experience within a gifting mechanism, where time, creative efforts, resources and postage are donated to create a positive, connective experience between two strangers. In this way a private correspondence becomes amplified by a third party, who adds beauty, surprise and connectivity to the transaction; a sense of the magical or unexpected. The individual impact to the worker (volunteer) is to feel a sense of agency, creativity and significance. The aggregate impact is a sense of reframing reality to something more interesting and creative, of being part of a special program and community.

Model Opportunity Gap: is simply to increase reach per year; currently they operate for one week per year, and reach a limited number of pairings. It would be interesting to see the expansion of this project, and what it may accomplish socially.

User Feedback: Both clients and workers reported extremely positive experiences.

Fig #18: SnailMailMyEmail.org Process: How it works

Fig #19: SnailMailMyEmail.org Process: Letter Gallery

EXPERT INTERVIEWS

Expert interviews were utilized to build upon the research achieved via the the literature review, in order to expand the foundational understanding of the topics which showed further potential to be beneficial in the creation of the new microwork model. It was decided that expert interviews would be a beneficial resource, as subject matter experts may be able to dive more deeply into current states of their expertise, as well as expand upon that knowledge to potentially innovate upon existing microwork models, and further thinking.

Therefore, expert interviews were performed for the following topics:

- **Social Organization for Social Impact:** Discovery of social impact potentials, their organization, process and potentials, both real world and technological
- **Microwork:** Real-world implementation of the digital microwork model, the challenges and barriers, and how their actualized functionality can be improved upon in the new model
- **Gamification:** Elements of gamification and how they might apply to the microwork model
- **User Gaming Experience:** Understanding the real-wold experience of gaming, how it impacts users on an individual level, and whether it might be utilized to create communities and social cohesion
- **Inclusive Experience Design:** Assessing how the mechanics and approaches of Inclusive Design might be utilized to impact the microwork model in order drive user interaction
- **Mobile Development, UX/UI:** Evaluating the structural UX/UI design elements and how they might impact microwork model adoption and usability

The above theories proved to be fruitful, and expert interview deep dives into each of the above topics garnered lessons learned from the exploratory dialogue. These added learnings are presented in the 'Findings' section, and were instrumental in comprising the new microwork model.

This major research project explored the primary investigation area of microwork, as well as sub-areas of complex and wicked problems, gamification, gifting, business model innovation, behavioural change, and technology, among others. The learnings garnered via a Literary Review, Case Studies and expert interviews were synthesized in order to try to identify an opportunity gap within the microwork model, and attempt to suggest a new model that facilitates an improved user experience, in order to drive participation, increase the number of actions, and allow for potential for positive social impact on individual and collective levels, and to ultimately further social cohesion through micro-action.

The New Microwork Social Impact Model

The goal of this major research project has proven successful; the lessons learned from the literary review, and knowledge gleaned via expert interviews have indeed garnered a suggested new model of microwork, which we will explore further below. However, based on the research and learning, especially that of Jones' et al work with the Flourishing Business Model Canvas (and the requirement to map process and progress for a Flourishing Society), a new Microwork Social Impact Business Model Canvas has also been created, in order for other microwork projects (and platforms) to gain access, and use it to potentially evaluate their social impact from the outset, or as an agile process during their existing projects (REF).

Thus, the most relevant findings utilized in the creation of the new Microwork Social Impact Model are:

1. **Drive increase in worker participation and task completion:** The complex problems prevalent today require a new, timely, distributed volume-based approach; the microwork model may be one of the potential approaches, due to its geo-distributed, available workforce that can increase in size to save time and resources, as well as lower risk to iteration. This approach may even be adapted to attempt to impact wicked problems in future.

2. Distribute wealth to democratize power: Distribution of tasks might also translate to a democratization of power through the provision of remuneration via task completion (an infusion of monetary funds where necessary), combined with social recognition for active workers.

3. Capture lost capacity: These small tasks and their relatively low time and resource expenditure can be utilized to capture the lost capacity of people's time and energy in otherwise disengaged moments; while they are waiting for the bus, or bored at home.

4. Drive influence through aggregate impact: The Wangari Maathai example showed that these small tasks, when aggregated, may have a much larger positive social impact, and even be utilized to build community, or aid in crisis response as in the case of Occupy Sandy. Occupy Sandy also showed us that workers benefit from being able to select tasks that they have a skill set and preference for, as well as to allow for (and facilitate) the connection of digital and real-world networks when possible.

5. Drive social cohesion through the act of gifting: A Gifting mechanism within the digital microwork platform can enable a feeling of social cohesion through the acts of giving and receiving, which combine to further the social contract to continue proliferating the gifting exchange, thereby driving positive interaction.

6. Introduce culture to drive social cohesion and task completion: Gamification mechanisms can also be utilized to drive task completion and social cohesion, through careful execution of game dynamics that propose an alternate reality (or culture) of game-play, and refocus the (potentially boring) micro-tasks as a small portion of a fun, larger undertaking in order to facilitate task completion success rates.

7. Drive behavioural change through micro-successes: Through the use of micro-successes, we may be able to facilitate behavioural change in the individual, and in aggregate, potentially within society, by allowing people (as contributing microplayers) to learn that their individual impact matters, and is captured as part of a greater whole. In short, we can teach people that their contribution counts to a larger community of active participants, who form a community via their collective actions (tasks).

