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Exploring Intrinsic and Extrinsic Motivations to Participate in a Crowdsourcing Project to Support Blind and Partially Sighted Students

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Abstract. There have been a number of crowdsourcing projects to support people with disabilities. However, there is little exploration of what motivates people to participate in such crowdsourcing projects. In this study we investigated how different motivational factors can affect the participation of people in a crowdsourcing project to support visually disabled students. We are developing "DescribeIT", a crowdsourcing project to support blind and partially students by having sighted people describe images in digital learning resources. We investigated participants' behavior of the DescribeIT project using three conditions: one intrinsic motivation condition and two extrinsic motivation conditions. The results showed that participants were significantly intrinsically motivated to participate in the DescribeIT project. In addition, participants' intrinsic motivation dominated the effect of the two extrinsic motivational factors in the extrinsic conditions.

Keywords. Crowdsourcing, motivation, accessibility, students with visual disabilities, image descriptions

1. Introduction

The use of Virtual Learning Environments (VLE) to facilitate teaching and learning in higher education has been widely adopted in many countries. Lecturers typically upload their digital learning resources to the VLE, which can include handouts, slide packs and other materials used for lectures and seminars. Digital learning resources now include many images, for example photographs, graphs, diagrams and drawings. While some of these images are for decorative reasons, many of them are vital to understand the materials and being able to learn from them. Without descriptions of the image, blind and partially sighted students are not able to access the information contained in those images. This can put them at a severe disadvantage when preparing for lectures, assessments or practical activities with other students.

Screen reading programs for blind and partially sighted computer users can now deal well with the text in digital learning resources. However, screen readers cannot

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extract any information from images. Unfortunately lecturers do not generally provide explicit descriptions themselves of every image in their learning resources and lack the time and resources to do so. This is a situation very parallel to the image description problem on websites [1]. However, this is a situation in which crowdsourcing could be applied successfully to support blind and partially sighted students.

In this paper we present DescribeIT, a crowdsourcing project aimed at supporting the description of images in digital learning resources by sighted people for blind and partially sighted students. In particular, we present a study which investigated what would motivate people to contribute to the project.

2. Crowdsourcing: A New Paradigm for Socially Responsible Projects

The term "crowdsourcing" was introduced in 2006 by Howe [2]. He defined it as "the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call" [2]. In other words, crowdsourcing is a means for an organization (the "crowdsourcer") to obtain knowledge, expertise, information or resources from a group of people (the "crowd"), usually by breaking the work into small tasks that are relatively easy to do and distributing the work over the Web. The crowd members are often asked to contribute for free or for very small payments.

In the recent years crowdsourcing has become an important and growing trend; it has been widely applied in many contexts both in the private and public sectors. Although crowdsourcing is relatively new, it already has numerous successful platforms and projects, for instant, Amazon's Mechanical Turk (MTurk), Wikipedia, Threadless, and InnoCentive. In addition, a number of projects have been proposed to support people with disabilities.

2.1. Crowdsourcing to Support People with Disabilities

Bigham Ladner and Borodin [3] surveyed initial examples of crowdsourcing projects to support disabled people. These projects presented the task to be accomplished to participants in a number of forms, for example, as a game. One of the interesting early initiatives in this form was the ESP game developed by Von Ahn and Dabbish [4] which involved players tagging images on the Web as part of the game play. In addition to being fun and entertaining for the players, this contributed to describing images on the web which is particularly helpful for blind web users.

Takagi et al. [5] developed a crowdsourcing project to address the web accessibility problems encountered by a wide variety of disabled web users. The Social Accessibility Project allowed disabled web users to report a problem on a website with a simple shortcut key command. The problem would then be posted for the crowd of supporters to try to solve.

While these projects addressed the problems of disabled people encounter on the web, other crowdsourcing projects have addressed the problems that disabled people have in navigating the physical environment. Such a project was created by Hara, Le and Froehlich [6] to tag Google Street View images with information about the accessibility of sidewalks. With a similar aim, Cardonha et al. [7] used crowdsourcing to create accessibility maps of cities. In a second project by Hara et al [8], they used crowdsourcing to collect information about bus stops for visually disabled people.

