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Tools Enabling Online Contributions by Older Adults

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Abstract
Having a sense of purpose is one of the tenants of well-being, at any age. In this paper we review technologies that could help older adults to be an active part of society - in particular those who cannot leave their home regularly or easily - and we discuss areas that current research and practice have not yet addressed satisfactorily.

Author Keywords
Older adults, Seniors, Online contribution, Online work, Remote work

Introduction

The physical and mental health benefits of having a productive role in society are well documented in the literature (e.g. [10, 13]). After retirement, older adults can experience social withdrawal and loss of identity and purpose, which are detrimental to their physical, psychological and social well-being (e.g. [11]). Engaging in productive activities after retirement, paid or not, has shown to be protective against these effects (e.g. [10]), with greater benefits in volunteering work for and by older adults (e.g. [9]).

However, volunteering (and societal contributions in general) presents many challenges for older adults. First, age-related diseases and functional problems, such as visual impairments, depression, arthritis, respiratory and heart diseases, and mental disorders [19], make contributing difficult (often for the simple reason that it is more difficult to get out and around, especially if the environment is poorly designed for accessibility): volunteers tend to be healthier and more integrated individuals [9]. Second, despite the benefits, motivation tends to drop over time: a study that followed volunteers for over a decade showed that only 6% sustained continuous volunteering, while most adults volunteered once or never [18].

In this paper we review technologies that enable and facilitate the process of contributing to society in a sustained fashion. Given our focus on older adults, starting at age 60 (according to WHO, www.who.int/healthinfo/survey/ageingdefnolder/en") and including those who cannot leave home, we

concentrate on technology that enables contributions **from home**. Applications along this line are abundant and very successful (from volunteering sites to crowdsourcing sites), and constitute in principle a tremendous opportunity for enabling contributions by older adults at home – especially as older adults are increasingly adopting new technologies and tools (e.g., tablets and online services); see reference [14] for a systematic review on technologies for older adults. This, for the reasons described above, would significantly impact societal well-being. However, as we will show, this opportunity is rarely made available to or exploited by older adults.

We focus our review on the analysis of online services, particularly volunteering and crowdsourcing sites, in terms of the contribution process, the online opportunities they offer, the type of motivational features they rely on, and more importantly, how they support the work by older adults. We complement this analysis with current findings in the literature, to then highlight some gaps between research and practice.

Tools for online contribution

In an initial phase, we screened over 200 volunteering and crowdsourcing services that provide paid and non-paid opportunities to work online. Volunteering services were searched in the Google search engine (http://google.com) using the keywords “online volunteering”, “volunteer online”, “micro volunteering” and “online volunteering websites”, and considered if they appeared in the first four result pages - as both direct links or indirect links in online lists. Crowdsourcing services, on the other hand, were obtained from the curated list at crowdsourcing.org (http://www.crowdsourcing.org/directory), in the categories “cloud labour”, “creativity” and “open innovation” (excluding categories such as crowdfunding and tools, to focus on productive activities), with the English language filter set.

From this list, we excluded platforms, software and services that were either discontinued or crowd-based but did not offer an option to contribute online. As a result, we included a total of 99 services (49 volunteering, 50 crowdsourcing) listed here https://goo.gl/JZdFtK.

We analyse the tools and the literature based on this set of perspectives:

- **Role of technology** in the social contribution process: For example, technology might help in *performing* the tasks online, in *advertising* volunteering projects, or in *organising and coordinating* work online.
- **Type of online activities**, that is, the kind of work supported. This is relevant since some activities are more beneficial and effective than others in terms of their contributions to health and well-being of older adults [10, 13].
- **Motivations and rewards**, as they are correlated to the *attachment* to volunteering activities. A comprehensive study by Wilson and Musick associates this attachment, among other contextual factors, to the resources older adults bring to these activities and the rewards obtained by participating [17].
- **User interaction with the technology**. We aim to study the possibility of older adults to contribute, including those physically and cognitively challenged. For this population, the interaction paradigms supported are critical to enable contributions [5].

As we will discuss in the next sections, older adults enforce specific requirements to each of the above dimensions. However, lessons from design tell us that when designing for extreme groups we are making

our solutions available to a wider audience. Thus, we expect some of the findings to be equally applicable to the general population, though certainly more critical to our target audience.