8. Lower barriers to action: The majority of people in the 33 countries surveyed have limited computer and technology skills, therefore initial microtasks must be simple to execute, and have a low initial task complexity, in order to create the least barrier to entry for all potential workers, to create further opportunity for action.

9. Allow workers to learn and advance: Workers may learn higher task complexity execution through the use of the microwork platform, and can increase in their abilities over time; the microwork mechanism can maximize effort, time and participation of each worker.

10. Introduce Tech Community Hubs: Create physical and digital hubs that work in unison to drive in-situ community interaction; tech hubs can be comprised of shipping containers in rural areas, and equipped with computers and internet that are readily available.

Given the relevant findings presented above, we can combine effects to visualize how they may impact the current microwork business model:

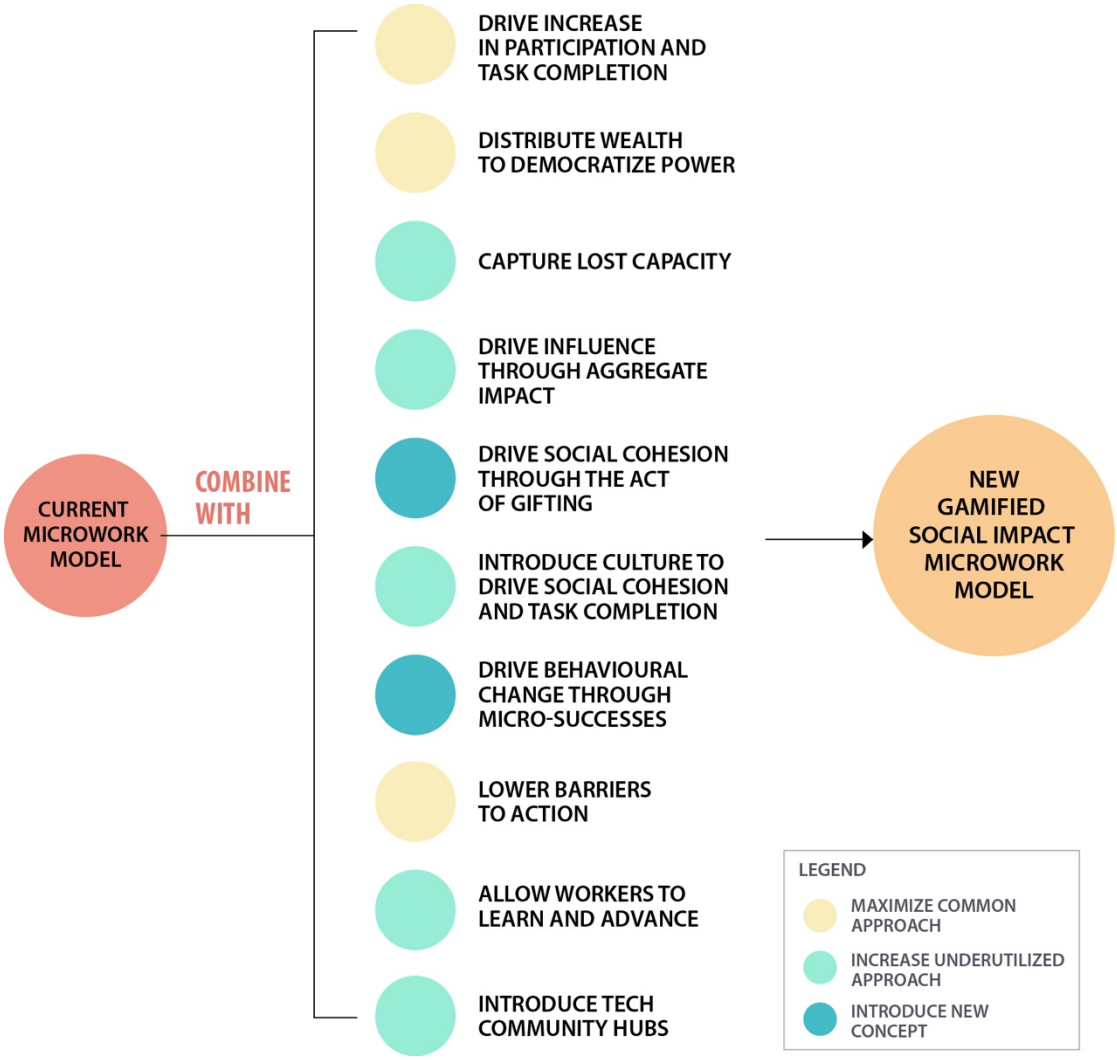


Figure #20: New Microwork Social Impact Model Impacts

Thus, this major research project has captured and combined the findings listed above in order to present the New Microwork Model, discussed further below.

The New Social Impact Microwork Model

In order to create the the New Social Impact Microwork Model, numerous existing microwork models were considered and evaluated. The most salient were depicted and discussed in the Case Studies section to illustrate their social impact

potential and model evolution, while the most common model was utilized as a starting point for model change. The standard data-driven task-oriented microwork model, which is very similar to the Amazon Mechanical Mechanical Turk model, is depicted below.

