

Gamifying Social Media to Encourage Social Activities with Digital-Physical Hybrid Role-Playing

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Abstract. This paper proposes a new way to gamify the *micro-crowdfunding* service. *Micro-crowdfunding* is a crowdsourcing service to achieve a sustainable society based on a crowdfunding concept and an aging money concept. In this type of service, each activity to achieve a sustainable society is called a mission, and performing a mission is encouraged through social and economic incentives. A new approach described in this paper enhances the original strategies by using a game concept. The approach consists of two techniques. The first technique adopts several concepts from dramaturgy. The technique coordinates multiple missions and encourages people to complete them by providing a fictional goal that most people want to achieve. The second technique incorporates persuasive ambient mirrors that reflect people's current situation with visual and fictional expressions. The technique emotionally increases people's incentives by using operant conditioning. We also conduct a user study to validate the approach proposed in this paper.

Keywords: Social Media, Crowdfunding, Crowdsourcing, Fictional Expressions, Sustainability, Dramaturgy, Digital-Physical Hybrid Role-Playing, Gamification.

1 Introduction

Sustainability is one of the most important issues in modern society. Information technologies are considered useful tools that reduce energy and recycle resources to achieve a sustainable society. However, technical advances alone cannot solve many essential problems. People need to be aware of the importance of their contribution to solving these problems. Human-computer interaction can help people become aware of this importance and alter their behavior toward a more sustainable society [2]. Psychological techniques to alter people's attitude and behavior have become popular, and findings in social psychology have been widely adopted to shape behavior through public policies [5]. If these design patterns can be immersively incorporated into our daily environments by using information technologies, they will increase the opportunity to improve a sustainable lifestyle.

In this paper, we first present a new social media service named *micro-crowdfunding*, in which each community manages the sustainability of its shared resources by using a micro-level crowdfunding method, as shown in Fig. 1 [11]. One

member of a community proposes a small mission to contribute the sustainability of its shared resources to the community. Usually, the mission is trivial and easily completed, such as clearing a shared garbage box. In our approach, a crowdfunding concept is adopted to increase each community member's awareness about which activities are effective for increasing social sustainability. The community member owns some amount of virtual money, and the money is used to invest in supporting the proposed mission. Through the investment, community members can understand why the mission is important.

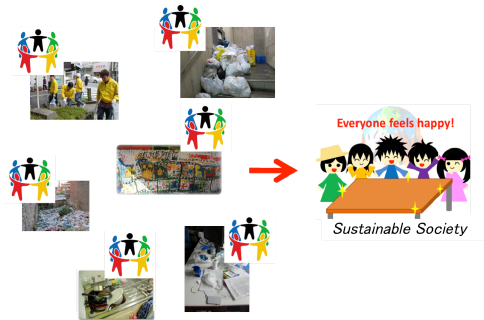


Fig. 1. Achieving a Sustainable Society with Micro-Crowdfunding

In the evaluation of the previous version of *micro-crowdfunding*, we found that an additional mechanism is necessary to encourage participants [11]. This paper proposes to add two game-based concepts to increase the emotional stimulus. The first concept is called *incentive Web* and is proposed as a tool in dramaturgy [3]. Incentive Web coordinates multiple missions to create a drama for participants that encourage them to complete these missions. The second concept is a *persuasive ambient mirror*, which offers visual and fictional expressions that reflect people's current attributes and behavior to encourage them to complete the missions with operant conditioning. These enhancements are a promising way to gamify human activities in *micro-crowdfunding*.

The paper is organized as follows. Section 2 presents an overview of micro-crowdfunding. In Section 3, we show how incentive Web is integrated with micro-crowdfunding. Section 4 shows how a persuasive ambient mirror is added to micro-crowdfunding. Section 5 shows the evaluation of the current approach, and we discuss the current design in Section 6. Finally, we conclude the paper and describe future directions in Section 7.