Finally, one of the most ambitious crowdsourcing projects to date to support disabled people is VizWiz [9]. This project ais to provide nearly real-time answers to questions about visual information for visually disabled people, for example the labels on food packets, dials on appliances and the colours of objects. The visually disabled person takes a photo of the information with their mobile phone which is then relayed to MTurk workers in real time using a special service, quikTurkit. They then describe the information and it is relayed back to the visually disabled person immediately.

These initiatives show that crowdsourcing has the potential to be a useful means of providing support for people with disabilities in the problems they face in daily life. However, many technical and practical challenges need to be addressed to achieve a successful and sustainable crowdsourcing project in this area. One of these challenges is the need to provide appropriate incentive mechanisms that ensure people are motivated to participate in such crowdsourcing projects.

2.2. Motivations to Participate in Crowdsourcing Projects

One central question about crowdsourcing is what motivates people to participate in these projects. Although crowdsourcing projects to support people with disabilities have not investigated this question, researchers have investigated motivational factors that lead people to participate in crowdsourcing projects in general. Table 1 summarizes the motivational factors that have been identified in previous research. These motivational factors are generally divided into intrinsic and extrinsic motivations. In the context of crowdsourcing, extrinsic motivation means that crowd members are motivated by factors external to the crowdsourcing task; these might be financial rewards, social recognition, or job opportunities. Whereas intrinsic motivation means that crowd members are motivated by factors related to the task itself, such as the satisfaction they got from doing the task well.

Lakhani et al. [10] explored the motivation of the crowd to participate in a scientific problem solving project, InnoCentive. They conducted an online survey in which respondents who were active crowd members rated the importance of 16 motivational factors. While InnoCentive crowd members reported that they were motivated by monetary rewards, they were significantly more motivated by intrinsic motivation factors, such as the intellectual challenge of problem solving. Interestingly, both the extrinsic motivation of money and intrinsic motivations were significantly correlated with being a successful problem solver on InnoCentive.

Brabham [11] investigated the motivation of crowd members on iStockPhoto, an online agency for amateur photographers. An online survey with 651 “iStockers” showed that the strongest motivators were to make money, improve one’s creative skills, and to have fun, whereas passing the time and building a network of friends were the least popular reported motivators. In a second study Brabham [12] conducted interviews with 17 members of Threadless, an online t-shirt company that crowdsources the design process of its product through an ongoing online competition. Brabham found that crowd members reported a mix of intrinsic and extrinsic motivations, money, for example developing creative skills, the potential to leverage freelance design work, and the love of the Threadless community. Most interestingly, one motivation was “addiction” to the Threadless community.

Table 1 A summary of the previous studies that investigated crowd members' motivations to participate in crowdsourcing projects, either Intrinsic Motivation (IN) or extrinsic motivation (EX).

Motivation	Platform	Study Methodology	Authors
Money (EX) Intellectual challenge (IN)	InnoCentive	online survey	Lakhani et al. [10]
Money (EX) Improve creative skills (EX) Fun (IN)	iStockPhoto	online survey	Brabham [11]
Money (EX) Develop creative skills (EX) To leverage freelance work (EX) The love of the community (IN) Addiction to the community (IN)	Threadless	Instant messaging interviews	Brabham [12
Money (EX) Fun/Enjoyment (IN) To pass the time (IN)	Amazon MTurk	online survey	Ipeirotis [13]

Ipeirotis [13] assessed the motivations of the "workers" on Amazon Mechanical Turk (MTurk), a popular micro-payment crowdsourcing platform. He conducted an online questionnaire with 1,000 workers which showed that approximately 50% of the workers are American and 40% are Indian. Indian workers reported that they were motivated by money as primary source of income, whereas American workers consider MTurk a secondary source of income. However, although money was considered the primary motivating factor to participate in MTurk, workers also mentioned other intrinsic motivations such as to have fun and to pass the time.