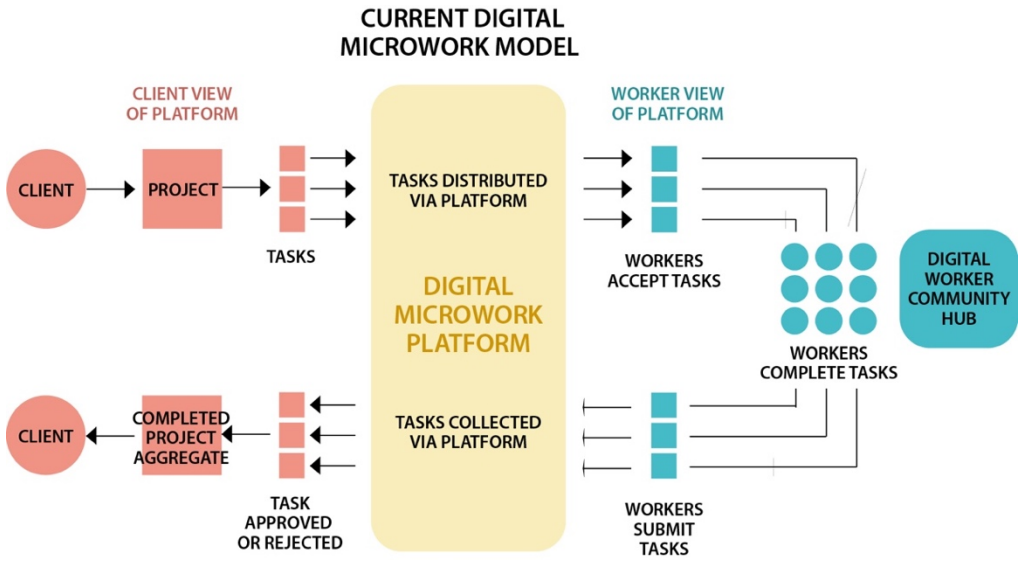


Figure #21: Standard Microwork Digital Platform (Task-oriented) Model
Adapted from the AMT model example (Amazon Mechanichal Turk, 2016))

The standard task-oriented model shown above was impacted by the changes noted in the lessons learned via research and expert interviews to create a new model, which features a gamification engine that captures individual task performance to create a gamified experience for the user. In this regard, the worker is incited to explore the culture and reframed experience created by the platform to keep on returning to further task completion, and increased action, such as skills education.

Game dynamics and mechanics are utilized to motivate and reward the worker beyond simple remuneration for the completed task; the remuneration itself is a positive by-product, but in this model, not the primary driver. As such, the 'worker' is reframed to a 'player' and in this gamified world, becomes the hero on a quest. The gamified platform therefore reframes tasks to a game, and also, work to a form of play, in order to incite further action.

This model can be depicted visually as:

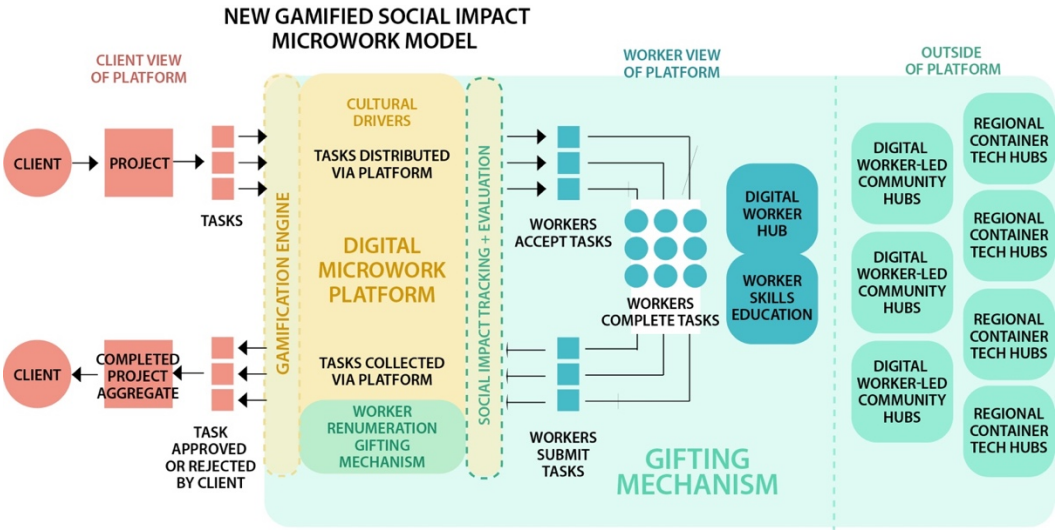


Figure #22: New Gamified Social Impact Microwork Model

Based on the relevant findings, the mechanics behind the Proposed Social Impact Microwork Model are:

1. Increasing user volume and driving task completion through reframing the microwork model: Although this model does not yet propose *how* to impact wicked problems via microtasks (this opportunity will need to be explored further by another researcher or research team perhaps), it does propose that increasing an actively available, geo-distributed workforce may be an asset to impacting problems rooted in complexity by enabling volumes of action, as can seen in the case study examples listed above. This model proposes to increase the number of users as well as number of tasks completed by each user by incentivizing action through the mechanics listed below.