2 Micro-crowdfunding: A Community-Based Crowdsourcing Service for Achieving a Sustainable Society

Crowdfunding is an emerging new way of funding new ideas or projects by borrowing funding from crowds. In this concept, a person proposes a new project, explains the importance and the target amount of money, and shows what people who fund the project will receive when the mission is successfully completed. When the total

amount of funds from contributors exceeds the target amount, the project begins. After successful completion of the project, each contributor receives the benefits according to his or her funding level. If the benefit offers high scarcity value, it has a high incentive for contributors. However, existing crowdfunding platforms such as *Kickstarter* require participants to contribute real money; thus, only people who have extra money can participate.

Micro-crowdfunding adopts a crowdfunding concept to increase people's awareness of the importance of sustaining our society. It helps to motivate people in urban areas to participate in achieving a sustainable society. In *UbiAsk* [7], which is a typical crowdsourcing service based on social incentives, the completion of micro tasks is motivated through the use of social incentives, and individuals complete the tasks through their own spirit of reciprocity for strangers. This incentive is not strong enough to complete the more complex micro tasks referenced in *micro-crowdfunding*. In *micro-crowdfunding*, the completion of micro tasks is motivated within a community whose members are known to each other. An economic incentive is also used to motivate the community members to complete the tasks, but the incentive is not in the form of a monetary reward. Instead, *micro-crowdfunding* increases people's awareness of the meaning behind the completion of micro tasks, thereby increasing their intrinsic motivation to complete the tasks. Using mobile phones is a key factor in reducing the barriers to contributing to the community. The community's members increase their activities in the face of smaller incentives because activities can be performed anytime and anywhere by accessing the services through mobile phones.

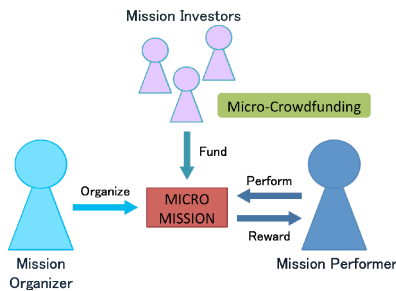


Fig. 2. An Overview of Micro-crowdfunding Activities

The main characteristics of the approach are as follows:

- The *crowdfunding* concept is adopted to allow people to choose among the small, common resources to which they would like to contribute to maintain sustainability;
- The currency used in the proposed approach is based on the *aging-money* concept, which encourages people to participate in *micro-crowdfunding* before the money's value is gradually degraded;
- The interaction in *micro-crowdfunding* is lightweight. People in a community can easily propose new micro tasks, called missions, in *micro-crowdfunding* and fund them from their smart phones through a simple interaction; and
- The participants can share information and details about a mission and receive appropriate feedback for the activities that they perform.

Fig. 2 shows an overview of *micro-crowdfunding*. In *micro-crowdfunding*, a member of a community related to a small common resource, called a *mission organizer*, proposes a new mission when he or she is aware that an activity must be completed to maintain the sustainability of a resource. Typical examples of such common resources are a public sink on a floor of a building or a public shelf used by a university laboratory. The proposal includes the mission's summary, which specifies the necessary activities and the total amount of money required to achieve the mission. The mission proposal is accomplished by touching the common resource with the mission organizer's smart phone and sending a photo showing the resource's current status. In the next step, when other members, called *mission investors*, receive requests to fund the mission, they decide whether they want to fund the mission based on the delivered photo. If some members would like to fund the mission, they simply click on the requests on their phones to notify the mission organizer that they want to fund the mission. When the total submitted funds exceed the target amount, the mission can be executed by any member who can access the resource in his or her spare time. Such a member is called a *mission performer*. The mission is usually a very simple task, such as cleaning up a public sink or putting a shelf in order. After completion, the mission performer takes a photo of the resource to show the mission's completed status and sends it to the *mission organizer*. Finally, the *mission organizer* verifies the quality of the achievement, and a completion notification of the mission containing a photo of the resource is delivered to all members who have funded the mission. More details about the design, implementation, and evaluation of *micro-crowdfunding* can be found in [11].