Hossain [14] targeted 400 crowdsourcing platforms to identify the key activities and incentive mechanisms used. He found that only 27.6% of the platforms used intrinsic motivations to motivate their crowd members, whereas 72.3% used extrinsic motivations. Of this latter group, approximately 50% of the platforms use monetary rewards as the extrinsic motivation. These results show that intrinsic motivation is much less common on crowdsourcing platforms than extrinsic motivation, and that monetary rewards are the most common motivation.

While there is an overlap between what appears to motivate people to participate in crowdsourcing projects, the motivators for crowd members in different projects such as InnoCentive, Threadless and iStockphoto are different. As a result each project has a group of motivations that not necessarily helpful to apply in other projects. These differences mean what motivates people to participate in one crowdsourcing project, will not necessarily motivate them to participate in another one. It is also very important to note that most studies that investigate the motivations of the crowd rely on respondents' self-report of their motivations. As Antin and Shaw [15] note, this methodology is very vulnerable to social desirability bias, meaning participants may respond to questions in ways that they believe would be appropriate and socially acceptable. As a result, it is important to study the actual behaviors of people in crowdsourcing projects to fully understand their motivations.

We are interested in investigating how best to motivate people to participate in crowdsourcing projects to support people with disabilities, and more specifically how to motivate sighted people to participate in a crowdsourcing project to support blind

and partially sighted students. This is because we are developing a crowdsourcing project, DescribeIT, to create descriptions of images in digital learning resources. In designing this project, we are considering what factors to incorporate into the project to motivate people to participate.

In this study, we explored the motivations of two groups of people to participate in the DescribeIT project. One group was already actively involved in crowdsourcing (Mechanical Turk workers) and the second group (students) was not. We also investigated the relationship between people's sense of altruism, attitude toward people with disabilities and their sense of motivation to describe images for blind and partially sighted students and their readiness to participate in the project. We hypothesize that:

- There will be a positive relationship between participants' sense of altruism and their participation in the project.
- There will be a positive relationship between participants' attitude towards people with disabilities and their participation in the project.
- There will be a positive relationship between participants' level of intrinsic motivation and their participation in the project.

3. DescribeIT: A Crowdsourcing Project to Describe Images to Support Blind and Partially Sighted Students

DescribeIT is a crowdsourcing project to support blind and partially sighted students in higher education by the description of images in digital learning resources. Lecturers would be able to upload their digital learning resources that require descriptions of the images before giving them to a class of students. Once the images are described by sighted students, the lecturer could check the quality of the descriptions, and if desired, edit the descriptions, possibly selecting and/or editing the best description, if a number are provided for the same image. In addition, lecturers could give feedback to the students on their descriptions. The feedback provided could improve students' skills for future descriptions and could potentially increase students own understanding of the teaching materials. The materials could then be provided in advance of lectures and seminars to blind and partially sighted students, as they often find it very helpful to study materials in advance of these sessions. Of course, the materials, with their image descriptions, would be available during and after sessions, for interactive use and revision.

To help sighted students create good image descriptions, the DescribeIT project information page provides guidelines on how to describe images for blind and partially sighted people and an example description of a typical image. The guidelines used in this project were developed from those developed by Yongjie [16] for describing images on museum websites for blind and partially sighted people.

Once participants start describing images they are presented with a digital learning resource such as a digital slide and a text-box in which to type their description of the image on the slide. Participants are able to create a description and submit it and then go to the next image for description, or skip the image, if they do not wish to describe the current image (for example if they do not understand it) and then go to the next image.

4. Method

4.1. Design

The study investigated how different motivational factors can affect the participation of people in a crowdsourcing project to support blind and partially sighted students. We investigated the behaviour of people in a crowdsourcing project to undertake the image description task. There were three conditions: one intrinsic motivation condition and two extrinsic motivations conditions. Two groups of participants, one already involved in crowdsourcing (MTurk workers) and the other have not been involved in crowdsourcing before (university students). For the MTurk workers there was one condition: the Extrinsic Motivation (ExMot) monetary reward. For the student participants there were two conditions. One is Intrinsic Motivation (InMot) in which the image description instructions emphasised altruism, and wanting to help others. The other is Extrinsic Motivation (ExMot), in which the instructions emphasised improving the participants' own study skills.