2. Distributing wealth to democratize power, via gifting and gamification: This element that is already is use by some current microwork models, which grant worker remuneration for completion of microtasks. This model will continue to utilize the act of remuneration in order to incentivize and reward the contributing worker/players, however, it will also gamify the mechanism of

remuneration by granting 'tokens' instead of money upon the completion of a task. Tokens can be 'cashed out' (traded in for money) at any time; yet the disambiguation of money to tokens is an important part of the process, as it allows for easier gifting, explained further below. These two mechanisms are planned to translate to a democratization of power through the distribution of wealth to any active user globally.

3. Capturing lost capacity through task specificity: This model proposes tasks that are purposely micro, in that they are meant to be the smallest possible investiture of time and effort, so that users are able to utilize their lost capacity of time and energy in otherwise disengaged moments for 30-90 seconds at a time (per task; when bored, while waiting, or at home, for instance) and slightly more time as their investment and skills increase. Of course, task types will vary per project, and this model advocates for mixing the tasks in a large batch; tracking task completion rates and user happiness per task type; and favoring types of tasks specific to user preferences via gathered data, so that the tasks featured to each user are specific to the types of tasks they previously favored, with some new task types added for variability and interest (ex. puzzle tasks, or image matching tasks).

4. Driving influence through aggregate impact: The Wangari Maathai example illustrated the possibility for large social impact via small, aggregate tasks. However, microworkers often lack the visibility of the impact of their completed microtask, or general efforts. This model suggests to feature a gamified 'levels' and 'token' tracking mechanism, by which users can see the progression of their actions over time, by levelling up, and seeing how many completion tokens they have accumulated over time. Secondly, when accepting a task, each user will have the ability to see the percentage of project completion currently completed by all players globally, so that they get a sense of scale, as well as their involvement in something larger than themselves. Users can subscribe to project updates to stay abreast of completion.

A further possibility exists in the connection of digital and real-world networks via Tech Hubs, noted below, where a hub can begin a new project and feature high scoring users (workers who have garnered the highest number of tokens in their hub) as change-makers on that project.

5. Driving social cohesion through Gifting: This model suggests to allow users to Gift their remuneration (gathered through the completion of microtasks) to themselves, or each other.

This game model is further supported by a gifting mechanism, in which each player is able to 'gift' their remuneration—the tokens acquired by completing each task—to either themselves, or another *random active player*. By this mechanism, each task becomes the potential for a gift to self, or a gift to another—either way, an act of kindness. The worker/players who need the funds can enact an act of kindness towards themselves and gift themselves the wealth, while those who do not need the funds can enact the act of kindness towards another, and gift the wealth to a random worker/player globally.

The aspect or random gifting is quite important, due to several reasons:

- Players who have randomly received a gift of wealth may feel a sense of support, and therefore social cohesion from receiving the act of kindness from an unknown person.

- The potential for random infusions of wealth would motivate a greater number of players to join the platform, be active in completing tasks, and return frequently to see if there is a 'gift' awaiting them (since gifts will only be received by active players who have recently completed tasks).

- Players who gifted their tokens to a random person may feel a sense of accomplishment by enacting kindness, and potentially feel a sense of social cohesion via positive contribution.

- Random acts of kindness towards random people globally may translate to social cohesion overall socially, in that randomness ensures there are no gender, age, geo-location or racial preferences, therefore instilling a sense of 'sameness' of all players.

- All players would have the option of featuring their task completion on social media via APIs and connections; while gifting players are also able to publish their 'gift'; and thus be motivated to spend more time on the platform completing tasks because their time is both well-spent due to tangible, visible, positive outcomes (task completion), and social recognition (motivation).

- This model positions the remuneration as initially disambiguated from actual money by the utilization of 'tokens', where tokens can be traded in for money at any time, yet are at first received as part of the gamified experience. This disambiguation through the use of tokens (in lieu of money) is meant to facilitate the act of giving.

- The acts of repeated giving and receiving constitute a subtle social contract, which may drive an increase in the circular nature of the gifting.

6. Introducing culture to drive social cohesion and task completion: This model suggests utilizing a reframed user experience to drive a specific platform culture, where each user is part of an independent, gamified 'hero's journey', while all heroes are part of a larger collective undertaking, or 'quest'. The microtasks achieved independently are a small yet meaningful part of the larger whole, and position each player as collaboratively working with other players

globally. We suggest that this approach may also create a sense of cohesion (especially if future project may be linked to real-world problem solving, and actual social impact). Gamification mechanisms and dynamics need to be explored further to determine specifics, yet can be utilized to drive an alternate sense of reality during game-play, and refocus the (potentially repetitive) micro-tasks as a necessary undertaking (to facilitate task completion success rates).

7. Driving behavioural change through micro-successes: Given the above mechanics, the use of featured micro-successes may facilitate behavioural change in the individual via Pavlovian response (with use of positive reinforcement, such as motivational sounds). This can potentially also be achieved in aggregate within society, by allowing players to feature their successes, see the successes of others via social media, and be able to track the progression of project completion to projects they have contributed to. Thus, worker/player efforts are captured as part of a greater whole, noting that their individual impact matters, and therefore may increase individual and collective perceptions of agency. Via this mechanism, we may be able to teach users, as well as those watching the successes on social media, that their contribution 'counts', and is added to a larger community of active participants.