3 Gamifying Micro-crowdfunding: Using Incentive Web As a Tool for Dramaturgy

The first game concept that we introduce comes from *Live Action Role-Playing (LARP) games* [19] and *Alternate Reality Games (ARG)* [8]. Gamifying *micro-crowdfunding* activities is similar to the game design of LARP and ARG, and their design methodologies can be used to coordinate multiple missions for gamifying *micro-crowdfunding* activities. Incentives are rarely used alone to encourage human activities. They often require other incentives to yield meaning, and one incentive may trigger another. *Eirik Fatland* proposed a concept called *incentive Web* [3]. In the current design of *micro-crowdfunding*, we also adopt a concept called the *puppet master*¹ from ARG to define *incentive Web* to coordinate multiple missions. The *puppet master* in *micro-crowdfunding* is a game designer in each community who can gamify *micro-crowdfunding* activities. The *puppet master* proposes new missions as a *mission organizer* to achieve a goal that he or she defines as a game designer. Additionally, a *puppet master* helps users to play roles that enhance their abilities in the real world.

¹ A *puppet master* is hidden from a user so that the user is not aware of the existence of a magic circle. In contrast, a game master in a role-playing game is noticed by a game player. Thus, the player is always aware that he is playing a game.

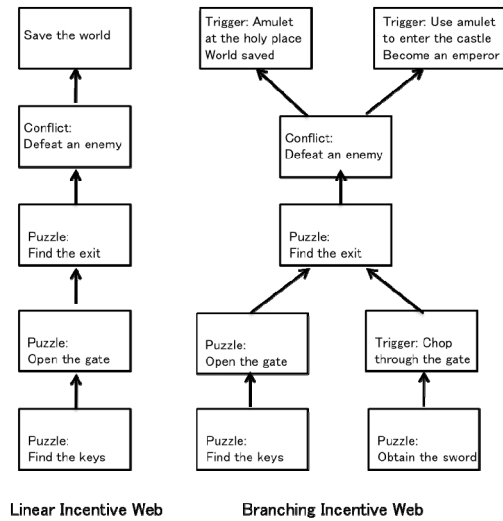


Fig. 3. Incentive Web

In [3], several types of incentives are defined and shown.

Conflict: typical dramaturgies establish some form of *conflict* between characters.

Trigger: If a certain thing happens, then another thing will also happen.

Puzzles: When the conditions of *triggers* become sufficiently complex, they represent a distinct source of challenge to the players/characters, and it makes sense to talk of them as a *puzzle*.

Instructions: *Conflicts*, *triggered events*, and *puzzles* all give a *puppet master* some measure of control over *micro-crowdfunding* activities. *Instructions* are a group of incentives (*meta instructions*, *fates*, and *suggestions*) that give a *puppet master* a great deal of control over *micro-crowdfunding* activities, particularly their chronology. *Meta-instructions* are a form of *instruction* that borders on an incentive. Unlike *fates* and *suggestions*, *meta-instructions* clearly have a non-diegetic purpose. *Fates* are absolute *instructions* given as a part of the character text. They are, by definition, unavoidable, although human error might make it impossible to carry them out. *Suggestions* are a less rigid version of the fateplay technique. A *fate* is something the player must do or something the character inevitably will do no matter how much he or she resists.

Tasks and scheduling: Tasks and scheduling are two types of incentives that are reminiscent of instructions but that double as purely diegetic information. A task is the job of a character or group, as defined from the onset of *micro-crowdfunding* activities. Schedules establish daily rhythms and/or schedules for specific events during *micro-crowdfunding* activities.

Fig. 3 shows two types of incentive Web. The first one is a linear incentive Web, in which performing each mission that offers its own incentive allows people to perform the next mission. The second one is a branching incentive Web, in which a participant has choices in performing missions based on his or her incentives, and multiple missions may need to be performed before performing the next mission. In *micro-crowdfunding*, a

mission is either fictional or factual. A fictional mission can be performed as a mission defined in a fictional world. Thus, a virtual gift may be given as a reward of the mission, or a virtual sub-goal that is easier to be achieved than a factual mission can be offered to increase a community's motivation to achieve a sustainable society.

As described above, an incentive Web is established by a puppet master. One of the members in each community is the puppet master in the community to promote micro-crowdfunding activities. The puppet master designs an incentive Web by proposing new missions as a mission organizer and attempts to encourage his or her community members to participate in more micro-crowdfunding activities. The puppet master can dynamically change the incentive Web by adding a new mission when community members' activities become low. One of the problems of the current design is that participants may notice that only one person proposes new missions and that the person may be a puppet master. To solve this problem, each participant uses his or her own avatar. If a community is virtual and each member may not know each other in the real world, members may not know that the multiple avatars operated by a puppet master are actually operated by only one person. As described in Section 6, this approach is also desirable to maintain participants' privacy. However, the approach may be difficult to use in a real community in which each member knows the others well.