Role of technology

Research on crowdsourcing has identified the phases of the remote contribution process [15]:

- *Matchmaking (task publication and worker pre-selection)*, where both work *performer* and *work provider* agree that the performer will do the task
- *Task Execution*, where the worker performs the selected task
- *Validation*, where the work is assessed and accepted or rejected; and
- *Reward*, where monetary or other kind of rewards are given on (successful) completion of the task

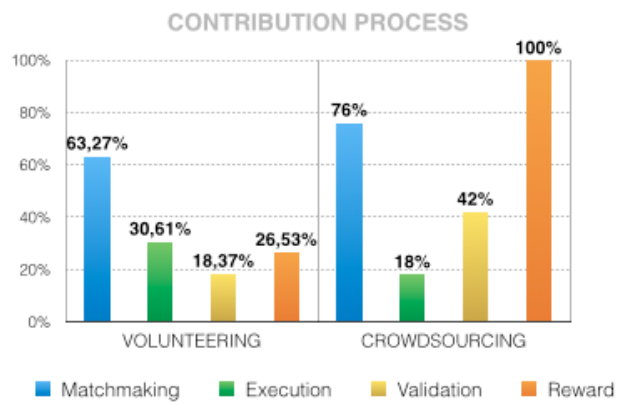
As seen in our analysis different tools support different phases of this process. General purpose **volunteering services**, such as VolunteerMatch (http://www.volunteermatch.org), act as bridges between volunteers (or potential volunteers) and organisations, focusing mostly on the matchmaking phase (96%). Organisations use these sites to advertise initiatives and find those willing to collaborate and having the required skills. VolunteerMatch, facilitates this matching for older adults, which is particularly important given the fact that they are more likely than young adults to pass on opportunities they do not find "interesting and challenging" [16]. Execution and validation are virtually not implemented (execution 4%, validation 0%). The rewards in these sites are implemented only by the 37%, due to the fact that the benefit is mostly in the well-being that helping others generate [1]. Volunteering services for a specific purpose, for example Distributed Proofreaders (http://www.pgdp.net), are much less flexible in terms of matchmaking but they have higher support in terms of execution (56%) and validation (36%).

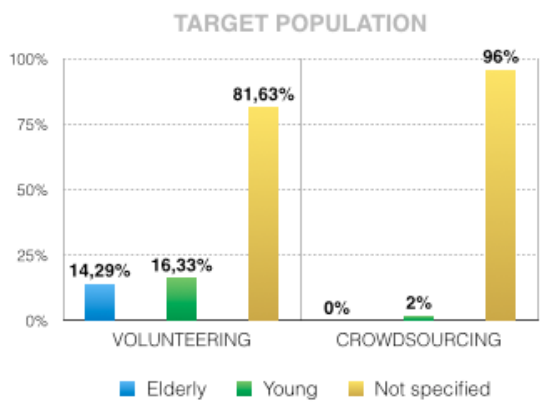
Crowdsourcing services offer greater support for the phases of the remote online contribution process (48% of services support 3 or more phases, against 12% for volunteering). In crowdsourcing there are also both specific and general-purpose services to be found, although there is not a marked distinction in terms of supported phases. However, if we consider the categories given by our crowdsourcing directory, the execution phase has clearly a stronger support for open innovation (50%) than for labour (5%) services. The reason being that for the first type, one can simply post ideas or suggestions, while crowd labour involves more challenging tasks. Services offering particularly challenging tasks, such as Innocentive (http://www.innocentive.com), still require the work to be completed out of the systems, and submitted later. A surprising finding was that the support for task execution was lower in crowdsourcing services than in volunteering. Nonetheless, crowdsourcing applications allow the definition of specific and custom logic for worker selection and task validation to a greater extent, and the rewards are very often in terms of money.

Finally, we mention that the *task execution* phase can be supported by a variety of tools intended for a completely different purpose, that of **connecting people** (such as video conferencing, email, or file sharing applications). Examples are the video conferencing service Skype, which has been used to support a tutoring project involving retired school teachers and children [3], and, more recently, the Speaking Exchange (http://www.cna.com.br/speakingexchange) program that also uses video conferencing to connect young Brazilians who want to improve their English skills, with native speaking older adults.