8. Lowering barriers to action: This model suggests keeping the Level 1 tasks deliberately simple to lower the barriers to first action, due to the limited technology skills levels potentially available globally, and in order to capture the greatest volume of players possible. Higher level tasks can increase in task complexity, to keep play interesting for repeat players.

9. Allowing users to learn and advance: Players may need to acquire additional skills to advance in levels, thus the act of education, or 'qualification' is gamified and reframed as part of the hero's quest. Higher task complexities can be introduced via this mechanism, and technology training applied to maximize of effort, time and participation of each worker.

10. Introducing Tech Community Hubs: Funding-permitting, this model suggests support via plug-and-play technology centres, with internet connectivity, computers and a community 'hub' setting; both in rural areas that need the technology support, and in developed areas that may not. The hub would act as a real-world connector to the digital sphere, and drive digital hug to real-world hub translation. Existing hubs could also be used as points of distribution in times of crisis.

Thus, the proposed new social impact microwork model strives to create a sense of cohesion through the mechanics listed above, as well as incite a greater volume of worker/players, and drive an increase in the number of tasks completed individually, and collectively.

In addition, elements of Scholtz' *Platform Cooperatives Model* are suggested in order to ensure workers are fairly treated, with common accepted standards that incite workers towards cooperative platform ownership within an interconnected ecosystem that shares resources, rewards, approaches and lessons learned, in order to help each other build and multiply success (Scholtz, 2016).

This approach lends itself to three specific tiers of platform impact, including:

- **Micro:** Our suggested impact model (listed above), which enables microtasks that we have previously defined as the lowest viable level of action. This level may be able to address complex and wicked problem via iterative projects on ecosystem-driven platforms

- **Meso:** An intermediate level of action that is not the lowest viable task, yet also not complex. This level of action may benefit active microworkers, who have gained additional skill levels, and can enact larger impacts via higher complexity tasks

- **Macro:** The highest level of action, requiring complex skillsets and creativity, in which workers are enabled creators, and can self-determine project directions to impact change

Together, these three tiers can connect tasks, workers and platforms in an ecosystem that correlates impacts, elements and approaches, and may be able to integrate task actions towards complex problem solving, and in time, even elements of wicked problem challenges.

The New Social Impact Microwork Model Canvas

The New Social Impact Microwork Model suggests the process and mechanics by which we can undertake aggregate projects that are broken down into approachable microtasks. However, as task and project complexity increases, it also becomes increasingly important to be able to formulate a project strategically, as well as track progress, and note if focus, task, and process changes may be necessary in order to adjust course towards desirable outcomes. The challenge arises of *how specifically* one might formulate each microwork project, and based on the synthesized learning from the primary and secondary research, this paper suggests that the The New Social Impact Microwork Model Canvas, noted below, may be of use.

Based on the collaboratively-created Business Model Canvas (Ostewalder et al, 2010) and informed by the peer-reviewed Flourishing Business Model Canvas in creation by the collaborative team at flourishingbusiness.org (REF); the new The New Social Impact Microwork Model Canvas noted below takes into account the standard items such as the Value Proposition, but also the specific needs and requirements of a microwork project, such as the differentiated Segments of workers, clients and beneficiaries, as well as the Gifting mechanism and its potential impacts.

The New Social Impact Microwork Model Canvas can be noted below:

