A Social Recommendation Mechanism for Crowdfunding

Yung-Ming Li[1], Jyh-Hwa Liou[1,2(✉)], and Yi-Wen Li[1]

[1] Institute of Information Management, National Chiao Tung University, 1001 University Road, Hsinchu 300, Taiwan R.O.C.
yml@mail.nctu.edu.tw, alioujh@gmail.com, c80617@gmail.com

[2] Center for General Education, Hsin Sheng College of Medical Care and Management, Taoyuan, Taiwan

Abstract. In recent years, a new kind of fund-raising mode crowdfunding, is gradually arising. Through the rapid spread of the Internet, customers can show their creativity and ideas on the fundraising platform and attract backers to invest extensively in support of the count painting or product development. However, according to fund-raising platform statistics, we found that the success rate of fund-raising plans is less than half. Therefore, the purpose of this study is to propose a backers recommendation mechanism, which integrates information from fundraising and social networking platforms, considering the factors of social relationship, user preferences and background analysis, to help creators improve the success rate of crowdfunding.

Keywords: Crowdfunding · Crowdfunding platforms · Social network · Social relationship · Social recommendation

1 Introduction

In simple terms, crowdfunding is a new way to gain the funds to complete a specific project. The marketplace of crowdfunding keeps growing as soon as possible and it has reached up to 50 billion in 2013 [1]. In recent years, more and more crowdfunding platforms have appeared, like: Kickstarter, which is the biggest crowdfunding platform in the world, has funded $529 million USD in 2014 [1]. Besides, there are 3.3 million people to back the projects in Kickstarter [2]. But, according to the recent statistics, the success rate of projects are never over 50% since crowdfunding platforms appeared [3]. Even though creators prepare very well to promote their projects, they only have half of success possibility to achieve their goals. There are lots of reasons for the frustration of crowdfunding activity.

We want to use a phase recommendation to help the creator to break the bottleneck of different fundraising phase with the combination of Facebook. The proposed mechanism will solve the problems of crowdfunding with the combination of social networks via the phase recommendation system. The issues to be conquered are as follows.

- How to find the backers who are interested in the crowdfunding projects from the social network?

W. Abramowicz (Ed.): BIS 2017 Workshops, LNBIP 303, pp. 18–25, 2017.
https://doi.org/10.1007/978-3-319-69023-0_2

- How to reinforce the willingness of investing crowdfunding projects and improve the degree of trust.

Nowadays, everything in the Internet can be recommended for someone, so we want to develop a new application of phase recommendation systems. We develop a brand social network based recommendation mechanism to improve the diffusion of crowdfunding projects. Overall, the mechanism can reinforce the relationship of social networks and recommend appropriate backer in different phase. In the proposed mechanism, we will divide fundraising activities into different stages.

This paper is organized as follows. The basic concepts and literature related to our research topics are provided in Sect. 2. In Sect. 3, we present the system framework. Section 4 describes the processes of the experiment and discusses the empirical results. Section 5 concludes our research contributions and describes research limitations and the future works.

2 Related Work

2.1 Crowdfunding

Crowdfunding is a novel method of financing for those people who don't have independent wealth but want to complete a project [3]. Whose people originate fundraising projects in the crowdfunding platforms to show their ideas are be called creator. Conversely, whose people have willingness to invest crowdfunding projects in the websites are be called backers [4]. Basically, crowdfunding has three different types according to the feedback: lending crowdfunding, equity crowdfunding and rewards crowdfunding. Crowdfunding can help creators earn funds from the Internet [5]. Generally, the backers often are ordinary people and the money they invest is too less to affect their daily life so that most people have the ability to back some interesting projects [4]. Massolution reported that crowdfunding has reached $1.5 billion in 2013 [6]. Kickstarter, Indiegogo, and GoFundMe are all famous crowdfunding platforms in the world [7], especially Kickstarter, the site has raised $1.5 billion in funding and over $7.8 million backers to back 78 thousand successful projects [2].

2.2 Recommendation Systems

Recommendation systems aim to recommend something or someone to a specific user. In the past, recommendation system often focus on points of interest (POI) to identify top k items which satisfied user's requirement and rank it for user [8]. Then, a related research which is based on collaborative filtering recommendation appeared. There are various technique like: decision tree, clustering, regression, neural networks and association rule mining. According to the technique, recommendation system can be classified two types: a content-based and a collaborative-based systems [9].