The main dependent variable was the number of images described. Other variables measured were: participants' overall level of altruism, measured using the Self-Report Altruism Scale (SRA) (Rushton et al. 1981); participants' attitude toward people with disabilities, measured using the Interaction with Disabled Persons Scale (IDP) (Gething 1994); participants' motivation while doing the image description task, measured using the Situational Motivation Scale (SIMS) (Guay et al. 2000). This set of measures plus a demographic questionnaire were collected through an online questionnaire.

4.2. Participants

4.2.1. Participants Involved in Crowdsourcing (MTurk workers)

A total of 65 MTurk workers participated, and 41 (20 were American, 12 were Indian) completed the online questionnaire (9 participants did not answer the demographic questions). The 42 included 22 women and 10 men, aged 27 to 64 years, with mean age of 41.2 years (SD = 11.1). All participants are heavily engaged in crowdsourcing, mainly in MTurk, however, participants reported participating in other platforms such as Kickstarter and Wikipedia. These participants were recruited through the Amazon MTurk platform. The image description project restricted participation to a minimum level of qualifications, workers who have Human Intelligence Task (HITs) approval rate of greater than 95% and who have at least 5000 approved HITs. Participants were offered USD 0.10 (equivalent to GBP 0.07) per image description; this was in line with other MTurk research tasks of the same magnitude. In addition as an incentive to complete the online questionnaire, participants were entered into a prize draw for one of 10 Amazon vouchers worth GBP 10 (USD 13).

4.2.2. Not Involved in Crowdsourcing (UniversitysStudents)

64 university students in Libya participated, 30 participants in the InMot condition and 34 participants in the ExMot condition. Only 46 students completed the online questionnaire, comprising 26 participants in the InMot condition and 20 participants in the ExMot condition. The 46 included 34 women and 12 men, aged 18 to 41 years, with mean age of 26.8 years (SD = 6.3). As an incentive to complete the online

questionnaire, participants were entered into a prize draw with the same incentives as the MTurk workers.

4.3. Materials

The online questionnaire consisted of three scales and demographic questions:

- Self-Report Altruism Scale (SRA). A 16-item scale rating the frequency with which participants have engaged in altruistic behaviors on 5 point Likert items. Scores ranged from 16 (least altruistic) to 80 (most altruistic).
- Situational Motivation Scale (SIMS). A 16-item scale to assess why participants were engaged in the image description activity, on 7 point Likert items (1=not at all, and 7= exactly). This includes four subscales:
  Intrinsic Motivation: level of engagement in the activity for its own sake;
  Identified Regulation: extent to which the activity is perceived as being chosen by oneself;
  External Regulation: extent to which the activity is perceived as being regulated by rewards or negative consequences;
  Amotivation: perception that the activity lacks consequences, positive or negative.
- Interaction with Disabled Persons Scale (IDP). A 20 item scale measuring students' perception of their interaction with disabled people on 6-point Likert items (1= agree very much to 6 = disagree very much). We used Maclean and Gannon's (1995) subscales which measure "Discomfort" and "Sympathy" toward people with disabilities.

Demographic questions: This section collected information such as participants' age, gender, and previous experience with crowdsourcing.

4.4. Procedure

Two versions of the projects were created. One was on Amazon MTurk, a popular micro-payment marketplace for online work, and the other was on Crowdcrafting, a voluntarily web-based service to support scientific projects.

MTurk workers were invited to participate in the project through standard MTurk procedures. Student participants were recruited through university contacts in Libya, a recruitment email was sent out to prospective participants and two reminder emails at approximately 5 day intervals. Student participants were randomly assigned to the ImMot or ExMot conditions as they volunteered.