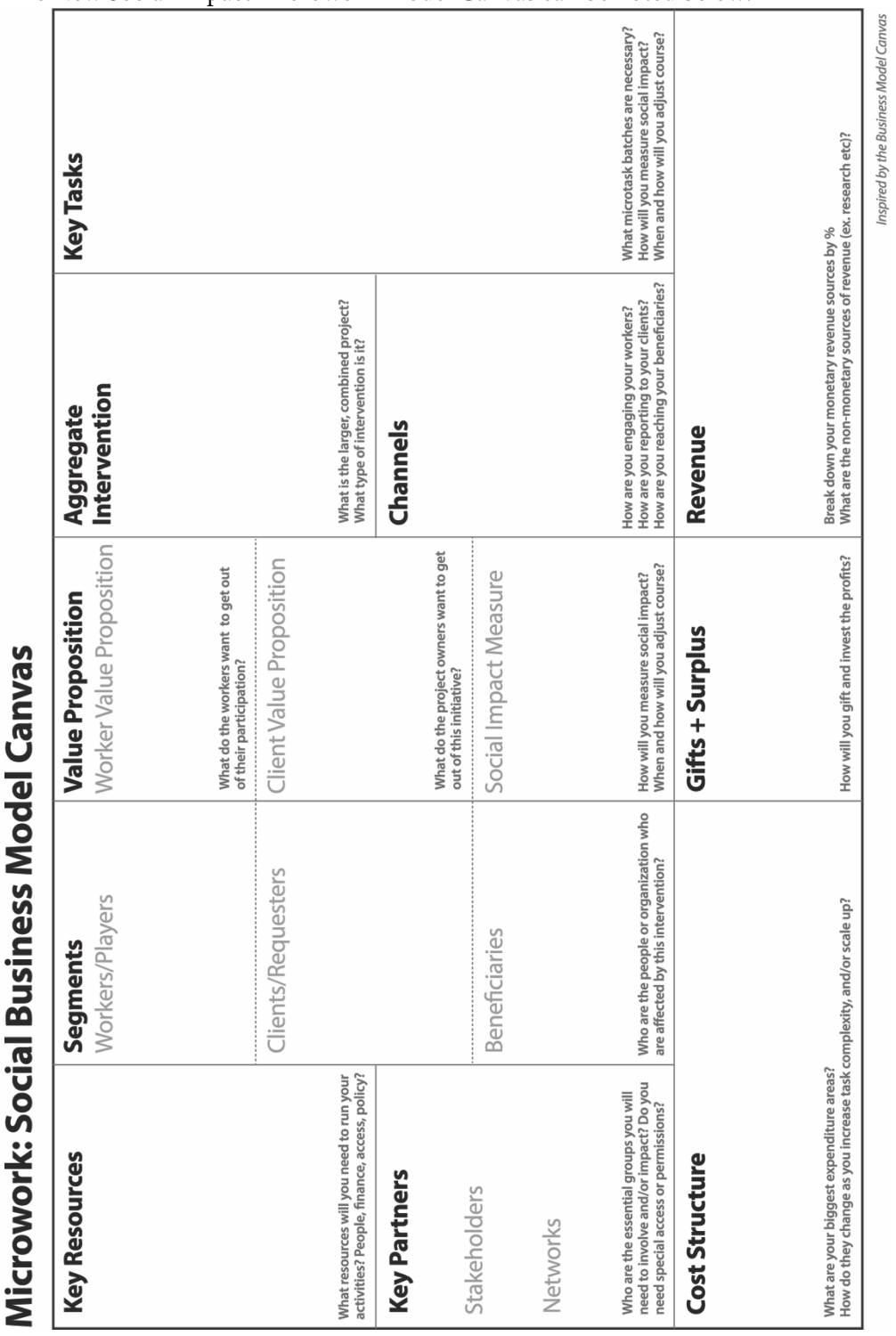


Fig #23: The New Social Impact Microwork Model Canvas

The significance and use of the New Microwork Social Business Model Canvas can be noted as:

Canvas Section	Microwork Project Point of Focus	Contribution to new Microwork Model
Key Resources	What resources will you need to run your activities, in terms of people, finance, access, polices et al?	Planning, tracking and adjusting the resources needed to achieve mandates, in accordance to project changes and learning
Key Partners	Q: Who are the Stakeholders, existing Networks and essential groups that need to be involved and/or impacted? What are the special access points or permissions required to access these groups?	Planning, tracking and adjusting the Stakeholders and Networks needed, and how to gain access, so that project can be adjusted over time to increase possibility of success via partners
Segments	Who are the people that will be affected by this intervention, in terms of workers, clients and beneficiaries?	Keeping focus on the people impacted by the project, in order to plan, track and adjust process and outcomes according to project needs
Value Proposition	How will you measure impact, in terms of workers, clients and social impact? When and how will you adjust course?	Planning, tracking and adjusting the overall project value proposition, and measuring the process impacts so that adjustments can be made
Aggregate Intervention	What is the larger, aggregate project? What type of intervention is it supposed to be?	What is the actual real-life intervention that we are attempting to achieve with the project; are we approaching it in our process, and does course (strategy) need to be adjusted
Channels	By which channels are you engaging the workers, reporting to clients, and reaching beneficiaries?	How might we best engage with our audience segments, in order to engage and report in the most salient way
Key Tasks	What are the necessary microtask batches, is it possible to grow microtask complexity over time, and is it possible to further gamify the process?	How might the project be broken down into batches (and microtasks), and how might the project assist workers in acquiring skills over time, so that task complexity can be increased? Is the work simultaneous or sequential (based on team size and task complexity)? Might we

		utilize gamification to enable process?
Cost Structure	What are the biggest expenditure areas?	How where and when does the project require an influx of financial resources?
Gifts + Surplus	Is it possible to create gifting mechanisms, and invest the profits further?	Are there other gifting mechanisms that can be introduced, and can profits be invested to multiply impact?
Revenue	How might you break down the monetary revenue of the project by %, and are there non-monetary sources of revenue that apply (such as research)?	How are we planning for, tracking and adjusting revenue expectations, and are there non-monetary sources of revenue we can capture?

Table #3: New Microwork Social Business Model Canvas; Relevance and Impacts

In short, the New Social Impact Microwork Model Canvas can be utilized to strategically focus the elements of a social-impact microwork project, to build and track key performance indicators, and finally, to utilize the gathered data in order to adjust project focus to drive desirable project outcomes.

Insight Summary

One can see how this major research project began with a preliminary focus on the topic of microwork models and approaches, striving to inform the opportunity gap within the current models, and form a basis for a new social impact microwork model by exploring additional areas of inquiry. An exploration on problems rooted in complexity was presented to showcase a collective global need for approachable task distribution, and therefore, future mass action in order to enact global change in a timely, risk-averse approach. Research showcased salient mechanisms of gifting, gamification and the behavioral economy to drive action and potentially, an increase in social cohesion.