According to the above study, we can understand that recommendation system has great development in recent years. However, most of recommendation system can't match our needs, we want to design a flexible system which can adjust the weights with

different crowdfunding phases to avoid the failure of crowdfunding projects. We adopt a hybrid personalized recommendation by combing with content-based and collaborative-based on social network.

3 The System Framework

In this research, we develop a novel social-based crowdfunding recommendation mechanism that can help all participants in this crowdfunding campaign. We aim to help creators to find potential backers and reach their crowdfunding goals, through a mechanism of social network activities mining and proper recommendation lists selecting. The system architecture is shown as Fig. 1. The components included in the systems are described as follows.

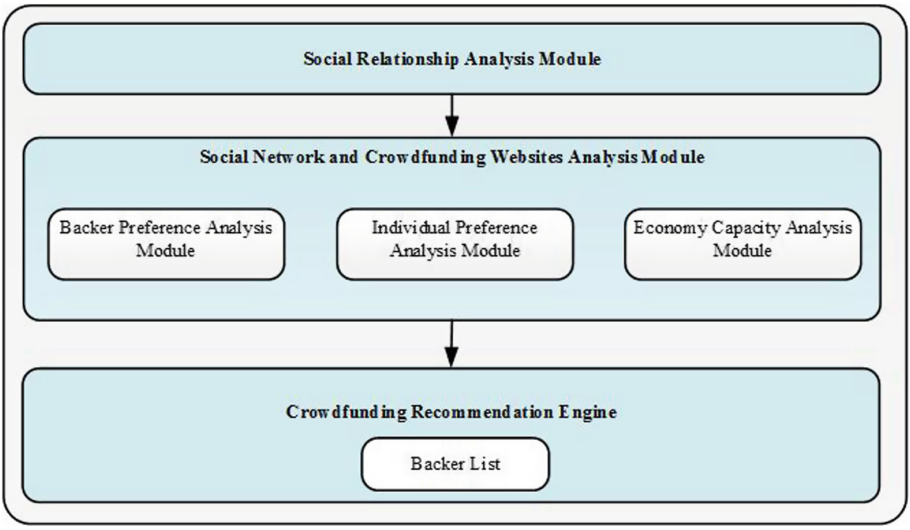

Fig. 1. The system framework

3.1 Social Relationship Analysis Module

This module will construct a creator's social network to evaluate the social distance between the creator and the backer. We compute the interaction and closeness to complete this module.

Social Interaction Analysis. There are four kinds of social data we use: (1) the number of two users tagged together in the same comments, photos, check-ins and posts, (2) the number of comments by the two users written in the each other's posts, comments, photos, status and check-ins, (3) the number of likes given by two users in the each other's' posts, comments, photos, status and check-ins and (4) the number of clubs the two user joined.

Social Closeness Analysis. In this section, we have to calculate the distance between the creator and the backer. If they have more mutual friends in the social network, we can reasonably infer they have more association.

3.2 Social Network and Crowdfunding Websites Analysis Module

Backer Preference Analysis Module. In order to understand users' behavior in the crowdfunding platforms, we collect and analyze users' activities. In Backer Preference Analysis Module, we will record and analyze a backer's activities.

In this part, we would start to collect related information from the platforms. We denote $BackerPreference(b_i, type)$ as a value that represents the score of backer's preference of a specific type in the crowdfunding websites. b_i represents a backer i and *type* represents the project's type. The value will be used to judge the degree of recommendation in the next module.

$$BackerPreference(b_i, type) = ShareTimes(b_i, type) + TypePreference(b_i, type) \quad (1)$$

$ShareTimes(b_i, type)$ represents the total times of sharing a specific project type in social media from backer b_i. For example, if a backer b_i shared a crowdfunding project about "Art" three times on Facebook, the value of $ShareTimes(b_i, Art)$ is 3. $TypePreference(b_i, type)$ represents b_i's preference about a type in the crowdfunding platform. If the value of $TypePreference(b_i, type)$ is higher, it represents the project type is more attractive for backer b_i.

In the Social Analysis Module, we will analyze user's preference to know what project type the backer focuses on. We compute preference and similarity to complete this module.