Work regarding both applications and research studies, on online remote contributions for older adults is scant, especially in terms of design, acceptance and usage. Few applications for remote online contribution target the older adult population specifically, our review shows that only 14% of the services do so and all of them are for volunteering and none for crowdsourcing. In the literature, however, we find examples targeting older adults, including the tutoring projects Speaking exchange and Skype Grannies [3], as well as the work from Kobayashi et al. [7,8] on enabling proofreading tasks through crowdsourcing. Not many online services combine the possibility of matching your skills and abilities, and allowing users to execute the tasks in context. This increases the need for context switching and learning to use different tools, thus potentially limiting the participation of older adults. Additionally, analysis of usage and acceptance of these applications by older adults has received minimal attention by researchers so far. Kobayashi et al. investigated the participation of older adults in their crowdsourcing application [8] and found that using micro-tasks and allowing users to choose the tasks based on their skills simplifies the work for seniors. They also found that the accuracy of performance matched that of younger participants. Moreover older adults were most of the top contributors and they became “longer-standing workers” once they had joined the community. This is encouraging considering our belief in the potential for contributions by older adults.

We summarised implications for older adults and the findings of our analysis in Figure 1.





Considerations for older adults:

- Older adults are more likely to pass on opportunities they do not find interesting and challenging.
- Crowdsourcing simplifies the work for seniors.

Findings:

- Few applications for remote online contribution target the older adult population specifically (14%).
- Scant support for full coverage of the whole remote contribution process, leading to an increased need for context switching and use of different tools, potentially limiting older adult participation.
- The matchmaking phase is very well supported by both volunteering (63%) and crowdsourcing services (76%).
- Support for task execution is lower in crowdsourcing services (18%) than in volunteering (31%).

Figure 1. Analysis for the Role of Technology in volunteering and crowdsourcing services

Type of online activities

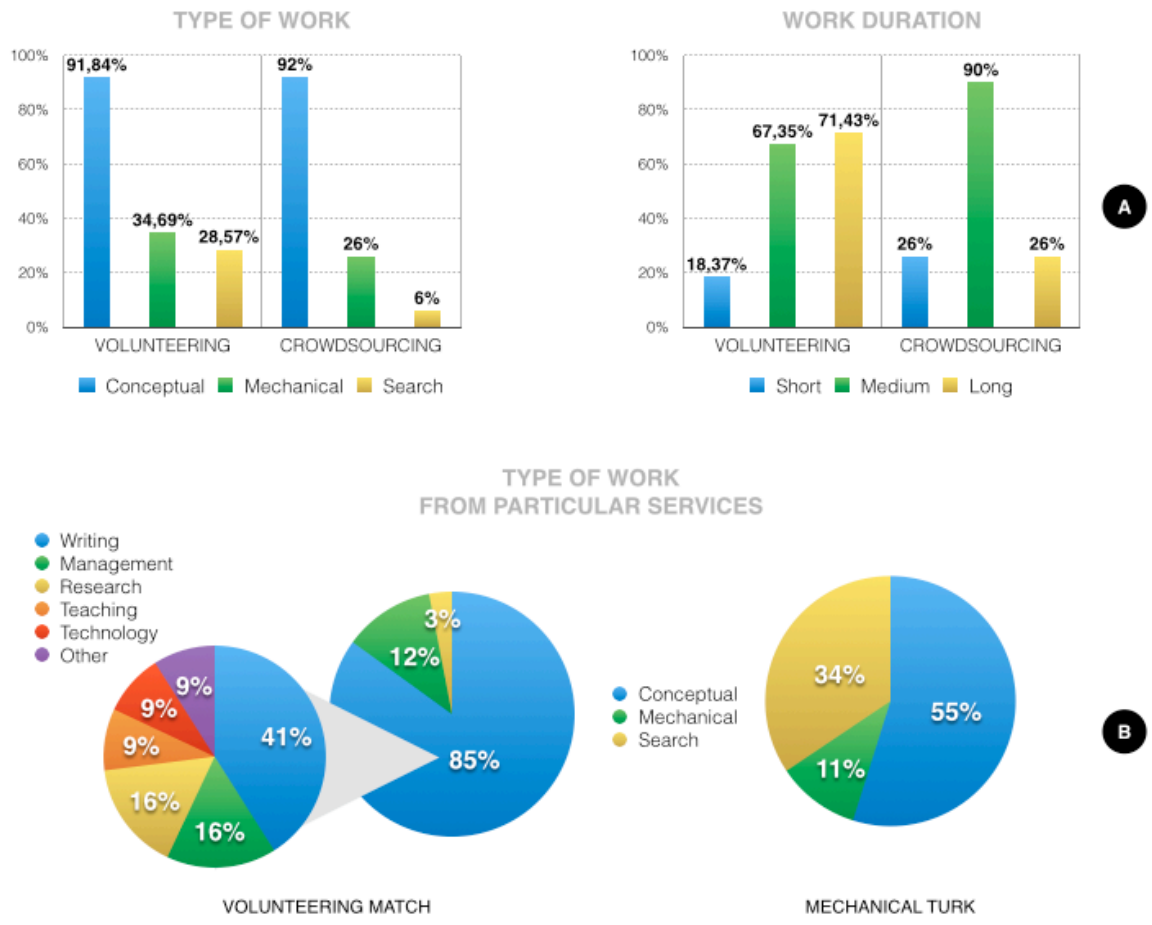
The key issue in contributions from home is *what* can be done remotely. In an analysis of two representative services (VolunteerMatch and Amazon Mechanical Turk) we have identified different types of activities in terms of type of online work, and categorised them into: *conceptual*, requiring thinking and use of specific skills; *mechanical*, tasks that don't require higher levels of thinking and can be performed almost mechanically; and *search*, requiring to look for additional data on external sources. We have also identified different levels of commitment based on work duration, ranging from: *short*, for seconds or minutes; *medium*, implying a one-time commitment or hours of work; and *long*, if tasks are performed multiple times over a longer period of time.