5. Results

The MTurk participants produced 477 descriptions, a mean of 7.52 descriptions per participant (SD=10.47). The student participants produced 444 descriptions, a mean of 9.65 descriptions per participant (SD=3.85). In the InMot condition participants produced 259 descriptions, a mean of 9.96 description per participant (SD=3.78) and in the ExMot (non-financial) participants produced 185 descriptions, a mean of 9.25 description per participant (4.01)

The mean ratings and standard deviations of all participants' scores on the SIMS (4 sub-scales), the IDP (2 sub-scales), and the SRA are summarized in Table 2. We

conducted Kolmogorov-Smirnov and the Shapiro-Wilk tests to check whether the distributions of each of these sets of scores met the assumptions of normality. For both tests the results were significantly non-normal ($p < 0.05$) for four of the scales (Intrinsic Motivation, External Regulation, Amotivation, Discomfort) in the ExMot (financial) condition, so we conducted non-parametric statistical analyses rather than parametric ones.

To investigate whether participants' situational motivation sub-scales scores were statistically different from the neutral midpoint rating of 4, a series of one-sample t-test were carried out for the InMot and ExMot (non-financial) conditions and one-sample Wilcoxon signed rank test were carried out for the ExMot (financial) condition. The results of these tests are summarized in Table 2. For the InMot condition, Intrinsic Motivation scores were significantly higher than the midpoint, scores for External Regulation and Amotivation were significantly lower than the midpoint. For the ExMot (non-financial) condition, Intrinsic Motivation scores were significantly above the midpoint and scores for Amotivation were significantly below the midpoint. For the ExMot (financial) condition, scores for Intrinsic Motivation and Identified Regulation were significantly higher than the midpoint, whereas scores for Extrinsic Regulation and Amotivation were significantly lower than the midpoint.

To investigate differences between the InMot, ExMot (non-financial) and ExMot (financial) conditions, one way ANOVA was conducted. The results are summarized in Table 2. A Tukey post-hoc test revealed that participants of the ExMot (non-financial) reported lower level of Amotivation than those in the ExMot (financial) condition; participants of the ExMot (non-financial) significantly reported a higher level of sympathy toward people with disabilities than participants of the ExMot (financial) condition; and participants of the ExMot (financial) condition significantly reported a higher sense of altruism in compare to participants of the InMot condition. In addition, there was no difference between the numbers of images produced in the three conditions.

Table 2 Means, standard deviations and significant tests for SIMS, IDP, SRA scales in the three conditions

	InMot **University students Mean (SD) (sig)**	**ExMot (Non-financial) University students Mean (SD) (sig)**	**ExMot (financial) MTurk workers Mean (SD) (sig)**	***F* (sig)**
SIMS subscales				
Intrinsic Motivation	4.8 (1.2) (+ **)	4.7 (1.4) (+ *)	5.3 (1.3) (+ **)	1.64 (n.s)
Identified Regulation	4.5 (1.6) (n.s.)	4.7 (1.6) (n.s.)	5.1 (1.1) (+ **)	1.15(n.s)
External Regulation	3.5 (1.2) (- *)	3.4 (1.5) (n.s.)	2.9 (1.9) (- **)	1.33(n.s)
Amotivation	2.3 (1.0) (- **)	1.5 (0.5) (- **)	2.6 (1.8) (- **)	5.07 (**)
IDP Scale				
Sympathy	25.3 (3.5)	27.0 (2.2)	23.9 (3.1)	7.38(**)
Discomfort	15.2 (5.7)	12.2 (6.1)	13.3 (6.1)	1.51(n.s)
SRA Scale	46.2 (8.7)	51.1 (9.2)	52.5 (11.1)	3.23(*)

N.B. + = significantly above midpoint; - = significantly below midpoint. * = $p < 0.05$, ** $p < 0.01$.

To investigate whether there was a relationship between the number of images produced and the scores on the SIMS, IDP and SRA, a series of correlations were

conducted. These are summarized in Table 2, which shows that there were significant correlations only for the ExMot (non-financial) condition. In this condition there was a significant correlation between the number of images described and Intrinsic Motivation, Identified Regulation and External Regulation.