Individual Preference Analysis Module. In order to understand backer' preference, the module will gather user's personal information from Facebook, the most popular social network in the world.

$$\begin{aligned} &IndividualPreference(b_i, type) \\ &\quad = SocialPreference(b_i, type) * Similarity\left(\overrightarrow{b_i}, \overrightarrow{type}\right) \end{aligned} \quad (2)$$

We compute the value of $SocialPreference(b_i, type)$ by the following kinds of social data: (1) check-ins: check-ins records the service of social network to exhibit what his/her does or where his/her is, (2) pages: the page is a user likes or pays attention to on social media, (3) like: the like is a button that a user can click it on social media, like: Facebook and (4) comment: the comment is a user write or give the rank on Facebook.

Facebook has their rule to classify check-ins, pages, like, and comment so we just have to transform the social data to match the TypeTree. For example, user who like to check-ins in art exhibitions, we can infer his/her might be interested in the arts. Similarly, like and pages have the own category in Facebook, we just have to make sure the category to match the TypeTree.

$$SocialPreference(b_i, type) = checkins_{type}(u_i) + page_{type}(u_i) + like_{type}(u_i) + comment_{type}(u_i) \quad (3)$$

$$Similarity\left(\overrightarrow{b_\iota}, \overrightarrow{type}\right) = \overrightarrow{b_\iota}, \overrightarrow{type} = \sum_{i=1}^{n} \overrightarrow{b_\iota}, \overrightarrow{type_\iota} \quad (4)$$

Economy Capacity Analysis Module. The most important factor to consider is to make sure whether a potential backer user has the economy capacity to invest something. We will judge it through the analysis of occupation and background.

In order to understand user's economy capacity, we will ask user to fill in the questionnaire about some basic information, including: (1) ages: backer's ages, (2) educational background: backer's the higher academic degree, (3) work experience: to understand backer's income and (4) income: the salary of the backer.

3.3 Crowdfunding Recommendation Engine

After collecting enough information from the above four modules, we will use the weight values of four criteria, this mechanism can have the ability to measure the suitability-of-recommendation that the backer u_i will be recommended to invest the project p of creator u_j in a specific crowdfunding phase. We denote the suitability-of-recommendation of backer i as $Suitability(b_i, c_j, type)$. We calculate the value of $Suitability(b_i, c_j, type)$ by the aggregation of the weight value of each criterion with the corresponding score of the criterion which calculated by the social relationship, backer preference, individual preference and crowdfunding preference analysis module. The value of $Suitability(b_i, c_j, type)$ is measured as the Eq. 5.

$$\begin{aligned} Suitability(b_i, c_j, type) = {} & W_S(i) * SocialRelationship(b_i, c_j) + \\ & W_I(i) * IndividualPreference(b_i, type) + \\ & W_B(i) * BackerPreference(b_i, type) + \\ & W_E(i) * EconomyCapacity(b_i) \end{aligned} \quad (5)$$

After calculations in the above sections, we could generate a proper list for recommendation and exhibit it for the creator. The creator will receive a recommendation list which provides basic information about the going project: (1) the distance of the going project and (2) the phase of the going project. Besides, the backer list also provides five types of backer's information: (1) name, (2) picture, (3) social relations with the creator, (4) individual preference and (5) Facebook Personal Website: to offer the contact way to creators.

4 Experiment

4.1 Experiment Design

In our experiments, we have 282 users join the system. We use Facebook PHP SDK and Graph API to access their Facebook information after they agree the authorization. In the past 12 months, they have 27636 check-ins, 81216 posts, 133104 tags, 11280 fan paged liked, 345732 likes and 225600 comments. The average number of friends of each user is 280. The user's age is 18 to 40 years old. The gender distribution is 161 males and 121 females. The education background is 164 master degree, 112 university degree and 6 high school. 141 users have 1 to 2 work experience, 68 users have one work experience and 73 has no work experience.

In the proposed mechanism, we should know to compute the importance of four factors: social relationship, backer preference, individual preference and economy capacity. Users have to answer which factor is the most important to them with respect to different scenarios. According to AHP structure, we use the fundamental scale to represent the relative importance: 1 represents "equal importance", 3 represents "weak importance", 5 represents "essential importance" and 7 represents "very strong importance".

The evaluation we use questionnaire to understand user's feeling via likeness for the invitation. The scale of the scores which used to the questions was from 1 to 5.

4.2 Experimental Results

The Evaluation of Likeness. Figure 2 shows the results of users about how much do you like this project invitation in different models and scenario. The value of every model is average score.

Fig. 2. Likeness of the project invitation

According to Fig. 2, we can find that the random model has the lower value of the likeness of the project invitation and the phase recommendation model has the highest value. Besides, we can understand the social relationship has more influence to user.