Initial suggestions were made based on factors potentially maximizing social impact via microwork projects, with Case Studies featured to illustrate lessons learned; the historical example of Wangari Maathai and the Green Belt Movement, which educated Kenyan women individually, created community collectively, and utilized symbols in order to to inspire workers to plant thousands of trees (an analog microtask), in order to positively affect the ecology of the nation. They were successful in not only achieving these environmental aims, but also created additional social impact by garnering male support, changing environmental legislation and ultimately, increasing feelings of agency of involved individuals, proving that individual yet aggregate microtasks can have a lasting social impact.

The widely known Amazon Mechanical Turk microwork platform was utilized as an example of how the current task-oriented model misses the opportunity to pursue deliberate social impact aims; AMT is indeed a high-functioning microtask engine, yet does not significantly focus on impact sourcing, or social impact projects beyond the positive effects of task remuneration for its users. However, due to its continued success, this model was used as a basis for the new model creation.

The third area of focus was upon microwork as a social impact engine within a

participatory aid environment, such as occurred within the Occupy Sandy example, which garnered the existing real-world and digital resources provided by the Occupy Network, and enabled them via a centralized approach, facilitated by a website and social media volunteers. Moreover, Occupy Sandy was an example of the value of distributed networks in working within complex, time-sensitive situations.

The FoldIt case study example showcased the possibilities of resource enablement when an interesting problem is presented in a gamified, fun way; the FoldIt protein typing puzzles were solved by a distributed network of global gamers, having previously eluded formal scientific solution.

Finally, the example of Gifting within a social impact context was noted in the SnailMailMyEmail.org example, where gifting, creative strangers connected the private correspondences of global pairs. What was most interesting about this example, is that in addition to volunteering their creative work, the creative also donated the resources and postage necessary to facilitate the outcomes.

The Literary Review uncovered several areas of further inquiry, and expert interviews were conducted in order to garner further depth and lessons learned in those areas, including microwork, gamification, social impact, among others, and their understanding were combined to create the proposed new Microwork Social Impact Microwork Model, as well as the Social Impact Microwork Canvas—in order to enact a new mechanism for microwork, and potentially track its progress and impacts.

Proposed Innovation Implementation Example

Theory is, in itself, a worthwhile pursuit. However, theory enacted in a proposed practice may have significant illustrative qualities, in that it allows us to embody the initial theory in a possible, projected practice. As such, this Proposed Innovation Implementation Plan strives to enliven the new microwork model, and showcase how it might be enacted within an existing complex challenge of enabling the sustainability of global farming practices.

Specific Challenge:

> ***How might we enable distributed global farming communities to standardize practices, ensure highest quality crop yields, and utilize repeatable process that ensure worker fairness, and environmental sustainability?***

Proposed Microwork Solution:

Utilizing the new microwork model proposed above combined with Scholtz' Cooperatives Model, we propose a solution that enables cooperatives of workers that:

- Utilize an easily accessible mobile platform
- Feature active player/worker/owners as contributing subject matter experts
- To populate the content of an educational farming game; by

1. Increasing user volumes and driving worker alliances: Incentivizing tasks, and determining correct task action via strategic model mechanics, such as the formation of early distributed worker alliances to combine ideas in order to determine best, most innovative, sustainable, fair and profitable practices for their own geographic region and unique challenges; in this case, gamified, peer-reviewed, and upvoted task preferences (what to do, with specific approaches, tools and in what order – such as types of seed, or farming approaches).

2. Distributing wealth to democratize power, via gifting and gamification: Gathering tokens by completing player/worker actions, such as completion of tasks that may include upvoted content creation, and/or education by gaming (participating) in existing content; the ability to gift oneself, or another the monetary gain from the tokens garnered. Additional remuneration obtained via support of invested agencies (such as tax credits granted via governmental bodies who have a vested interest in healthy farming yields and sustainable practices).

3. Capturing lost capacity through task specificity: Creating a game-play model that allows for educational farming process tasks that are specifically micro in their

complexity, and can therefore be chunked, and completed in tiny time investments, when workers are bored or waiting. Task completion rates are tracked, and preference given to the highest completion rates and worker/player happiness rating per task type.

4. Driving influence through aggregate impact: Tracking of task completion rates on the digital platform (with farming content creation as an upvoted expert, and farming content consumption as a learner), as well as the farming yield outputs in real-world farming practices of the worker/player; did their yield increase in volume, in quality, in cost, in sustainability; did they form alliances with other farmers? Showcasing worker/player impacts, by allowing worker/players to feature their game-play level, as well as impacts and gains (if they wish).

5. Driving social cohesion through Gifting: Allowing worker/players the ability to gift their tokens to themselves - or if they choose - a random, active worker/player globally, in order to drive social cohesion through acts of connection via gifting.

6. Introducing culture to drive social cohesion and task completion: Creating an easily digestible, fun user experience to drive a positively competitive yet collaborative platform culture, where each worker/player is learning and contributing farming content on an individual journey, yet feels they are part of a larger platform community.

7. Driving behavioural change through micro-successes: the use of positive motivations for each individual task completion (such as a positive sound reinforcement); of task progress (such as a visual of a seed that grows into a small plant, then consistently larger plant); and aggregate project contribution (such as the worker/players own plant being shown as part of the community garden to illustrate project progress).