Table 3. Correlations between SIMS, IDP, SRA scales and the number of images described in the three conditions

	InMot **University students** **Mean (SD) (sig)**	**ExMot** **(Non-financial)** **University students** **Mean (SD) (sig)**	**ExMot** **(financial)** **MTurk workers** **Mean (SD) (sig)**
SIMS subscales			
Intrinsic Motivation	n.s.	$p < 0.05$	n.s.
Identified Regulation	n.s.	$p < 0.05$	n.s.
External Regulation	n.s.	$p < 0.05$	n.s.
Amotivation	n.s.	n.s.	n.s.
IDP Scale			
Sympathy	n.s.	n.s.	n.s.
Discomfort	n.s.	n.s.	n.s.
SRA Scale	n.s.	n.s.	n.s.

N.B. * = $p < 0.05$.

6. Discussion and Conclusions

This study investigated how different intrinsic and extrinsic motivational factors can affect the participation of people in a crowdsourcing project to support blind and partially sighted students. We explored participates' behaviour in the DescribeIT project in relation to their situational motivation, attitude toward people with disability, and their self-report sense of altruism. We also explored the attitudes and behaviour of people experienced in crowdsourcing and those not experienced in crowdsourcing

The study showed that participants in general (across all conditions) were intrinsically motivated to participate in the DescribeIT project. Participants in both the InMot condition and the ExMot (non-financial) condition did not perceive the description task as chosen by themselves, whereas, participants in the ExMot (financial) condition perceived the task as chosen by themselves. Perhaps this is because participants in both InMot and ExMot (non-financial) conditions were the students newly introduced to crowdsourcing. While, participants in ExMot (financial) condition are generally heavily involved in crowdsourcing. Thus, their sense that one has voluntarily chosen to participate in the project was high.

The results on the external regulation sub-scale in the three conditions were very interesting. While it was understandable that participants in the InMot condition were not motivated by external rewards or negative consequences, it was not expected that participants in ExMot (financial) condition were also not motivated by the money reward they received upon completing the description task. This contrasts with a previous self-report study which found that money is the primary motivation factor for MTurk workers [13]. In addition, we did not anticipate that participants in the ExMot (non-financial) condition would be neutral about the external intended outcome of their participation (i.e. improving their skills). The effect of the external motivation factors (non-financial and financial) seems to be substantially weakened in the two conditions

because participants were significantly intrinsically motivated to participate in this particular project to support disabled students.

Lastly, the level of participation was measured by the number of images described in each condition and by each participant. We hypothesized that there would be a positive relationship between the number of images described and the participants' sense of altruism, attitudes towards disabled people, and their situation motivation. We found no difference in the number of images produced in each condition. In terms of the number of images produced by each participant, there was a positive relationship between three of the situational motivational factors and level of participation for the ExMot (non-financial) condition, with positive relationships between level of participation and intrinsic motivation, identified regulation, external regulation. The first two correlations make sense, but the third seems at odds with the previous finding on Amotivation and Sympathy toward people with disability. In addition, unexpectedly there was no relationship between participation in the DescribeIT project and any of these variables in both the InMot and ExMot (financial) conditions.

It is interesting that although the ExMot (financial) condition showed significantly higher scores for sense of altruism (SRA) compared to the InMot condition, this did not produce a corresponding difference in the number of images described (mean for ExMot: 7.52; mean for InMot: 9.96). In addition, there was no relationship between the number of images described and the SRA.

To summarize, the present study showed that participants were intrinsically motivated to participate in a crowdsourcing project to support blind and partially sighted students. The intrinsic motivation dominated the effect of the two extrinsic motivational factors in the extrinsic conditions.

Further investigation is needed on the relationship between participants' level of participation in relation to their situational motivation, attitude toward people with disability, or participants' self-report sense of altruism. Our future work will investigate the quality of descriptions produced as another measure of engagement with the task. It will also explore cross-cultural differences in motivations to support disabled students.

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