The Evaluation of Share Rate. After the backer receives the project invitation, they can choose to "share" the system page via the Facebook plugin function (Fig. 3). The share times can obtain from our system record and is measured as:

$$ShareRate = \frac{\Phi ShareTime}{\Phi Invitation}$$

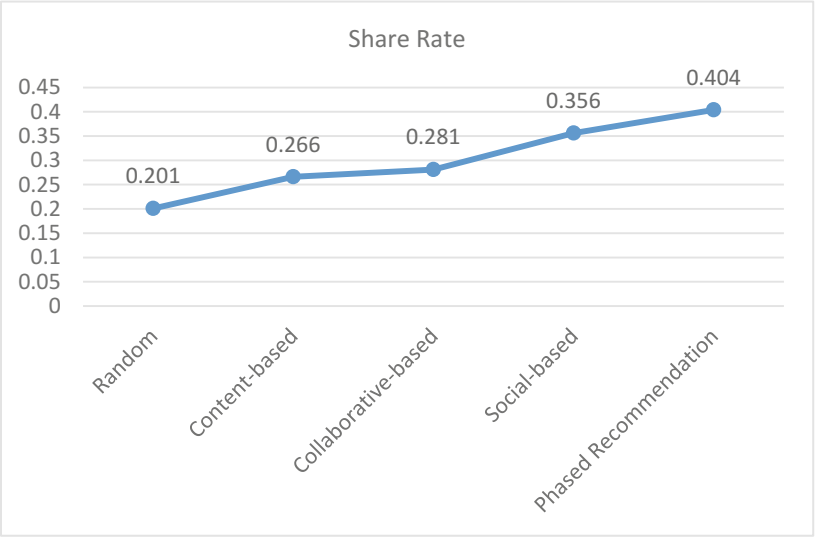

Fig. 3. The share rate of five model

5 Conclusion

We develop a new crowdfunding project recommendation mechanism and the contributions are as follows. First, from the system development perspective, we design an efficient and effective recommendation system for crowdfunding project. From the experimental results, we prove that our system can improve the backer's willingness to invest. Second, from the methodological perspective, we consider the multi-criteria factors of social relationship, individual preference and backer's preference and found that use the four criteria together can bring about the most perfect consequent for the recommendation. Third, from the practical perspective, the existing crowdfunding platforms, such as Kickstarter and Flying V, just offer a platforms for the creator so that the success rate sill couldn't over 50%. The approach of combining the social network,

Facebook, can analyze the user's preference and find the potential backer for the creator to overcome current problem of crowdfunding project.

There are some limitations in this research listed as following. First, the proposed mechanism gather related information from Facebook, however, there are more popular social network like: Twitter and Weibo. In the future, we can combine more social network to collect users' information and analyze users' preference exactly. Though more reliable sources, we could strengthen the recommendation for user. Second, our mechanism may have the problem of cold start, if the user of our system is too few, the recommendation would lose accuracy. Third, in fact, social networks only can offer a part of the interaction between two users because social network sometimes can't reflect the real world.

References

1. Entrepreneur. The Basics of Crowdfunding. Entrepreneur (2013)
2. Kickstarter. The year in Kickstarter 2014 in Kickstarter (2014). https://www.kickstarter.com/year/2014?ref=footer#intro
3. Zheng, H., Li, D., Wu, J., Xu, Y.: The role of multidimensional social capital in crowdfunding: a comparative study in China and US. Inf. Manag. **51**(4), 488–496 (2014)
4. Mollick, E.: The dynamics of crowdfunding: an exploratory study. J. Bus. Ventur. **29**(1), 1–16 (2014)
5. Chiu, C.M., Liang, T.P., Turban, E.: What can crowdsourcing do for decision support? Decis. Support Syst. **65**, 40–49 (2014)
6. Massolution.com. 2013 The Crowdfunding Industry Report (2013). http://www.crowdsourcing.org/research
7. gofundme. Top 10 Crowdfunding Sites (2014). http://www.crowdfunding.com
8. Kim, J.K., Kim, H.K., Oh, H.Y., Ryu, Y.U.: A group recommendation system for online communities. Int. J. Inf. Manag. **30**(3), 212–219 (2010)
9. Mishra, R., Kumar, P., Bhasker, B.: A web recommendation system considering sequential information. Decis. Support Syst. (2015)