As discussed in Section 6, in the future design of *micro-crowdfunding*, we need to allow any community members to become *mission organizers* without losing a consistent drama defined by an *incentive Web* designed by a *puppet master*.

4 Reflecting Participants' Behavior in Virtual Forms

The basic approach of *micro-crowdfunding* to offer social and economic incentives is promising to encourage people to complete missions that are related to the sustainability of their communities [11]. However, the current strategy does not return proper feedback that stimulates people's emotions to alter their lifestyle. Our solution is to adopt *virtual forms* [10, 12, 16] to increase a psychological incentive. In this case, we choose a *persuasive ambient mirror* proposed in [9] as a *virtual form* for *micro-crowdfunding*. A *persuasive ambient mirror* monitors people's current attitudes and behavior by using sensors and presents visual and fictional expressions reflecting their current attitude and behavior. The fictional expression offers more emotionally effective feedback than factual feedback. For example, the *Virtual Aquarium* reflects people's daily toothbrushing behavior in the condition of the *Virtual Aquarium*. Similarly, in the *Mona Lisa Bookshelf*, people's housekeeping of their public bookshelf is reflected on a *Mona Lisa* picture. To increase the persuasiveness of ambient feedback, we also consider the adoption of an approach used in *documentary games* [4] to incorporate ideological messages represented as *procedural rhetoric* [1]. As shown in [13, 16], ideological messages can be incorporated into the real world by representing goods or characters that become metaphors for the ideological concept.

In the current *micro-crowdfunding* prototype system, three types of *persuasive ambient mirrors* to return ambient feedback have been added to the original *micro-crowdfunding* design, as shown in Fig. 4. The first type of *persuasive ambient mirrors* is installed as a public display in various places for community members. It shows a

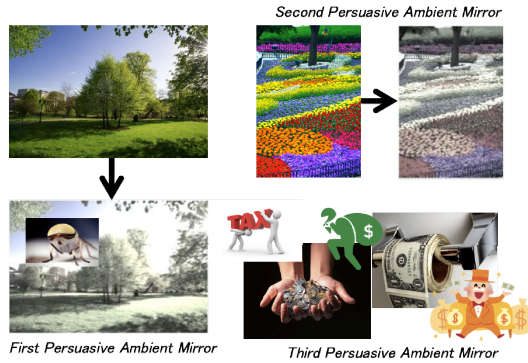


Fig. 4. Persuasive Ambient Mirrors in Current Micro-Crowdfunding Prototype

scene of a natural landscape, and the fictional scene reflects the accumulated contribution of all members in a community. If their efforts are not sufficient, the landscape becomes polluted, but the landscape becomes clean if the community members complete a sufficient number of missions. The polluted state shows that the surrounding environment cannot maintain sustainability without the efforts of many members. This provides a strong incentive to encourage other members to contribute to missions. The second type of *persuasive ambient mirrors* is shown on a community member’s mobile phone. It shows a fictional flower garden with a large number of flowers blooming in the garden if the member’s contribution is good. The flower garden reflects each member’s individual efforts and offers him or her a psychological incentive to increase his or her individual contribution. The third type of *persuasive ambient mirrors* shows an ideological message stating that the government likes to steal the people’s money for useless projects that increase the government’s reputation but that do not benefit the people. The *procedural rhetoric* contains an ideological message pointing out the current problems in our environmental tax system.

5 Evaluation and Discussion

In this section, we present several evaluations to validate our current design. In our experiment, we set up two configurations: the first one with *persuasive ambient mirrors* and the second without them. The mission used in the experiment was to clean the participants’ public table. Additionally, we evaluated two cases using *persuasive ambient mirrors*. In the first case, a *mission performer* cleaned the public table to make the landscape more beautiful. In the second case, the first *persuasive ambient mirror* showed a monster that attempted to destroy the natural landscape. When the public desk was cleaned, the monster disappeared.

