

# Running on the Gatherun Cloud Platform: Using Self-determination Theory to Increase Motivation to Participate in Sporting Events

Tsai-Hsuan Tsai<sup>1(✉)</sup>, Hsien-Tsung Chang<sup>2</sup>, Yu-Wen Lin<sup>1</sup>,  
Yi-Hao Hu<sup>2</sup>, Chih-Wei Chen<sup>3</sup>, Yi-Cheng Chen<sup>3</sup>, and Wei-Hung Wu<sup>3</sup>

<sup>1</sup> Department of Industrial Design,  
Chang Gung University, Taoyuan, Taiwan  
ttsai.cgu@gmail.com

<sup>2</sup> Department of Computer Science and Information Engineering,  
Chang Gung University, Taoyuan, Taiwan

<sup>3</sup> Metal Industries Research & Development Centre, Kaohsiung, Taiwan

**Abstract.** For the purpose of stimulating the interest in and motivation of exercise participation by the exercise group (e.g., roadrace runner) and the potential exercise group (e.g., spectators) through the use of social technologies, the social exercise platform developed in this study uses the currently popular road race as the central core, utilizing the characteristics of social media and the self-determination theory as the design rationale to design suitable social exercise features. Finally, the system usability is verified with mobile-specific heuristic guidelines; the results show that the newly developed system is in line with usability standards.

**Keywords:** Road running · Mobile application · Cloud competition · Self-determination theory · Virtual game · Avatar creation · Exercise participation · Spectator participation · Heuristic evaluation

## 1 Introduction

Sports motivation has always been one of the topics on which sports psychologists and researchers have focused. As people grow from children to adolescents to adults, their exercise activity rate starts to decrease, as does their competitive motivation for sports participation [1]. Studies have noted that exercise habits in early adulthood lay the foundation for individuals' future exercise behavior; thus, studying the exercise participation motivation of adults is particularly important [2, 3]. Deci and Ryan [4] propose self-determination theory (SDT) to understand motivation in human behavior. The basic assumption of SDT is that human behavior is related to three variables of psychological needs, namely, autonomy, competence, and relatedness. When these three needs are satisfied, people's execution motivation in any field will be performed in a more dynamic and sustained manner. Currently, SDT is widely used in physical exercise behavioral research. Frederick and Ryan [5] demonstrate that interest, entertainment, and a sense of competence can positively predict people's weekly exercise hours.

Mullan and Markland [6] indicate that it is easier for people with exercise autonomy to participate in and draw positive experiences from exercise activities. Edmunds et al. [7] establish an intervention method based on SDT and find that people who need more exercise facilitation and support tend to be more autonomous and have more motivation to participate in exercise. Patrick and Canevello [8] develop computer software containing demand support as the exercise coach of users, and they note that people who need more support tend to have more autonomy and competence in exercise behavior, which indirectly induces higher levels of exercise frequency, persistence and entertainment. Additionally, some research uses SDT to investigate the motivation of people who share physiological information on social websites after walking or exercising [9, 10]. In terms of practical applications, there already exist health and fitness apps that contain autonomous motivation, competence motivation, and relatedness motivation. For example, Nike+ Running contains a fitness trainer function that can be used by users in independent training; additionally, Endomondo provides a challenge mode that stimulates the competence motivation of users. The goal of relatedness motivation design is to allow exercisers to post and share their exercise information within the software or on an external website. The abovementioned studies show that applications of modern mobile technology can indeed raise people's physical health awareness and facilitate the establishment of exercise habits. Moreover, the introduction of social platforms changes exercise from "one person" endurance-concentrated training into a social activity consisting of "a group of people"; these platforms influence not only the behavior of the exerciser but also the exercise participation motivation of spectators on the social platform. Unfortunately, the developed exercise-related fitness applications mostly concentrate on the exercisers themselves, ignoring the spectators on social platforms. For the purpose of stimulating the interest in and motivation of exercise participation by the exercise group (e.g., road-race runner) and the potential exercise group (e.g., spectators) through the use of social technologies, the social exercise platform developed in this study uses the currently popular road race as the central core, utilizing the characteristics of social media and SDT as the design rationale to design suitable social exercise features. Finally, the usability of the system is evaluated through a mobile-specific heuristic evaluation checklist.