Tasks offered by online volunteering services include writing, research, management, among others, and are performed mainly via email, word processing software and videoconference. Older adults who have volunteered over the internet reported engagement in such tasks, although it must be noted that these are skilful and highly educated individuals [12]. Our analysis shows that 92% of volunteering services requires conceptual work, and to a lesser extent work of mechanical (35%) and search (29%) type. Another characteristic of volunteering services is the tendency to offer work of medium (67%) or long (71%) duration. However long term commitment might be an obstacle to capture or retain older adults as volunteers, given their tendency to lose motivation over long periods of time [18].

Similarly, crowdsourcing services offer work that requires thinking and use of specific skills (92% conceptual work) while mechanical (26%) and search (6%) are less common. However, in contrast to volunteering, crowdsourcing is concentrated mostly towards one-time commitment work (90% medium and 26% short). Nonetheless, little can be said for older adults since we have found no crowdsourcing services targeting them specifically. Indeed the participation of older adults in crowdsourcing markets has been shown to be very limited [6] and few studies have explored their potential in crowdsourcing. Among these studies, Kobayashi et al. investigated, with positive results, the feasibility of engaging older adults in helping people with print disabilities, by handing proofreading micro-tasks [7].

In summary, while services provide plenty of opportunities to contribute, very few of them are specifically targeting online work by seniors, and studies involving older adults, especially the “oldest old”, are very limited and in some cases anecdotal. Therefore this is an area where research, studies and experiments are needed to assess viability and potential.

In Figure 2 we complement our findings on volunteering and crowdsourcing services, with an analysis of two general-purpose services. We investigated the type of work required in 200 tasks from Amazon Mechanical Turk and 100 tasks from VolunteerMatch to have a deeper understanding of offers within particular services. This analysis shows that while most tasks can be categorised as conceptual, few provide the opportunity to learn or apply competences.



Considerations for older adults:

- Studies report on the engagement of older adults in activities for online volunteering.
- Positive results in using micro-tasks as a form of online work in crowdsourcing.
- Older adults might be difficult to recruit or retain as long-time volunteers, given their tendency to lose motivation over time.