In the experiment, we surveyed acceptance of the enhancements on a 5-point Likert scale (5 = strongly agree, 4 = agree, 3 = don’t know, 2 = disagree, 1 = strongly disagree). After Y persons attempted to use the *persuasive ambient mirrors*, they answered the survey regarding the respective *persuasive ambient mirrors*. The participants were between the ages of 21 and 52 and included 22 males and 4 females. The acceptability of the first *persuasive ambient mirror* was 3.73, the second was 3.65, and the third was 2.38. We also interviewed five participants to understand the reasons for their

acceptance in detail. Most of them were familiar with computer science technologies. One of the participants said, “*The first and second persuasive ambient mirrors easily delivered the meanings, but just changing colors is not enough. Inserting textual messages on the pictures would also be effective to make the messages clear. However, returning appropriate feedback is effective to encourage a community to help each member contribute to achieving a sustainable society*”. Another participant said, “*It is hard to deliver ideological messages with only a picture, but I understood that the picture meant that the current situation of something was not good*”.

The results show that *persuasive ambient mirrors* containing fictional stories are promising because the destruction of nature by a monster can be easily understood and can motivate participants to protect nature. However, the current approach to expressing the ideological concept was not clearly understandable by participants in the experiment..

In the next step, it is necessary to redesign the current *persuasive ambient mirrors* using a *value-based design framework* [10, 13]. The current design adopts only the *aesthetic value* to design the first and second *persuasive ambient mirrors*. As described in [14], the personality of each person affects his or her perceived value. For example, one person may perceive value in jewelry, but another person may not perceive this value. The *persuasive ambient mirror* for each person’s mobile phone can be customized according to his or her personality, but the *persuasive ambient mirrors* for a community need to use public displays that multiple persons can watch simultaneously. Because each person perceives a different value for his or her most important item, the *persuasive ambient mirrors* for public displays must offer multiple values to satisfy all of them. As described in [17], a participatory design helps to incorporate multiple values into one *persuasive ambient mirror*. When multiple people with different personalities incorporate their values in one *persuasive ambient mirror*, the potential for more people to prefer this mirror increases. For example, incorporating a pretty character increases the *empathetic value* for a person, and rarity increases the *economic value* for another person. If a *persuasive ambient mirror* contains both values, the possibility of satisfying both persons increases.

Using the *ideological value* is not easy, as shown in the results of the experiment. Delivering an ideological message is difficult because it is not easy to understand the meanings of this type of message. A lengthy explanation is usually needed to deliver an ideological message with *informative value*. However, a metaphor is an effective tool to deliver complex information without a lengthy explanation. As shown in [12, 16], virtual characters or goods appearing in some popular animation movies can be used to remind members of the importance of the ideological message embodied in the movies.

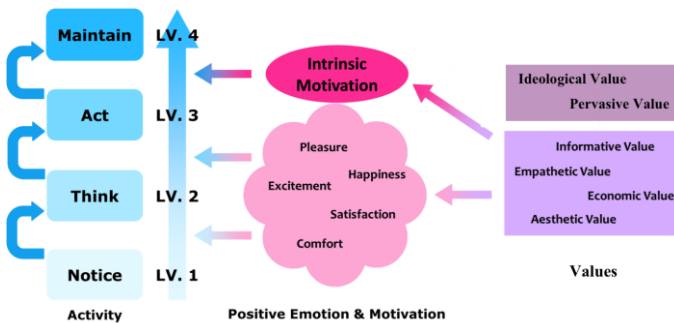


Fig. 5. A Framework for Human Attitude and Behavior Navigation

To design persuasive virtual forms that can change people's attitudes and behavior, Fig. 4. shows a framework to help with the design of the *virtual forms* based on the *value-based design framework*. First, values to increase *extrinsic motivation* are used to *inform* people of why they need to change their attitude and behavior. Next, more information is provided to make people *think* about the reasons for their changes. *Extrinsic motivation* increases people's *pleasure, happiness, excitement, satisfaction, and comfort* and stimulates positive emotion. However, to make people into real activists who *act* to make changes, *intrinsic motivation* should be taken into account. In this case, the *ideological value* and the *persuasive value* play more important roles. These values increase people's *intrinsic motivation*, and their self-efficacy to change their attitude and behavior helps them to *maintain* their changes. This framework becomes a guideline to design various urban and city services to shape people's attitudes and behavior [17].