8. Lowering barriers to action: Keeping microtasks deliberately approachable in terms of mobile platform delivery, as well as visual and verbal language necessary; allowing for verbal translation by other microworkers to be available for worker/players who cannot type.

9. Allowing users to learn and advance: Providing education and skill increase as part of advanced game play, so that active worker/players can advance in task complexity.

10. Introducing Tech Community Hubs: As Phase II, and funding-permitting, allowing the creation of plug-and-play technology hubs, where container hubs are created in active rural farming areas, with internet connectivity and technologies available; where worker/players can meet in a real-life setting, and further drive community. Hubs can also be utilized as distribution centres to disseminate knowledge, or enabling elements such as seeds and tools.

With the above considerations, one can see how a farming collective might in fact be able to translate local best practices and knowledge into upvoted content created by its worker/player/owner base, in which remuneration can be garnered via government-funded grants, and sponsored by in-kind contributions of supporting agencies (that are approved by the collective rather than being lobbied). This format allows for the key local challenges to be addressed by the collective, and most cogent learning to be captured. Most upvoted contributors, and most active learners can be featured as local game winners, and gain the greatest number of game tokens, which can be gifted into remuneration to themselves, or a random, active worker/player. Progress can be tracked and featured to incite future action, both on the digital platform, and in the real world farming yields. In this micro-format, worker/players can be treatred fairly and, incentivized into further action, where levels can be addressed over time to rise to both meso, and macro levels over time, and drive further creative ownership by the worker base, to not only focus on their own farming community, but also share learning and approaches with global farming community ecosystems.

Further Development

Of course, this major research project did not have the resources necessary to fully explore all of the potential opportunity gaps, and more work is needed. Firstly, it is suggested that further work be done on the specific area of gamified play, so that specifications can be created around the suggested mechanisms of the new model. This

exploration is a separate work in and of itself, and would be best explored by an entrepreneurial team, or researcher.

Secondly, much more exploration and testing would be necessary around our understanding of how to specifically work with problems rooted in complexity, and wicked problems specifically, and how they might potentially be impacted by the new gamified social impact microwork model; how might wicked problems be noted in sections or areas that are translatable to microwork projects, and able to be implemented, tracked and tested?

Thirdly, it would be beneficial to create KPIs (Key Performance Indicators) of social cohesion and impact, so that measurement can be illustrative of impact and course.

Lastly, it would be of benefit to enact a Peer Review of the Microwork Social Impact Model Canvas, to garner the expertise and knowledge of the peer base, and update the Canvas for future use, as well as to test the suggested Gamified Social Impact Model of microwork, and see how actual workers / players interact with it, to make model adjustments based on real world implementation.

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APPENDIX A

The Aggregate Manifesto:

All people have the potential within themselves to create positive impact,
however large or small; that tiny, minuscule positive actions
can be added together to create something large and beautiful;
that no person or moment needs be wasted when it can be put into service;
and that together, we can do anything, so let's do something good.
Because every little bit counts.

An Ethos in 10 Principles:

Radical Inclusion: Anyone may be a part of an Aggregate Project. We welcome and respect the stranger. No prerequisites exist for participation in our community.

Gifting: Each Aggregate Project task is a devoted act of gift-giving. The value of a gift is unconditional. Gifting does not contemplate a return or an exchange for something of equal value.

Decommodification: In order to preserve the spirit of gifting, our community seeks to create digital and social environments that are unmediated by commercial sponsorships or advertising. We stand ready to protect our culture from such exploitation. We resist the substitution of consumption for participatory experience.

Lost Capacity: Aggregate Projects encourage the individual to discover, exercise, and rely on his or her inner resources, and to use them to capture the capacity within every task.

Contribution as Self-expression: Contribution as self-expression arises from the unique gifts of the individual. No one other than the individual or a collaborating group can determine its content. It is offered as a gift to others. In this spirit, the giver should respect the rights and liberties of the recipients.

Communal Effort: Our community values creative, aggregate collaboration. We strive to produce, promote, and protect social networks, public spaces, works of research

and discovery, works of art, and methods of communication that support such interaction.

Civic Responsibility: We value civil society. Community members who organize projects or events should assume responsibility for public welfare and endeavor to communicate civic responsibilities to participants. They must also assume responsibility for conducting events in accordance with local, state, and federal laws.

Positive Impact: Our community respects ecosystems and the environment. We are committed to leaving no negative trace of our activities wherever or however we act. We add value, clean up after ourselves, and endeavor, whenever possible, to leave people, places, and things in a better state than when we found them.

Participation: Our community is committed to a radically participatory ethic. We believe that transformative change, whether in the individual or in society, can occur through the medium of connected contribution through participation. We achieve being through doing. Everyone is invited to work. Everyone is invited to play. We make the world real through actions that open the heart.

Immediacy: Immediate experience is, in many ways, the most important touchstone of value in our culture. We seek to overcome barriers that stand between us, to recognize our individual and collective capacity, and a recognition of our inner selves, the reality of those around us, participation in society, and contact with a natural world exceeding human powers. No idea can substitute for this experience.

10 Principles adapted from http://burningman.org/culture/philosophical-center/10-principles/ (The 10 Principles of Burning Man, 2016)