Findings:

- The type of work offered online is mostly conceptual (92% for both volunteering and crowdsourcing). However, an analysis of particular tools (B), shows that conceptual tasks typically require to categorize text, find errors, write questions on a text, or answer questions on all topics. While not mechanic, few of the tasks allow people to learn a subject or apply competences.
- The work offered online requires mostly medium (hours or one time commitments) to long term commitments.
- When comparing our analysis of services to that of particular tools, we have seen that the tendency for type of work is maintained. However for Mechanical Turk we observe a marked reduction in conceptual tasks in favor of search.

Figure 2. (A) Analysis and comparison of work in volunteering and crowdsourcing services (B) Analysis and comparison of work in VolunteerMatch and Mechanical Turk.

Motivation and rewards

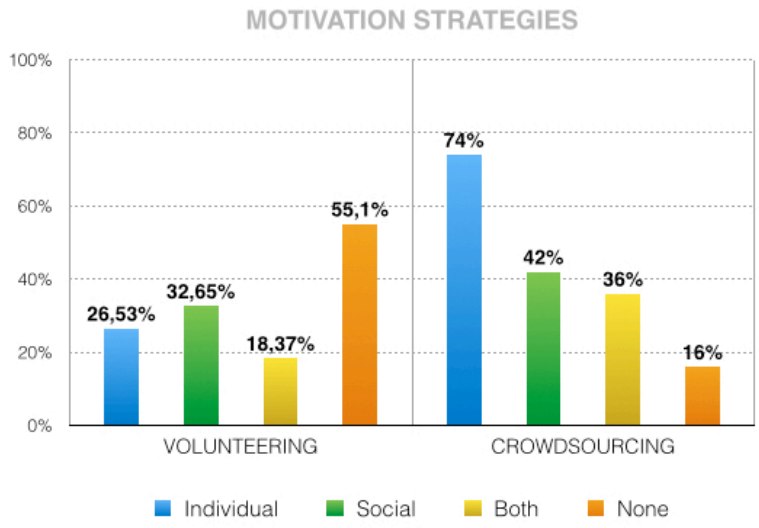
Finding the right motives to engage in productive activities is key to long-term attachment [17]. Motivations can be *intrinsic* (the satisfaction of helping others and enjoyment of the activity itself) and *extrinsic* (more instrumental motivations such as money, social recognition and rewards). However we know that older adults are less likely than younger adults to engage in productive activities for instrumental reasons [4].

Online services rely at different levels on both intrinsic and extrinsic motivation to attract and retain contributors. From our analysis we have observed that 55% of volunteering services do not implement motivation strategies. Indeed older adults mainly volunteer because they feel they make a difference [3,12] relying strongly in intrinsic motivations. Furthermore, studies show that older adults (55 and over for these studies) are *twice* as likely to pass on opportunities that they do not find interesting and challenging, and look for something where they can apply their own skills [16]. Indeed, these adults are reported to *not* volunteer because they do not find the right opportunity nor see that they are learning new skills. We should note, however, that older adults volunteering online tend to be more skilled and highly educated [12].

Some online volunteering sites adopt motivating mechanisms such as ratings and peer recognition. In some cases (e.g., UN volunteers - http://www.unv.org), these are utilitarian as they help organisations to select candidates; in others (e.g., SkillsForChange - http://skillsforchange.org), they are meant to create community feeling and recognition. Social interactions during volunteering also act as a strong motivational instrument, and are even responsible for some of the positive effects of volunteering activities (e.g., countering depression due to the mediating effect of social resources such as attendance to volunteer work meetings) [13]. We have seen social motivation strategies (33%) to be slightly more used than individual strategies (26%) by volunteering services.

We have also found monetary reward to be the prime mover for crowdsourcing services, as reported in the literature [6], with a 92% of them paying from work. As opposed to volunteering, crowdsourcing uses individual persuasion the most (74%), however social motivation strategies (42%) are also adopted. The few studies analysing the participation of older adults in crowdsourcing tasks have shown the importance of the sense of purpose, and in particular social-purpose tasks, on motivation [8]. Most studies, however, are limited to experimental settings, where the motivation to contribute was not the main goal.

In summary, the motivational aspect in contributions by older adults is fairly well understood, although there are still only small studies and issues remain in understanding i) how to promote a *sustained* contribution, ii) if the same motivational aspects apply to people contributing from home, as most studies relate to people contributing in person, iii) if social interactions play a factor, and to what extent.