## 2 Gatherun Design and Development

Compared to other types of exercise, running has low requirements for professional competence and technical proficiency and is not constrained by hardware facilities and equipment limitations such as site or the urban-rural gap. Running, which has become a popular sport, has the lowest participation requirements, and various types of marathon and road running activities have become fashionable. Accordingly, the Gatherun system uses the road race as the implementation case and designs a social feature that allows the participation of both exercisers and spectators, based on SDT and the need for autonomy, relatedness, and competence noted above. The Gatherun mobile application was jointly developed by the Digital Media Lab and WIDE Lab of Chang Gung University in Taiwan and the Metal Industries Research and Development Center in Taiwan to help Taiwan's Global Solution International Co., Ltd., which is a

professional manufacturer of fitness appliances and systems, and will support the official version of iOS 8.0 or higher of all iPhone operating systems; Gatherun be published in March 2016 on the App Store for consumer download. The main features of Gatherun are described below.

## **2.1 Establishing User Need for Autonomy Through a User-Friendly Interface Design and Virtual Game Environments**

Autonomy in SDT means that the individual is the action initiator and has freedom of choice, including personal self-determination, self-regulation, and self-selection. In terms of using fitness applications, autonomy means providing users the choice of favorite and satisfactory self-enjoyment decisions. In addition, a friendly user interface (UI) design also has the ability to raise user autonomy needs. In terms of raising user autonomy needs, first, the developed Gatherun system provides a simple and friendly user interface that can be easily operated by a novice. Second, the setting function enables personalized settings, such as the UI layout mode and privacy settings. Furthermore, concepts of cloud competition, avatar creation, and game enjoyment are incorporated so that users can have efficient game-based player performance and an effective enjoyable experience through participating in running on the Gatherun cloud platform (see Figs. 1 and 3).

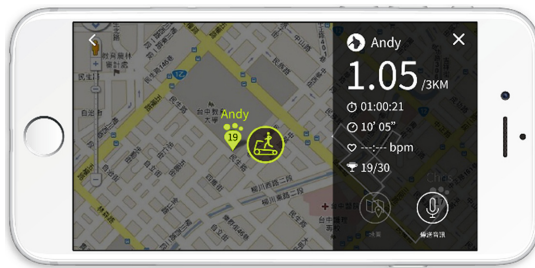
## **2.2 Establishing User Need for Relatedness Through Cloud Competition and Spectator Participation**

The need for relatedness stated in SDT refers to the degree of affective connection with other people produced during an individual's behavior process. When the environment provides sufficient acceptance, caring and warmth, and emotional power, the individual can be encouraged to accept various obstacles and challenges, thus achieving the purpose of psychological growth. For example, in road running, under normal circumstances, the runner typically runs individually, without company. Although a road race can achieve the goal of popular participation, the limitations of time and location often prevent people from actually joining the race. Therefore, the developed Gatherun platform provides users with the cloud race feature. Figure 1 shows that compared to a real road race event, holding a cloud road race has far fewer practical constraints and can enable users at various times and locations to simultaneously conduct a road race in a virtual environment. A real map function can allow users to observe the actual location of other racers (Fig. 2). The Gatherun system also emphasizes the participation of spectators; through the support of community friends, the relatedness motivation of individuals can be raised. The real-time spectator function allows spectators to participate in the ongoing virtual road race. In addition to displaying the instantaneous information of runners, spectators can interact with avatars (runners) through, for example, voice messaging to instantaneously encourage runners (as in Fig. 3). In addition, the common photo gallery function, as shown in Fig. 4, can gather images taken by road race participants (including runners and spectators) during the race into

an event-concept shared album, allowing Gatherun users to browse and share on the community platform at any time.



**Fig. 1.** Cloud virtual road race feature, enabling individual runners to participate in a virtual race with other runners.



**Fig. 2.** Real map feature, showing the locations of other runners



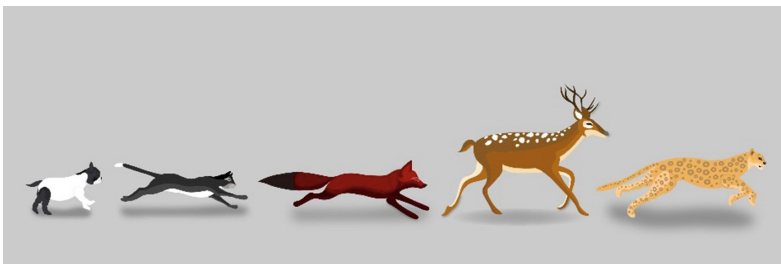
**Fig. 3.** Real-time spectating feature, enabling spectators to watch an ongoing road race and encourage race runners through instant voice messaging.