6 Experiences with the Current *Micro-crowdfunding* Design

One of the questions in the current design is how participants in *micro-crowdfunding* determine the proper price for missions. In the current design, we use virtual currency that does not have a strict relationship with real money. One solution is to use real money, but these transactions are complex. An *activity-based billing system* makes a real money payment easier, but this approach is not realized in the real world [20]. In our current approach, each participant receives some amount of virtual money from the money they paid as an environmental tax [11]. The aged money is used for the sustainability of public infrastructure, but the participants' money can be used to maintain their own common resources in their community if they join *micro-crowdfunding* activities. Additionally, employing a drama to coordinate multiple missions in *micro-crowdfunding* activities allows us to determine the proper price for missions based on a good game design, specifically the level design [6]. The level design is an aspect of game development involving the creation of video game levels - locales, stages, or missions. Currently, a *puppet master* who designs an *incentive Web* determines the prices for missions, but in the future, we will reconsider this design to determine the mission's price in the community autonomously without involving the *puppet master's* supervision.

In the current design of *micro-crowdfunding*, we did not extensively consider security issues. Of course, an authentication mechanism is needed to identify the community to which a participant belongs. *Micro-crowdfunding* uses participants' mobile phones, and we have already integrated with various social media sites such as *Facebook*. *Micro-crowdfunding* may use the existing mechanism to authenticate participants. We also need to consider privacy issues in the future. Each participant looks at the currently proposed missions and the current amount of funds for the missions on his or her mobile phone. In the current design, the real names of the mission organizer, investors, and performers are shown. This approach increases the trust relationship among participants, but their privacy is disclosed, which may increase social pressure. Another approach is to use an avatar for each participant. The participants can decorate their avatars to increase their agency, but other participants will not know the real person behind the avatar. This approach can maintain each participant's privacy, but

we need to investigate how this approach affects the trust relationship among participants. If *micro-crowdfunding* ensures that participants will not cheat in *micro-crowdfunding* activities, avatars can be used without losing the trust relationship.

In the next step, we will redesign the current *micro-crowdfunding* design based on the *GamiMedia* model. The *GamiMedia* model allows us to define the meanings of video games based on a *persuasive and ambient transmedia storytelling* concept [15]. In recent video games, the background stories for each characters and scenes are defined in a complex manner. A story of a video game may have a complex relationship with other stories in animations, comics, or novels. The *GamiMedia* model can analyze the meanings of the video games. When gamifying *micro-crowdfunding* a *puppet master* considers that the current situation can offer meanings that allow each participant to understand the situation correctly. Of course, there is the ability to offer open interpretation intentionally [18]. As described in [13, 16], a *puppet master* may use a virtual character from some stories as a metaphor to add an ideological message to the stories through a transmedia storytelling concept.

A *puppet master* defines an *incentive Web* in the current design. However, if a community can create a new story based on existing stories and if each participant's story can be integrated into one story without losing the reality of each story [12, 16], most participants are satisfied to participate in *micro-crowdfunding* activities because a drama defined by a *puppet master* may not be favorable for them. We need to investigate how a community defines its own drama to encourage *micro-crowdfunding* activities.

7 Conclusion and Future Directions

In this paper, we presented two enhancements to the original design of *micro-crowdfunding*, which is social media based on a crowdfunding concept to encourage sustainable behavior. The first enhancement is to use *incentive Web* to coordinate missions to create dramas. The approach emotionally encourages people to perform more missions. The second enhancement is to add a *persuasive ambient mirror* to reflect people's current attitude and behavior. The evaluation showed that the enhancements are effective to encourage participants.

We believe that the proposed approach described in this paper is effective to gamify daily activities to create more desirable lifestyles. Daily activities can be considered missions. Missions in the real world are often boring and trivial for most people. If these missions are coordinated as a drama to increase their emotional stimulus, the potential for people to perform these missions increases because drama has desirable effects to enhance positive thinking and self-efficacy and to establish intrinsic motivation to allow people to complete missions autonomously.

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