Considerations for older adults:

- Older adults are less likely to engage in productive activities for instrumental reasons (e.g. for career advancement).
- Older adults volunteer mainly because they feel they make a difference.
- Social interactions during volunteering act as a strong motivational instrument.
- The sense of purpose, in particular social-purpose tasks, is important for motivation.

Findings:

- Volunteering services do not implement motivation strategies for the most part (55%), solely relying on intrinsic motivation. On the other hand only 16% of crowdsourcing services lack motivation strategies, relying mostly on payment.
- Despite the importance of social interactions, only 33% of volunteering services implement social support features.
- Crowdsourcing services rely strongly on individual motivation strategies (74%).

Figure 3. Analysis and comparison of rewards in volunteering and crowdsourcing services.

Interaction with the technology

Social contribution sites support the “traditional” interfaces, for desktop, tablet and smartphones. New paradigms (from watches to gestures) have not yet entered the volunteering or crowdsourcing domains. As expected, the lack of ICT skills, as well as decline associated with ageing, is a problem for older adults [5], and help from others could be required to overcome usability issues [7].

Perhaps more surprising is that studies report many social contribution sites to have a rather poor design from an accessibility perspective. Indeed, studies on older adults’ experiences with online volunteering sites report problems with the layout of websites, internet connection and input devices [12]. An analysis on Mechanical Turk’s interface, observing Web Content Accessibility Guidelines noted several problems including lack of page headings and skip links, no use of alternative text for images, unlabelled input elements, time limits for completion of tasks, nested tables and elements that could not be accessible through keyboard navigation, and more [2]. Recommendations emerging from this analysis were to provide accessible templates and guidelines, and allowing workers to request more time for tasks completion, mark tasks as inaccessible or requiring specific abilities, as well as filtering them based on abilities required.

The need for 'more adult friendly' mediums and patterns is also acknowledged by Kobayashi et al [7], who argue in favour of touch devices and simple tasks (such as those requiring yes-no answers), which make the use of applications easier for older adults. Since there appears to be consensus on users requiring at least some technology-related skills, to get involved effectively in virtual contributions [3], the aforementioned issues have to be considered and dealt with in order for older adults to participate and obtain real benefits out of their online contributions.

Analysis and findings

This survey points to findings that are in part expected and in part surprising. First, we observe that older adults have a desire and willingness to help others, by making a difference in causes they care about; helping others is in fact *the* motivating factor [16]. However, as evidenced in our analysis of tools for online contribution, hardly any opportunities are specifically designed for older adults, both in terms of technology and of online work. The lack of research on the topic - combined with the success that other areas have witnessed in technologies for older adults [14], and the evidence on the importance that older adults give to being active and feeling helpful [3,12] - seems to indicate towards the still untapped potential of this area.

The analysis also highlights challenges that need to be solved to enable online contributions from home:

- **Integrated process for contributing online.** Today, services that cover the entire online contribution process are few (we only found 5 in our review), and include motivational elements, task types and interactions not designed for older adults. A positive aspect is the support for matchmaking, which could enable older adults to find suitable tasks.
- **Task types.** Older adults, more than their younger counterparts, need tasks that let them *apply their skills* and *learn* [16]. Even when tasks are conceptual, they hardly offer the opportunity to apply skills or for learning (e.g. 41% of tasks include writing press releases or reports). We should note, however, that nowadays a very selective group of older adults - skilful and highly educated - participate in virtual volunteering [12], which requires further studies on the topic.
- **Motivation.** Motivations can be intrinsic, although older adults need to understand the purpose and importance of their contribution [3]. We need to highlight that for long-term commitment, motivation features might be needed to ensure sustained participation – whose effectiveness has been demonstrated in other application areas [14].
- **Social interaction.** Part of the positive effects of contributing are due to social interactions [13]. This is also true for older adults. However, less than 40% of the services we have reviewed offer social support features. We should also note that no formal studies have addressed the effects of online social support during the contribution process.

These observations highlight the need for systems that i) let people find (challenging) tasks in line with their skills, and for causes they care about, ii) that allow for social support during the contribution process, and iii) that are accessible for older adults. This is not easy, but we know from other domains that technology can successfully help adults in later life, and all indications point to a high potential for success on technologies enabling online contributions from home.

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