**Fig. 4.** Common photo gallery, using the road race as a group to compose a commonly shared album.

### 2.3 Establishing User Need for Competence Through Avatar Creation

The competence stated in SDT refers to the degree of the sense of control and mastery of the external environment by an individual, that is, the individual's sense of whether the external demand can effectively be met by the individual's own ability. To obtain a sufficient sense of competence, an individual may select jobs or tasks that are perceived as challenging. In terms of using fitness applications, the competition mode typically stimulates the motivation of exercisers more than independent road running; thus, many fitness applications provide community friends with an achievement leaderboard to induce competence motivation. To raise the competence needs of the users participating in the road race, road racers are created as avatars and used as self-symbolic imagery in the game-based virtual environment established by Gatherun. The avatar level-up standard is judged by the road running performance and race participation status of users. From novice to professional, the avatar levels, in order, are bulldog, cat, fox, deer, and leopard. Different avatars show different participant rivalries and the real-time performance in the race, as shown in Fig. 5.



**Fig. 5.** Use avatar creation, forming a virtual and immersive gameplay environment

### 3 System Validation

This study uses the mobile-specific heuristic guideline proposed by Yáñez Gómez et al. [11] as the Gatherun system validation method. According to the 13 usability heuristics of Yáñez Gómez et al. the Gatherun system does not contain one of the items: the help and documentation sub-heuristic. Therefore, this item is eliminated, and the system usability evaluation is performed according to a 12-item mobile-specific heuristic guideline. It is important to note that we invited five interactive interface design and mobile application development experts to conduct the usability test; two of them have an information engineering background and are well experienced in mobile application development, whereas the other three experts have a digital media background and numerous system interface design experiences and had previously performed system usability assessment tests. The experts tested the system usability by using a mobile-specific heuristic checklist. In addition, the experts identified design weaknesses and defined the usability issues through the exchange of opinions and discussion. The 12-item usability heuristic-based assessment results are as follows:

- Visibility of the system status: The Gatherun interface design can easily recognize the current feature location, and the information display is clear and easy to understand. Adding visual cues in the interface swap feature is recommended.
- Match between the system and the real world: There is true correspondence with the user operation. When operating various functions, users can instantly sense changes in the interface.
- User control and freedom: Gatherun system operation is simple and easy to learn; functional operation has obvious distinguishability. Providing default values to more conveniently initiate the virtual race function is recommended.
- Consistency and standards: The color, font, and icons displayed by the system are highly uniform and in line with the design principles. Permanently adding a logout function in the main feature manual is recommended.
- Error prevention: No error handling mechanism is provided; however, the system is easy and has simple operations that can reduce the error occurrence rate. Imposing an input length limit to avoid use input errors is recommended.
- Recognition rather than recall: The Gatherun system provides an icon supplemented with text options, which can increase the degree of system recognition and reduce cognitive load without excessive user memorization.
- Flexibility and efficiency of use: The system feature display is clear, not requiring any special memory or search. Locating the friend search function on the homepage to increase usability is recommended.
- Aesthetic and minimalist design: The graphical interface design is exquisite, beautiful, clean, and simple.
- Helping users recognize, diagnose, and recover from errors: No issue assistance feature is provided. Adding a feature introduction to help novices quickly understand system features is recommended.
- Skills: Technical operation is in line with the normal range of user operational abilities.

- Pleasurable and respectful interaction: A graphical interface is provided, and the game-based interaction can raise usage enjoyability.
- Privacy: The level of privacy is very low, suited for use on a personal mobile device. When it is used on a public device, adding a foreign device login warning is recommended.

## 4 Conclusion

To raise the performance of exercisers and the interest in and willingness to participate of spectators, based on the three basic psychological needs defined by SDT, this study develops a mobile road running community group application – Gatherun. The Gatherun system provides a cloud competition to enable individual runners in different locations and time to participate in a virtual race scenario. Avatar creation and a game-based virtual environment provide users a fun and diverse experience model. Furthermore, to enhance the social interaction between users (exercisers and spectators), in addition to the runners participating in a race, spectators can also participate in a race and encourage follow runners instantly through the instant spectating feature. The common photo gallery feature can record the race status, and photos can be shared with all race participants and users. Finally, the system usability is verified with mobile-specific heuristic guidelines; the results show that the Gatherun system is in line with usability standards. The system will be improved in the future based on expert recommendations.

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